Interprofessional Online Learning for Primary Health Care
Findings from a Scoping Review
Acknowledgements and Authorship

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This study was authored by
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Glossary

Asynchronous interaction
Online communication which takes place at different times from different locations.

Blended learning
An approach in which individuals learn using both traditional face-to-face methods and e-learning methods.

E-learning
Learning utilizing electronic technologies to access educational curriculum outside of a traditional classroom. In most cases, it refers to a course or program delivered on an online basis.

Interprofessional collaboration
Involves different health and social care professions who regularly come together to negotiate and agree how to solve complex care problems or provide services.

Interprofessional education
Occurs when members (or students) of two or more health and/or social care professions engage in learning with, from and about each other to improve collaboration and the delivery of care.

Interprofessional learning
Learning arising from interaction between members (or students) of two or more professions. This may be a product of interprofessional education or happen spontaneously in the workplace or in education settings, and therefore be serendipitous in nature.

Online learning
See definition of e-learning.

Primary care
The first point of contact in a health care system. The main source of primary health care is general practice or family medicine.

Synchronous interaction
Online communication which takes place at the same time from different locations.
This report presents the findings from a scoping review which explores the nature of interprofessional online learning in primary health care.

**METHODS**
Six electronic databases were searched from 2000 to October 2015 for relevant materials. In addition, Google, Google Scholar, organisational websites and journal hand searches were undertaken. Once duplicates were removed, 1307 records were screened, independently by two reviewers to determine inclusion in the review. Following this initial screening, 181 full-text articles were assessed for eligibility. Independent assessment of these papers, again by two reviewers, resulted in 23 studies, which were included. Key educational, methodological and outcomes information was abstracted from all studies for analysis and synthesis.

**RESULTS**
The review found that the 23 included studies employed a range of different e-learning methods with contrasting course durations, use of theory, participant mix, approaches to accreditation and assessment of learning. Nevertheless, the following eight key educational themes were identified from the included studies: ‘realising the potential of e-learning’; ‘enhancing collaboration and communication’; ‘improving time pressures’; ‘overcoming geographic boundaries’; ‘economics and cost effectiveness’; ‘convenience, flexibility and accessibility’; ‘learner isolation’ and ‘technical challenges’.

Methodologically, most studies employed quasi-experimental designs and typically gathered data in the form of surveys/questionnaires. There was also some use of mixed methods and qualitative methods with these studies gathering individual interviews and focus groups. There was wide variety in the sample sizes reported for the included studies.

Most of the included studies reported outcomes associated with learner reactions and positive changes in participant attitudes/perceptions and improvement in knowledge/skills as a result of engagement in an e-learning course. In contrast, fewer studies reported changes in participant behaviours, changes in organisational practice and improvements to patients/clients.
IMPLICATIONS
Based on these results the following educational, methodological and outcome implications could be offered:

+ Interprofessional e-learning offers some valuable educational experiences to primary care practitioners. Importantly, this form of learning can support the development of interprofessional collaboration.

+ E-learning can be an effective method of education for busy primary care practitioners as its accessibility and ease of use helps overcome time pressures related to their clinical work.

+ E-learning is particularly useful where geographic limitations exist to accessing traditional forms of education (e.g. for practitioners based in rural communities).

+ Economically, the use of e-learning methods can elicit a variety of financial gains – reducing costs for physical learning spaces and travel expenses. However, the overall cost effectiveness of e-learning approaches remains unclear.

+ A key advantage to e-learning is its flexibility for engagement in a wide range of self-directed, facilitative, interactive, synchronous and asynchronous activities which can be organised to fit practitioners' work schedules.

+ The move from the traditional classroom-based approach has resulted in some learners feeling isolated or reporting a lack of support from online educators. However, the use of blended approaches can overcome this shortfall.

+ Technical difficulties, usually linked to minor software failures and connectivity problems, can undermine the quality of learners' e-learning experiences, and so efforts are needed to eliminate such problems.

+ While it is important to develop the evidence for e-learning related to changes in practitioners' knowledge and skills, future evaluations should also focus on developing the robust evidence for its longer-term effects on behaviour, organisational practice, cost effectiveness and benefit for patients/clients.
Introduction

“[E-learning offers] learners increased control over learning sequence, pace of learning, providing effective support mechanisms and removing time obstructions. Geographical barriers are broken down allowing educators to promote programmes to a wide cohort of learners, from a variety of backgrounds, and disciplines, who can tailor content to their experiences to meet their personal learning objectives”

Jenkins et al., 2014, p18
Online learning (e-learning) has been a growing part of health professions education for well over a decade. Meta-analyses reporting the effects of e-learning studies have found that this type of education is effective for improving a range of professional competencies – attitudes, knowledge, skills and behaviours (Cook et al., 2008; Means et al., 2010). It has been reported that online learning can be as effective as physical attendance in a traditional classroom. However, consideration must be given to factors such as development of clear guidelines for educators regarding roles and responsibilities, clear learner competencies, even access to technology and sufficient funding (Thomas et al., 2010). Applied learning approaches, such as scenarios and interactive ‘second-life’ programmes, can be engaging, though there is a need to ensure training is relevant to clinical evidence-based practice (Sutton et al. 2011). Use of free web tools, such as Skype and Moodle, has shown useful educational outcomes while alleviating travel pressures and expenses for learners (Lillis et al. 2010).

There is also evidence that the benefits of using online learning can result in less constrained discussion, as learners feel more able to engage in online discussions rather than verbal face-to-face conversations (Murphy 2008). It has also been found that e-learning can enhance the quantity, quality, cost and accessibility of health professions education (Maloney et al., 2012), though technological problems can often be a key disrupting factor (Sivamalai et al., 2011).

Nevertheless, it has been indicated that online learning may be viewed by some as isolating and disconnected when compared to traditional learning methods due to a lack of a social connection (Roberts & McInerney 2007). In addition, it has been noted that technological difficulties can undermine this method, as well as a potential loss of collegiality linked to traditional forms of face-to-face learning (Lillis et al. 2010).

While interprofessional e-learning can help with the logistics and costs of traditional face-to-face collaborative learning and can help to overcome the isolating effects learners can feel when learning alone online, there is added complexity with managing new software, a loss of nonverbal group cues and technological glitches which can at times undermine its quality (Hanna et al., 2013). Nevertheless, it has been found that this type of e-learning can support professionals to connect together online to discuss and co-create solutions to real-life issues for patients/clients from geographically disparate locations (MacNeill et al., 2014).

When used to promote interactions and relations between different professional groups, an increasing number of studies have suggested that the use of e-learning technologies can enhance interprofessional collaboration. (Reeves & Freeth 2003; Snowdon et al., 2010)

As indicated above, while there has been growth in both professional and interprofessional e-learning in health professions education, to date, there has been no effort undertaken to explore the use of interprofessional e-learning for primary care teams. To fill this gap in knowledge, this report presents the findings from a scoping review of this literature to provide an overview of the empirical literature in order to generate an insight into the nature of evidence of e-learning for primary care teams.

* These two terms are used interchangeably in this report
Methods

In order to explore the nature of evidence on online interprofessional education for primary health care, a scoping review methodology was selected as it provides a summative ‘map’ of the literature within a particular field (Arksey & O’Malley, 2005; Levac, Colquhoun, & O’Brien, 2010). Unlike systematic reviews, scoping reviews do not seek to answer a specific question, nor do they examine the quality of the reviewed literature (Arksey & O’Malley, 2005; Levac et al., 2010; Armstrong et al., 2011). Rather, this methodology aims to capture an image of the breadth and depth within a particular field (Levac et al., 2010). The goal of a scoping review may be to “examine the extent, range, and nature of research activity, determine the value in undertaking a full systematic review, summarizing and disseminating research findings, or identify gaps in the existing literature” (Levac et al., 2010, p.1). This report specifically concerns the examination of the extent, range and nature of evidence for the use of interprofessional e-learning for primary care teams. Within this report, Arksey & O’Malley’s (2005) six-step framework for interpretive scoping literature reviews was utilised with modifications suggested by Levac et al. (2010) and Daudt et al. (2013) (Table 1).
TABLE 1

