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A best evidence systematic review of interprofessional education: BEME Guide no. 9

M. HAMMICK[1], D. FREETH[2], I. KOPPEL[3], S. REEVES[4] & H. BARR[5]

[1]UK, [2]City University, UK, [3]University of Westminster, UK, [4]University of Toronto, Canada, [5]University of Greenwich, UK

Abstract

Background and review context: Evidence to support the proposition that learning together will help practitioners and agencies work better together remains limited and thinly spread. This review identified, collated, analysed and synthesised the best available contemporary evidence from 21 of the strongest evaluations of IPE to inform the above proposition. In this way we sought to help shape future interprofessional education and maximize the potential for interprofessional learning to contribute to collaborative practice and better care.

Objectives of the review:

- To identify and review the strongest evaluations of IPE.
- To classify the outcomes of IPE and note the influence of context on particular outcomes.
- To develop a narrative about the mechanisms that underpin and inform positive and negative outcomes of IPE.

Search strategy: Bibliographic database searches as follows: Medline 1966–2003, CINAHL 1982–2001, BEI 1964–2001, ASSIA 1990–2003 which produced 10,495 abstracts. Subsequently, 884 full papers were obtained and scrutinized. In addition, hand searching (2003–5 issues) of 21 journals known to have published two or more higher quality studies from a previous review.

Topic definition and inclusion criteria: Peer-reviewed papers and reports included in the review had to be formal educational initiatives attended by at least two of the many professional groups from health and social care, with the objective of improving care; and learning with, from and about each other.

Data collection, analysis and synthesis: Standard systematic review procedures were applied for sifting abstracts, scrutinizing full papers and abstracting data. Two members of the team checked each abstract to decide whether the full paper should be read. A third member was consulted over any discrepancies. Similarly, each full paper was read by at least two members of the team and agreement sought before passing it to one member of the team (SR) for data abstraction. Other members of the team checked 10% of the abstraction records. Coding into a Statistical Package for Social Scientists (SPSS) data base led to collection of different outcome measures used in the primary studies via the common metric of an adapted Kirkpatrick's four-level model of educational outcomes. Additionally, a narrative synthesis was built after analysis of primary data with the 3-P model (presage-process-product) of education development and delivery.

Headline results: Government calls for enhanced collaboration amongst practitioners frequently leads to IPE that is then developed and delivered by educators, practitioners or service managers. Staff development is a key influence on the effectiveness of IPE for learners who all have unique values about themselves and others. Authenticity and customization of IPE are important mechanisms for positive outcomes of IPE. Interprofessional education is generally well received, enabling knowledge and skills necessary for collaborative working to be learnt; it is less able to positively influence attitudes and perceptions towards others in the service delivery team. In the context of quality improvement initiatives interprofessional education is frequently used as a mechanism to enhance the development of practice and improvement of services.

Introduction

Interprofessional education (IPE) has been invoked internationally (WHO 1988) and nationally by policy makers, health and social care professionals and educators as a means to improve collaboration and service delivery in fields such as child protection (Department of Health 1995), community care (Department of Health 1990), mental health (Sainsbury Centre for Mental Health 1997) and to deploy the healthcare workforce more flexibly (Department of Health 1997, 2000). It is argued that if individuals from different professions learn together they and their agencies will work better together, improving care and the delivery of service. This argument has a strong appeal for those working in the context of significant organizational and attitudinal barriers, encouraging them to create interprofessional learning opportunities. Published evidence to support the argument's proposition, although it is growing and improving, remains limited and thinly spread. This review identifies, collates, analyses and synthesizes the best available contemporary evidence to inform the proposition and help to shape future interprofessional education.

Correspondence: Marilyn Hammick, C/O BEME, Tay Park House, 484 Perth Road, Dundee, DD2 1LR, United Kingdom. Tel: +44(0)1 82 381224; email: mhammick@bemecdlaboration.org

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Practice points

- The review includes those international studies judged to provide the best available evidence on the impact of IPE until April 2005: it is inevitable given the amount of IPE presently being delivered that newly published work is available at the date of the review's publication.
- References cited in included studies were not hand searched.
- Journals likely to publish evaluations of IPE, but not abstracted by Medline were not hand searched.
- The grey literature was not included on this occasion (but see our UK review: Barr et al. 2000).

We have been reviewing evaluations of IPE since 1997 (Barr et al. 1999, 2000, 2005; Zwarenstein et al. 2000; Koppel et al. 2001; Freeth et al. 2002; Reeves et al. 2002). Results from our 2005 review of 107 high quality studies indicated that a wide range of positive outcomes were associated with IPE and that there were some mixed, neutral and negative reactions. There was a high proportion of work based initiatives, undergraduate IPE and in service IPE whilst less attention given team development and very little of the learning attracted academic credits. Box 1 lists some additional headline information from that review.

This present updated review of evaluations of formal IPE for the BEME Collaboration spans 1966–2005 and takes a lead from the call for 'best evidence' in the BEME title. Thus, we have restricted discussion to the 21 strongest evaluations of IPE from the 399 evaluations that we have reviewed.

Defining interprofessional education

Echoing the CAIPE (the UK Centre for the Advancement of Interprofessional Education) definition (CAIPE 1997 & 2006), which we helped to develop, for this review we defined IPE as follows:

> Interprofessional education is those occasions when members (or students) of two or more professions learn with, from and about one another to improve collaboration and the quality of care.

This definition has been extended as our work, and that of others in the field, has developed (see Glossary). Nevertheless, all understandings of IPE render it a subset of multiprofessional education (MPE), which is when members of two or more professions simply learn side by side whatever the purpose. IPE demands an interactive element in the learning experience. Examples of learners from different professions merely sharing lectures are therefore excluded from this review. Shared listening alone (Miller et al. 1999) will not, in our view, lead to interprofessional learning. Our focus is the potential for interprofessional learning to contribute to collaborative practice and better care. The 21 studies in this review indicate the diversity of international interprofessional education initiatives being delivered to many different teams of health and social care practitioners.

Box 1: Some headline information from a previous review.

Most of the 107 studies were from US (54%) & UK (35%)
The duration of the IPE was as follows: the majority were longer than 2 days, with 54% of 7 + days and 24% of between 2-7 days.
There was an equal distribution between hospital & community-based IPE (45% each).
Doctors & nurses were the most usual participants (89% & 82%).
The IPE was more likely to be post-qualification education (79% v 19%).

Review objectives

- To identify and review the strongest evaluations of IPE.
- To classify the outcomes of IPE and note the influence of context on particular outcomes.
- To identify and discuss the mechanisms that underpin and inform positive and negative outcomes of IPE.

Review methodology

Background and approach to review work

Our approach to the technical aspects of reviewing evaluations of IPE is influenced by the Cochrane Collaboration training received by four of us (HB, MH, IK & SR) in preparation for our first review of the effectiveness of IPE (Zwarenstein et al. 2000).

We developed and refined a comprehensive search strategy (see Appendix I www.bemecollaboration.org) and quantitative and qualitative data coding sheets (Appendix II www.bemecollaboration.org). Sources influencing the content of the qualitative data extraction sheet included Popay et al. (1998) and the Critical Appraisal Skills Programme (2002). Piloting established acceptable consistency among the review team and practicability for each new version of an abstraction form.

Standard systematic review procedures were applied for sifting abstracts, scrutinising full papers and abstracting data. Two members of the team checked each abstract to decide whether the full paper should be read. A third member was consulted if a difference of opinion arose. Similarly, each full paper was read by at least two members of the team and agreement sought before passing it to one member of the team (SR) for data abstraction. Other members of the team checked 10% of the abstraction records.

To facilitate comparisons and summaries data from the abstraction forms were further condensed into a SPSS data file. The variables coded included characteristics of the interprofessional learning opportunity (e.g. level, duration, learning and teaching methods), and outcomes categorized as shown in Figure 1 and discussed below. We were also interested in the robustness of the studies and coded for characteristics of the evaluation (e.g. rationale, design, and data collection).

The abstraction process included allocation of scores (out of five) for the quality of the study and the quality of the information provided (see below for application of these

Level 1: Reaction	Learners' views on the learning experience and its interprofessional nature.
Level 2a: Modification of perceptions & attitudes	Changes in reciprocal attitudes or perceptions between participant groups. Changes in perception or attitu de towards the value and/or use of team approaches to caring for a specific client group.
Level 2b: Acquisition of knowledge & skills	Including knowledge and skills linked to interprofessional collaboration.
Level 3: Behavioural change	Identifies individuals' transfer of interprofessional learning to their practice setting and their changed professional practice.
Level 4a: Change in organisational practice	Wider changes in the organization and delivery of care.
Level 4b: Benefits to patients/clients	Improvements in health or well being of patients/ clients.

