Research on Teaching of Evidence Based Practice in Ireland – to Healthcare Professionals and Healthcare Students

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The Clinical Effectiveness Unit of the National Patient Safety Office for the National Clinical Effectiveness Committee on the advice of its Education and Training Subcommittee.

National Clinical Effectiveness Committee (NCEC)

Clinical effectiveness is a key component of patient safety and quality. The integration of best evidence in service provision, through clinical effectiveness processes, promotes healthcare that is up to date, effective and consistent.

The National Clinical Effectiveness Committee (NCEC) is a Ministerial committee established in 2010 as part of the Patient Safety First Initiative. The NCEC is supported by the Clinical Effectiveness Unit (CEU), Department of Health. The NCEC is a partnership between key stakeholders in patient safety and its mission is to provide a framework for national endorsement of evidence-based clinical guidelines and audit to optimise patient and service-user care.

The NCEC has a subgroup on clinical effectiveness education and training to:

- Guide the development of multidisciplinary education in clinical effectiveness
- Liaise with postgraduate and undergraduate educational organisations to identify mutual goals and areas of interest relevant to clinical effectiveness and evidence based practice
- Make recommendations to the NCEC regarding training and education in clinical effectiveness.

As part of the work of this subgroup, invitations to tender were issued in October 2016 and a public procurement competition held for the conduct of research into the current provision of EBP teaching in Ireland.

Further information on the NCEC and NCEC subgroups is available at www.health.gov.ie/patient-safety/ncec

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Note: A summary version of this report is also available from ncec@health.gov.ie and on https://health.gov.ie/national-patient-safety-office/ncec/

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List of Abbreviations

BEAR: Brief Evidence-Based Assessments of Research
BL: Blended Learning
CAT: Critical Appraisal Topic
CCT: Controlled Clinical Trial
CG: Control Group
CEBM: Centre of Evidence Based Medicine (Oxford)
CME: Continuing Medical Education
CMLS: Case Method Learning Sessions
CONSORT: Consolidated Standards of Reporting Trials
CPD: Continuous Professional Development
CT: Critical Thinking
DEBP: Developing Evidence-Based Practice Questionnaire
DL: Didactic Learning
DoH: Department of Health
EBM: Evidence Based Medicine
EBP: Evidence Based Practice
EBPI (S): Evidence Based Practice Implementation Scale
EBPQ: Evidence Based Practice Questionnaire
EPHPP: Effective Public Health Practice Project
GAS: Goal Attainment Scale
GATECAT: Graphic Appraisal Tool for Epidemiological Studies Critical Appraisal Tool
HCPC: Health Care Professional Council
HEI: Higher Education Institution
IG: Intervention Group
IOM: Institute of Medicine
KAB: Knowledge, Attitude, Behaviour
KTA: Knowledge to Action
MCQ: Multiple Choice Questionnaire
MI: Multi-intervention
NCEC: National Clinical Effectiveness Committee
NICE: National Institute for Health and Care Excellence
NMBI: Nursing and Midwifery Board of Ireland
NR: Not Reported
OSCE: Observed Structured Clinical Examination
PBL: Problem Based Learning
PG: Postgraduate
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PW: Professional Writing
RCT: Randomised Controlled Trial
SD: Standard Deviation
SIGN: Scottish Intercollegiate Guidelines Network
STROBE: Strengthening the Reporting of Observational studies in Epidemiology
UG: Undergraduate

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Executive Summary

Background

Internationally, Evidence-Based Practice (EBP) is an established healthcare priority. The directive for its promotion arises from the need to achieve the following: (1) improved patient experience of care (including quality and satisfaction), (2) improved health of populations and (3) reduced per capita cost of healthcare (Berwick *et al*., 2008; Melnyk *et al.,* 2012; Gilliam and Siriwardena, 2014). Accomplishing these healthcare goals involves an emphasis on clinical effectiveness which is a key component of patient safety and quality. The integration of best evidence in service provision, through clinical effectiveness processes, promotes healthcare that is up-to-date, effective and consistent (Department of Health, (DoH), 2016).

Achieving EBP however is a complex undertaking. One of the most consistent findings in health service research is the gap between best EBP and actual clinical care (Zelenikova *et al.,* 2014). The promotion of EBP requires a healthcare infrastructure committed to supporting organisations to deliver EBP and an education system effective in supporting healthcare professionals in acquiring EBP competencies (Dawes *et al.* 2005). Evidence-based practice is increasingly recognised as a foundation for healthcare education across disciplines and international borders (Dawes *et al.,* 2005; Ilic and Maloney 2014). The acquisition of EBP competencies begins during an individual's professional training. To this end, healthcare education programmes must design curricula that target these competencies (Thomas *et al.,* 2011). It is acknowledged that EBP is a relatively young discipline, with the development of professional education to facilitate EBP identified as a major and immediate challenge (Reilly *et al.*, 2004; Dawes *et al.* 2005, Meats *et al.,* 2009; Aglen *et al.,* 2016).

The National Clinical Effectiveness Committee (NCEC) provides strategic leadership for the national clinical effectiveness agenda. It's subgroup on education and training provides advice and support to the NCEC in guiding the development of multidisciplinary health professional education in clinical effectiveness. This involves liaising with educational organisations to identify mutual goals relevant to clinical effectiveness and evidence-based practice and making recommendations to the NCEC on how 'best practice' can be achieved in these areas (DoH, 2016). There is currently a lack of baseline data on the provision, practice and variation of evidence-based practice education in Irish third level educational organisations and professional training/regulatory bodies across the health professions. The collation and analysis of such data is required to lay the foundation to inform the standards and requirements of education programmes for healthcare professionals in Ireland and contribute to the overall body of evidence for 'best practice' in national clinical effectiveness education.

Aims

The overall aim of this commissioned work was to:

Determine current provision, practice and variation in Evidence-Based Practice (EBP) education in Irish third level healthcare professional education.

Objectives were to:

1. Determine current provision, practice and variation in evidence based practice (EBP) education in Irish third level education.
2. Describe current practice in other English speaking countries (to include UK, Canada, New Zealand and Australia) of how they are delivering EBP education to health care professionals (undergraduate and postgraduate).
3. Inform the development of a core syllabus/curriculum and competencies/competency framework for EBP education in Ireland.
4. Inform standards and requirements for education programmes in evidence based practice for health professionals at Ireland's Higher Level Institutions (HEIs) /courses leading to an award on the National Framework of Qualifications.
5. Act as a baseline study which can be repeated in the future.
6. Contribute to evidence for 'best practice' in national clinical effectiveness education.
7. Inform the content and optimum delivery mode for training programme(s) for the competency and skills required by all relevant stakeholders.
8. Support the NCEC and the Department of Health to provide strategic leadership for the national clinical effectiveness agenda.

Methods

To meet the project aims and objectives, the following three distinct, but interlinked phases of research were conducted.

1. A desk-top structured rapid review, following the Knowledge to Action (KTA) 8-step evidence summary approach was undertaken to provide a summary and synthesis of current international literature, including grey literature, on standards of education in EBP e.g. syllabus/curriculum, competencies, methods of assessment, teaching methods and effectiveness for teaching of EBP.
2. Evidence-based practice expert interviews were carried out to ascertain current and nuanced information on EBP education for healthcare professionals in other English-speaking countries. Experts from the United Kingdom (Professor Carl Heneghan), Canada (Professor Gordon Guyatt), New Zealand (Professor Rodney Jackson and Professor Bruce Arroll) and Australia

(Professor Leanne Togher) were chosen based on their contribution to peer-reviewed literature on the subject area and recognised innovation in EBP education. Qualitative content analysis techniques were employed to categorise the findings.

3. A descriptive, cross-sectional, online survey was undertaken to capture and describe baseline data relating to the current provision and practice of EBP education to healthcare professionals at third level institutions and professional bodies in Ireland. A purposive sampling strategy was employed to ensure that stakeholders involved in the provision, oversight or regulation of healthcare professional education were recruited. Specifically, HEIs, National University of Ireland Recognised Colleges and Institutes of Technology that offer undergraduate and postgraduate healthcare profession education courses were sampled in addition to professional training and regulatory bodies. The survey was developed in consultation with the NCEC, and following a review of literature. Following quality appraisal processes for survey validation, online data collection via Survey Monkey© commenced and was complete within a six-week period.

Key Findings

Structured Review Findings

Narrative analysis and synthesis of 83 empirical studies revealed that participation in any form of EBP education has beneficial effects across all EBP competencies. The most apparent trend in positive changes in EBP competencies derive from multi-modal EBP interventions which address at least two or more of the five EBP steps of Ask, Acquire, Appraise, Apply, Assess. With respect to professional curricula development, there is evidence to suggest that the application of educational theories, such as adult learning theory, behaviour change theory and, from an undergraduate perspective, theories of cognitive maturity development and knowledge transfer, can assist in structuring curricula overall to facilitate the integration of EBP as a core component. What is not equivocally evident is what form or combination of EBP education components have the most beneficial long-term effects, particularly in terms of translating knowledge and skills into clinical application of EBP. Similarly, there is insufficient evidence to suggest that an EBP intervention will have similar effects across a range of health professions. Due to the extent of non-validated instruments used to measure outcomes across the evidence base, changes in EBP competency post educational intervention must be interpreted with caution. With respect to grey literature, particularly from an international perspective, explicit reference to the requirement of healthcare professionals to engage in EBP for the provision of the highest quality of care and cost-effective services to society is evident throughout all professional training / regulatory body policy documents.

EBP International Expert Interview Findings

Content analysis of the experts' interviews brought attention to the significance of the following three key categories, namely: (i) 'EBP Curriculum Considerations'; (ii) 'Teaching EBP' and (iii) 'Stakeholder Engagement in EBP Education'. Definitive advice in relation to curriculum considerations was provided with a clear emphasis on the need for EBP principles to be integrated throughout all elements of healthcare curricula. Embedding EBP within compulsory profession-specific competencies and/or accreditation processes was suggested to present opportunities for real integration of EBP. It was advised that EBP competencies should centre on the oft-cited steps of asking questions, acquiring, appraising, applying and assessing evidence to patient care decisions with additional attention required on developing professionals' ability to communicate evidence effectively and participate in shared decision-making.

Insights into the adoption of effective strategies to realise successful student learning and understanding were provided with a strong emphasis on employing teaching methods that are clinically based. EBP role models and clinicians with the 'X-factor' were highlighted as being integral to demonstrating the application of EBP in clinical decision-making and facilitating the contextualisation of EBP within a specific setting/organisation. Reference to the importance of training educators to further develop skills and use of resources necessary for effective EBP teaching was made on a number of occasions.

Engagement of national policy makers, healthcare professionals and patients' with EBP was also suggested as having potential to advance EBP teaching and application in the clinical context. Establishing a coherent national policy on EBP education and investment in resources and related initiatives were deemed of merit in advancing the EBP teaching agenda. Providing structured and embedded EBP activities relevant to clinical care was highlighted as a pragmatic approach to improve healthcare professional consistency with EBP. Enabling patients to engage with evidence with a view to informing healthcare professional/patient interactions and care decisions was also advocated.

The overarching theme derived from interview analysis was; 'Improving healthcare through enhanced teaching and application of EBP'. This theme represents the focus and purpose of the effort required to optimally structure HCP curricula, promote effective EBP teaching and learning strategies and engage with key stakeholders for the overall advancement of EBP education.

National Survey Findings

Representation from 11 health and social care professions (i.e. dentistry, occupational therapy, nursing, midwifery, pharmacy, physiotherapy, radiography, dietetics, psychology, medicine and speech and language therapy) across undergraduate, postgraduate and continuing professional development academic levels was obtained with an overall survey response rate of 67 percent.