Overview of the framework for conducting a scoping study

<table>
<thead>
<tr>
<th>Review Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying the research question</td>
<td>Identifying the research question provides the roadmap for subsequent stages. Relevant aspects of the question must be clearly defined as they have ramifications for search strategies. Research questions are broad in nature as they seek to provide breadth of coverage.</td>
</tr>
<tr>
<td>Identifying relevant studies</td>
<td>This stage involves identifying the relevant studies and developing a decision plan for where to search, which terms to use, which sources are to be searched, time span, and language. Comprehensiveness and breadth is important in the search. Sources include electronic databases, references lists, hand-searching of key journals, organisations and conferences. Breadth is important; however, practicalities of the search are as well. Time, budget and personal resources are potential limiting factors and decisions need to be made upfront about how these will impact the search.</td>
</tr>
<tr>
<td>Study selection</td>
<td>Study selection involves post hoc inclusion and exclusion criteria. These criteria are based on the specifics of the research question and on new familiarity with the subject matter through reading the studies.</td>
</tr>
<tr>
<td>Charting the data</td>
<td>A data-charting form is developed and used to extract data from each study. A 'narrative review' or 'descriptive analytical' method is used to extract contextual or process oriented information from each study.</td>
</tr>
<tr>
<td>Collating, summarising, and reporting results</td>
<td>An analytical framework or thematic construction is used to provide an overview of the breadth of the literature but not a synthesis. A numerical analysis of the extent and nature of studies using tables and chart is presented. A thematic analysis is then presented. Clarity and consistency are required when reporting results.</td>
</tr>
<tr>
<td>Consultation (optional)</td>
<td>Provides opportunities for consumer and stakeholder involvement to suggest additional references and provide insights beyond those in the literature.</td>
</tr>
</tbody>
</table>
Identifying the Relevant Research Question

Responding to the intention to formulate and establish an interprofessional e-learning model, the research questions should enable: the mapping of existing work which addresses interprofessional e-learning in primary care teams; an understanding of the influence of such work and the depth and breadth of ‘the field’; and the identification of significant knowledge gaps and areas for improvement. With these points in mind the following research questions were posed:

- What is the nature of evidence on online postgraduate education for primary care interprofessional teams?
- What methods of interprofessional e-learning, if identified, work – i.e. improve learning outcomes?

Online or e-learning can be described as both a pedagogical and technological approach (MacNeill et al., 2014). As a result, this report presents the research questions above in a way which focused on two elements: first, the characteristics of the interprofessional e-learning approaches/methods evaluated in included studies; second, the range of reported consequences (outcomes) for primary care learners, their organisations and the care delivered to patients/clients.

Identifying Relevant Studies

Using the research questions as a guide, keywords were applied to a search strategy which was then preliminarily applied to the electronic databases Medline and Cinahl. This offered an indication of the relevance of the search terms and the subsequent feasibility of their application was based on the numerical results generated from this preliminary search. This process enabled the following search strategy to be adopted (Box 1).

Following a consultation with university information scientists in an attempt to gauge the efficacy of the strategy and identify further databases, these key terms were applied to six electronic sources. Including studies from January 2000 to October 2015, the following databases were searched:

- Medline
- Cinahl
- British Educational Index
- Pubmed
- Scopus
- Web of Science

An additional search of online and grey literature using Google and Google Scholar was undertaken. Furthermore, a hand search of 10 journals which have published the majority of papers found in the searches (Box 2) was conducted.
### BOX 1

**Search terms**

<table>
<thead>
<tr>
<th>#1 Primary Care</th>
<th>#10 Team or Teamwork</th>
</tr>
</thead>
<tbody>
<tr>
<td>#2 Care, Primary Care</td>
<td>#11 #7 or #8 or #9 or #10</td>
</tr>
<tr>
<td>#3 Healthcare, Primary</td>
<td>#12 E-learning</td>
</tr>
<tr>
<td>#4 Care Primary</td>
<td>#13 Electronic Learning</td>
</tr>
<tr>
<td>#5 General Practice</td>
<td>#14 Learning, Electronic</td>
</tr>
<tr>
<td>#6 #1 or #2 or #3 or #4 or #5</td>
<td>#15 Remote Learning</td>
</tr>
<tr>
<td>#7 Interprofessional or Interprofessional</td>
<td>#16 Learning, Remote</td>
</tr>
<tr>
<td>#8 Interdisciplinary or Interdisciplinary</td>
<td>#17 Learning, Blended</td>
</tr>
<tr>
<td>#9 Multidisciplinary or Multidisciplinary</td>
<td>#18 Video conferencing</td>
</tr>
<tr>
<td></td>
<td>#19 #12 or #13 or #14 or #15 or #16 or #17 or #18 #20 #6 and #11 and #19</td>
</tr>
</tbody>
</table>

### BOX 2

**Journals Searched**

- British Journal of Community Nursing
- BMC Public Health
- BMC Medical Education
- BMJ Quality and Safety
- British Journal of General Practice
- Education for Primary Care
- Journal of Continuing Education in the Health Professions
- Journal of Interprofessional Care
- Medical Teacher
- Trials
From an initial yield of 1,568 potential sources (generated from electronic database and additional searches), which following a rigorous screening process (see below), resulted in 23 included studies (Figure 1).

**Study Selection**

In order to address the research question for this review, the following inclusion criteria were employed:

- Papers that describe evaluations of online/e-learning involving interprofessional teams based in primary care/family medicine
- All research evaluation designs (e.g. action research, case study, ethnographic, experimental, quasi-experimental studies)
- Any reported outcome from the online/e-learning evaluation (see outcomes typology below).

As the searches and screening of potential sources progressed, it became apparent that there was very little literature reporting online postgraduate education for primary health care interprofessional teams. As a result, two key modifications were made to the inclusion criteria. First, the scope of review was widened to include postgraduate education and continuing education. Second, the review was widened to include team-based interprofessional online learning as well as general interprofessional e-learning (involving primary care practitioners, but not necessarily based in the same interprofessional team).
FIGURE 1
Searching and screening results

Identification

Abstracts identified through database searching
n=1,303

Additional sources identified through other searches
n=265

Searching

Records after duplicates removed
n=261

Records screened
n=1,307

Full-text articles excluded with reasons n=1,126
Not interprofessional n=63
Not primary care n=52
No online learning n=37
No evaluation n=6

Eligibility

Full-text articles assessed for eligibility
n=181

Included

Studies included
n=23
Charting the Data

Key information from the included studies was abstracted by combining a categorisation of e-learning methods (Raymond et al., 2012) with an abstraction approach used in a previous systematic review (Barr et al., 2005).

Using this approach, the following information was elicited from each of the included studies:

+ study aims/objectives
+ research design, sampling, data collection/analysis
+ location and duration of the e-learning intervention/activity
+ professional mix of learners
+ methods of e-learning employed
+ technologies used to support e-learning
+ assessment/accreditation of learning
+ all reported outcomes from the e-learning activity.

For more information on the range of information collated from the included studies see Appendix 1.

Collating, Summarising, and Reporting the Results

Given the heterogeneous nature of the included studies, a thematic approach to the analysis was employed (Mays et al., 2005). This allowed the emergence of key issues (themes) from the literature, enabling an insight into the characteristics related to online learning.

In addition, to capture the diversity of reported outcomes in the included papers, Barr and colleagues’ (2005) extended version of Kirkpatrick’s educational outcomes model, which has six differing but non-hierarchical levels, was utilised (Table 2).

Methodological Quality

All materials generated from database searches (n=1,303) and additional searches (n=265) were reviewed independently by two members of the review team to determine if they met the inclusion criteria (see above). The full text article was obtained (181 papers) if the abstract met these criteria. These articles were screened independently by two reviewers to determine if they met the inclusion criteria.

Review limitations

There are three key limitations to this review. First, only English-language articles were considered for inclusion in the study. As such, this review did not include potentially relevant materials written in other languages and published in non-English speaking countries. Secondly, the review searched for materials published from 2000, which means any papers published before this date will not have been included. Third, only a partial range of grey literature was searched. For example, the review did not search primary care conferences for possible materials. This restriction on grey literature was necessary to limit the volume of materials and maintain a focus on research studies.

The breakdown of these additional searches were: Google search: 110 results; Google Scholar search: 136 results; Journal hand searches: 14 results; Websites: 5 results.
### Table 2

**Key Outcomes**

<table>
<thead>
<tr>
<th>Level</th>
<th>Outcome</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reaction</td>
<td>These outcomes cover learners’ general views and perspectives on the learning experience, presentation, content, teaching methods and organisation (e.g. time-tableing, materials, quality of teaching).</td>
</tr>
<tr>
<td>2a</td>
<td>Modification of attitudes/ perceptions</td>
<td>These outcomes relate to changes in reciprocal interprofessional attitudes or perceptions between participant groups, towards patients clients and their conditions, circumstances, care and treatment.</td>
</tr>
<tr>
<td>2b</td>
<td>Acquisition of knowledge/skills</td>
<td>These outcomes relate to the acquisition of concepts, procedures and principles of interprofessional collaboration. For skills, this relates to the acquisition of thinking/problem-solving, psychomotor and social skills linked to collaboration.</td>
</tr>
<tr>
<td>3</td>
<td>Behavioural change</td>
<td>Outcomes at this level measure the transfer of interprofessional skills and learning to workplace, such as support for change of behaviour in the workplace or willingness of learners to apply new knowledge and skills about collaborative work to their practice style.</td>
</tr>
<tr>
<td>4a</td>
<td>Change in organisational practice</td>
<td>These outcomes relate to wider changes in the organisation/delivery of care, attributable to an education programme, such as changes in organisational policies or clinical pathways that promote interprofessional collaboration, communication and teamwork.</td>
</tr>
<tr>
<td>4b</td>
<td>Benefits to patients/clients</td>
<td>These outcomes cover any improvements in the health and well-being of patients/clients as a direct result of a programme, such as, health status measures, disease incidence, duration or cure rates, mortality, complication rates, readmission rates, adherence rates, patient or family satisfaction, continuity of care, costs to carer or patient/client.</td>
</tr>
</tbody>
</table>
Results

Results from the analysis and synthesis of the included studies are presented in three sections. The first section provides an overview of these studies relating to a range of information including the use of e-learning activities and methods of evaluation. The second section presents the key educational issues linked to the included studies covering a variety of elements such as time pressures, flexibility and effectiveness. The final section offers an insight into the range of outcomes reported in the included studies.
Overview of studies
This section offers an overview of both the e-learning approaches and also the methodological approaches employed in the included studies.