Figure 1. Classification of interprofessional outcomes.

scores). Studies that scored at least four for both dimensions are included in this review. All team members read all the included studies ($n = 21$) and reviewed the associated SPSS data file and analyses.

Our intellectual approach to reviewing evaluations of interprofessional education is influenced partly by 'realistic evaluation' (Pawson & Tilley 1997), which stresses the embedded nature of all human action, foregrounding context and social processes as central to creating and understanding outcomes. It draws attention to mechanisms for change that act within dynamic contexts to trigger outcomes that are contingent upon the specific natures of the change mechanism and the context. Thus the realistic evaluation perspective eschews simplistic questions about IPE, such as "does it work"? More appropriate questions include:

- What types of IPE under what circumstances result in what types of outcome?
- What mechanisms for change are implicit in IPE interventions?
- How effective can these mechanisms be in the dynamic contexts of heath and social care?

What follows was not originally conceived as a realistic synthesis (Pawson et al. 2004), but we have paid attention to contexts, mechanisms and the contingent nature of outcomes. In keeping with the value of the emerging genre of realist review, we offer explanation rather than judgement and seek further understanding of the complexities of IPE (Pawson et al. 2005).

Inclusion/exclusion criteria

Type of education. The studies included in this review were evaluations of educational experiences that met the criterion 'occasions when members (or students) of two or more professions learn with, from and about one another' in accordance with our definition of IPE. They were thus all interactive learning experiences.

Elsewhere (Freeth et al. 2005) we have mapped a 'spectrum' of IPE. It is possible to simplify the range of IPE opportunities into three categories: formal (where explicit planning of IPE occurs), informal (where IPE occurs in the process of another planned activity) or serendipitous (truly ad-hoc encounters between different professionals providing opportunity for an exchange and interprofessional learning). In an earlier review (Barr et al. 2005) we included formal and informal IPE. Studies demonstrating only informal IPE tend to be concentrated in evaluations of quality improvement programmes for which members of different professions are brought together with the objective of improving care; and learning with, from and about each other is an integral part of the process.

For this review, we have taken a more focused approach and have included only studies evaluating formal IPE, albeit sometimes in conjunction with an element of informal IPE. Our aim is to distil key messages for those who wish plan education that explicitly has interprofessional aims, learning outcomes and methods.

Participants. We accepted studies documenting IPE initiatives attended by learners from at least two of the many professional groups in health and social care. Some studies also include other relevant occupations, such as police officers or schoolteachers.

Outcomes. In contrast to the Cochrane systematic review (Zwarenstein et al. 2000), the outcomes of learning were not restricted to those demonstrating impact on service users or service organizations. We also included:

- learners' reactions, which may not directly relate to an impact on professional behaviour or service, but may create a good foundation for developing a positive attitude to IPE and working with others,
- changes in learners' skills, knowledge or perceptions of and attitudes to others,
- changes in learners' behaviour.

Study type and grade

We included only peer-reviewed papers and reports. We placed no restriction on the evaluation methodology but graded the quality of studies in relation to fitness for purpose and the robustness of the execution. Studies graded at least four on each dimension were included: see section commencing on assessing the quality of evaluations for discussion of the five point quality scales.

Language of publication

We reviewed studies published, or having an abstract, in English or French. Fourteen abstracts (from more than 10,000) were discarded from the bibliographic database searches as a result of that decision.

Search strategies: bibliographic databases & hand searches

Two approaches were used to locate studies for inclusion in this review. Firstly, bibliographic database searches as follows: Medline 1966–2003, CINAHL 1982–2001, BEI 1964–2001, ASSIA 1990–2003. These were chosen to span health and

social sciences, including related education. There are substantial overlaps between them so we used *Reference Manager* Software to store abstracts and identify duplicates.

Using these different databases, we sequentially searched each of them to ensure the review included relevant health, social care and education literature. Sequential searching and processing of abstracts and papers took into account substantial overlap between the databases. For example, our CINAHL search identified 124 studies previously located in our initial Medline search. Early analysis of Medline, CINHAL and BEI searches indicated that pre-1990 IPE research was scant and of a poorer quality than post 1990. As a result we subsequently searched ASSIA from 1990. Given the large amount of relevant research contained in Medline we updated our initial search (1966–2000) from 2001–2003. In total, these searches produced 10,495 abstracts. Subsequently, 884 full papers were obtained and scrutinized. This process identified 353 evaluations of IPE. Twelve of these studies evaluated formal IPE and were graded highly on our two quality scores and are included in this review.

The comprehensive bibliographic search strategy that was developed built on experience from our earlier reviews of IPE. It evolved to capture the largest number of potential studies by specifying permutations of four key words and their synonyms: interprofessional, education, research and outcome. These were derived from two filter questions: is this a study of interprofessional education, and has it been evaluated? The illustrated strategy in Appendix I pertains to Medline. Other databases required minor modifications specific to their vocabulary or search terms.

One aspect of searching the databases that became increasingly clear was that the variable indexing of studies evaluating IPE prevented refinement to reduce the number of redundant abstracts during the process of conducting an updated search. The burden of reviewing thousands of abstracts and hundreds of papers was extending the time between update searches and the publication of filtered and synthesized results to an unacceptable degree. Overload had to be avoided. Many systematic reviews achieve this by limiting inclusion to specific study designs or limiting inclusion to studies that report specific types of outcome. We knew from our first Cochrane review that IPE literature does not lend itself well to these mechanical filters. The trade off between sensitivity and specificity (Petticrew & Roberts 2006) is too high. A more innovative approach was needed.

After analysing the findings from our database searches, we found that a small number of journals were repeatedly publishing high quality IPE evaluations. To capitalize on this, we decided to focus the last stage of our work on a targeted hand search of these key journals. Studies of IPE are widely dispersed across education oriented journals and specialist journals for the sector of care which the IPE addresses. Nevertheless there is some concentration of higher quality studies in certain journals. We revisited our previous review (Barr et al. 2005) which identified 107 studies of IPE that scored at least three on each of the five-point quality scales that we have developed. Still casting the net relatively wide, we identified 20 journals (Appendix III) that published two or more of the 107 higher quality studies listed in our previous review and hand searched these journals for the period January 2003 to April 2005. Our decision to limit this search in this way was pragmatic. It took into consideration the need for timely publication of the review, the time it would take to find relevant papers in the 47 journals that had only published one paper in our original group of 107 studies and the very low likelihood of finding more papers.

Our wider knowledge of the IPE literature, accrued through daily work, alerted us to an additional probable source of good quality studies: *Learning in Health and Social Care*, a new journal in 2002. This was hand searched from its inception to April 2005.

The hand searches identified 46 studies for potential inclusion. These were independently reviewed by two members of the team. Nine high quality studies of formal IPE (scoring at least four on each quality scale) were added to the set identified through bibliographic database searches, making a total of 21. Figure 2 summarizes both search processes and Table 1 summarizes the 21 studies reviewed.

Cross checking between the hand and bibliographic search methods confirmed that all nine studies identified by the hand searches would have been identified through the bibliographic database searches (along with 5455 mainly redundant abstracts). We cannot say with certainty whether we have missed any higher quality studies published in journals that did not feature in our list of hand-searched journals, selected as the most likely sources of robust studies of IPE. Nevertheless our daily work within the international IPE community gives us a good awareness of many current developments and most major studies. We continue to monitor publishing trends in IPE so that any advisable changes in our search strategies can be identified.

Assessing the quality of the evaluations

Two quality scores were allocated to each study to aid the selection of well-designed and clearly reported studies. In the way suggested by Huwiler-Muntener et al. (2002) we distinguished between 'quality of the study' and 'quality of the information provided'. Our overarching concerns were fitness for purpose, clearly articulated decisions and well-evidenced inferences.

The quality of study score reflected the design and execution of the study. For example, a good fit between the methodological approach and research questions; attention to ethical concerns; adequate recruitment and retention of participants; and appropriate analysis and inferences. The quality of information score reflected the statement of a clear rationale for the IPE and its evaluation, good contextual information, sufficient information on sampling, ethics and possible bias and an analysis described in sufficient detail.

Each quality score had an ascending five-point scale and only studies attaining at least four on both dimensions were eligible for inclusion in this review. No study scored five. Our scoring may have been too stringent, but consistently applied, served its purpose. We identified the strongest studies available, using a wide range of criteria which were tailored to the evaluation methodology.