For the majority of respondents, formal teaching of EBP was introduced within respective institutions more than 10 years previously and is predominantly taught by academic staff. 'Blended learning', that is a combination of traditional and problem-based learning, is the principal teaching approach used to deliver healthcare curricula overall, of which EBP is a component. 'Stand-alone' didactic lectures are the most frequently used method of teaching EBP across all academic programme levels, with non-face-to-face methods and practice-based learning workshops allocated the least amount of teaching time. A named EBP Lead/Champion is not identifiable within the majority of institutions.

In relation to curriculum issues specific to EBP, overall, there was strong agreement that EBP principles are embedded within curricula to achieve core professional competencies, with undergraduate and postgraduate written curricula reflecting an EBP philosophy. There was also strong agreement that academic staff decide which subjects are appropriate for teaching EBP with a lower percentage of respondents agreeing that clinical educators have such input. All EBP learning activities as outlined by the Sicily Statement (ask, acquire, appraise, apply and assess) are included as key content areas across healthcare profession programmes with activities in relation to the retrieval, accessing and appraisal of evidence classified as the most common activities. While over 75% of respondents indicated strong agreement that formative and summative assessments are used by academic staff to determine the extent of EBP learning, agreement on the use of such assessment strategies by clinical educators was considerably less. The most common methods used to assess EBP learning include Critically Appraised Topics (CATs) and Observed Structured Clinical Examinations (OSCEs) with the application of CATs within a clinical setting least used. With regard to current teaching practices in the area of clinical effectiveness, patient safety and quality improvement processes are the subjects most frequently taught.

Education on clinical audit was provided by the majority of represented institutions and across all academic programme levels, although notably less so at a continuing professional development level. Methods of teaching include small group tutorials, integration of audit material into other lecture topics

and the application of audit methods into practice settings. Just under half of respondents indicated that learning outcomes in relation to clinical audit were assessed.

Overall, attitudes towards EBP are very positive with the vast majority acknowledging EBP as necessary for improved clinical decision-making and quality of patient/client care. Just over half of respondents indicated that staff have received formal training in teaching EBP namely through attendance at EBP teaching workshops or in-service training sessions. Informal activities undertaken to assist in teaching EBP ranged from drawing on personal professional experiences of being an evidence-based practitioner to self-directed learning in relation to accessing and appraising information.

The top three rated barriers to EBP teaching include difficulties integrating evidence into practice, the lack of time for EBP within curricula and the lack of importance or the perceived relevance by students of EBP education provision. Access to courses to enhance knowledge of EBP/teaching of EBP, in addition to evidence of improved patient outcomes from the use of EBP are seen as potentially helpful strategies to enhance EBP teaching.

Conclusions and Recommendations

This is the first survey to report on EBP teaching within healthcare education across different professions and academic levels within the Republic of Ireland. Similar to national surveys of EBP teaching conducted in the UK (Meats *et al.* 2009), North America (Aiyer *et al.,* 2002; McDonald *et al.,* 2014; Blanco *et al.* 2014) and Australia (Togher *et al.,* 2011), there is a considerable amount of EBP activity throughout health profession education in Ireland, with strong recognition of the need for EBP principles and processes within curricula to achieve core professional competencies. While this evidence is promising, effectively embedding EBP throughout health education curricula remains in the early stages and requires further development. To achieve 'best practice' in healthcare professional education with respect to clinical effectiveness and EBP, the following key recommendations were formed on the basis of the salient findings from the structured review, expert interviews and national survey.

Healthcare Profession Education Domain	Key Observations to Inform Recommendations	For reflection and action by key stakeholders
Curricula (undergraduate/ postgraduate)	1. Explicit and consistent inclusion, documentation and demonstration of EBP principles and processes[1] throughout academic and clinical programme components is advocated to focus curricula development and associated learning activities.	Academic and clinical educators[2] within Higher Education Institutes (HEIs), Health Service Providers (HSPs) and professional training bodies.
	2. Educational theories, for example, adult learning theory and theories of cognitive maturity development and knowledge transfer, offer guidance in structuring curricula, with a particular utility in facilitating the integration of EBP as a core curriculum component.	Academic and clinical educators within HEIs, HSPs and professional training bodies.
	3. Where not already present, explicit inclusion of EBP as a core competency within professional standards and requirements, with consideration given to linking with professional accreditation processes is recommended to facilitate improved integration of EBP within academic and clinical curricula.	Professional Regulator & Training Bodies
	4. The application of mapping tools to health education curricula is valuable to ensure the vertical and horizontal integration of EBP throughout all programme elements.	Academic and clinical educators within HEIs, HSPs and professional training bodies
	5. Scaffolding acquisition of EBP learning outcomes across novice, intermediate and professional entry levels within undergraduate programmes has gained increased attention as a potentially effective method of structuring learning and application of EBP throughout the duration of a programme of study.	Academic and clinical educators within HEIs, HSPs and professional training bodies

[1] EBP Principles and Process: As defined by the Sicily statement (Dawes et al., 2005).

[2] Clinical Educators: Teachers/Trainers/Role Models of EBP in health sector but not in University/Academic settings.

	6.	National agreement among key stakeholders of the minimum standard educational requirements and core EBP learning objectives is advocated with consideration given to international models i.e. Sicily Statement/Oxford/McMaster in the development of such requirements.	NCEC, Professional Regulatory & Training Bodies, HEIs/HSPs and other stakeholders
EBP Competencies/ Additional Skills	7.	Increased emphasis is needed on developing competency in, and providing access to, pre-appraised evidence resources to facilitate a more 'real-world' and pragmatic approach to the acquisition and appraisal of evidence to inform practice (see also Key Observation No. 15).	Academic and clinical educators, in addition to library providers and information specialists within HEIs and HSPs.
	8.	Additional opportunities for students and practitioners to engage in the application of EBP and the assessment of its impact in practice through audit and associated activities is advised.	Academic and clinical educators within HEIs and HSPs.
	9.	Further emphasis on skills relating to communication of evidence and shared decision-making processes with patients/clients is increasingly recognised as key to EBP competency.	Academic and clinical educators within HEIs and HSPs.
Teaching and Learning Approach	10.	An interdisciplinary teaching approach to the delivery of core common components of EBP education across undergraduate and postgraduate programmes is suggested as a helpful strategy for enhancing EBP teaching and learning.	Academic and clinical educators within HEIs, HSPs and professional training bodies.
	11.	Employment of effective teaching strategies which are clinically integrative, interactive and multi-modal in terms of delivery are considered essential for enhanced EBP competence and knowledge transfer.	Academic and clinical educators within HEIs, HSPs and professional training bodies.

	12.	The use of a *wide range* of validated assessment strategies (where possible, e.g. Fresno Test, Berlin Questionnaire, GATECAT, OSCE), that can accurately assess EBP competency attainment is advised to promote a consistent evaluation of EBP teaching outcomes.	Academic and clinical educators within HEIs, HSPs and professional training bodies.
Strategies for Overcoming Teaching and Learning Barriers	13.	Engagement with stakeholders to agree and direct the delivery and integration of EBP education across undergraduate, postgraduate and continuing professional programmes is advised to advance the EBP agenda in a co-ordinated and cohesive manner.	NCEC, Academic and clinical educators within HEIs & HSPs Professional Regulatory and Training Bodies
	14.	Achieving 'best practice' in EBP teaching – EBP educators charged with responsibility for health professional education (university/academic staff, regulatory body education officers and practice/health service clinical educators) should have formal training in EBP and EBP teaching across all steps of EBP (ask, acquire, appraise, apply, assess) and be facilitated to undertake such training.	Academic and clinical educators within HEIs, HSPs, and professional training bodies.
	15.	The incorporation and promotion of EBP activities and resources e.g. journal clubs, grand rounds, audit, access to clinical librarians/information specialists and EBP literature within clinical/health service settings is advocated to facilitate enhanced engagement with evidence based practices.	Health Service Providers
	16.	Increased discourse between academic and clinical educators through curriculum development and evaluation processes presents an effective opportunity to enable further integration of EBP teaching into practice.	Academic and clinical educators within HEIs, HSPs and professional body educators.

Research (Overall Observation) Research Recommendations (International) Research Recommendations (National)	17.	Research and funding agencies (national & international) to consider allocation of grants to develop and support this area of capacity building specifically in relation to researching teaching and learning of EBP.	Academic and clinical educators within HEIs, HSPs and professional body educators and other key stakeholders.
	18.	Develop and evaluate a common core programme of study using standardised outcome measures across healthcare professions in relation to the achievement of EBP competency.	
	19.	Investigate the efficacy of implementing specific andragogic learning strategies to direct health profession curricula in relation to the integration of EBP.	
	20.	Evaluate, through longitudinal studies, the impact of current health professional education on developing EBP skills and knowledge in addition to changing and sustaining practice behaviour.	
	21.	EBP educators should be encouraged to form collaborations with educational researchers in order to design and develop rigorous studies to successfully compete for research funds and increase the evidence base for EBP teaching and practice.	
	22.	Conduct a follow-up national survey following the implementation of overall recommendations/key observations to allow for comparison with repeat data.	
	23.	Conduct a baseline study examining communication and collaboration practices between academic/HEI, clinical (HSP) and professional body educators in relation to EBP education, particularly its integration and assessment in clinical settings.	
Report Implementation/	24.	Consult with stakeholders with responsibility for the delivery of	NCEC and all stakeholders

Knowledge Transfer Acquisition		healthcare professional education (i.e. HEI, HEA, DoE, Interdepartmental Workforce Planning group, Professional Training/ Regulatory bodies, Health Service Providers, Forum of Postgraduate Training Bodies (as required)) to address report findings.	
	25.	NCEC to continue to engage key stakeholder groups to progress the development of standards and core competency framework for EBP in Ireland.	NCEC and all stakeholders

Chapter 1- Background

1.1 Introduction

The National Clinical Effectiveness Committee (NCEC) provides oversight for the National Clinical Effectiveness Agenda, which is key to the delivery of safe and quality health services in Ireland (DoH 2010). Clinical effectiveness aims to ensure that healthcare practice is based on best available data and evidence of effectiveness (DoH 2016). It brings together information gathered from national and international research and audit to help healthcare practitioners and their patients to make decisions about what is best for the Irish healthcare system and its individual users (DoH 2016). The NCEC subgroup on Education and Training provides advice to the NCEC for its role in strategic leadership for the national clinical effectiveness agenda and in guiding the development of multidisciplinary health professional education in clinical effectiveness. This involves horizon scanning national and international developments in healthcare education, liaising with educational organisations to identify mutual goals relevant to clinical effectiveness and evidence-based practice and making recommendations to the NCEC on how 'best practice' can be achieved in these areas (DOH 2016).

This report was commissioned by the Clinical Effectiveness Unit of the National Patient Safety Office for the NCEC to capture baseline data on the provision and practice of evidence-based practice education in Irish third level educational organisations and professional bodies across the health professions. It is a fundamental step towards informing the standards and requirements for education programmes in EBP for healthcare professionals in Ireland.

1.2 Context

Evidence-based practice (EBP), whose philosophical origins extend back to ancient historical accounts of treatments for illness, remains a contemporary topic for healthcare professionals, public health practitioners, educators, policy makers, and the public. Guyatt (1991) introduced the phrase ''evidence-based medicine'' (EBM) with the original definition suggesting that the process was *"an ability to assess the validity and importance of evidence before applying it to day-to-day clinical problems" (*p. A16). In 1996, Sackett *et al.,* introduced two other components to EBM by making the link between clinical judgment, patient values and preferences and knowledge of the relevant scientific evidence in medical decision-making. In 2005, Dawes *et al.,* recommended that the concept of evidence-based medicine be broadened to "evidence-based practice".