E-learning approaches
Of the 23 included studies, 12 were undertaken in the UK, four in North America (two in the USA and two in Canada) and two studies involved multiple countries (one study included the Netherlands, France and the UK, the other Germany, Austria and the UK). In addition, one study was undertaken in the following countries: Brazil, Australia, France, Germany and Mexico. In relation to professional involvement, medicine (14 studies) and nursing (13 studies) were the two predominant professional groups. Pharmacy was involved in three studies, physiotherapy (two studies), social work (two studies), community workers (one study), nutrition (one study), occupational therapy (one study), podiatry (one study) and psychology (one study).

Table 3 provides an overview of key contents of the included papers in relation to a number of elements, including: the aim of the e-learning course, participants involved, use of e-learning methods, course accreditation and assessment of learning. As this table indicates the included studies report upon a variety of different primary care e-learning courses in relation to aims, duration and use of underlying educational theory. For example, in terms of course duration, this varied from hours, to a few days to weeks and even years. Similarly, there was a wide range in numbers of participating professions involved in the studies – from 24 participants in one study to over 30,000 participants in another much larger study. In addition, while just over half of the studies did not mention the use of an underpinning theory in the development of their e-learning course, a variety of contrasting theories were employed by other studies, including: adult learning approaches, social learning theory, theory of planned behaviour and constructionist theory.

This heterogeneity is also found in the mixture of differing e-learning approaches, types of interaction, course accreditation and assessment of learning (Table 3).

TABLE 3
Key Outcomes (continued overleaf)

<table>
<thead>
<tr>
<th>Citation</th>
<th>Aim of e-learning / duration / theory</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barber et al., 2010</td>
<td>To improve knowledge and utilisation of occupational asthma guidelines in primary care&lt;br&gt;One hour duration&lt;br&gt;No theory identified</td>
<td>783 primary care professionals (not specified)</td>
</tr>
<tr>
<td>Bekkers et al., 2010</td>
<td>To enhance the quality of antibiotic prescribing amongst primary care practitioners&lt;br&gt;Duration not indicated&lt;br&gt;Theory of planned behaviour</td>
<td>244 general practitioners and nurse practitioners</td>
</tr>
<tr>
<td>Buriak et al., 2015</td>
<td>To improve education on cancer survivorship&lt;br&gt;Duration not indicated&lt;br&gt;Theory of planned behaviour</td>
<td>229 physicians, 213 nurse practitioners, 1,367 nurses</td>
</tr>
<tr>
<td>Cuggia et al., 2006</td>
<td>To improve information sharing between primary care professionals&lt;br&gt;Duration not indicated&lt;br&gt;No theory identified</td>
<td>General practitioners and nurses (numbers not specified)</td>
</tr>
<tr>
<td>Degryse et al., 2009</td>
<td>To improve knowledge about the diagnosis of dementia&lt;br&gt;Five hour duration&lt;br&gt;Discovery learning theory</td>
<td>28 general practitioners and nurses</td>
</tr>
<tr>
<td>Docherty &amp; Sandhu, 2006</td>
<td>To improve knowledge of interprofessional diabetes care&lt;br&gt;No duration indicated&lt;br&gt;No theory identified</td>
<td>35 general practitioners and nurses</td>
</tr>
<tr>
<td>Fox et al., 2001</td>
<td>To improve understanding of change management concepts and principles for primary care professionals&lt;br&gt;12 week duration&lt;br&gt;Theories of change management</td>
<td>111 post primary care professionals (unspecified)</td>
</tr>
<tr>
<td>Gensichen et al., 2009</td>
<td>To improve the understanding of e-learning approaches for primary healthcare professionals&lt;br&gt;No duration indicated&lt;br&gt;No theory identified</td>
<td>76 primary healthcare professionals (unspecified)</td>
</tr>
<tr>
<td>E-learning methods</td>
<td>Type of interaction</td>
<td>Accreditation / Assessment</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Online self-directed learning using web-based resources</td>
<td>Asynchronous</td>
<td>BMJ Accredited</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Formative assessment</td>
</tr>
<tr>
<td>Online self-directed learning, reflection, interactive presentations and practice-based seminars, simulated standardised patients, web forum</td>
<td>Mixed: asynchronous &amp; synchronous</td>
<td>STAR programme accreditation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Formative assessment</td>
</tr>
<tr>
<td>Online self-directed learning using patient based case scenarios</td>
<td>Asynchronous</td>
<td>Professional body accreditation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Formative assessment</td>
</tr>
<tr>
<td>Online self-directed learning, real-time interactions and teleconsultations</td>
<td>Mixed: asynchronous &amp; synchronous</td>
<td>Accreditation not mentioned</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Formative assessment</td>
</tr>
<tr>
<td>Online self-directed learning interactive software, simulated patient cases</td>
<td>Asynchronous</td>
<td>Accreditation not mentioned</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Formative assessment</td>
</tr>
<tr>
<td>Online self-directed learning, residential workshop, online learning, interactive exercises</td>
<td>Mixed: asynchronous &amp; synchronous</td>
<td>University accreditation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Summative assessment</td>
</tr>
<tr>
<td>Online self-directed learning exercises</td>
<td>Asynchronous</td>
<td>Accreditation not mentioned</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Formative assessment</td>
</tr>
<tr>
<td>Unspecified</td>
<td>Asynchronous</td>
<td>Accreditation not mentioned</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assessment not mentioned</td>
</tr>
</tbody>
</table>
## TABLE 3
### Key Outcomes (continued)

<table>
<thead>
<tr>
<th>Citation</th>
<th>Aim of e-learning / duration / theory</th>
<th>Participants</th>
</tr>
</thead>
</table>
| Halabisky et al., 2010 | To enhance collaborative practice among healthcare teams in long term care homes  
8½ hour duration  
Change management                                                                                                                 | 59 family physicians, nurses, nurse practitioners and pharmacists                                      |
| Hannon et al., 2012 | Improve the diagnosis and management of Chronic Fatigue Syndrome (CFS) in primary care  
Duration not indicated  
No theory identified                                                                                                                  | 44 participants (general practitioners, practice nurses, CFS specialists, carers, patients             |
| James et al., 2011  | To educate practitioners in the safe use of insulin  
One hour duration  
No theory identified                                                                                                                     | 31,089 participants (general practitioners, nurses, pharmacists, others – not specified)              |
| Jenkins et al., 2014 | To improve interprofessional pain management education in primary and community care settings  
14 week duration  
Theories of adult learning                                                                                                           | 24 general practitioners, 10 nurses, 10 pharmacists, four physiotherapists                            |
| Kang et al., 2015   | To enhance the management of chronic disease for primary healthcare providers  
13 week duration  
No theory identified                                                                                                                   | 27 family physicians and seven nurse practitioners                                                     |
| Macfarlane et al., 2000 | To increase understanding of epidemiology for primary care practitioners  
Duration not indicated  
No theory identified                                                                                                                     | Not clear                                                                                               |
| Maloney et al., 2015 | To improve knowledge and practice of using social media  
Duration not indicated  
No theory identified                                                                                                                     | 317 physicians, physiotherapists, podiatrists and others (not specified)                                  |
<table>
<thead>
<tr>
<th>E-learning methods</th>
<th>Type of interaction</th>
<th>Accreditation / Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online activities, audio/video clips, worksheets, face-to-face team contact</td>
<td>Mixed: asynchronous &amp; synchronous</td>
<td>Accreditation not mentioned Formative assessment</td>
</tr>
<tr>
<td>Blended learning, (podcasts, soundbites, diagnostic descriptions, patient interface, management options)</td>
<td>Asynchronous</td>
<td>Accreditation not mentioned Assessment not mentioned</td>
</tr>
<tr>
<td>Online self-directed learning using audio-visual resources</td>
<td>Asynchronous</td>
<td>Accreditation not mentioned Summative assessment</td>
</tr>
<tr>
<td>Online self-directed learning using critical reflections, case studies, blog postings</td>
<td>Mixed: asynchronous &amp; synchronous</td>
<td>University accreditation Summative assessment</td>
</tr>
<tr>
<td>Blended learning (learning objectives, clinical rotations, mentorship)</td>
<td>Mixed: asynchronous &amp; synchronous</td>
<td>Professional body accreditation Summative assessment</td>
</tr>
<tr>
<td>Online self-directed learning using interactive software</td>
<td>Asynchronous</td>
<td>Accreditation not mentioned Assessment not mentioned</td>
</tr>
<tr>
<td>Online self-directed learning using a range of web-based resources</td>
<td>Asynchronous</td>
<td>Accreditation not mentioned Assessment not mentioned</td>
</tr>
</tbody>
</table>