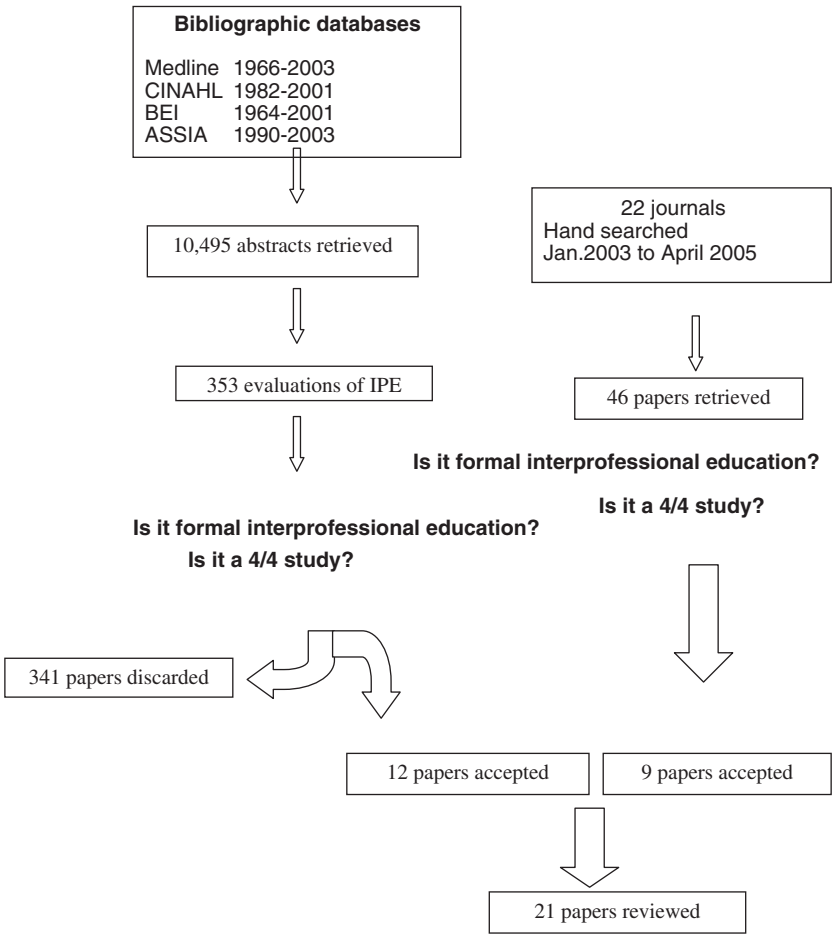

Figure 2. Literature searching and selection of papers for review.

Table 1. Summary of the 21 studies reviewed.

Authors	Year	Country	Practice context for IPE	Level & educational context
Barber et al.	1997	USA	Care for older people	Pre-qualification, classroom & practice-based
Carpenter	1995	UK	Mental health	Pre-qualification, university-based
Carpenter & Hewstone	1996	UK	Mental health	Pre-qualification, university-based
Cooke et al.	2003	UK	Breaking bad news	Pre-qualification, university-based, simulation
Crutcher et al.	2004	Canada	Diabetes care	Mixed (final year students & residents), classroom
Dienst & Byl	1981	USA	Ambulatory care	Pre-qualification, classroom & practice-based
Horbar et al.	2001	USA	Neonatal intensive care	CPD, practice-based quality improvement
Ketola et al.	2000	Finland	Primary care: cardiovascular disease	CPD, practice-based quality improvement
Kilminster et al.	2004	UK	Communication skills, team roles	Pre-qualification, university-based, simulation
Morey et al.	2002	USA	Emergency departments	CPD, practice-based quality improvement
Morison et al.	2003	UK	Paediatrics	Pre-qualification, classroom & practice-based
Mu et al.	2004	USA	Rural & underserved populations	Pre-qualification, practice-based
Nash & Hoy	1993	UK	Palliative care	CPD, residential workshops
Pollard et al.	2005	UK	Communication and teamwork skills	Pre-qualification, classroom & practice-based
Ponzer et al.	2004	Sweden	Orthopaedics	Pre-qualification, practice-based
Reeves	2000	UK	Community care/general practice	Pre-qualification, practice-based
Reeves & Freeth	2002	UK	Orthopaedics & rheumatology	Pre-qualification, practice-based
Shafer et al.	2002	USA	Chlamydial screening	CPD, practice-based quality improvement
Solberg et al.	1998	USA	Primary care: preventive services	CPD, practice-based quality improvement
Tucker et al.	2003	UK	Clinical skills	Pre-qualification, university-based, simulation
Tunstall-Pedoe et al.	2003	UK	Common foundation programme	Pre-qualification, university-based, some practice visits

Data analysis–an outcomes model

As a means of distilling all the different outcome measures used in the primary studies, it was necessary to develop what Shadish et al. (2002, p. 425) called a 'common metric'. We adapted Kirkpatrick's (1967) four-level model of educational outcomes for this (which may be more easily accessed through Thackwray

(1997: 17–28). The original model seeks evidence in relation to:

- learners' reactions;
- learning (mainly conceptualized as the acquisition of skills and knowledge);
- behavioural change;
- results stemming from the learning opportunity, particularly in relation to intended outcomes.

Kirkpatrick did not see outcomes in these four areas as hierarchical; rather he wanted to encourage more holistic and comprehensive evaluations to better inform future policy and development. He acknowledged that at each level it becomes progressively more difficult to gather trustworthy data related to the educational intervention. Thus, it is not surprising that many course leaders confine themselves to eliciting reactions from a feedback form that marks the end of the education or training session.

In common with other authors (e.g. Issenberg et al. 2005) we felt Kirkpatrick's model was a useful starting point as a common metric for analysing the outcomes (planned and unplanned) reported in evaluations of IPE. After initial tests of the model in use, however, elaboration was deemed necessary. This was especially apparent in the category of 'learning', and for level four, results, where there seemed to be value in distinguishing between outcomes that related to people and those that had an impact on service delivery.

By an iterative process of reflection upon the literature and discussion (among the group and with practitioner and academic peers) we agreed upon six categories. These are summarized in Figure 1. We have used these categories since 2000 (Barr et al. 2000). They have proved useful and, contrary to our initial expectations, sufficient to encompass all outcomes in the hundreds of studies reviewed to date.

Data analysis – an explanatory narrative

From previous review work we were mindful that practitioners and policy makers wanted new knowledge to assist in the development of IPE. We synthesised the studies in this review into a narrative to encourage theory development and show links between mechanisms (Shadish et al. 2002). From this we were able to draw out implications for practice and key messages for those developing and delivering IPE. This approach to analysis accommodated the eclectic nature of the 21 evaluations and contrasts sharply with more traditional meta-analytical techniques.

Elsewhere (Freeth et al. 2005) we have suggested the 3-P model (Biggs (1993), building upon Dunkin & Biddle (1974)) as a useful tool for describing and analysing IPE, with utility for putting IPE into practice. The 3-P (presage, process, product) model of learning and teaching was originally devised by Biggs (1993). In his paper, Biggs regarded 'presage factors' as the socio-political context for education and the characteristics of the individuals (planners, teachers and learners) who participate in learning/teaching. 'Process factors' were regarded as the approaches to learning and teaching that were employed in an educational experience and 'product factors' were seen as the outcomes of the learning. Reeves & Freeth (2006) recently applied the 3-P model to the evaluation of an interprofessional initiative in mental health. They found that the model was useful in helping to untangle the complex web of factors that promoted and inhibited success in this initiative. In particular, the model proved effective in yielding new insights, making connections clearer and highlighting the key importance of presage in relation to process and product. Thus the 3-P model (Figure 3) served as an analytical framework for the 21 studies and the means of presenting the emergent review findings.

After initial whole group discussion of our individual critical readings of the 21 papers, two pairs of reviewers (HB/DF and MH/IK) independently distilled issues (each pair focussed on 10 or 11 studies) that mapped onto the 3-P model and then agreed a blended list. This work involved populating the presage, process, product sections with extracted points and creating subheadings and extra categories as needed. We looked for real and influential mechanisms within the particular setting in which the IPE under evaluation was delivered (Pawson and Tilley 1997). This open coding stage was followed by axial coding by the fifth reviewer (SR). This sought to merge the two sets of open coding results: expanding or collapsing themes and searching for contradictions and disconfirming cases. At this point a draft narrative emerged that was subsequently discussed and refined by the review team who agreed the final narrative findings given below.

Results

Overview of the studies included in the review

The 21 studies were published between 1981 & 2005; the majority since the turn of the century. Studies were divided between Europe and North America (UK 11, USA 7, Canada 1, Finland 1 and Sweden 1).