This was to reflect and recognize other health professions acceptance and adoption of an evidence-based approach to practice and learning. The corresponding definition of EBP states that "*EBP requires*

that decisions about healthcare are based on the best available, current, valid and relevant evidence. These decisions should be made by those receiving care, informed by the tacit and explicit knowledge of those providing care, within the context of available resources ……" (p.4) Dawes *et al.,* (2005).

The directive for promoting EBP stems from the need to achieve the following; (1) improved patient experience of care (including quality and satisfaction), (2) improved health of populations and, (3) reduced per capita cost of healthcare (Melnyk *et al.,* 2012; Gilliam and Siriwardena 2014). Worldwide, the implementation of EBP is presented as one of the main solutions to delivering such outcomes. Research findings support this contention with compelling reports that evidence-based practice contributes to improved patient outcomes (Cleary-Holdforth and Leufer, 2009; McGinty and Anderson 2008), a superior quality of care (Glanville, Schirm and Wineman 2000; Emparanza *et al.,* 2015; Leufer and Cleary-Holdforth, 2009; Melnyk 2007), potential cost efficiencies (Helfand, 2005; Sandelar and Ball, 2010) and importantly, attainment by healthcare organisations of high reliability in patient safety (Melnyk *et al.,* 2012).

Achieving EBP is a complex undertaking. With the expansion of information, healthcare professional knowledge should be greater and practice more effective. Unfortunately, this is not always the case. This recognised gap between best evidence and practice is one of the driving forces behind the further development of EBP (Barends and Briner, 2014; Zelenikova *et al.,*2014). Common barriers to embedding EBP in healthcare decision-making include lack of time, inability to access research, difficulties comprehending and evaluating research language, negative perceptions about research and an inability to change practice at an institutional level (Solomans and Spross 2011; Togher *et al.,* 2011). The promotion of EBP requires both a healthcare infrastructure committed to supporting organisations to deliver EBP and an education system effective in supporting healthcare professionals in acquiring EBP competencies (Dawes *et al.,* 2005).

Evidence-based practice is increasingly recognised as a foundation for healthcare education across disciplines and international borders (Dawes *et al.,* 2005). The acquisition of EBP competencies begins during an individual's professional training. To this end, health professional academic programmes must design curricula that target these competencies (Thomas *et al.,* 2011). In a series of landmark North American EBP summits, sponsored by the Institute of Medicine (IOM), it was recommended that all health professional educational programmes comprise of 5 competencies, including; (1) providing patient-centred care, (2) applying quality improvement principles, (3) working in inter-professional teams, (4) using EBP, and (5) using health information technologies (IOM 2003, IOM 2009).

Internationally, the Sicily consensus statement on EBP developed by a working group representing both educational organisations and individual teachers and developers of EBP, produced recommendations for the facilitation of evidence-based outcomes, including the realisation of 'true' evidence-based healthcare practices. This culminated in the description of core skills required to practice in an evidence-based manner and a curriculum that outlines the minimum requirements for educating health professionals in EBP (Dawes *et al.,* 2005). Educators are encouraged to develop EBP curricula that address a refined 5 step model as originally proposed by Guyatt and colleagues at McMaster University. These steps include; (1) translation of uncertainty to an answerable question, (2) systematic retrieval of best evidence available, (3) critical appraisal of evidence for validity, clinical relevance and applicability, (4) application of results in practice and (5) evaluation of performance (Dawes *et al.,* 2005). Clinical Audit is defined as a quality improvement process which seeks to improve patient care and outcomes through systematic principles and subsequent change implemented where required. Whilst it is not explicitly listed as one of the 5 EBP steps, it is considered an implicit step of the EBP principle.

Training and education in EBP has been implemented internationally across different health professional curricula in undergraduate, postgraduate and continuing professional development settings (Ilic and Maloney 2014). Over two decades after the publication and application of the tenets in the seminal paper “Evidence-Based Medicine: A New Approach to Teaching the Practice of Medicine” (Evidence- Based Medicine Working Group, 1992), more than 300 articles have been published on teaching evidence-based medicine alone and more than 30 experiments have been conducted to measure its effects (Barends and Brimer 2014). While the significance and necessity of EBP is recognized, its application is observed irregularly at the point of patient contact (Dawes *et al.,* 2005). It is acknowledged that while EBP is a well-established principle it is time to move forward with its effective implementation. Thus far the development of professional education to facilitate EBP has been identified as a major and immediate challenge (Reilly *et al.,* 2004; Dawes *et al.,* 2005, Meats *et al.,* 2009; Aglen *et al.,* 2016).

To highlight and advance the clinical effectiveness and evidence-based practice agendas, the Institute of Medicine (IOM) set a goal that by 2020, 90% of clinical decisions will be supported by accurate, timely and up to date clinical information and will reflect the best available evidence to achieve the best patient outcomes (IOM, 2009). To ensure that future health care users can be assured of receiving such care it is recommended that the healthcare professions incorporate the necessary knowledge, skills and attitudes of EBP into their professional education programmes and registration requirements.

There is currently a lack of baseline data on the provision, practice and variation of evidence-based practice education in Irish third level educational organisations and professional bodies across the health professions. Such information is required to lay the foundation to inform standards and requirements for healthcare professional education programmes in Ireland and to contribute to the body of evidence for 'best practice' in national clinical effectiveness education.

1.3 Project Aims and Objectives

The overall aim of this project was to:

Determine current provision, practice and variation in Evidence-Based Practice (EBP) education in Irish third level healthcare professional education.

Specific objectives were to:

1. Determine current provision, practice and variation in evidence based practice (EBP) education in Irish third level education.
2. Describe current practice in other English speaking countries (to include UK, Canada, New Zealand and Australia) of how they are delivering EBP education to health care professionals (undergraduate and postgraduate).
3. Inform the development of a core syllabus/curriculum and competencies/competency framework for EBP education in Ireland.
4. Inform standards and requirements for education programmes in evidence based practice for health professionals at Ireland's Higher Level Institutions (HEIs) /courses leading to an award on the National Framework of Qualifications.
5. Act as a baseline study which can be repeated in the future.
6. Contribute to evidence for 'best practice' in national clinical effectiveness education.
7. Inform the content and optimum delivery mode for training programme(s) for the competency and skills required by all relevant stakeholders.
8. Support the NCEC and the Department of Health to provide strategic leadership for the national clinical effectiveness agenda.

1.4 Overall Project Management

To meet the project, aim and objectives, four interrelated work packages (WP) were undertaken (see Figure 1.1).

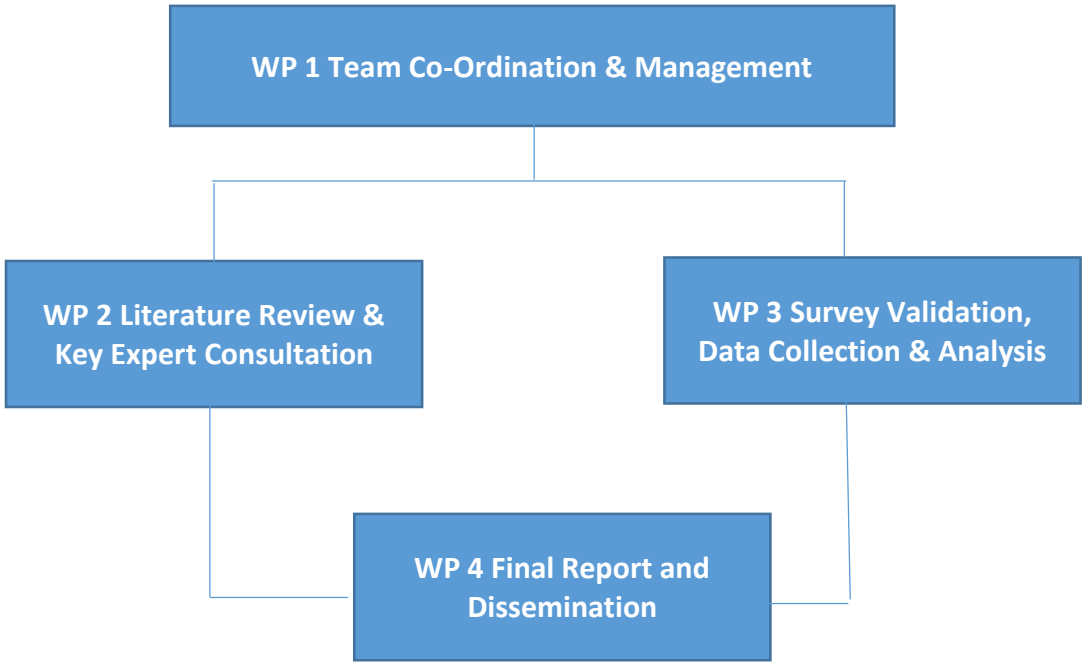


Figure 1. 1 Project work-package flow

The following table outlines each work-package objective; method(s) used to achieve the specified objective and associated target outcome(s).

Table 1. 1 Work Package Objectives, Methods and Target Outcomes

Work Package (WP)	Objective(s)	Methods	Target Outcome
WP1	To ensure project is completed within the required time-frame, whilst ensuring appropriate governance and high-quality processes and outcomes.	-Risk Management Plan (RMP). -Communication Strategy. -Financial Oversight.	-Appropriate governance and high-quality processes and outcomes. -Project delivered within timeframe.
WP2 A	To conduct a literature review and present a critical synthesis of evidence relating to the standards of education in EBP within empirical and 'grey' literature.	Structured review guided by the *principles* of conducting systematic reviews in relation to search, review, extraction and synthesis processes.	-Replicable search strategy. -Data extraction tables. -Synthesized findings.
WP2 B	To ascertain current and nuanced information from key expert consultation in other English-speaking countries (UK, Canada, New Zealand, Australia) on EBP education for healthcare professionals.	EBP expert consultation via semi-structured interviews with content analysis.	-Report on key expert consultations.
WP3	To develop and validate a survey to capture data relating to the provision, practice and variation of EBP education in Ireland.	Survey development, validation and distribution methods.	-Online validated EBP survey. -Survey results as baseline national data.
WP4	To submit a final report to the DoH Clinical Effectiveness Unit and operationalise a clear dissemination and knowledge exchange plan.	-Drafting of report. -Feedback consultation with project team and NCEC.	-Final report outlining current national provision and practice of teaching EBP to HCPs at 3rd level in Ireland including key future recommendations. -Presentation and publication strategy.

1.5 Project Report Structure

This report comprises of 5 chapters. Following on from this introduction, Chapter 2 presents the methods and results of the structured review. Chapter 3 details the methods and findings of the qualitative expert interviews, following which, a combined synthesis of the review and interview findings are presented. In Chapter 4, survey methods and results are described. Chapter 5 presents a summary of the key messages from all findings and closes with reference to main conclusions and key future recommendations.

Chapter 2- Structured Review

2.1 Introduction

As specified by the Department of Health, the aim of this review is to:

Provide a summary of current/recent international literature, including grey literature on the standards of education in evidence based practice (EBP) e.g. syllabus/curriculum, competencies, methods of assessment, teaching methods and effectiveness for teaching of evidence based practice.

2.2 Review Questions

The review addressed the following questions:

1. What is the current practice of teaching EBP at undergraduate and postgraduate level across the healthcare professions?
2. What are the most effective components of EBP education for healthcare professionals (i.e. mode of delivery, programme components, programme duration, outcome assessment, and effect on EBP competencies)?
3. What are the effective components of EBP curriculum development processes?