**TABLE 3**

Key Outcomes (continued)

<table>
<thead>
<tr>
<th>Citation</th>
<th>Aim of e-learning / duration / theory</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marsh-Tootle et al., 2011</td>
<td>To improve and sustain knowledge and screening for Amblyopia in primary care</td>
<td>136 primary care providers (not specified)</td>
</tr>
<tr>
<td></td>
<td>Duration not indicated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Theories of adult learning</td>
<td></td>
</tr>
<tr>
<td>Pereira et al., 2015</td>
<td>To improve the management of alcohol abuse in primary care</td>
<td>67 primary care professionals (not specified)</td>
</tr>
<tr>
<td></td>
<td>9 hour duration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No theory identified</td>
<td></td>
</tr>
<tr>
<td>Robinson et al., 2011</td>
<td>To improve confidence and knowledge about providing rural healthcare</td>
<td>75 participants including nurses, occupational therapists, psychologists and social workers</td>
</tr>
<tr>
<td></td>
<td>24 week duration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constructivist theory</td>
<td></td>
</tr>
<tr>
<td>Robson, 2009</td>
<td>To combine learning strategies with published guidelines with the intention of changing practice</td>
<td>45 general practitioners and practice nurses</td>
</tr>
<tr>
<td></td>
<td>Duration not indicated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Theories of adult learning</td>
<td></td>
</tr>
<tr>
<td>Rudolf et al., 2010</td>
<td>To develop practitioners to work effectively with parents of babies and pre-school children in the prevention of childhood obesity</td>
<td>137 primary practitioners (health visitors, nurses, outreach workers, centre managers, family support workers)</td>
</tr>
<tr>
<td></td>
<td>2 day duration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Family partnership model</td>
<td></td>
</tr>
<tr>
<td>Russell et al., 2006</td>
<td>To improve knowledge of primary care practice</td>
<td>Primary healthcare practitioners (not specified)</td>
</tr>
<tr>
<td></td>
<td>1-2 year duration (part-time MSc)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constructionist theory</td>
<td></td>
</tr>
<tr>
<td>Sandars &amp; Langlois, 2005</td>
<td>To understand the role of e-learning approaches in primary care</td>
<td>Not mentioned</td>
</tr>
<tr>
<td></td>
<td>Duration not indicated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No theory identified</td>
<td></td>
</tr>
<tr>
<td>Tapia-Coyner et al., 2013</td>
<td>To improve knowledge of chronic kidney disease</td>
<td>844 participants from medicine, nursing, nutrition, social work</td>
</tr>
<tr>
<td></td>
<td>Duration not indicated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No theory identified</td>
<td></td>
</tr>
<tr>
<td>E-learning methods</td>
<td>Type of interaction</td>
<td>Accreditation / Assessment</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Online self-directed learning using case based web-based modules, videos and animations</td>
<td>Asynchronous</td>
<td>Accreditation not mentioned Formative assessment</td>
</tr>
<tr>
<td>Online self-directed learning, web-conferences, face-to-face conferences, videos, text, e-chats, audio chats</td>
<td>Mixed: asynchronous &amp; synchronous</td>
<td>University accreditation Summative assessment</td>
</tr>
<tr>
<td>Online self-directed learning, interactive exercises, moderated discussion forums, chat forums, telephone, video conferencing</td>
<td>Mixed: asynchronous &amp; synchronous</td>
<td>Accreditation not mentioned Formative assessment</td>
</tr>
<tr>
<td>Online self-directed learning (web-based resources)</td>
<td>Asynchronous</td>
<td>Accreditation not mentioned Formative assessment</td>
</tr>
<tr>
<td>Online learning, using web-based activities, face-to-face interactions, website and resource toolkit</td>
<td>Asynchronous</td>
<td>Accreditation not mentioned Formative assessment</td>
</tr>
<tr>
<td>Online self-directed learning and e-based interactive learning</td>
<td>Mixed: asynchronous &amp; synchronous</td>
<td>University accreditation Summative assessment</td>
</tr>
<tr>
<td>Self-directed learning, online materials, resources</td>
<td>Mixed: asynchronous &amp; synchronous</td>
<td>Accreditation not mentioned Assessment not mentioned</td>
</tr>
<tr>
<td>Online self-directed learning, virtual tutors, face-to-face interaction with health experts</td>
<td>Mixed: asynchronous &amp; synchronous</td>
<td>Professional body accreditation Summative assessment</td>
</tr>
</tbody>
</table>
Methodological approaches

Table 4 presents an overview of information relating to key elements of the methodological approaches employed in each of the 23 studies. As presented in this table, most studies employed quasi-experimental designs (e.g. pre/post intervention, post-intervention) and typically gathered data in the form of surveys that were not validated. Only one study employed an experimental design (randomised controlled trial), though this study also gathered un-validated survey data. There was also some use of mixed methods and qualitative methods (case study design), with these studies gathering individual interviews and focus groups.

Table 4 also indicates a wide variety in the sample sizes reported for the included studies – ranging from a study involving 24 participants to studies involving hundreds and thousands of participants. Most of the studies employed a convenience sampling technique.
### TABLE 4

**Overview of methodological information**

<table>
<thead>
<tr>
<th>Citation</th>
<th>Study Design</th>
<th>Data collected</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barber et al., 2010</td>
<td>Pre/post intervention study</td>
<td>Surveys (not validated)</td>
<td>n=258</td>
</tr>
<tr>
<td>Bekkers et al., 2010</td>
<td>Case study</td>
<td>Individual interviews</td>
<td>n=31</td>
</tr>
<tr>
<td>Buriak et al., 2015</td>
<td>Post-intervention study</td>
<td>Survey (validated)</td>
<td>n=1,809</td>
</tr>
<tr>
<td>Cuggia et al., 2006</td>
<td>Longitudinal study</td>
<td>Surveys (not validated)</td>
<td>Not reported</td>
</tr>
<tr>
<td>Degryse et al., 2009</td>
<td>Post-intervention study</td>
<td>Survey (not-validated)</td>
<td>n=30</td>
</tr>
<tr>
<td>Docherty &amp; Sandhu, 2006</td>
<td>Case study</td>
<td>Individual interviews</td>
<td>n=35</td>
</tr>
<tr>
<td>Fox et al., 2001</td>
<td>Pre/post intervention study</td>
<td>Surveys (not validated)</td>
<td>n=68</td>
</tr>
<tr>
<td>Gensichen et al., 2009</td>
<td>Delphi study</td>
<td>Surveys (not validated)</td>
<td>n=76</td>
</tr>
<tr>
<td>Halabisky et al., 2010</td>
<td>Mixed methods study</td>
<td>Surveys (validated), focus groups, interviews</td>
<td>n=51</td>
</tr>
<tr>
<td>Hannon et al., 2012</td>
<td>Case study</td>
<td>Interviews</td>
<td>n=44</td>
</tr>
<tr>
<td>James et al., 2011</td>
<td>Longitudinal study</td>
<td>Surveys (not validated)</td>
<td>n=16,540</td>
</tr>
<tr>
<td>Jenkins et al., 2014</td>
<td>Case study</td>
<td>Course documents</td>
<td>n=48</td>
</tr>
<tr>
<td>Kang et al., 2015</td>
<td>Post-intervention study</td>
<td>Surveys (not validated)</td>
<td>n=24</td>
</tr>
<tr>
<td>Macfarlane et al., 2000</td>
<td>Post-intervention study</td>
<td>Survey (not validated)</td>
<td>Not reported</td>
</tr>
<tr>
<td>Maloney et al., 2015</td>
<td>Mixed methods study</td>
<td>Surveys (not validated), individual interviews</td>
<td>n=173</td>
</tr>
<tr>
<td>Marsh-Tootle et al., 2011</td>
<td>Randomised controlled trial</td>
<td>Surveys (not validated)</td>
<td>n=65</td>
</tr>
<tr>
<td>Pereira et al., 2015</td>
<td>Pre/post intervention study</td>
<td>Surveys (not validated)</td>
<td>n=33</td>
</tr>
<tr>
<td>Robinson et al., 2011</td>
<td>Mixed methods</td>
<td>Survey (validated), Interviews</td>
<td>n=28</td>
</tr>
<tr>
<td>Robson, 2009</td>
<td>Mixed methods study</td>
<td>Surveys (not validated), individual interviews</td>
<td>n=45</td>
</tr>
<tr>
<td>Rudolf et al., 2010</td>
<td>Mixed methods study</td>
<td>Surveys (not validated), interviews</td>
<td>n=137</td>
</tr>
<tr>
<td>Russell et al., 2006</td>
<td>Case study</td>
<td>Unspecified</td>
<td>Not clear</td>
</tr>
<tr>
<td>Sandars &amp; Langlois, 2005</td>
<td>Post-intervention study</td>
<td>Survey (non-validated)</td>
<td>Not clear</td>
</tr>
<tr>
<td>Tapia-Coyner et al., 2013</td>
<td>Post-intervention study</td>
<td>Course documents</td>
<td>n=362</td>
</tr>
</tbody>
</table>