Most (15, 72%) of the studies evaluated IPE delivered to undergraduate health professions' students, those most often participating being from medicine and nursing (13 studies each) and physiotherapy (seven studies), with pharmacy, occupational therapy, dentistry, social work and midwifery appearing less often. These studies included between two and six professions (mode = 2). The six remaining studies evaluated IPE at in-service continuing professional development level, with doctors and nurses being the most frequent participants.

Synthesizing evaluations of IPE using the 3-P model

The findings are presented in a narrative based on the 3-P headings, supported where relevant by descriptive statistics drawn from the SPSS file which resulted from the abstraction process. Firstly, we comment on the presage factors under three headings: context; learner characteristics and teacher characteristics.

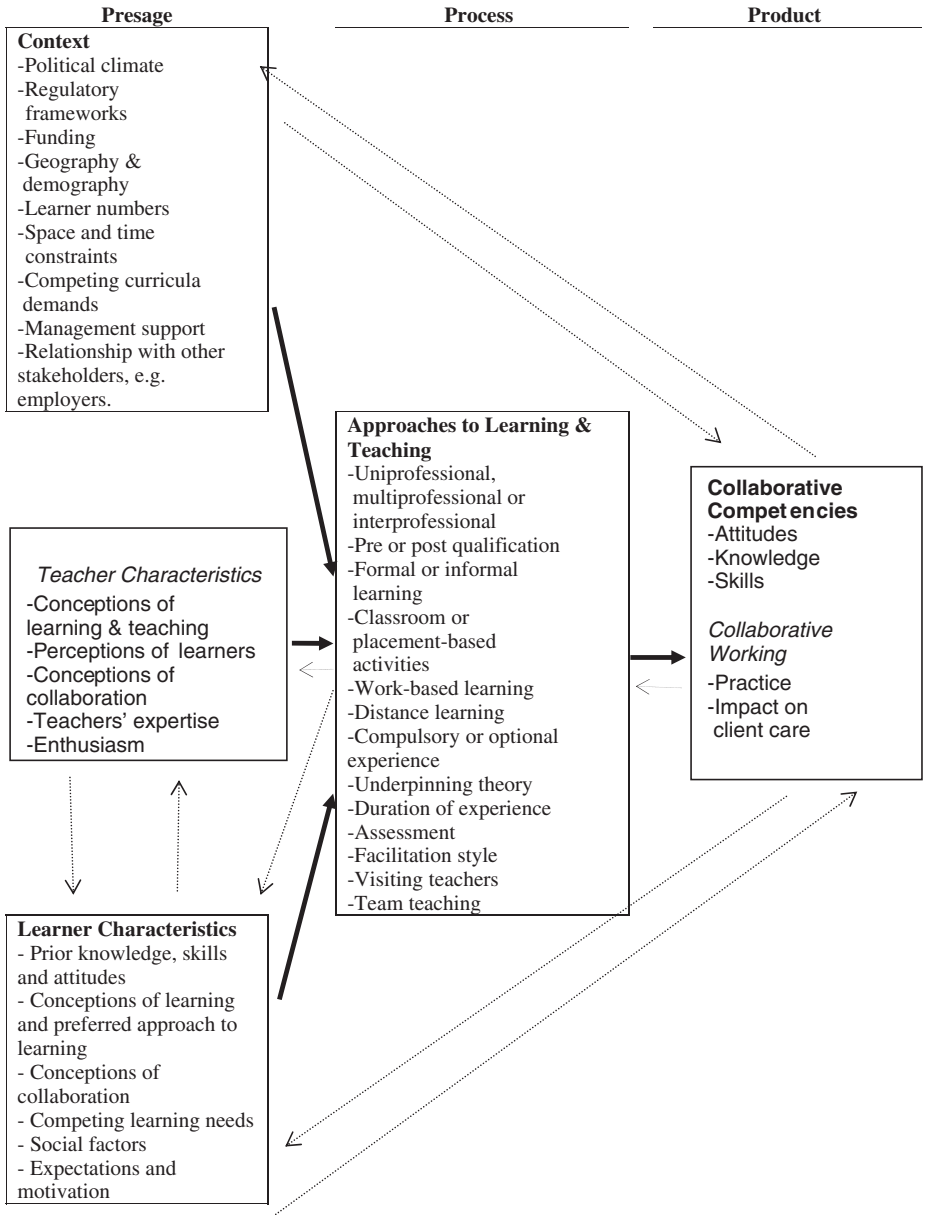

Figure 3. The 3-P model used as the analytical tool.
Source: adapted from Freeth & Reeves (2004) and first published in Freeth et al. (2005) Evaluating Interprofessional Education: Self-Help Guide Higher Education Academy, Learning and Teaching Support Network for Health Sciences and Practice: London.

Presage: the context of the IPE

This section considers drivers for the development of IPE: geography and demography, learner numbers and professional mix, turning finally to resources.

Drivers for interprofessional education

Normally, IPE occurs as the result of a desire to improve patient outcomes or service delivery through improvement in interprofessional collaboration (also referred to as team work). The drivers behind this desire can be described as either top-down or bottom-up and are frequently supported by IPE champions.

Top-down drivers include government policy. For example, Carpenter & Hewstone (1996) reported IPE that grew from an earlier project to identify organizational requirements and training needs to implement the then new UK government policy on caring for people in community settings rather than in hospitals. That project concluded that

'the best way of learning to work together was by doing it: taking an active part in a project with agreed joint and realistic objectives to develop a joint system helped participants learn about each others' tasks, roles and skills and how they could collaborate in a shared model of care' (p. 240).

Topics (in their follow-on course for final year social work and medical students) included alcohol abuse, dealing with psychiatric emergencies, deliberate self-harm and community services for people with learning disabilities.

Cooke et al. (2003) cited the call by the NHS (National Health Service) in the UK for eradicating rigid professional demarcation. They selected training in communication skills for breaking bad news as vehicle for an IPE pilot course for medical and nursing students. Shafer et al. (2002) cited calls by a number of professional organisations for improvement in Chlamydia screening among adolescent girls as a driver behind evaluating the impact of an IPE initiative in paediatric clinics.

Another top-down stimulus which might be said to be an amalgam of governmental, professional and public drivers arises from the need to reduce medical error. Morison et al. (2003); Tucker et al. (2003) and Tunstall-Pedoe et al. (2003) included, as part of their rationales for implementing interprofessional education, responses to the enquiry in the UK into the management of children receiving complex heart surgery (which criticised teamwork in the health care professions and linked this with poor performance). Similarly, Morey et al. (2002) made the link between adverse events and teamwork behaviour in support of their argument that teamwork training can prevent or mitigate such events. Here, research that originated with aviation crew resource behaviour (CRM) is applied to emergency medical care as an equally high stakes environment.

Naturally, top-down drivers need translation into action. Thus, the work of champions, such as the medical and nursing school deans described by Reeves & Freeth (2002), becomes a part of the presage as what can, perhaps, be called a transition driver. Morey et al. (2002) identified a need for leadership at all levels of the organization, not only at the team level, particularly to support continued commitment to change. Awareness of these issues shaped the IPE work by Shafer et al. (2002). They identified the need for support from opinion leaders who were interested in adolescent health to 'ensure effective implementation of practice change strategies' (p. 2851).

The development of IPE initiatives that evolve from 'bottom-up' interests in improving collaboration is also described. For example, Barber et al. (1997) described the evaluation of the Life Span Forum curriculum that developed from the recognition that the

> old-old age group of elderly require a diverse range of complex services . . . and co-operative planning among multiple disciplines (p. 48).

The course, developed by a local group of gerontology professionals provided 'supervised practice in collaborative experiences' (p. 49). Mu et al. (2004) reported interprofessional rural training in the US as a response to health care providers' identification of the challenge of 'meeting the health care needs of residents in rural and underserved areas' (p. 125). Another 'bottom-up' driver for developing IPE has been the need to ensure that knowledge transfer to relevant professionals not only re-enforces appropriate knowledge and skills, but also facilitates learning about how to work together in complex situations, e.g. in neonatal intensive care (Horbar et al. 2001) or addressing detection of risk factors for cardiovascular disease in primary care (Ketola et al. 2000).

Geography and demography

Overall there was little information about some of the context features, such as geography, age profile, gender and ethnicity that might play an important role in shaping IPE programmes, participants' experiences and possibly outcomes: although we will return to gender in the section on learner characteristics. One study (Mu et al. 2004) mentioned a split site delivery of the programme for one cohort of students, yet this challenge to programme design did not appear to affect the outcomes.