2.3 Review Methods

A rapid structured review was undertaken, following the Knowledge to Action (KTA) evidence summary approach. A rapid review is defined as *"a type of systematic review in which components of the systematic review process are simplified, omitted or made more efficient in order to produce information in a shorter period of time, preferably with minimal impact on quality. Further, they involve a close relationship with the end-user and are conducted with the needs of the decision-maker in mind*" (*Haby et al., 2016, p2).*

Rapid reviews take a streamlined approach to synthesizing evidence in a timely manner and are considered a contextualized resource that succinctly and methodically address a broader scope of scientific evidence quickly. Rapid reviews are typically for the purpose of informing decisions faced by policymakers, decision makers, stakeholders and other knowledge users in healthcare settings (Khangura *et al.,* 2012). An eight-step approach to evidence summary methodology was adopted to ensure adherence to systematic principles associated with rapid reviews. The eight steps are as follows; 1) Needs Assessment, 2) Question development and refinement, 3) Proposal development and approval, 4) Systematic literature review, 5) Screening and selection of studies, 6) Narrative synthesis of including studies (including assignment of evidence level), 7) Report production, and 8) Ongoing

follow up and dialogue with knowledge users. The first three steps of this review process were already defined by the tendering body. Steps four, five and six will be addressed in this chapter. The production of the overall report addresses step seven, while step eight will be facilitated by the NCEC through dialogue with knowledge users and wider stakeholders.

Selection Criteria for Studies

The PICOS framework was used to support study selection criteria (see Table 2.1).

Table 2. 1 PICOS framework for article selection process.

PICO Framework	
Population	All healthcare professionals, including doctors, dentists, nurses, occupational therapists, pharmacists, physiotherapists, speech and language therapists, dieticians, audiologists, radiographers, radiation therapists, podiatrists, paramedics; at undergraduate, postgraduate, or continuing medical education (CME) level were included.
Intervention	Empirical studies or systematic reviews whose findings explicate the following: 1) Current practices in delivering /teaching/assessing/evaluating EBP education (defined as a co-ordinated educational activity) that included any or all of the 5 steps of EBP (asking questions, searching the literature, critically appraising the literature, applying the results, evaluating the process). 2) Facilitators / barriers to implementing EBP curriculum/ teaching (as defined within an EBP intervention). 3) Curriculum development processes /competency models.
Comparison	Comparison against other interventions or with no intervention.
Outcome	*Primary outcomes;* • EBP knowledge, measured by evaluating knowledge scores with a pre-and post-training questionnaire, such as the Fresno test (Ramos *et al.,* 2003) or Berlin test (Fritsche *et al.,* 2002). • EBP skills, measured by evaluating skill scores with a pre-and post- training questionnaire, such as the Fresno test (Ramos *et al.*, 2003) or Berlin test (Fritsche *et al.,* 2002). • EBP attitude and behaviours, measured with Likert-scale questions pre- and post-training (e.g., Baum, 2003) or by self-report (e.g. number of questions formulated, searches undertaken). *Secondary outcomes;* • Barriers to the implementation of an EBP intervention measured with Likert-scale questions post-training, or open-ended questions yielding qualitative data. • Curriculum development processes.
Setting	Specific to educational/healthcare settings in Ireland, UK, New Zealand, Australia, Canada or countries categorized as high in the Human Development Index (UNDP, 2014[3]).
Publication type/level of evidence	Empirical literature (quantitative or qualitative designs), including systematic reviews; Grey literature and evidence based policy documents from referenced countries. Published between January 1st 2007 and January 1st 2017. Written in the English language.

[3] The human development index is calculated using a composite of: life expectancy at birth (duration of life and pseudo measure of health); expected years of schooling (knowledge parameter), and gross national income per capita (indicator of standard of living) and is published by (UNDP, 2014). Such countries have resource-limited health care settings, facilities, systems thus limiting the transferability of the research findings to the Irish context. UNDP (2014) Human Development Report 2014. United Nations Development Programme (UNDP), New York, USA.

Exclusion Criteria

Studies were excluded if:

1) They reported evidence-based guidelines or educational interventions specific to health conditions rather than educational interventions to develop skills and knowledge of EBP (e.g. evidence-based education for Hospital Acquired Infections).

2) The study focused on educational interventions for facilitating learning of statistical concepts without addressing at least one of the five EBP steps.

3) They reported barriers, facilitators, attitudes, and behaviours relating to EBP without an educational intervention.

4) Studies focused on theoretical reviews of different components of EBP.

5) The study was based on health care settings in countries categorized as either medium or low Human Development Index (UNDP, 2014).

6) The published report did not contain sufficient detail regarding intervention or outcome measures.

7) The publication was a narrative, letter or book providing recommendations or strategies for teaching skills in EBP, literature review, discussion paper, integrative review, opinion piece or thesis.

8) They were oral/poster conference abstracts, due to the limited data available for data extraction.

Search Strategy

A systematic search strategy was developed using search strings with various combinations of free text words and subject headings relevant to EBSCOhost which was the main database used (databases within EBSCOhost search included; Academic Search *Complete, CINAHL (the Cumulative Index to Nursing and Allied Health Literature), Medline, PsycARTICLES, Psychology* and *Behavioral Science Collection, ERIC and UK/Eire Reference Centre).* The Cochrane Library was also searched to identify relevant publications within the Cochrane Database of Systematic Reviews. The Campbell Collaboration OT Seeker and PEDro were also searched with comparable search terms.

The Grey literature search included Open Grey, WHO, Lenus, HRB, Institute of Public Health, NHS Evidence database, NICE, TRIP, SumSearch 2, Joanna Briggs Institute, UK Evidence for policy and Practice Information and Co-ordinating Centre (EPPI-Centre), TUNING Project and ERASMUS repository. Specific educational policy publications by regulatory and professional bodies for healthcare professional in the references countries were also searched.

The full search terms and combinations are presented in Appendix 1 (Empirical Literature search strategy), and Appendix 2 (Grey Literature search strategy).

Review Process

All potentially eligible papers identified in the search strategy were exported to Endnote (Version7.0) where duplicates were identified and removed. Remaining references were then transferred to *Covidence* (online software product for healthcare evidence synthesis). Articles were screened initially for title and abstract independently by a cohort of the research team (EL and PLW, JH and COR) to determine articles that merited a full text read. An equal number of papers were allocated to each pair. Agreement by both members of the paired team was required for an article to merit a full text read. Disagreements were resolved by consensus within each paired team and where necessary a third reviewer was consulted. A record of decisions made during the process was kept via *Covidence.*

Search Output

The search yielded a total of 9373 records, which following the screening and full text read processes were reduced to 83 papers for inclusion in the structured review. See Figure 2.1 below for the screening process details as per PRISMA guidelines.

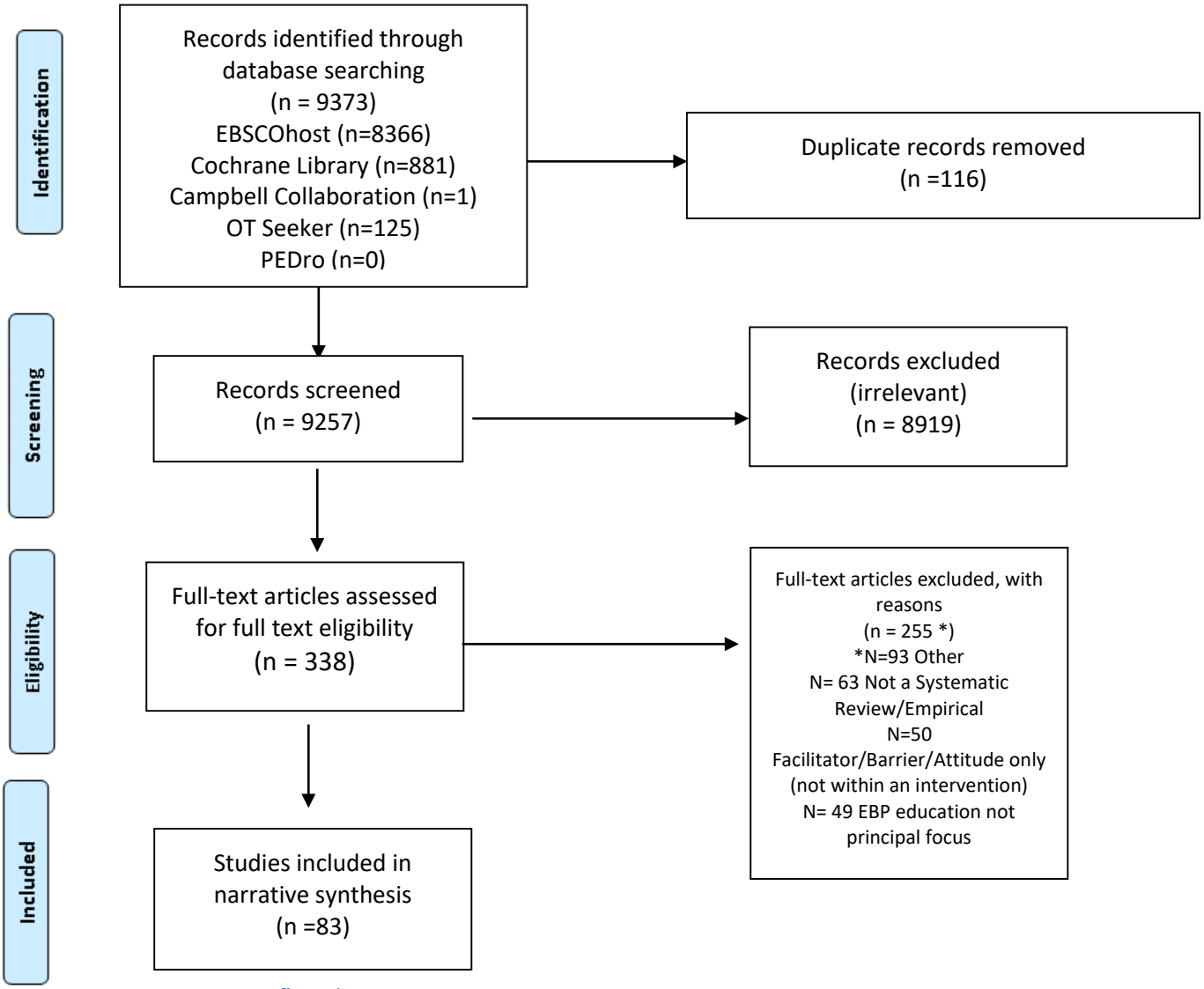


Figure 2. 1 PRISMA flow diagram

(Moher *et al.,* 2009).

Audit Trail

To ensure transparency in terms of total numbers of articles retrieved searches were saved using an EBSCO account. This also allowed for additional searching of new papers over the course of the review. Articles retrieved were exported to Endnote to allow for the removal of duplicates, the generation of reference lists and the subsequent export of references to the *Covidence* software (online software program) for the screening process.

Data Extraction

The review questions guided the data extraction process, including details of the EBP mode of education, components of the EBP intervention, duration of the intervention and outcome measures used to assess the effect of intervention. Furthermore, data on authors, year, country of publication, type of study, academic programme level studied and discipline. Empirical literature data was extracted by COR and a sample cross-checked by research team member EL to ensure consistency. Systematic review data was extracted by EL and similarly a sample cross-checked by COR. Full details of data extraction can be seen in Appendix 3 (Data extraction empirical literature), Appendix 4 (Data extraction systematic reviews) and Appendix 5 (Data extraction curriculum models).

Quality Appraisal

Studies were stratified and grouped according to their study type, i.e. systematic reviews, empirical literature (quantitative and qualitative) and curriculum model processes. Empirical quantitative literature was appraised using the EPHPP (Effective Public Health Practice Project) (Thomas *et al.,* 2004) quality appraisal tool, while the Assessment of Multiple Systematic Reviews (AMSTAR) quality appraisal tool was used for systematic reviews (O'Shea *et al.,* 2009). Quality appraisal was conducted by two members of the research team (EL and COR). Data were extracted as per the relevant criteria of the appropriate quality appraisal tool and a sample of each cross-checked to ensure consistency.