*Sample sizes reported in Table 4 may be lower than the number of participants in Table 3 as the studies did not include all participants in their data collection activities.*
Key educational issues

Based on the analysis and synthesis approach outlined above, a number of key educational issues emerged from the included studies. In total, the following eight issues were identified:

+ realising the potential of e-learning
+ enhancing collaboration and communication
+ improving time pressures
+ overcoming geographic boundaries
+ economics and cost effectiveness
+ convenience, flexibility and accessibility
+ learner isolation
+ technical challenges.

Below the report outlines each of these issues in order to provide a narrative account of the core educational findings.

ISSUE 1
Realising the potential of e-learning

The review found that the included studies, in general, provided reports of how the use of e-learning changed the way primary care professionals learned together. For example, Degryse et al. (2009) evaluated an e-learning course that used a discovery-based learning approach for the diagnosis and collaborative management of dementia in primary care practitioners based in France, the Netherlands and Great Britain. These authors found that e-learning offered practitioners a more stimulating shared virtual learning space. As they noted, “the problem-solving experiences and motivation of discovery learning are combined with the effective guidance of tutorial interactions. This ‘mixed initiative’ tutorial strategy does not attempt to teach the user; instead it provides an environment in which the user may learn” (Degryse et al., 2009, p.398).

In relation to the benefits of e-learning, Halabisky et al. (2010) questioned the use of conventional learning methods, stating, “traditional learning approaches (lectures, hand-outs, audio-visual material, seminars, role playing and group discussion) are not currently meeting the needs of providers […] when effectively designed and facilitated the online approach can provide an even more interactive and collaborative approach than face to face learning” (p. 265).

The use of social media for developing richer forms of collaborative e-learning for primary care professions was explored by Maloney et al (2015), who found that such applications provide, “a distinctly new model of student engagement, and a paradigm shift in how we conceptualise education. Education within social media enables a pedagogical approach that appropriately blends academic and personally elating experiences.

More than just information seeking, learners have the chance to feel a part of the source of valued information, becoming co-creators and curators of the content” (p.254). The use of such online learning methods was regarded positively in its ability to transform the learning process for primary health
care practitioners. Maloney et al. (2015) also stated, “social media provides an opportunity to link health professional learners to new learning opportunities, thereby expanding the classroom and providing a potentially international audience to locally produced education” (p.254).

Other studies which reported educational changes resulting from the use of e-learning included:

+ Docherty and Sandhu (2006) stated that the use of e-learning technologies such as “interactive menus, on-line case studies and video-clips” (p.344) could improve the quality of collaborative learning for primary care providers.

+ Jenkins et al. (2014) explored the use of online blogs as a learning method in their evaluation of a postgraduate e-learning course, finding that the use of a blog platform promoted interprofessional interaction and learning, which helped generate improved decision-making skills.

+ Russell et al. (2006) found that “web-based learning has been identified as offering the potential for students to engage in rich and effective construction of knowledge” (p. 469).

+ Tapia-Coyner et al. (2013) found that online learning offered a more diverse and productive learning environment: “the e-learning platform offers much more in the way of resource materials beyond the mere videos; it is a powerful teaching tool that combines the flexibility of online educational information and learning with continuous interactions with health experts” (p. 175).

+ Kang et al. (2015), who explored the effects of an online interprofessional course in HIV chronic disease management for family physicians and nurse practitioners, found that combining two or more different e-learning methods was more effective at helping support changes in collaborative interprofessional behaviour and patient outcomes than the use of didactic learning.

**ISSUE 2**

Enhancing collaboration and communication

A number of studies reported that the use of e-learning approaches could effectively support the collaborative efforts of participating primary care professionals. For instance, Gensichen et al. (2009), Maloney et al. (2015), Robson (2009), Rudolf et al. (2010) and Russell et al. (2006) all describe how their respective e-learning activities supported interprofessional collaboration between different primary care learners.

In regards to the rationale for using e-learning to support interprofessional collaboration, Buriak et al. (2015) in their US-based study of online education on cancer survivorship for family physicians, nurse practitioners and nurses noted that, “given the rapid evolution of team-based models of health care delivery, online educational interventions [...] should emphasise the importance of collaborative care delivered by interdisciplinary teams” (p. 62)

Also, as Cuggia et al. (2006) stated, in relation to an e-learning programme designed to promote information sharing between French primary care professionals, “the proposed information system is based on the principle of sharing and exchanging information between professionals”, thereby promoting effective interprofessional collaboration. Robson (2009) also provided a useful summary of the use of interprofessional e-learning in offering, “the very best chance of resulting in change in practice [...] if key individuals study and then are able to share their learning with their teams, discuss and introduce plans for change [then] effective change will occur” (p. 107).
Other studies provided some useful accounts of the use of online learning to nurture effective primary care collaboration. Jenkins et al. (2014) went on to note that their e-learning module supported interprofessional collaboration for primary care physicians, consultant nurses and clinical psychologists by using blogs “to allow students to interact with other professionals” (p. 18) where they can interact, discuss and reflect on each other’s blog entries. Similarly, Maloney et al. (2015), who have evaluated the potential of social media for global information exchange in primary care, stated that such online applications support “open seeking and sharing of information, encouraging collaboration and cooperation between learners” (p. 254). For these authors, the advantage of using e-learning methods is that it can foster a sense of collaborative community for participating learners.

In addition, in a study of the effect of web-based learning strategies on practice change in primary care, Robson (2009) stated that

“the modules provided a useful stimulus to team learning”

(p. 108)

due to the high levels of participant interaction.

Providing further evidence for the use of e-learning to promote collaboration in their study of a range of UK based primary care professionals - predominantly general practitioners and nurses - Rudolf et al. (2010) found, “the opportunity to train as a whole team was valued [...] allowed staff, as one manager said, ‘to be singing from the same hymn sheet’. Another manager commented that there was a general feeling of positivity among the staff and that they were more open and supportive of each other” (p. 854).

In addition to these examples of promoting interprofessional collaboration for participating primary care practitioners, the included studies provided other reports of how different forms of collaboration were facilitated by interprofessional e-learning. In respect to collaboration between providers and patients/carers, a study by Hannon et al. (2012), who explored the development of electronic educational resources for the diagnosis of chronic fatigue syndrome (CFS), stated, “a strength of this study is the patient and public involvement that has been central to the development of the resources. By collaborating with patients and carers, we ensured that the research would reflect their needs and priorities” (p. 9). In respect to collaboration between learners and their online facilitators, Russell et al. (2006) reported that,

“the online environment has opened up enormous opportunities for interaction between students and tutors and between tutors, and has brought collaborative learning centre stage in distance education”

(p. 470-471)

These authors went on to report that, “e-learning also opens up opportunities for more personalised one-to-one communication between students and tutor [which facilitates team teaching and contributes to the quality of feedback]” (p.474-475).
ISSUE 3

Improving time pressures

The ability of e-learning methods to alleviate some of the time pressures on the clinical workloads of primary care practitioners to allow them to engage in professional development activities was found to be an important issue within the included studies.

In their relatively early study of online technologies, Sandars & Langlois (2005) noted,

“the benefits of the rapidly evolving technology include ease of access to learning content ‘anytime and anyplace’ and the opportunity to choose from a variety of formats and delivery systems”

(p.129)

They went on to outline a number of benefits of online learning for primary care professions, including, “the availability of up to date information, the speed and ease of access to a wide range of resources and the opportunity for the learner to work at their own pace” (p.131).