Learner professions and numbers

Particularly at pre-qualification level, there is a need to develop IPE that can be delivered to large cohorts of students. Pollard et al. (2005) evaluated IPE delivered to 840 students from 10 pre-qualifying programmes. Most studies (17, 81%) described IPE that limited complexity by including no more than four professional groups. The IPE models described by Dienst & Byl (1981); Barber et al. (1997) and Mu et al. (2004) showed how sustainable IPE for interprofessional student teams can be delivered in care settings.

The widely differing numbers of students and practitioners across professions is also influential. For example Morison et al. (2003) described how a medical student cohort twice the size of a children's nursing cohort was accommodated by delivering the programme to some interprofessional and some uniprofessional groups.

Resources

Resources such as time, spatial factors and management support emerged as key determinants in establishing and sustaining IPE initiatives. One of the aims set by Kilminster et al. (2004) (for their evaluation of three IPE workshops for medical, nursing and pharmacy students) was to assess the 'additional benefits' of the workshops because 'IPE is complex and time consuming to arrange and sustain' (p. 719).

Morey et al. (2002) commented on the role that physical layout of a department and 'ongoing management efforts' play in enabling learnt teamwork behaviour. Carpenter & Hewstone (1996) reported differences in the perception of institutional support by the participants, saying that it does 'not auger well' (p. 254) when, as in their example, medical students not only have low expectations of the IPE but perceive the intervention as not being supported by their institution.

An important issue was the limited time and identifying commonly available time for IPE initiatives within pre-registration professional courses. In a study of IPE for clinical skills Tucker et al. (2003) reported that 'timetabling the sessions to identify times when all students were free was problematic' (p. 634). Practical issues of shift and timetable incompatibility were the most significant barriers to the successful practice-based IPE reported by Morison et al. (2003). Students in the study by Crutcher et al. (2004) said that one of three worst things about a half-day diabetes teaching programme was that it was 'too short', and another that there was 'not enough information', with broad

agreement that 'interdisciplinary teaching and learning was helpful' (p. 441).

Thirteen (62%) of the primary studies acknowledged specific external project funding to develop and/or evaluate the IPE. The reporting of funding varies between journals and over time so the proportion is probably a little higher. Time-limited external funding provides an important boost for innovation in IPE but the challenge then becomes one of embedding the achievements within normal budgets.

Presage: teacher characteristics in IPE

The 3-P model identifies teacher characteristics as key determinants of educational processes and outcomes: several studies in this review addressed the facilitation of IPE and supervision of interprofessional practice. In the study by Ponzer et al. (2004) the 'quality of the supervision was the most important contribution to student satisfaction' (p. 735).

Reeves & Freeth (2002) revealed that facilitators on an interprofessional training ward adopted styles of facilitation with their student teams that ranged from offering high levels of encouragement and direction on how to collaborate as an interprofessional team through to minimal input. These facilitators tended to 'work in parallel' with each other leading the authors to conclude that they had 'missed a valuable opportunity to be role models for good interprofessional practice' (p. 47). Reeves (2000) found that teachers felt unprepared for facilitating interprofessional groups of medical, nursing and dental students in seminar discussions. Linked to this, Morison et al. (2003) noted that there were 'staff training implications if educators are required to act as interprofessional role models' (p. 102). Elsewhere, visiting teachers or facilitators were mentioned in studies describing multi-centre quality improvement initiatives. Their input was of two types: teaching the team about quality improvement methodology (Shafer et al. 2002) or facilitating reflection on the proposed changes to practice (Horbar et al. 2001).

Presage: learner characteristics in IPE

We found abundant details on this aspect of presage and the following section looks at learner characteristics such as expectations, beliefs and motivations about IPE, collaborative care and other professions.

Carpenter (1995) and Tunstall-Pedoe et al. (2003) both noted prior positive attitudes towards IPE amongst participants. Following an invitation to participate in IPE there was a mixture of mostly positive responses from medical and nursing students about the utility and contact with another profession and an awareness of the 'sources of difficulty between the professions' (Carpenter 1995, p. 268). Tunstall-Pedoe et al. found that the more mature and experienced learners were more favourably disposed towards IPE than the younger and less experienced learners. Kilminster et al. (2004) documented learners' prior experience of IPE and found it to be limited; thus we have little evidence of the influence of previous IPE on participant attitudes to a subsequent IPE event.

Differences between the willingness of students from different professional groups to participate in optional IPE emerged in some studies. Reluctance was often linked to structural issues, such as clashes with profession-specific teaching or inequalities in assessment, rather than general antipathy. Reeves (2000) found that nursing students joining, at relatively short notice, an IPE placement organised originally for medical and dental students experienced clashes with their profession-specific lecture schedule and the rapid incorporation of this placement into their programme prevented the learning being summatively assessed. Similarly medical students in the study by Morison et al. (2003) 'found it difficult to justify spending time on learning that was not being assessed' (p. 100). Medical students in a study by Cooke et al. (2003) were more reluctant to volunteer to participate in IPE, having completed a similar uniprofessional course previously. These studies reveal justifiable reasons for reluctance. Also, the desire to 'maintain some professional distance and acquire skills . . . to do it alone', as found by Cooke et al. (2003), also places a limit on the benefit of interprofessional exchange. Reeves and Freeth (2002) noted that the success of an IPE initiative is only sustainable if initial problems are resolved; in their case 'student participation in team duties' (p. 51).

Stereotyping and negative views of respective professional roles was another presage factor identified in a number of studies. Students in the study reported by Cooke et al. (2003) thought that set professional stereotypes and hierarchies could be a problem in IPE. Reeves (2000) found that many first year students involved in a primary care IPE initiative had entered their respective professional courses with a stable set of traditional (largely negative) stereotypes of other professionals. This shaped their early interprofessional interactions. Whilst each student group in a study by Carpenter (1995) rated themselves higher than others, the academic quality of medical students was rated overall higher by social workers and that of the social workers improved in the view of the medical students over the course of the IPE in the work by Carpenter & Hewstone (1996). More differentiated pre-IPE views about other professions emerged in the Tunstall-Pedoe et al. (2003) study. For example, medical students were considered less caring, more arrogant, and highly academic by nursing and allied health professions' students, whilst medical students rated the other groups as less academic. This study concluded that 'any notion that students arrive without preconceived ideas about other professions is misplaced' (p. 169).

Pollard et al. (2005) in the UK reported that, for students from professions that included medicine, nursing, midwifery and radiography, 'professional orientation strongly influences interprofessional learning' (p. 264). This study also shows clearly that age, previous work experience and profession interact in a complex way to influence students' views about other professionals and collaborative care. Other complexities emerged in attitudes to collaboration. Dienst & Byl (1981) reported positive attitudes towards collaboration at the beginning of the course but resistance to team approaches to

care. The study reported by Tucker et al. (2003) revealed that fear of failure in front of others is felt by students regardless of their professional background.

Gender is a key element of presage in our 3-P model. One study in this review reported gender differences following the delivery of an IPE initiative. Pollard et al. (2005) found that female nursing, radiography, physiotherapy, diagnostic imaging, midwifery, occupational therapy, social work students held more positive attitudes towards IPE than the male students. The majority of participants in IPE are women because most health care professionals are women. One study (Kilminster et al. 2004) documented the influence of a gender imbalance on group dynamics: reporting that the male participants, and the doctors (in this case, pre-registration house officers) were more likely to be involved in role play and appeared to dominate the discussion.

Process

Many factors influence the process of teaching and learning as indicated by the list in the 3-P model (Figure 3). Our analysis of the 21 studies in this review groups these features into either the process of facilitating interprofessional learning or that of curriculum design for adult learners: a level of abstraction related to the diversity of the educational events evaluated in the primary studies.

Facilitating interprofessional learning

The wider IPE literature provides some useful discussions of what attributes are required for an effective interprofessional facilitator, such as an ability to work creatively with small groups and knowledge of the historical relationship shared by the health and social care professions, for example, Holland (2002) and Oandasan & Reeves (2005). Our analysis of how learning was influenced and mediated by facilitation practice during the delivery of the IPE is, of course, inextricably linked to the discussion above about teacher characteristics as a presage factor.

A number of studies reported on varying aspects of the facilitation process within their different initiatives. For example, three, Nash & Hoy (1993); Reeves & Freeth (2002) and Mu et al. (2004) found that the use of regular reflection upon personal and professional IPE experience helped staff in their facilitation role. In addition, a few studies focused on teambuilding or team learning activities as the process for IPE, e.g. Barber et al. (1997) or Morey et al. (2002).