Systematic Reviews

The AMSTAR tool was used to assess the quality of systematic reviews (O'Shea *et al.,* 2009). The reliability, construct validity, agreement and feasibility of this tool has been demonstrated (Pieper *et al.,* 2015). The tool consists of 11 items which measure the methodological quality of systematic reviews. Responses include *Yes/ No, Can't Answer or Not Applicable. "Can't Answer"* is chosen when the item is relevant but not described within the paper. *"Not applicable"* is used when the item is not relevant.

The 11 items are as follows;

1. Was an “a priori” design provided?
2. Was there duplicate study selection and data extraction?
3. Was a comprehensive literature search performed?
4. Was the status of publication (i.e. used grey literature) used as an inclusion criterion?
5. Was a list of studies (included and excluded) provided?
6. Were the characteristics of the included studies provided?
7. Was the scientific quality of the included studies assessed and documented?
8. Was the scientific quality of the included studies used appropriately in formulating conclusions?
9. Were the methods used to combine the findings of studies appropriate?
10. Was the likelihood of publication bias assessed?
11. Was the conflict of interest included?

Quantitative Empirical Studies

The Effective Public Health Practice Project (EPHPP) tool was used to assess empirical studies with a quantitative design. The EPHPP has established reliability and construct validity, as well as inter-rater agreement (Thomas *et al.,* 2004). The tool assesses methodological quality in the following 8 areas:

1. Selection bias
2. Study Design
3. Confounders
4. Blinding
5. Outcome measures
6. Withdrawals and follow-up
7. Intervention Integrity
8. Analysis

Each item has two questions which require a strong, moderate or weak rating. An *overall* strong, moderate or weak rating is determined based on the number of weak ratings accumulated across the eight areas. No weak rating, indicates a “strong” quality paper, one weak rating indicates a “moderate” quality paper, two or more weak ratings, denotes a “weak” quality paper. See Appendix 6 for full details of related sections and appraisal criteria.

Data Analysis

A statistical analysis could not be conducted due to the heterogeneity of the studies; therefore, descriptive narrative analysis was performed.

2.4 Findings

Characteristics of Studies

Type of Evidence

Eighty-three papers were reviewed, the majority of which were reported as being of a pre-post-test design (n=32), RCT (n=17) or systematic review (n=10). Eight papers were classified as descriptive evaluations of EBP curriculum development processes. The remaining papers used quasi-experimental designs (n=9), mixed-methods (n=6) and one controlled clinical trial. The types of evidence are presented in Figure 2.2.

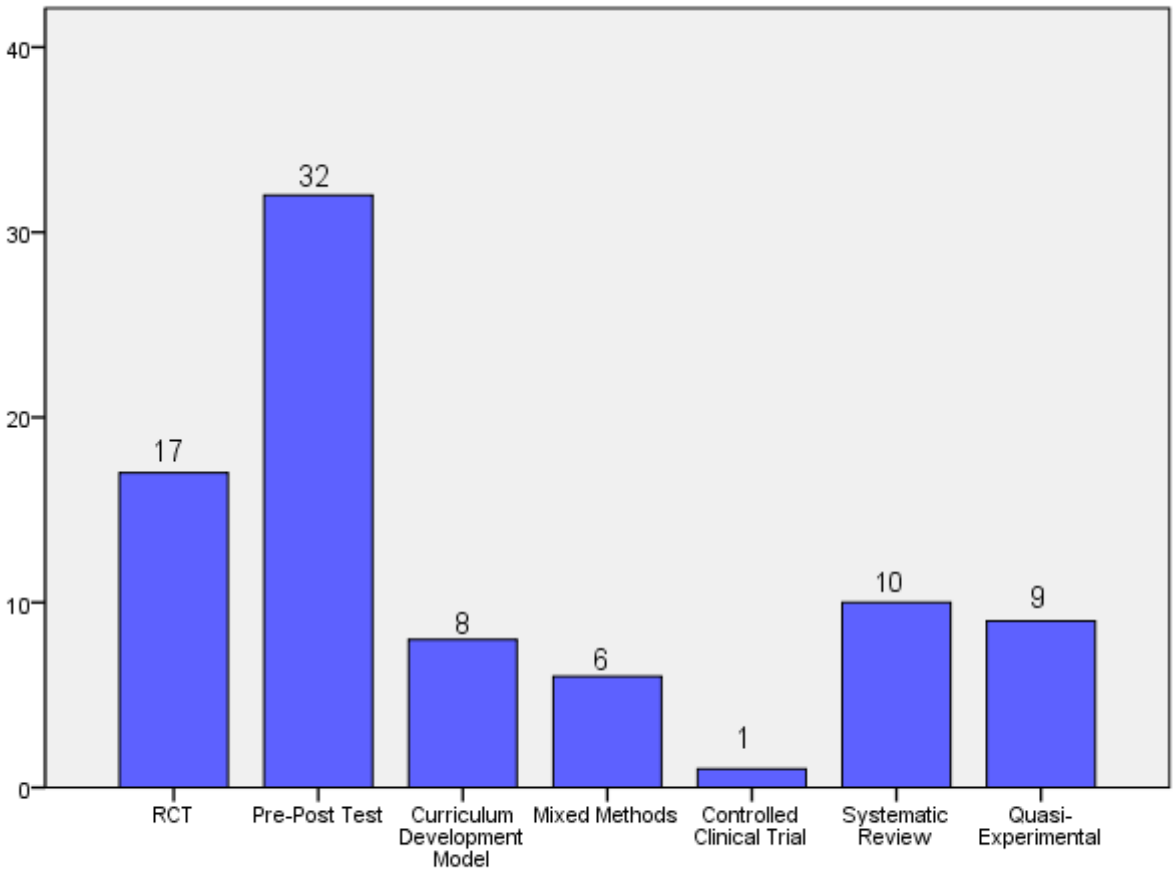


Figure 2. 2 Breakdown of study designs

Country of Origin

The country of origin for the majority of primary authors was the USA (n=30), followed by Australia (n=11), Canada (n=5), Iran (n=6), and the UK (n=5). The remaining studies were from; Netherlands (n=4), Spain (n=3), Ireland, Taiwan, China, Israel, (n=2 each) and Turkey, Korea, Finland, Sweden, Thailand, Germany, Norway, France, Jordan, Denmark and Italy (all n=1).

Academic Programme Level

Of the papers reviewed, 35 examined undergraduate programmes (UG), 11 investigated EBP education at postgraduate (PG) level and 30 involved continuous professional development (CPD) training. The remaining 7 papers looked at different combinations of these academic programme levels as seen in Figure 2.3.

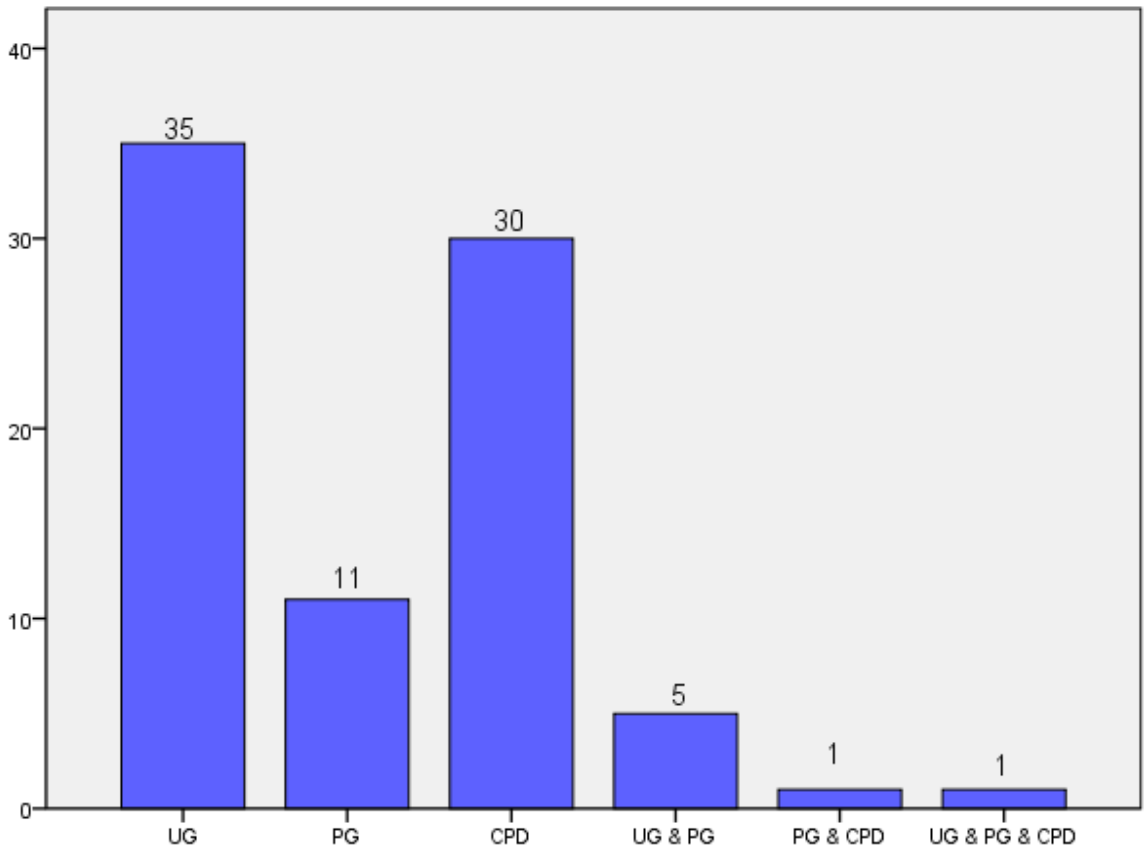


Figure 2. 3 Frequency of academic levels studied

Healthcare Discipline

Across the various disciplines, those most commonly reported upon were medical (n=39; {UG n=26, PG n=13}) and nursing (n=19 {UG n=7, PG= 12}) students. Twelve studies examined a number of disciplines concurrently while the remaining studies included disciplines such as, Physiotherapists (n=4), Occupational Therapists (OT) (n=6), Speech and Language Therapists (SALT) (n=1) and Pharmacists (n=1). Please see Figure 2.4 below.