Russell et al. (2006), who studied staff and student experiences on a web-based primary care master’s programme, helpfully outlined how online interprofessional learning can reduce time pressures on engagement for learners. They noted, “our decision to develop the course in an online environment was partly based on further identified needs of our learners – busy health professionals needing convenient and flexible access to learning (delivered to the desk top) and opportunities for both self-paced learning and interaction with others facing similar challenges in their work” (p.469, original emphasis).

A study by Hannon et al. (2012), which explored the effect of online learning to support the diagnosis of chronic fatigue syndrome (CFS) in primary care, found, “an online approach (to practitioner education) was preferred as face to face training was thought to be too time consuming” (p.9). These authors went on to note that the convenience associated with online methods was particularly welcomed, as a combination of heavy workloads and the additional complexity of CFS diagnosis meant that ease of access and speed of information transfer was paramount.

Robson’s (2009) evaluation of web-based learning strategies in combination with published guidelines also found that e-learning approaches can offer a helpful response to the time constraints experienced by primary care practitioners. Robson stated, “e-learning packages have the advantage that they can be used efficiently at anytime and anywhere; learners can work at their own pace, but can also receive immediate feedback on performance” (p. 104). This finding was complemented by Tapia-Coyner et al. (2013), who explored an online interprofessional chronic kidney disease education programme for nurses and primary care physicians. They found that,

“internet based education allows students to participate at a time and place convenient to them, facilitates instructional methods that might be difficult in other formats, and has the potential to tailor instruction to the individuals learning needs”

(p.174).
Overcoming geographic boundaries

A number of included studies found that use of e-learning methods could help to overcome traditional issues of having to deliver the educational content of interprofessional courses in the same geographic location. Exploring the potential of e-learning in the safe use of insulin for general practitioners, nurses and pharmacists, James et al. (2011) reported that,

“e-learning provides a practical solution to the provision of evidence based learning across many different staff groups and geographical boundaries”

(p.210)

These authors went on to describe a ‘virtual college’ in which access to online learning resources indicated the irrelevance of geographical distance, as the usual challenges of geography, including travel time and various environmental constraints were all avoided.

This issue was found to be of particular resonance for primary care professionals working in rural healthcare settings, where geographical isolation is a central problem for practitioners. In their study of an online orientation to rural mental health practice in Australia, Robinson et al. (2011) found that their interprofessional online learning programme had the potential to be disseminated widely for rural primary care practitioners based around the country. Indeed, these authors reported that this programme both prepared practitioners for work across rural areas and alleviated the problems associated with inaccessibility of education.

A study by Maloney et al. (2015) noted that e-learning can also respond to much broader trends linked to notions of globalised primary care. In their international study of social media use, which both delivered and assessed evidence-based practice for primary care clinicians, these authors reported that, “the extensive global use of social media by clinicians would enable access” to a range of online learning resources designed to promote their professional and interprofessional practice (p.254). As a result, the authors noted that this form of online learning can help make rare illness and complex conditions more visible and also can contribute to the creation of a more universal platform for primary care education. Similarly, a study by Jenkins et al. (2014), which examined the development of an online education intervention for UK based postgraduate students and primary care professionals in pain management, reported that,

“a relatively flexible e-learning approach means that healthcare professionals from all over the world can undertake the module”

(p.19)

thereby reinforcing the geographical reach (and scalability) of online educational approaches.
Economics and cost effectiveness

A number of the included studies considered the issue of cost, value and effectiveness related to the development and implementation of interprofessional e-learning activities in primary care.

Encouragingly, a number of studies reported a range of positive attributes linked to the cost effectiveness of interprofessional e-learning. For instance, in their study of an online learning course for improving screening of amblyopia in US-based primary care practices, Marsh-Tootle et al. (2011) stated that they selected an online learning approach “as the best delivery mode to implement facets of adult-based learning relevant to physicians as well as allowing low cost, wide spread dissemination of standardized information to individuals separated by time and distance” (p.7161).

These advantages have been echoed by Cuggia et al. (2006) in their evaluation of an online course designed to promote information sharing. These authors recognized the potential of using shareable electronic health records through email systems and web portals, stating, “web technologies provide an attractive infrastructure for efficient and low cost communications in regional health information networks” (p.454).

Another study by Pereira et al. (2015), which examined an e-learning module on improving alcohol abuse management for Brazilian primary health care professionals, reported that interprofessional e-learning makes economic savings related to “transportation costs, published material and physical space. If combined with recorded material, the learning experience can be reproduced several times, while securing procedural uniformity, resulting in an appealing time-flexible cost-effective strategy” (p.200).

However, a number of studies also noted other financial implications - some of which are not immediately obvious - which may impede upon the introduction and sustainability of online education. Gensichen et al. (2015) noted, “concerns were expressed regarding the initial high costs and resources needed to develop e-learning tools [...] the use and development of e-learning approaches are perceived to equate to high resource commitment in terms of time and finance. Institutions and employers recognise that dedicated [setup and maintenance] time is required but there seems to be a lack of appreciation of this fact” (p. 12-13).

A small of number of studies acknowledged that there were uncertainties regarding the initial financial investment and subsequent funding of e-learning. For example, in their evaluation of online course for rural practitioners, Robinson et al. (2011) reported, “significant fiscal and human resource barriers were identified that included the uptake and retention of course participants” (p.635).

Echoing similar concerns, Maloney et al. (2015) reported, “the cost effectiveness and sustainability of such models should be determined to allow informed risk management and to improve the adoption of such modalities” (p. 255). This view was supported by Rudolf et al. (2010), who argued that there is a need for future research to evaluate the cost effectiveness of e-learning interventions. Pereira et al (2015) offered a useful summary of these concerns by suggesting that future studies need to establish “cost effectiveness of e-learning [...] in comparison with other methods” (p. 205).
Convenience, flexibility and accessibility

Many, if not all of the included papers, indirectly acknowledged this issue in relation to the use of online interprofessional learning. However, the following four studies made explicit reference to it. Docherty and Sandhu (2006), who evaluated perceived barriers and facilitators related to e-learning for UK based general practitioners and practice nurses, reported that the “advantages include enhanced curriculum accessibility and increased flexibility of learning” (p.344). Another study by Halabisky and colleagues (2010), which explored the perceptions of interprofessional e-learning amongst primary care practitioners in Canada, found that, “internet-based technology has enabled a more convenient and flexible learning option to meet the needs of busy working healthcare providers” (p. 265)

In addition, MacFarlane et al. (2000), who explored the potential of e-learning for postgraduate learners in the UK, stated, “the flexibility of computer modules means that users can choose between modules and route their paths through them according to their own priorities” (p.320). This finding was supported by Maloney et al. (2015), whose study provided an insight into the use of social media to promote information exchange and collaboration, noting, “social media is a legitimate form of continuing professional development, with the advantage of being flexible” (p. 253-254).

Learner isolation

Although, as outlined above, online learning has the potential to develop practitioners’ professional and interprofessional competence, a small number of studies found that the move from traditional approaches to delivering education – in the same space at the same time – to an online environment whereby interactions are virtual in nature can present a challenging transition for some learners. As the following studies found:

+ Fox et al. (2001) reported, “negative aspects of the course were isolation and lack of interaction with the tutor or other students” (p.804).
+ Halabisky et al. (2010) reported how “isolation of learners from each other” (p.266) impeded the effectiveness of their online course.
+ Robinson et al. (2011) reported that learner isolation was reinforced by “a lack of support” by facilitators when undertaking their e-learning course (p.633).

Docherty and Sandhu (2006) noted that the move away from physical contact/interaction with teachers, mentors and other learners can undermine the quality of e-learning courses. Indeed, this situation can generate perceptions of alienation from learners. In their evaluation, these authors stated that, ”lack of support was reported by over 80% of the sample [leaving students] feeling isolated [...] two key inadequacies in support were reported: the need for greater practical support, in particular help with e-learning, and the need for greater tutor support, including improved contact and greater feedback” (p. 347, 348).

A useful summary of this issue is offered by Russell et al. (2006), who stated, “online collaborative learning, just like any other form of learning, does not suit all learners, and that further research is needed to understand our learner’s specific needs. Not all adapt well to the online environment and some find participation difficult” (p.473).
Technical challenges

A small number of included studies reported how technical difficulties linked to the delivery of the e-learning approaches they evaluated undermined the quality of the educational experience for participants. For example:

+ A study by Bekkers et al. (2010), which evaluated a blended learning intervention for UK-based general practitioners and nurse practitioners aimed at enhancing the quality of antibiotic prescribing, found, “six out of thirty three practices experienced initial technical difficulties (with access to the web forum)”, which diminished learner satisfaction with this course (p.7).