Other issues to emerge included the need for ongoing coaching and mentoring by interprofessional facilitators to assist the learners with developing and maintaining their teamwork expertise (Morey et al. 2002) and the importance of providing clinical staff with interprofessional facilitation experiences, as these were regarded as important professional development opportunities (Reeves & Freeth 2002). Dienst & Byl (1981) reported an evaluation of IPE in practice that found a closer relationship between the student's team experience and the clinical practice environment than to team development seminars.

Curriculum design for adult learning

Adult learning theory (e.g. Knowles 1975) suggests that learning is more likely to become embedded if the learner has a degree of control over the pace and content of learning and the area under study is personally and professionally relevant. The question of who exercises choice and control in the content and process of interprofessional learning thus becomes important.

This section addresses issues related to adult learning theory as identified in the 21 primary studies. In this we are following the premise of Knowles that adults learn best when there is collaboration between the learners and the facilitators of learning, where mutual respect is the basis of their relationship and informs curriculum development. In other words, a context where there is trust in teachers' expertise in the field and in learners' abilities to identify learning pathways and content relevant to their needs.

Firstly, we discuss learner choice and participation in curriculum design; secondly, customization and authenticity of the learning experience. Finally we take a brief look at reflection and informal learning in IPE.

Learner choice

Learner choice operates at different levels: choice about participating, choice about what you engage with or what is addressed during the IPE, choice about how you break up into small groups. We have the following examples from 16 of the 21 studies that documented the degree of choice given to students.

In six studies learners were given full choice of whether or not to participate (3 undergraduate and 3 postgraduate); in four undergraduate students' attendance at the IPE was compulsory; whilst an element of choice was present in the remaining six studies, equally divided between undergraduate & post-graduate courses.

IPE delivered to a group of learners is often initiated by others: either as workplace learning, (Solberg et al. 1998; Horbar et al. 2001; Morey et al. 2002; Shafer et al. 2002) or through curricula designed for undergraduates (Carpenter & Hewstone 1996; Tunstall-Pedoe et al. 2003; Ponzer et al. 2004; Pollard et al. 2005). In these cases either managers volunteered their unit or team or teachers agreed to implement IPE: the learners, it seems, did not have a choice. However, in quality improvement studies, i.e. those where IPE was an integral part of introducing change into clinical practice and where team members actively identified relevant issues and the obstacles to improvement, their motivation was an important ingredient in the process of change, e.g. Horbar et al. (2001).

One feature of some of the undergraduate programmes was the different degree of compulsion to attend the IPE. For some groups of students this was compulsory and for the others on the same course it was voluntary (Carpenter 1995; Kilminster et al. 2004) or they had freedom to develop ways of working together (Dienst & Byl 1981).

A very mixed picture of the link between the learners' degree of choice of participation and their contribution to the design of their learning emerged from our analysis. In two studies (Nash & Hoy 1993; Tucker et al. 2003) the curriculum

had congruence with principles of adult learning. In contrast, seven studies reported top-down design and seven more learner oriented design.

To take some of the mismatches: an attendance might have been compulsory in Carpenter & Hewstone's (1996) work, yet the students were actively involved in shared planning of managing a case. In the study by Morey et al. (2002) the clinical units participating were self-selected, but an expert panel designed the input. In four service quality improvement initiatives, (Solberg et al. 1998; Horbar et al. 2001; Ketola et al. 2000; Shafer et al. 2002) groups of professionals were volunteered by their managers but they identified their gaps in knowledge and worked together in a search for better patterns of care. The one study that measured differences in outcomes between those who volunteered and those who were required to attend an IPE course reported no discernible differences between groups (Kilminster et al. 2004).

Customization & authenticity

Shafer et al. (2002) considered that adaptability to each clinic (customization) to be a strength of the IPE that they studied. Horbar et al. (2001) reported a similar approach, with participants selecting the potentially better practices for development according to their unique institutional situation. Kilminster et al. (2004) reported a study of three half-day experiential workshops involving simulated patients (SPs) for doctor, student nurses and pre-registration pharmacists where situations the participants found difficult at work were used to develop clinical scenarios that the teams then explored with SPs. The sessions were 'held in the Clinical Skills Learning Centre to establish reality' (p. 719) with facilitator or participant initiated stops to permit reflection. Being able to receive feedback and a safe learning environment were perceived as useful. Working with SPs 'provided a powerful learning experience' (p. 723). Cooke et al. (2003) reported on IPE that incorporated SPs but students' views of working with SPs were not a focus of the evaluation. However, the medical students, who had previously completed a very similar uniprofessional programme, commented on the 'added realism that nursing students had bought to the programme' (p. 142). The IPE studied by Crutcher et al. (2004) gave prominence to experienced patients as teachers and this was the one of the 'best things' about the event according to the participants.

Customization extends beyond being relevant and appropriate to the participants professional practice to that of the individual learners unique learning context. Kilminster et al. (2004) reported the recognition of different levels of prior experience and knowledge by the adoption of a learning approach that enabled each participant to 'enter and leave the workshops at different points' (p. 723). The duration of the IPE was reported as important by Mu et al. (2004) with longer courses associated with more positive effects on the students' perceptions.

The studies in this review also revealed that IPE is often a valuable adjunct, most noticeably for post registration IPE initiatives delivered with the underlying purpose of addressing a practice development need. In such cases it can be argued that the IPE is secondary to this need and as such the learning team is initially formed with practice development in mind. In other words, the interprofessional nature of the learning group was not the primary aim of the IPE. So, for example, Solberg et al. (1998) organized teams to deliver Improving Prevention through Organization, Vision and Empowerment (IMPROVE) interventions by interprofessional teams that participated in IPE prior to delivering the intervention. In this case no specific teamwork training was given.

In contrast, Morey et al. (2002) advocated that team training was essential to implement and sustain changes in the delivery of error free and improved emergency care. They also emphasised the importance of the regular and reliable practice of communication and coordination behaviours. But for Ketola et al. (2000) difficulties in conducting a quality improvement programme were overcome by the IPE development team being interprofessional. Teaming up led to enjoyment and completion of the programme. Cooke et al. (2003) found that the interprofessional aspect of the course was 'the most enjoyable feature', (p. 141) according to the students.

Reflection

A number of studies explicitly documented the use of team reflection time (Nash & Hoy 1993; Barber et al. 1997; Reeves & Freeth 2002; Cooke et al. 2003; Kilminster et al. 2004; Mu et al. 2004; Ponzer et al. 2004). This could range from happening informally (yet was a part of the design) during a van ride to the location (Mu et al. 2004) to integration throughout the learning experience (Barber et al. 1997).

Informal learning

We have argued (Freeth et al. 2005) that informal interprofessional learning is important. Thus the social times within IPE, such as refreshment breaks (e.g. Morison et al. 2003) and shared journeys (Mu et al. 2004) during which learners from different professions can interact, could enhance positive attitudes to others and reinforce formal input. The IPE in one study was designed with this explicitly in mind in order to 'foster a collegial atmosphere' (Horbar et al. 2001, p. 15). Two studies found that social factors (in both cases, this was time spent together socially) played an important role within the IPE experiences of learners (Nash & Hoy 1993; Reeves 2000). Morison et al. noted 'it was also apparent that only students interested in learning about the other profession used these opportunities' (p. 98).

Product

The key products of an educational intervention are positive learning outcomes for the participants. For IPE these extend across the range of relevant knowledge, skills and attitudes deemed necessary for confidence and capability in the practice of collaborative care. For in-service IPE and interprofessional continued professional development, product also extends to changes in practitioner behaviour, to service delivery and patient/client care. This is of course also a far

Table 2. Diversity of reported outcomes across the 21 studies.

Outcomes		Positive	Neutral	Mixed	Not reported
1	Reaction	12	0	2	7
2A	Perceptions & attitudes	5	1	6	9
2B	Knowledge & skills	10	0	1	10
3	Behaviour	5	0	1	15
4A	Service delivery	2	0	1	18
4B	Patient/client care	4	0	1	16

reaching aim of undergraduate IPE but, as our findings attest to, it is much more difficult to measure.

Below, we report outcome data across the six levels of our adapted Kirkpatrick model described earlier. This is summarized in Table 2. The absence in this table of a column indicating negative outcomes only is a consequence of the reporting of these within the primary studies. For clarity, we include reports of negative findings, where these were given, in the following sections. Firstly, however, we comment on the challenges of reporting the products of an educational intervention as complex as IPE.