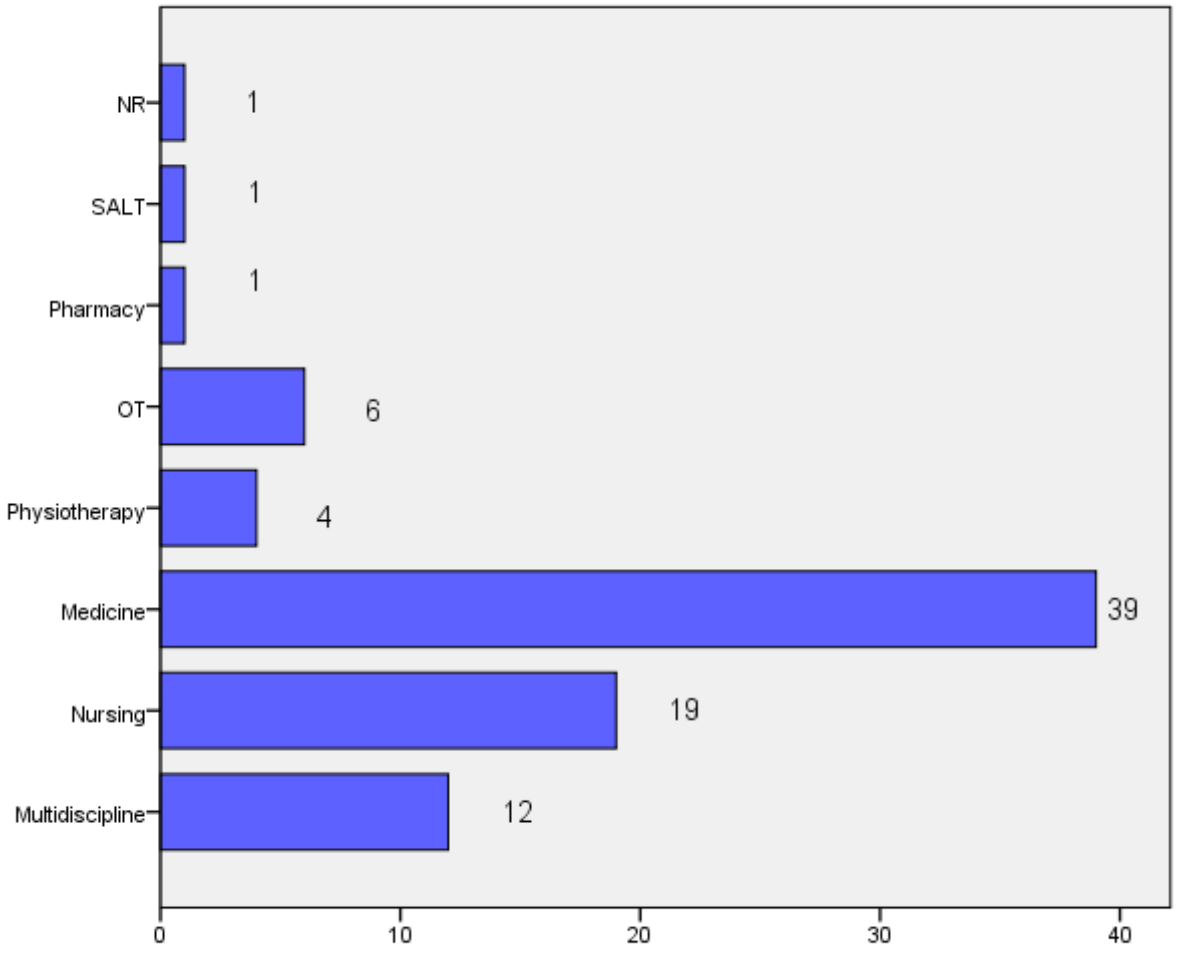


Figure 2. 4 Breakdown of healthcare disciplines

Sample Size

Sample sizes varied greatly across the studies included, ranging from < 50 (n=21) to over 150 participants (n=16). Authors of evidence synthesis papers did not report combined sample sizes for all studies reviewed nor did the papers providing descriptions of EBP curriculum development processes (see Figure 2.5).

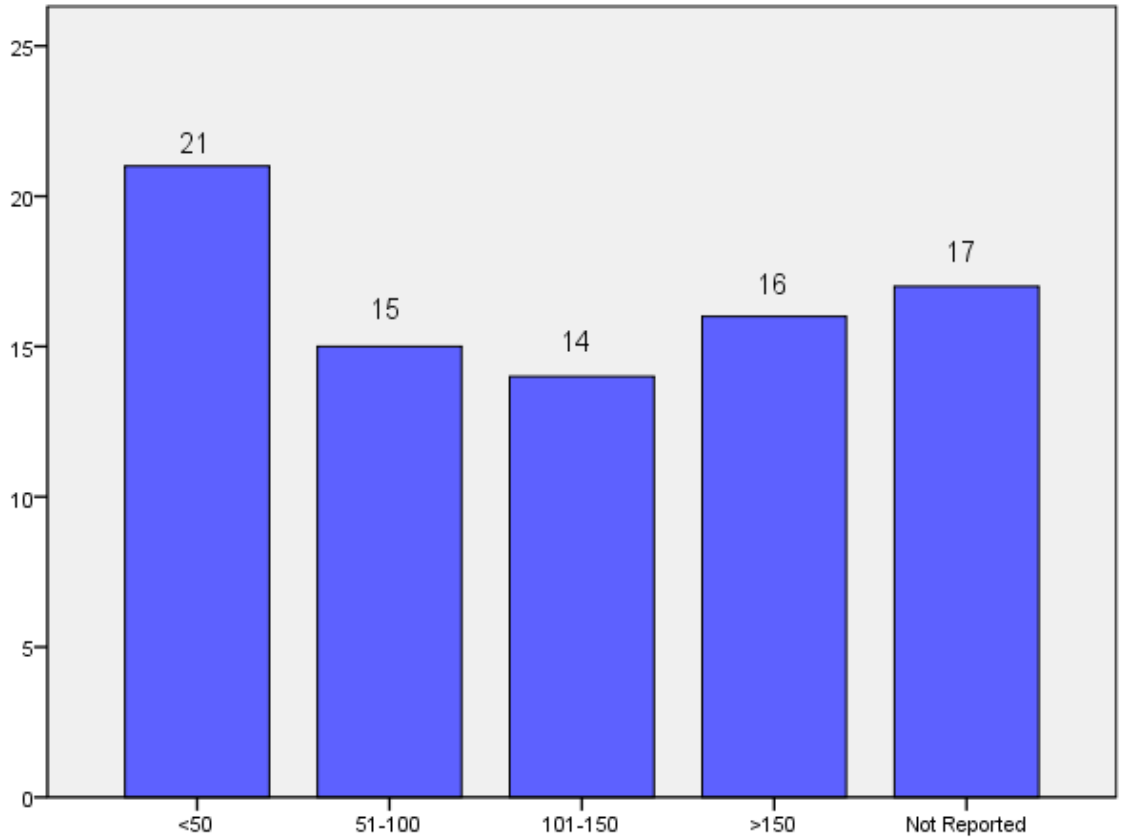


Figure 2. 5 Reported sample sizes

Methodological Quality of Studies

Quality of Systematic Reviews

The methodological quality of evidence synthesis studies (n=10) varied considerably. Of the eleven AMSTAR criteria only one study met 8 criteria (Dizon *et al.,* 2012); two studies met 7 criteria (Ahmadi *et al.,* 2015, Swanberg *et al.,* 2016), while a further two met six criteria (Flores-Mateo and Argimon, 2007, Harris *et al.,* 2011). The remaining five reviews scored five or below (Aglen, 2016, Haggman-Laitila *et al.,* 2007, Honey and Baker, 2011, Iliac *et al.,* 2014*,* Coomarsamy and Khan, 2004). Only one study provided an "a priori design" (Dizon *et al.,* 2012). Four studies completed a comprehensive literature search of at least two databases and/or a supplementary search of grey literature. All ten studies described the characteristics of the included studies. The majority of the studies used appropriate methods to combine study findings. Over half also assessed the scientific quality of studies and similarly used these quality findings to inform any conclusions drawn. The number of studies meeting each quality criteria is presented in Figure 2.6, with the overall appraisal of studies displayed in Table 2.2.

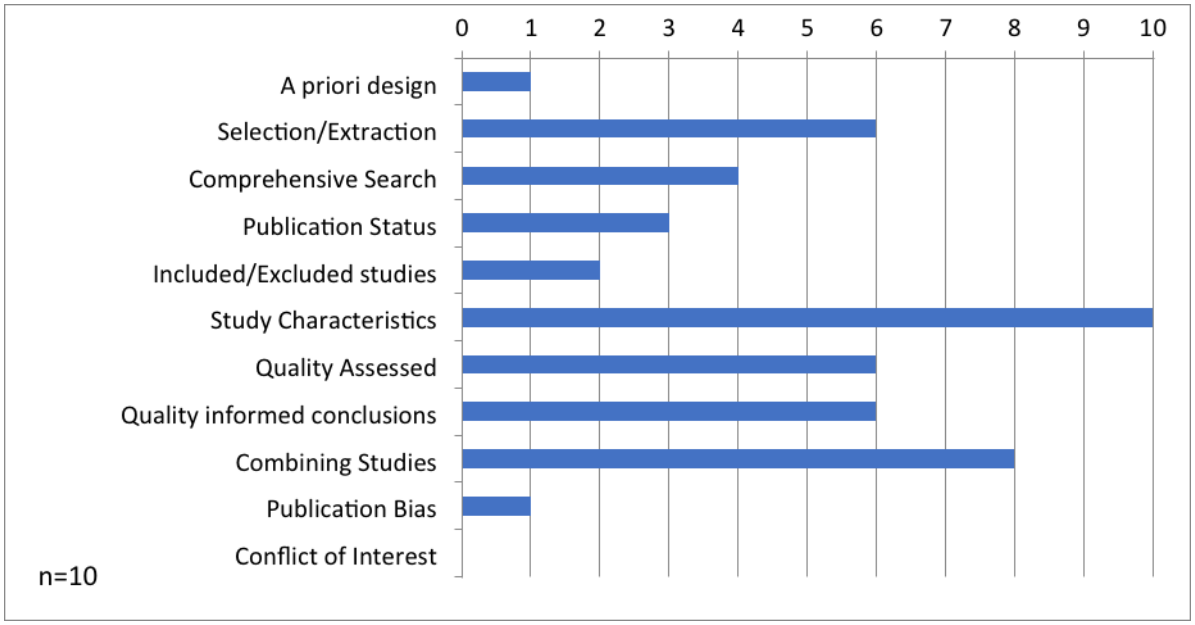


Figure 2. 6 Quality appraisal of systematic reviews using AMSTAR.

Table 2. 2 Quality of systematic reviews of EBP interventions using AMSTAR.

Author (year)	1.A priori design	2.Study selection and data extraction	3.Comprehensive literature search	4.Status of publication used as inclusion criteria	5.List of included/ excluded studies	6.Character of included studies	7.Scientific quality assessed	8.Scientific quality used to form conclusion	9.Methods to combine studies appropriate	10.Likelihood of publication bias	11.Conflict of interest	12. Score (Out of 11)
1.Aglen, B (2016)	No	no	Yes	No	no	yes	no	no	can't answer	no	no	2
2.Ahmadi *et al.,* (2015)	No	no	Yes	Yes	yes	yes	yes	yes	yes	no	no	7
3.Coomarasamy and Khan (2004)	No	can't answer	No	No	no	yes	no	no	yes	no	no	2
4.Dizon *et al.,* (2012)	Yes	yes	Yes	Yes	no	yes	yes	yes	yes	no	no	8
5. Flores-Mateo and Argimon (2007)	No	yes	No	No	no	yes	yes	yes	yes	yes	no	6
6. Haggman-Laitila *et al.,* (2016)	No	yes	No	No	no	yes	can't answer	can't answer	yes	no	no	3
7.. Harris *et al.,* (2011)	No	yes	No	No	yes	yes	yes	yes	yes	no	no	6
8. Honey and Baker (2011)	No	can't answer	No	No	no	yes	no	no	can't answer	no	no	1
9. Iliac *et al.,* (2014)	No	yes	No	No	no	yes	yes	yes	yes	no	no	5
10. Swanberg *et al.,* (2016)	No	yes	Yes	Yes	no	yes	yes	yes	yes	no	no	7

Quality of Quantitative Studies

Methodological quality of all other quantitative studies (n= 65) were assessed using the EPHPP quality assessment tool. This tool was developed by the Effective Public Health Practice Project Canada and covers quality appraisal of any quantitative design (Effective Public Practice Health Project, 2007). Thirty-three studies were deemed weak (two or more weak ratings from six), while 27 studies were classified as moderate (one weak rating). Only 5 studies were rated as strong as per the EPHPP (no weak ratings, four or more moderate or strong ratings). These included Ilic *et al.,* (2012), Kortekaas *et al.,* (2016), Ramos *et al.,* (2015), Shuval *et al.,* (2007), Varnell *et al.,* (2008). As per the EPHPP criteria, studies accumulated weak ratings primarily for the criteria of blinding and confounders. In these studies, both assessors and participants were aware of the research question and confounding variables between groups were not reported or accounted for in data analysis. Details of strong, moderate and weak ratings as per each criterion of the EPHPP are outlined below in Figure 2.7.