+ Another example was provided by Docherty and Sandhu (2006), who noted that technical problems (not specified) during the delivery of their online learning course “were found to cause major distress for the learner” (p. 344).

+ Similarly, Halabisky et al. (2010) reported learners experienced “frustration with technical difficulties” in their course evaluation (p. 266).

+ James et al. (2011) described initial difficulties with the roll-out of an online programme in the safe use of insulin, finding that technical problems generated “initial access problems” for learners’ (p. 210).

Whilst these studies reported technical issues, these were relatively minor and ultimately resolvable. It should also be noted that the low number of studies which described such issues suggests that this has not been a major cause for concern when compared to other difficulties.

Reported outcomes

Table 5 provides an overview of studies which reported outcomes across the six-point outcomes typology.

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<tr>
<td>Level 1 Reaction</td>
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<td>Level 2a Attitudes/perceptions</td>
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<tr>
<td>Level 2b Knowledge/skills</td>
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<td>Level 3 Behaviour</td>
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<tr>
<td>Level 4a Organisational practice</td>
<td>4</td>
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<tr>
<td>Level 4b Patient/client benefit</td>
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<tr>
<td><strong>Total</strong></td>
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As indicated in Table 5, of the total number of outcomes (n=42) reported across the included studies, most (n=28) were associated with individual changes at levels 1, 2a and 2b. In contrast, fewer studies (n=14) reported broader changes at levels 3, 4a and 4b.

Below the report describes in more detail the nature of the reported outcomes for all six type of levels: learner reactions, attitudes/perceptions, knowledge/skill, behaviour, organisational practice and patient/client benefit.

*The total number of outcomes contained in this table exceeds the number of included studies, as a small number of studies reported more than one outcome from their e-learning course.*
LEVEL 1

Learner Reactions

Six of the included studies reported outcomes at this level. Four of these studies reported positive reactions from the different primary care participants:

+ Gensichen et al. (2015) reported that their e-learning course was regarded as generally “beneficial” in vocation training (p. 12).

+ Rudolf et al. (2010) reported that “the opportunity to train as a whole team was valued” and “there was a general feeling of positivity among the staff” (p. 855).

+ Bekkers et al. (2010) reported that “the online aspect of the training was generally evaluated positively” and participants valued the “flexibility in accessing the programme” (p. 7).

+ Fox et al. (2001) reported that interviews with participants “indicated that the main advantages of taking an internet-based course were the convenience and flexibility” (p. 804).

In contrast, two studies reported more mixed outcomes. Docherty and Sandhu (2006) found a range of positive and negative reactions linked to their e-learning course. In relation to the former, participants valued the course and found it flexible and manageable to complete. However, in regards to the latter, it was noted that lack of support from tutors, lack of technical skills and isolation undermined their experiences of e-learning. In addition, Barber et al. (2010) reported a mixture of positive and negative reactions to their e-learning course on utilisation of occupational asthma guidelines in primary care.

LEVEL 2A

Changes in attitudes/perceptions

Eight studies reported outcomes at this level. Six of the studies reported increases in perceptions of confidence related to a range of different elements:

+ Rudolf et al. (2010) reported that their e-learning course “contributed to the increase in staff confidence” for professionals working with parents of babies/pre-school children around obesity and lifestyle concerns (p. 853).

+ Docherty and Sandhu (2006) reported that participants perceived that their e-learning experience improved “confidence in using e-resources and self-directed learning” (p. 349).

+ Halabisky et al. (2010) reported “learners were found to be significantly more confident (when working in teams)” (p. 269) after their involvement in their e-learning course which aimed to improve collaboration amongst primary care practitioners.

+ Bekkers et al. (2010) reported that participants of their e-learning course “reported greater self confidence in implementing their prescribing decisions” (p. 5).

+ Hannon et al. (2012) reported that their e-learning experience resulted in “improvements in primary care professional’s confidence in managing patients with this [chronic fatigue syndrome]” (p. 9).

+ Maloney et al. (2015) reported that “participant responses to the self-rating of their confidence for interacting with people with tendinopathy also increased” following their e-learning experience (p. 251).

+ Robson et al. (2009) reported improvement in practitioner confidence following their involvement in an e-learning course aimed at improving the use of clinical guidelines for primary care professionals.

Sandars & Langlois (2005) reported that their e-learning course improved participants’ perceptions of online learning, with participants agreeing that “online collaborative learning was positive” (p. 132).
Acquisition of knowledge/skills

Fourteen of the included studies reported outcomes at this level, all reporting a range of positive effects linked to the development of different forms of knowledge and skills:

+ **Marsh-Tootle et al. (2011)** reported that their e-learning course was “efficacious for improving knowledge of vision” related to screening for amblyopia for the participants of their e-learning course (p. 7166).

+ **Rudolf et al. (2010)** found their e-learning experience “improved their knowledge about obesity and how to work effectively with young families”, and also resulted in “an improvement in skills [for the primary care practitioners] when working with parents” (p. 844-845).

+ **Docherty and Sandhu (2006)** reported an increase in knowledge of “using e-resources, allowing them to develop transferable e-learning skills of value to their work” (p. 344).

+ **Robinson et al. (2009)** reported, “in terms of their knowledge […] participation in the [e-learning] programme resulted in improvements in participant knowledge about the role of other services, the availability of other services, the availability of professional networks and support structures” (p. 634).

+ **Russell et al. (2006)** reported that as a result of the online discussions in their e-learning experience, “the students are able to actively construct knowledge”, (p471) and have gained the ability to “practice and develop their higher order academic skills” (p. 472).

+ **Perieira et al. (2015)** reported that there was a “significant increase in alcohol knowledge” among primary care participants who completed an e-learning course on alcohol abuse management, which was sustained for two months after course completion (p. 204).

+ **Barber et al. (2010)** reported that their e-learning course “significantly improved participant’s knowledge” of occupational asthma guidelines for the participating primary care professionals.

+ **Fox et al. (2001)** found that comparing “pre and post intervention scores of subjects showed highly statistically significant improvements in scores on the learning objectives for each unit” of their e-learning experience of change management concepts within a primary care context (p. 804).

+ **Bekkers et al. (2010)** reported that their e-learning experience improved participants’ “communication skills” when managing patients’ expectations of antibiotics prescribing (p8).

+ **Jenkins et al. (2014)** reported that undertaking their online course enhanced participant “knowledge of pain management” (p.25) and developed their “analytical thinking” in this area (p.23).

+ **Maloney et al. (2015)** found a “significant positive shift in knowledge occurred regardless of profession or country” (p. 251) in their study of the use of social media for strengthening interprofessional collaboration within primary care.

+ **Tapia-Conyer et al. (2013)** reported, “online learning programmes for diabetes, dyslipidemia and hypertension have led to improved knowledge of treatment guidelines and complications” for primary care participants (p. 176).

+ **Halabisky et al. (2010)** reported that their e-learning course resulted in an increase of “understanding of each other’s [professional] roles” within the primary care team (p. 269).

+ **MacFarlane et al. (2000)** found that their e-learning course improved participants’ knowledge of epidemiology.
LEVEL 3

Individual behaviour change

In total, seven studies reported outcomes at this level. These studies provided the following behaviour changes associated with the involvement of e-learning activities:

+ **Halabisky et al. (2010)**, who explored the influence of e-learning strategies on interprofessional collaboration in primary care, reported, “learners felt that completion of the working together learning resource resulted in increased levels of interprofessional collaboration between team members” (p.266).

+ **Kang et al. (2015)** found that their e-learning course resulted in a positive change in individual practitioner performances, particularly in the area of interprofessional discussions to develop a comprehensive care plans for patients.

+ **Sandars & Langlois (2005)** reported that their e-learning course resulted in an increase of participant behaviours in “sharing of best practice and knowledge” with their colleagues (p. 132).

+ **Bekkers et al. (2010)** reported that participants in their e-learning course found it “useful in making decisions about the best treatment for their patients” (p. 7).

+ **Rudolf et al. (2010)** reported that their course resulted in improvements in primary care practitioner behaviour related to being “open and supportive of each other” (p. 855).

+ **Barber et al. (2010)** reported that their e-learning course helped participants begin to adopt clinical guidelines in their work.

+ **While Buriak et al. (2015)** did not report actual changes to individual practice, participants in their e-learning course stated an “intention to change clinical practice” (p. 58).

LEVEL 4A

Changes to organisational practice

There were four studies which reported changes to organisational practice following the implementation of an e-learning activity:

+ **Jenkins et al. (2014)** reported a range of behavioural changes resulting from their e-learning course, stating that, “learners’ end of module evaluations suggest that learners are starting to change practice based on their learning” (p. 25). These authors went on to offer a number of examples, including the introduction of guidance for self-management approaches, titration of anti-depressant therapy according to National Institute for Clinical Excellence guidelines, cessation of outdated practices where no evidence existed for effect and the introduction of early assessment of biopsychosocial issues using valid and reliable tools.