Diversity across outcomes

Different outcomes are, perhaps, to be expected given the diversity of any group of interprofessional learners. This is not necessarily simple or simply related to their profession as discussed above with reference to the results of Pollard et al. (2005). Horbar et al. (2001, p. 21) acknowledged that their heterogeneous results are 'unsurprising' given 'multiple factors' at work in improvement interventions. Barber et al. (1997) suggested that IPE can 'ameliorate' differences related to gender and discipline towards 'interdisciplinary' teams (p. 37). Diverse outcomes may also include a worsening of attitudes. For example, Carpenter and Hewstone (1996), found that 'in terms of change in "overall attitude" out of the 85 participants, 46 become more positive, 16 (19%) became more negative and 23 did not change' (p. 250).

Overall, more positive outcomes are reported than either mixed or neutral and this is especially noticeable for the learners' reaction to IPE (11/13) and changes in knowledge and skills (10/11). No negative outcomes are reported in the 21 primary studies but these may be covert in the reporting of mixed outcomes (see Table 2). There are fewer instances of mixed outcomes of reaction to the IPE (2/13). Similarly, of the 11 studies that measured changes in knowledge and skills only one reported that these were mixed.

More studies reporting on perceptions and attitudes reported mixed reactions (6 of 12, 50%) from the participants. Fewer studies, (Morey et al. 2000; Cooke et al. 2003; Morison et al. 2003; Kilminster et al. 2004; Mu et al. 2004; Pollard et al. 2005) reported on changes in behaviour. The only mixed outcomes in this group come from Pollard et al. (2005) who reported on perceptions of interprofessional interaction by students across 10 professional programmes. We discuss these findings further in relation to learner outcomes.

Types of evaluations

The widest ranging evaluations of IPE outcomes were Dienst & Byl (1981); Morey et al. (2002) and Reeves & Freeth (2002). These evaluations all acknowledged external funding. Dienst & Byl's work with nursing, pharmacy and medical student teams was supported by the US Bureau of Health, Manpower Training who had supported similar previous work. These authors note that for their study evaluation was given 'significant emphasis' (p. 282). Reeves and Freeth (2002) were also funded by a health related body (Special Trustees of St Bartholomew's Hospital, UK). In contrast, funding for the emergency department IPE evaluated in Morey et al. (2002) came from the US Army Research Laboratory.

Despite challenges in measuring and interpreting outcomes of IPE it is possible to identify commonly reported outcomes and make inferences from them. We discuss this firstly in respect of learners and then for service delivery and patient/client care.

IPE Outcomes for learners: reactions, knowledge, skills and attitudes

Table 2 shows that the 21 primary studies focused predominantly upon measuring either reaction to the education ($n=14$), participants' attitudes towards other professions or interprofessional teamwork (e.g. Carpenter 1995; Tunstall-Pedoe et al. 2003); or knowledge and attitudes to others in relation to certain patient/client groups (e.g. Barber et al. 1997, older people; Crutcher et al. 2004, diabetes). Others focused on gaining a detailed qualitative understanding of IPE participants' experiences (e.g. Cooke et al. 2003; Kilminster et al. 2004) and others on the behaviour of health care teams and associated clinical outcomes (e.g. Solberg et al. 1998; Horbar et al. 2001).

Learners' reactions to IPE, their changes in perception & attitude and knowledge & skills (categories 1, 2a and 2b) are each evaluated by at least half of the 21 primary studies. Nine studies (43%) only report outcomes within these categories (1, 2a, 2b), (viz: Nash & Hoy 1993; Carpenter 1995; Carpenter & Hewstone 1996; Barber et al. 1997; Reeves 2000; Tucker et al. 2003; Tunstall-Pedoe et al. 2003; Crutcher et al. 2004; Ponzer 2004).

Two of these, both before and after studies [B&A] (Barber et al. 1997; Crutcher et al. 2004), linked their evaluation to undergraduate interprofessional learning outcomes. Carpenter (1995) and Carpenter & Hewstone's (1996) developed a survey tool to evaluate IPE based on contact theory and showed almost completely positive results (some level 2a

results were mixed). Their questionnaire was later developed by Tunstall-Pedoe et al. (2003) for an evaluation of a Common Foundation Programme for undergraduates from five professions. Reeves (2000) eschewed the before & after design for a 'process-based approach' which showed how attitudes to IPE can be influenced by the setting (in this work the community IPE was perceived as low status) and whether or not it is assessed.

It is unsurprising that all but one of the studies discussed above evaluated IPE for undergraduate students. The time gap between their interprofessional learning and qualification clearly presents a challenges associated with evaluating levels 3, 4a and 4b outcomes. Note however that Barber et al. (1997) identified the need to evaluate other outcomes and Crutcher et al. (2004) comment that it is insufficient to only evaluate changes in knowledge and skills.

Exceptionally, Nash & Hoy (1993) used a self-rating pre and post course questionnaire to evaluate the impact of a residential terminal care workshop for general practitioner and district nurses.

IPE Outcomes for learners: behaviour

Six studies (29%) indicated changes in behaviour (category 3) (viz: Morey et al. 2002; Cooke et al. 2003; Morison et al. 2003; Kilminster et al. 2004; Mu et al. 2004; Pollard et al. 2005). These were, however, mainly self-reported perceptions of changes which must be regarded as weak approaches to measuring behavioural change. So, for example, Kilminster et al. (2004) reported that participants had asked more questions about medication and communicated better with patients. Three studies reported varying degrees of third party triangulation. The strongest, Morey et al. (2002) used robustly developed rating scales and well trained raters to assess team behaviours and technical skills in Emergency Departments. Cooke et al. (2003) reported researchers' observations of medical and nursing students working with simulated patients to explore breaking bad news. Nursing students were often passive at first (focus group data indicating that they were uncertain of their role); later: 'from direct observations of the nursing students in our study, we found that they gradually seemed more comfortable interjecting, particularly if they felt they could better explain something to the patient' (p. 141). Mu et al. (2004) reported that three former IPE participants, after graduation, returned to work with the under-served communities that hosted their IPE; furthermore serving as clinical instructors for subsequent cohorts of students. They did not note whether this was a marked contrast from historic patterns of employment upon graduation.

Outcomes of IPE for service delivery and patient/client care

One third of our set of robust evaluations reported changes in service delivery or patient care (categories 4a and 4b) (viz: Dienst & Byl 1981; Solberg et al. 1998; Ketola et al. 2000; Horbar et al. 2001; Morey et al. 2002; Reeves & Freeth 2002; Shafer et al. 2002). Five of these seven evaluations were of IPE for qualified practitioners undertaking service quality improvement (QI) initiatives.

Four papers (three from the US and one from Scandinavia) reported an interprofessional QI initiative as an effective way of improving screening or illness prevention services. Ketola et al. (2000) used IPE as a solution to difficulties in recording risk factors for cardiovascular disease; service settings that received the education intervention showed improved practice compared with controls. Horbar et al. (2001) showed significant decreases in morbidity for critically-ill pre-term infants following a three year intervention of self-selected intensive collaborative quality improvement initiatives in 10 US neo-natal intensive care units. Rates were compared with 66 prospectively chosen non-participating units. Shafer et al. (2002) reported a clinical practice development with team training that improved Chlamydia screening rates for adolescent girls. Solberg et al. (1998) studied QI initiatives in clinical preventative services more generally and concluded that the IPE intervention improved functioning compared with previous or with control services. The other measure of improvement in patient care was by Morey et al. (2002) who found significantly reduced numbers of observed clinical errors for US team work trained emergency department staff.

The remaining two studies in this group reported on undergraduate IPE (one from the US and one from the UK). Dienst & Byl (1981) concluded that a team education programme increased the volume of patients seen (level 4a) and the comprehensiveness of patient care (level 4b) by interprofessional undergraduate student teams undertaking community clerkships. More directly Reeves & Freeth (2002) found that patients on an interprofessional training ward were very satisfied with the care they received and felt they were given more attention; however, more staff were contributing to this care than might normally be expected. This highlights that one of the challenges in evaluating service and patient related outcomes for undergraduate interprofessional practice based education is how well student practice learning settings approximate to the reality of practice itself.

Discussion

The introduction of a new and sometimes contested aspect of professional education requires that evaluations of the initial programmes produce evidence that not only speaks to the notion of effectiveness but also informs educational development and influences policies that determine future educational practice. It is to both these ends that we undertook a quantitative and qualitative analysis of the 21 studies in this review. The 3P model, used here as an analytical tool, enabled us to identify some key aspects of context (or presage), a few mechanisms, (arising from IPE process) in relation to the diverse outcomes (or products) reported.

A key presage factor for IPE was government calls for more collaborative working, often with the aim of reducing medical error and reaching under-served communities. Formal IPE developed for this purpose can be restrained by contextual factors such as space, timetabling of other learning activities and hindered by lack of the management support. A context in

Box 2: Key messages from this review.