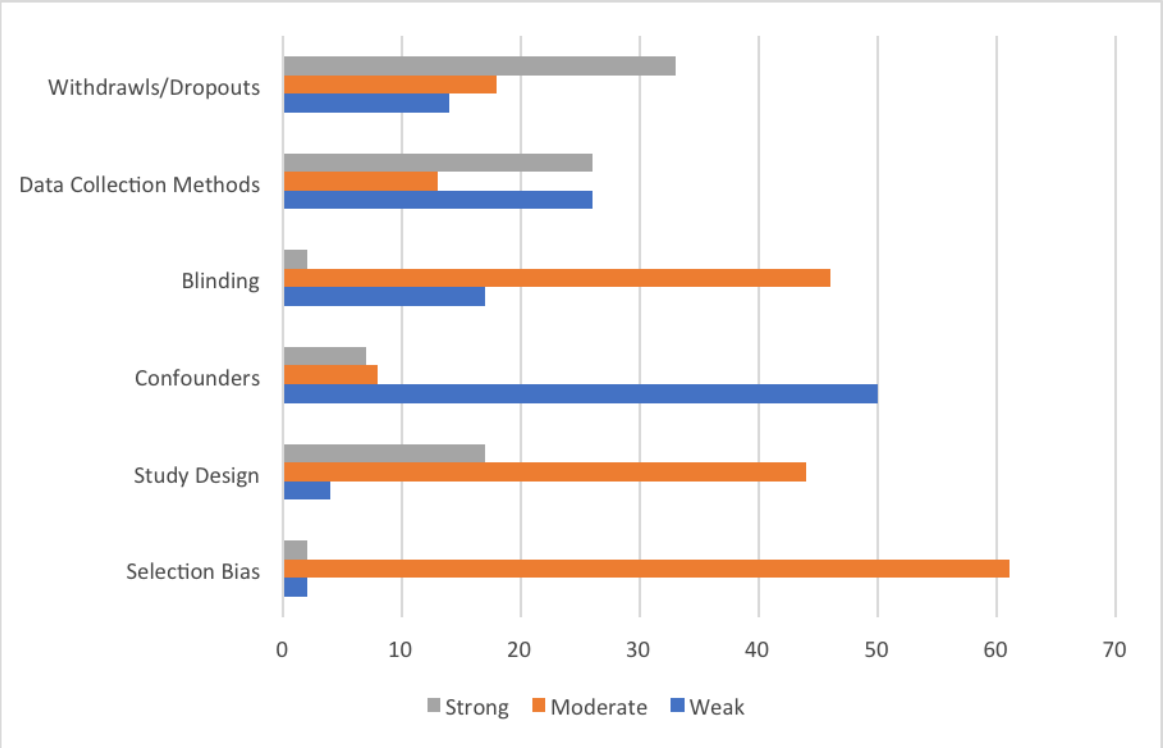


Figure 2. 7 Breakdown of strong, moderate and weak ratings of EPHPP criteria.

Table 2. 3 Quality Assessment of Quantitative studies

Author	Selection Bias	Study Design	Confounders	Blinding	Data Collection Methods	Withdrawals and Dropouts	Rating
Aitken *et al.,* 2011	2	2	3	3	3	3	Weak
Allen *et al.,* 2015	2	2	3	3	1	3	Weak
Amini *et al.,* 2016	2	2	3	2	3	2	Weak
Amsallem *et al.,* 2007	2	1	3	2	3	2	Weak
Argimon-Pallas, 2011	2	2	3	3	1	2	Weak
Aronoff, 2010	2	2	3	2	1	1	Moderate
Barghouti *et al.,* 2013	2	2	3	2	1	1	Moderate
Bennett *et al.,* 2011	2	2	3	3	3	2	Weak
Berthelsen and Holdge-Hazelton, 2010	2	3	3	2	3	3	Weak
Bookstaver et al., 2011	2	2	3	2	3	3	Weak
Bozzolan *et al.,* 2014	2	3	3	3	1	3	Weak
Brangan *et al.,* 2014	2	2	3	3	2	1	Weak
Campbell *et al.,* 2013	2	1	3	2	1	1	Moderate
Chang *et al.,* 2013)	2	2	3	2	3	1	Weak
Cheng *et al.,* 2012)	2	3	3	3	3	3	Weak
Cimol, 2012	2	2	3	2	3	3	Weak
Crabtree *et al.,* 2012	2	2	3	2	1	1	Moderate
Crist, 2010	2	2	3	3	3	2	Weak
Cyrus *et al.,* 2013	2	2	2	2	3	2	Moderate
Davis *et al.,* 2008	2	1	2	2	2	3	Moderate
Evans *et al.,* 2014	2	2	3	2	2	3	Weak
Evanson, 2013	2	2	3	2	3	1	Weak
Feldstein *et al.,* 2010	1	1	3	2	2	1	Moderate

Fernandez *et al.,* 2014	2	2	2	2	3	2	Moderate
Gaglardi *et al.,* 2012	2	2	3	2	1	1	Moderate
Gagnon *et al.,* 2015	2	2	3	2	2	2	Moderate
Geum *et al.,* 2010	2	2	3	2	3	1	Weak
Grillo *et al.,* 2015	2	2	3	2	3	1	Moderate
Hadley *et al.,* 2010	2	1	3	2	3	3	Weak
Harewood and Hendrick, 2010	2	2	3	2	3	1	Weak
Hart *et al.,* 2008	3	2	3	2	2	3	Weak
Hatmi *et al.,* 2010	2	1	3	2	1	1	Moderate
Heiwe *et al.,* 2013	2	2	3	2	3	2	Weak
Hugenholtz *et al.,* 2008	2	1	1	2	3	2	Moderate
Ilic *et al.,* 2012a)	2	1	1	1	1	1	Strong
Ilic *et al.,* 2012b)	3	1	2	3	1	3	Weak
Ilic *et al.,* 2013	2	1	3	2	1	1	Moderate
Jalali-Nia *et al.,* 2011	2	2	3	2	1	1	Moderate
Johnston *et al.,* 2009	2	1	3	1	1	1	Moderate
Jones *et al.,* 2011	2	2	3	3	3	2	Weak
Karimian *et al.,* 2013	2	2	3	2	1	2	Moderate
Khabbazi *et al.,* 2013	2	2	3	2	3	1	Weak
Khader *et al.,* 2011	2	2	3	3	3	1	Weak
Kim *et al.,* 2008	2	1	3	2	1	1	Moderate
Kim *et al.,* 2009	2	2	1	2	1	2	Moderate
Kortekaas *et al.,* 2016	1	1	2	2	1	2	Strong
Kuler *et al.,* 2009	2	1	3	2	2	1	Moderate
Liabsuekrakul *et al.,* 2013	2	2	3	3	2	1	Weak
Long *et al.,* 2016	2	1	3	2	3	1	Weak
Manspeaker *et al.,* 2011	2	2	3	2	1	1	Moderate
Mohr *et al.,* 2015	2	2	3	3	1	3	Weak

Nicholson *et al.,* 2007	2	3	3	3	1	1	Weak
Parrish and Rubin, 2011	2	2	3	2	2	3	Weak
Ramos *et al.,* 2015	2	2	2	2	2	1	Strong
Ruzafa-Martinez *et al.,* 2016	2	2	1	3	2	1	Moderate
Sastre *et al.,* 2011	2	2	3	3	3	1	Weak
Schrieber *et al.,* 2008	2	2	3	3	2	1	Weak
Shuval *et al.,* 2007a)	2	1	2	2	1	1	Strong
Shuval *et al.,* 2007b)	2	2	2	2	3	2	Moderate
Tian *et al.,* 2013	2	1	1	2	3	1	Moderate
Underhill *et al.,* 2015	2	2	3	2	2	2	Moderate
Varnell *et al.,* 2008	2	2	1	2	1	1	Strong
Wallen *et al.,* 2010	2	2	1	2	1	2	Moderate
Weberschock *et al.,* 2013	2	2	3	2	1	2	Moderate
Widyahening *et al.,* 2012	2	2	3	2	1	1	Moderate

EBP Interventions/Programmes

To answer the review questions, EBP programme components and their impact on EBP competencies are outlined in this section. This will include; mode of delivery, programme components, programme duration, outcomes measures and barriers to EBP teaching intervention implementation. In addition, curricular processes and components described within curriculum development studies are presented.

EBP Programme Description

Mode of EBP delivery

Two modes of training were reported; (1) stand alone, single mode EBP education interventions and (2) multifaceted or multi-modal interventions. The majority (n=60) of EBP interventions reported were multi-modal in design i.e. more than one form of teaching method was concurrently used to teach EBP competencies. These types of interventions were associated with the most significant improvements in EBP competencies including EBP knowledge, skills and attitudes compared to control groups (e.g. Johnston *et al.,* 2009, Kim *et al.,* 2008, Kim *et al.,* 2009, Shuval *et al.,* ,2007a, Wallen *et al.,* 2010). However, significant improvements ($p<0.005$) in EBP knowledge and attitudes were also seen from single mode intervention studies (n=23) (e.g. Crabtree *et al.,* 2012, Cyrus *et al.,* 2013, Ilic *et al.,* 2012a, Khabbazi *et al.,* 2013). Single mode intervention studies included workshops (n=10), web-based/online courses (n=8), journal clubs (n=2), lectures (n=1), and librarian based interventions (n=1). Please see Appendix 3 for data extraction table.

Programme Components (in terms of EBP competencies)

In accordance with the Sicily Statement (Dawes *et al.,* 2005) the EBP interventions included in this review related to at least one, two or all three of the first 3 steps of EBP (Ask, Acquire, Appraise) (see Figure 2.8). Only three studies are reported as having aimed to address all five steps of EBP education (see Table 2.4). These were Brangan *et al.,* (2014), Khader *et al.,* (2011) and Kortekaas *et al.,* (2016). Please see Appendix 3 for data extraction table. Each of these studies had significant improvement in EBP competencies. It should be noted however that both Brangan *et al.,* (2014) and Khader *et al.,* (2011) are rated as "weak" as per the EPHPP Kortekaas *et al.,* (2016) achieved a "strong" quality appraisal.

Figure 2. 8 The 5 As of Evidence Based Practice

Table 2. 4 Number of EBP steps addressed per intervention

Number of EBP steps addressed	Number of Studies
1	14
2	21
3	22
4	13
5	3

Table 2.5 provides a breakdown of the multi-modal intervention components used to address the EBP steps, including the number of times reported. Studies which combined one or more of the steps of EBP

were associated with more positive outcomes in terms of EBP competencies including knowledge, skill and attitude.

Table 2. 5 Frequency of reported EBP programme content

EBP Intervention Components	*N*
Introduction to EBP/Defining EBM	13
Asking a Question/ Forming a PICO	38
Designing/Undertaking a literature search	42
Literature Retrieval	13
Critical Appraisal	41
Interpretation of Findings/Application to clinical practice	27
CAT (Critical Appraisal Topic)	8
Case Study (Clinically based)	8
Presentation	9
Statistics	4
Referencing/Writing Styles	1
Trial Design	1
Not Reported (NR)	4
Other (journal club/workshop/ward round/focus group)	12

EBP Programme Duration

The duration of EBP education programmes varied greatly, as did the weekly time spent to dedicated EBP teaching per intervention. CPD courses (n=31) were the shortest in duration ranging from 7.5 hours to 7-day training courses in total. These courses, despite the short duration were associated with significant improvements in EBP competencies assessed including knowledge; attitude and skill (Brangan *et al.,* 2014, Gagnon *et al.,* 2015, Hart *et al.,* 2008). Undergraduate and postgraduate programmes typically spanned 1-2 semesters with 1.5 to 2 hours of teaching/ implementation weekly for between 3 weeks to 6 months (Evanson 2013, Gagliardi *et al.,* 2012, Ilic *et al.,* 2013, Kim *et al.,* 2009. Mohr *et al.,* 2015, Tian *et al.,* 2013). (see Appendix 3 for data extraction table).