+ **Robson et al. (2009)** found that participants felt their involvement in e-learning helped them change their clinical practice. Specific changes reported by these authors included: reduced urine testing; reduced and more-discriminating prescribing; change in preferred antibiotics in urinary tract infections; more-frequent testing for coeliac disease; greater awareness of the implications of test results and improvement in the practice chronic kidney disease protocol.

+ **Maloney et al. (2015)** found that the majority of participants in their e-learning course reported changes in “the way they practiced or intended to practice” (p. 252). These authors outlined the following three areas where participants identified changes in their individual practice: use of evidence-based interventions; patient monitoring and shared clinician/patient decision making.

+ **Docherty and Sandhu (2006)** found that their e-learning course helped affect changes in participants’ practice in relation to adopting evidence based practice. However, a small number of participants (13%) reported that e-learning had no impact upon their work practice.
Benefits to patients/client

Three of the included studies reported outcomes at this level. The first study, by Docherty & Sandhu (2006), reported that following their e-learning course, participants reported that, “patients now benefit from my increased knowledge base that I have got doing the course” (p.348). However, these authors do not specify in what ways patients actually benefitted.

The second study, by Bekkers et al. (2010), reported that their e-learning experience resulted in participants feeling more able to respond to the needs of both individual patients and the wider population. These authors stated that this experience provided participants “with the tools to negotiate with patients about antibiotics in the best possible interests not only of individual patients but also, in the long run, the population at large” (p.9). These authors also reported that the course provided participants with “greater insight into patient's wishes and demands, which was then seen to impact [...] ultimately on patients' self-management” (p.5).

The third study, by Kang et al. (2015), found that their interactive e-learning course had a positive impact on patient benefits relating to increases in assessments of HIV-positive patients, initiations of antiretroviral therapy, identification/monitoring of patients with treatment failures and assessments of HIV-related comorbidities. They also noted that the course resulted in a “136.76% increase in the number of distinct HIV-positive patients receiving HIV-related medication refills that were prescribed by the trainees” (p.714).
Key Implications

This final section of the report presents a series of educational, methodological and outcome implications based on the findings from the scoping review.
E-learning implications

Overall, the scoping review identified a number of key benefits related to the use of interprofessional e-learning for primary care practitioners. Its practicality was consistently reported to contribute to enhanced time management, the removal of geographic limitations and ease of access, which were found to help strengthen interprofessional collaboration and networking. It was also reported that economic savings could be made with the use of e-learning as, for example, reductions in travel costs and institutional overheads could be realised. However, it was noted that e-learning could result in learner isolation, and some technical problems were also identified. These were however, relatively minor in comparison to the reported benefits. Below we provide a series of implications linked to the eight educational issues detailed in the results section.

Realising the potential of e-learning

The review identified that the use of interprofessional e-learning is of value to primary care practitioners and was responsible for generating a range of positive outcomes. Indeed, it was reported across the included studies that e-learning has the capacity to both facilitate interprofessional interaction and help enhance access to a range of educational programmes, courses and workshops which can develop primary care practitioners’ professional and interprofessional competence. It is however, important to ensure that e-learning applications and software meet quality requirements in enhancing the experience for the learner while fully realising the potential of (increasingly) sophisticated synchronous and asynchronous e-learning technologies.

Enhanced collaboration

The scoping review identified that e-learning can support the development of interprofessional collaboration between primary care practitioners. Such improvements can take place on a number of levels ranging from team-based relations to global communication between practitioners. Indeed, interprofessional e-learning can offer a variety of useful opportunities to develop a range of collaborative competencies supported by a range of different e-learning technologies (e.g. online discussion forums, social media applications and message boards).
Time management

The review identified that the increasing intensity of primary care practice often creates a distinctly time-sensitive environment which can be alleviated by the use of e-learning methods. Difficulties associated with heavy workloads can be diminished as e-learning is easily accessible and flexible for practitioners. E-learning can therefore contribute to the development of practitioners' competence as they can, for example, incorporate a short online course during a busy working week with minimal disruption to their clinical schedules. As a result, e-learning can have a positive influence in the short and long term, benefitting practitioners as well as the care they deliver to patients/clients.

Avoiding geographic limitations

E-learning is particularly useful where geographic limitations exist to accessing traditional forms of education as it contributes to reducing costs and time pressures. In particular, for practitioners based in rural communities, e-learning can offer a valuable opportunity to engage in education, information sharing and collaboration with a range of local, national and international colleagues.

Cost effectiveness

The results from this scoping review suggested that the use of e-learning methods can elicit a variety of financial benefits. Being able to access educational resources without the need for travel, textbooks and course fees, which includes institutional costs for physical learning spaces, means e-learning is far more affordable, and therefore accessible. However, the review reported that there were less obvious costs associated with the development and implementation of an e-learning course. Also, the longer term effectiveness of e-learning remains unclear. As a result, the overall cost effectiveness of e-learning approaches remains unclear.

Flexibility

Whilst convenience, flexibility and accessibility are all dependent on local context, it is possible to identify that most, if not all of the studies reported some level of flexibility in their description of the various online education initiatives. Although the review found there has been significant diversity in the e-learning courses, the discussion of flexibility in these studies has remained prevalent, and was reported to have benefit to both practitioners and patients/clients.

Isolation

While there are numerous practical advantages to the use of e-learning, the move from the traditional classroom-based approach has resulted in some learners feeling isolated and others reporting a lack of support from their online educators. These are direct consequences of diminishing face-to-face, learner-to-learner and learner-to-educator interactions. The use of online learning may affect interprofessional interactions/dynamics which were more easily identifiable in previous contexts. To help overcome such issues, the use of blended approaches offers a useful means of transition between virtual and real educational contexts. However, the use of blended approaches does inevitably increase costs, given the need for physical space and travel expenses.

Technical difficulties

The review found that there have been concerns raised regarding technical difficulties encountered in the use of e-learning methods. These difficulties were usually linked to minor failures of software and connectivity problems which caused frustration and disappointment for learners. Although not widely reported in the included studies, it is important to note that coherent technological functioning is paramount to the successful delivery of e-learning. If possible, such minor faults should be prevented in the first instance as to not disrupt the quality of the e-learning experience.
Methodological implications

Overall, the 23 included studies employed a range of different study designs, gathered a variety of data and reported a number of differing outcomes related to use of primary care based e-learning. Based on the evidence of these studies and the outcomes they reported, we provide a series of key methodological implications.

Study outcomes

Collectively, the included studies indicated that the use of e-learning for primary care practitioners generated a range of positive outcomes for participant reactions (level 1), helped to generate improvements to their perceptions and attitudes (level 2a), as well as improvements to their knowledge and skills (level 2b). In addition, while the review indicated that the use of e-learning resulted in gains to participants’ individual behaviour (level 3), improvements the way their organisations practiced (level 4a) and could generate benefit for patients/clients (level 4b), there were fewer studies reporting at these levels. While it is important to gather data for outcomes at levels 1, 2a and 2b, future e-learning evaluations should also focus on developing the evidence for its effects on levels 3, 4a and 4b (including data on cost effectiveness) to help build a more robust insight into the longer-term outcomes for this type of primary care education.

Heterogeneity

While the included studies reported a promising number of outcomes associated with the use of e-learning, the wide range of e-learning activities/courses do generate some limitations. Specifically, due to the heterogeneous nature of the e-learning approaches reported in the 23 studies, it is difficult to draw a set of robust implications that can identify which types of e-learning methods may be effective and which may be less so (a problem which is compounded by the use of a mixture of differing study designs and methods). Nevertheless, it is possible to note that studies which employed a variety of approaches such as online self-directed learning, interactive web-based discussion supported by e-facilitator were well evaluated when compared to studies that only employed a single form of e-learning method. In addition, blended approaches (using online and traditional learning methods) were also well evaluated. However, as noted above, such approaches did increase costs due to the need to pay for learning space and travel expenses.

Self-reported data

Another word of caution needs to be applied to the included studies. While the review indicated that these studies reported a range of positive outcomes related to the use of e-learning in primary care, most of the 23 studies gathered data in the form of un-validated surveys, individual interviews and focus groups. As a result, the bulk of reported outcomes are based on self-reported data. This is a weak form of evidence as it is widely recognised that individuals are often inaccurate in assessing possible changes to their knowledge, skills and behaviours (Davis et al., 2006). As a result, such reports must be regarded as weak approaches to measuring change.
Included Studies


Docherty, A, Sandhu, H (2006) Student-perceived barriers and facilitators to e-learning in continuing professional development in primary care. Education for Primary Care; 17: 343-353


Other References


### APPENDIX 1

## Abstraction form

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Comments/Details</th>
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