- As the number of governments calling for enhanced collaboration amongst practitioners delivering services to the public grows, that call, frequently translated as a need for IPE, is then developed and delivered by educators and practice managers.
- Staff development to enable competent and confident facilitation of interprofessional learning is a key mechanism for effective IPE.
- Participants bring unique values about themselves and others into any IPE event which then interact in a complex way with the mechanisms that influence the delivery of the educational event.
- Authenticity and customisation of IPE so that it reflects appropriate and relevant service delivery settings are important mechanisms for a positive experience for the participants.
- Principles of adult learning for IPE are key mechanisms for well received IPE.
- Interprofessional education is generally well received by participants and enables practitioners to learn the knowledge and skills necessary for collaborative working; it is less able to positively influence attitudes and perceptions towards others in the service delivery team.
- In the context of quality improvement initiatives interprofessional education is frequently used as a mechanism to enhance the development of practice and improvement of services.

Box 3: Lessons for practice.

- Staff development in the facilitation of IPE is essential to its effectiveness.
- Teachers need to be aware that learner reaction to IPE is related to multiple factors.
- Learning about being interprofessional in a context that reflects the students' current or future practice is important for effective learning.
- IPE curriculum developers need to recognise the adult learning needs of the participants and structure teaching with this in mind.
- Staff should seek funding for robust evaluations of IPE especially for that delivered in real and simulated practice settings and to measure its impact on attitudes and behaviour.

which there are opportunities for informal IPE, supplementary to formal IPE, is a positive influence on the learning experience.

Another aspect of presage is the value of what can, perhaps, be called a *transition driver*. Educators and clinical managers often take such positions, acting on an external top-down call to initiate, develop and deliver IPE.

In the studies reviewed little mention was made of any funding barriers in relation to developing and delivering IPE but note our finding that 13 studies acknowledged external funding for their work and the three widest ranging evaluations were all funded. Thus the lack of any comments about funding as an enabler or a barrier does not mean that budgetary factors are unimportant. Indeed, these findings tentatively suggest that funding enables evaluations of IPE to make a real contribution to its further development.

Neither can we comment on the influence on outcomes of student numbers and the range or make up of participating professional groups: the primary studies did not provide sufficient data for this. However it is clear from these robust studies that IPE is frequently delivered within the context of large cohort sizes and a complex professional mix and awareness of the degree of difficulty this adds to the programme delivery is reported.

The capability of staff with the responsibility to facilitate interprofessional learning is a key factor in students' experience, being part of presage and influential during the process of the IPE. Staff development to ensure the competence and confidence of interprofessional facilitators is a key mechanism in the delivery of well received IPE.

The studies reviewed here indicated that undergraduates have prior perceptions/attitudes to IPE and collaborative working. These are shaped by a complex mix of factors, for example, age, prior work experience and gender. With the growth of IPE the learners' prior experience of IPE will add to this melange of factors, shaping views of subsequent experiences. In this review one study (Kilminster et al. 2004) documented learners' prior experience of IPE and found it to be limited but this will change as undergraduate learners with IPE experience participate in post-registration IPE.

Differences in students' attitudes to IPE can also be attributed to characteristics of the programme, for example, disparate perceptions of the importance of the IPE and whether it is optional or compulsory. We suggest that staff responsible for developing IPE should not assume groups of learners with, for example, similar professional backgrounds, will respond to IPE in the same way. Students from successive cohorts will bring their own characteristics that will impact on process and the effectiveness of the learning experience.

The value of using principles of adult learning for IPE emerged as a key mechanism for well received IPE in this review. Additionally, the unique nature of IPE demands authenticity from the learning experience, a characteristic that arises when the development and delivery process are customized to the particular learning group and their professional practice. Increasingly this is being recognised as part of *good IPE practice* with, for example, the use of simulated patients and learning in practice or simulated practice settings as a way to realise this. We suggest that authenticity is a mechanism that enhances the effectiveness of IPE through the diverse ways of delivering the curriculum mentioned above. Similarly, the customisation of IPE so that it reflects the reality of practice for specific groups of interprofessional learners acts as a mechanism for positive outcomes.

Our results showed more positive than neutral or mixed results from studies that evaluated achievement of the outcomes in our adapted Kirkpatrick model. This suggests that, in general for these studies, learners responded well to the IPE, knowledge and skills necessary for collaborative practice were learnt and there were positive changes in behaviour, service organization and patient/client care. However, a note of caution relates to a possible publication bias, as the need to publish work reporting on positive outcomes might militate against appearance of mainly negative

Box 4: Implications for future evaluations of IPE.

- Details of the student numbers and professional mix within a cohort of interprofessional learners and the influence of these on the outcomes of the IPE would further understanding of the management of this complex genre of professional education.
- Development and robust use of tools to identify mechanisms during IPE that assist in positively changing attitudes and perceptions of others would provide valuable data for the development of IPE curricula content and delivery.
- Adoption of a common outcomes model for measuring the 'products' of IPE (for example, the adapted Kirkpatrick model discussed in this review) would enable more robust comparisons between individual studies. Similarly, it would be of value if evaluations of IPE contributed to the development of an evidence informed 3-P model of IPE.
- More evaluations of IPE in real and simulated practice settings are needed to strengthen our knowledge of mechanisms that lead to positive behaviour changes and patient/client care and service delivery improvements.
- Funded evaluations are necessary and likely to lead to more evidence that is robust and addresses key unanswered questions about the impact of IPE.

studies. To balance the scorecard, note should be taken of our previous comments on reports that perceptions and attitudes towards others can worsen following IPE, although this is unlikely to be across the whole cohort. Our results showed measures of changes in perceptions and attitudes are more likely to show mixed results than the other outcome measures. This highlights the challenge of changing value based aspects of professional practice. Staff responsible for IPE should note that this may indicate that, following IPE, whilst practitioners may have the knowledge and skills to practice collaboratively, their perceptions and attitudes toward each other may have been little changed and may have worsened, with implications for applying their knowledge and skills in practice. Note, however, that Crutcher et al. (2004) contradict this in their report of a brief IPE event concluding that brief exposure to IPE did produce significant change in attitudes and role definition but not in knowledge. There are lessons here for the focus of IPE curricula in terms of content and delivery pattern.

Conclusion

In conclusion, this review has uncovered a substantial amount of new knowledge about the context of contemporary IPE. We have learnt something about some key mechanisms that act to influence the outcomes of IPE. Measuring those outcomes, and thus enabling informed judgements to be made about the impact of the many different IPE initiatives delivered internationally, continues to evolve towards a robust science. As this review shows such work leads to evidence informed interprofessional education practice and policy-making, and thus learner satisfaction and ultimately enhanced patient/client care and care service delivery.

We set out the key messages from this review in Box 2 and translate these into lessons for practice in Box 3. Box 4 contains the implications for future evaluations of IPE.

BEME disclaimer

BEME review results are, necessarily, interpreted in light of individual perspectives and circumstances. The conclusions presented in this review are the opinions of review authors. Their work has been supported by BEME but their views are not necessarily shared by all BEME members.

The aim of BEME is to make the results of research into the effectiveness of educational interventions available to those who want to make more informed decisions. This information is an essential contribution to the process of deciding whether to adopt a particular educational intervention or not. Information and the assessment of needs, resources and values; as well as judgements about the quality and applicability of evidence are equally important. It is unwise to only rely on evidence about the impact of a particular educational intervention. Understanding learning process for the students in your context, knowledge of past success and failures and how educational interventions work are all vital. BEME does not accept responsibility for the results of decisions made on the basis of a BEME Review.

Notes

1. Appendices to the review are available from www.bemecollaboration.org and in BEME Guide No. 9, published by the Association for Medical Education in Europe (AMEE) www.amee.org

Notes on contributors

MARILYN HAMMICK, Education and Research Consultant, Visiting Professor at the University of Central England and Anglia Ruskin University, UK & Chair, UK Centre for the Advancement of Interprofessional Education.

DELLA FREETH, Professor of Professional and Interprofessional Education, Health Care Education Development Unit, St Bartholomew School of Nursing & Midwifery, City University, UK.

IVAN KOPPEL, General Practitioner, Richford Gate Medical Practice, UK; Principal Lecturer, School of Integrated Health, University of Westminster, UK.

SCOTT REEVES, Associate Professor, Department of Family and Community Medicine, University of Toronto; Director of Research Centre for Faculty Development at St Michael's Hospital, Toronto; Scientist, Wilson Centre for Research in Education, University Health Network, Canada.

HUGH BARR, Emeritus Professor, School of Integrated Health, University of Westminster, Visiting Professor at King's College London, Kingston University with St George's University of London & the University of Greenwich, UK.

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