Evaluation of Outcomes (Assessment of learning/competence)

The outcome measures used to assess learning or change in EBP competency varied based upon the research question of the individual study (see Table 2.6). The majority of studies sought to measure changes in EBP competencies, e.g. knowledge, skill or attitude and were typically measured at baseline, post-intervention, and on occasion at follow up. Different instruments were used to measure outcomes. Twenty-three studies reported the use of researcher-developed instruments designed for the sole purpose of

assessing one intervention. Reliability and validity testing were not conducted on twenty of these instruments. This reduces the direct comparability of results amongst interventions, as well as the generalisability of results in a broader context. The use of reliable and valid outcome measures of EBP competency such as the Fresno test (n=10) and Berlin Questionnaire (n=3) allow for standardised outcome measurement and greater generalisability of results.

Table 2. 6 Frequency of Outcome Measures used and Psychometric properties

Outcome Measure	N=	Psychometric Properties
Fresno Test	10	Cronbachs Alpha 0.88 (Ramos *et al.,* 2003)
Berlin Questionnaire	3	Cronbachs Alpha 0.75 (Fritsche *et al,*, 2002)
EBPQ Survey	1	Cronbachs Alpha 0.64 (Rice *et al.* 2010)
Researcher developed Instruments	23	Not Reported
EPIC Scale	1	Cronbachs Alpha 0.89 (Salbach *et al.,* 2013)
KAB Scale	6	Cronbach Alpha >0.7 *(Johnston *et al.,* 2003).
EBPI	6	Cronbachs Alpha 0.92 (Wallen *et al.,* 2010)
EBAKAU	1	Not Reported
Other (exit questionnaires/ exam results, focus groups, EBR Tool, PSS)	5	Not Reported

Long-term Evaluation of EBP Competencies

Few studies (n=3, Gagliardi *et al.,* 2012, Ramos *et al.,* 2015, Ruzafa-Martinez *et al.,* 2016) conducted a follow up assessment of EBP competencies following an educational intervention which extended beyond a six-month period. Therefore, the long-term impact of EBP education interventions cannot be determined.

Impact on EBP Competencies

A summary of the training programmes and outcomes used in all interventions can be seen in Appendix 3 and Appendix 4. Knowledge and skills and attitudes were positively influenced by any form of EBP training, however not all changes were statistically significant (see Appendix 3 and Appendix 4). There was no unequivocal evidence suggesting which combination of components impacted most significantly on EBP competencies. However, overall there was a trend toward multi-intervention programmes having a more consistent impact across all competency domains compared to single delivery intervention methods.

Barriers to the implementation of an EBP educational intervention

A small number of studies, (n=7) reported the barriers to the successful implementation of an EBP training programmes as secondary outcomes. Each of the barriers reported by these studies were recorded and a content analysis and categorised into similar groups. These include *personal* and *organisational* or *other*, if not directly categorised as either (see Figure 2.9). Organisational barriers predominantly related to the availability of EBP resources at the point of care, e.g. access to evidence databases and the prioritization of patient care over EBP training/activities. Personal barriers centred around a perceived lack of knowledge and skill in relation to EBP and its translation to clinical practice. Of note, lack of personal discipline in consistently engaging in EBP activities was reported. Other barriers included the relative cost of providing EBP resources, e.g. clinical librarian and the nature of keeping up to date with changing evidence.

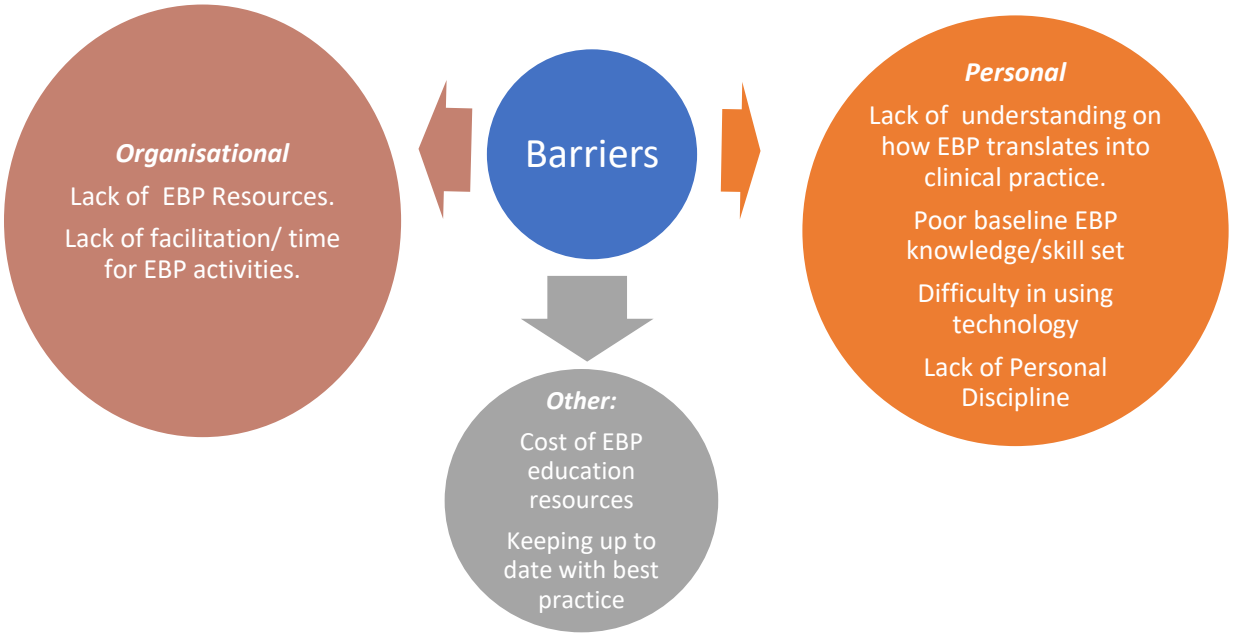


Figure 2. 9 Commonly reported barriers to the uptake and implementation of EBP education.

EBP Curriculum Development Models

Studies which developed and evaluated EBP curricula were included in this report (n=8). Theoretical and educational strategies to integrate EBP into healthcare professional curricula to improve knowledge, skills and attitudes were outlined. This development was prompted by a variety of reasons including;

a) Changes to professional standards and requirements by regulatory bodies of graduate councils mandating for the development of EBP skills and core competencies (Chitkara *et al.,* 2016).

b) To improve service provision (Underhill *et al.,* 2015) or patient outcomes (Aitken *et al.,* 2011) and the need for incorporating EBP into clinical practice.

c) To meet changes in professional education and the expectation of incorporating research into clinical practice (Larmon and Varner 2011).

A number of curricula (n=3) were underpinned by adult learning theoretical principles (Aitken *et al.,* 2011, Moch and Cronje, 2010) with Elcin *et al.,* (2014) adopting a "spiral approach" to organisation of curriculum content. Curricula aimed to align with the 5 steps of EBP according to the Sicily statement via multi-modal approaches across undergraduate (n=5), postgraduate (n=2) and CPD academic levels (n=1). Delivery modes across the curriculum included; didactic lectures (n=2), workshops (n=2), journal clubs (n=2), group work/discussions (n=7), CAT (n=2), presentations (n=3). Active consideration was given in 6 of the curriculum models to practical and clinical application of EBP knowledge and skills. Champion/mentorship programmes, the provision of research databases available in workplace settings, the use of clinical case studies for EBP presentations, the use of patient case studies and use of clinical CATs. Only one curriculum model quantitatively evaluated the outcome of the curriculum on students EBP attitude and skills (Allan *et al.,* 2008). Students critical appraisal abilities significantly improved ($p< 0.001$) and a positive improvement in attitude to EBP use was also demonstrated ($p=0.04$). A further two studies; Cohn *et al.,* (2014) and Elcin *et al.,* (2014) used qualitative surveys to determine student's satisfaction with the EBP model. A high level of satisfaction was associated with Cohn's MSc OT programme, with reports of moderate application of EBP to clinical practice following completion.

Grey Literature

Following a search of the grey literature (see search strategy in Appendix 2) ten articles were screened; however, none merited inclusion for data extraction. A further search of publications by regulatory bodies and professional agencies in the referenced countries (Ireland, Australia, United Kingdom, New Zealand and Canada) yielded the below outlined information from documents on education standards and professional frameworks for associated health professionals. Below is a summary of key findings by referenced country. Where no publications on standards or guidelines for EBP education was available from regulatory bodies and councils, a search of relevant documentation with the bodies position on evidence based practice was read, relevant information extracted and included below. A link to each of the relevant documents is available in Appendix 16.

Ireland

The Health and Social Care Professionals Act (2005) provides for the establishment of Registration Boards to establish and maintain Standards and Registers for a range of health and social care professionals in Ireland. CORU the body which regulates allied health professionals in Ireland calls for curriculum models for associated health care professionals to reflect relevant inter-professional education and should be guided by evidence informed professional knowledge relevant to current practice. It is also a requirement that education curricula provide a range of learning and teaching approaches that must be appropriate to the effective delivery of the curriculum. In accordance with CORU's standards of proficiency, health care professionals in Ireland are required to critically evaluate their own practice against evidence-based standards and implement subsequent improvements. They must also know and understand the principles and applications of scientific inquiry, including the evaluation of treatment/intervention efficacy, the research process and evidence informed practice. Furthermore, health care professionals in Ireland must demonstrate skills and evidence of EBP including translation of theory, concepts and methods into clinical practice.

The Nursing and Midwifery Board of Ireland (NMBI) require all registered practitioners to be familiar with and apply relevant legislation, regulatory policies and procedures, guidelines, codes of practice as well as current and emerging literature related to professional practice. The NMBI's code of conduct requires registered nurses and midwives to use evidence based knowledge and apply best practice standards in their work. In accordance with the NMBI's Code of Professional Conduct and Ethics, it is recognised that research is central to nursing and midwifery professions. Research informs the standards of care and ensures that

both professions provide the highest quality of care and cost-effective services to society. Furthermore, registered midwives are required to comply with midwifery practice standards and inform the evidence based practice of midwifery in Ireland.

The Medical Council of Ireland has published documents on Professional Conduct and Ethics for registered medical practitioners in the country. The council require practitioners to maintain clinical competence as well as the use of best evidence searches to guide professional practice. Of note, clinical audit is deemed a core CPD activity required by the Medical Council within their professional development competency schemes. They also advocate that registered practitioners must ensure patient care is safe, evidence based and in the patient's best interests. A progress report on education, training and practice in Ireland published by the Medical Council supports the use of EBP to enhance the quality of the medical workforce and supports evidence based decision making for the benefit of the public and health services. (Medical Education, Training and Practice, a Progress Report 2008-2013).

The Pharmaceutical Society of Ireland (PSI) is the Pharmacy Regulator for registered pharmacists in Ireland. The PSI requires pharmacists to maintain the Code of Conduct for Pharmacists. A statutory Code of Conduct was introduced under the Pharmacy Act 2007 and was formally laid before the Houses of the Oireachtas in February 2009. This six-principle code is a public declaration of ethical standards which govern practice of pharmacy and which the public, patients and other healthcare professionals require and expect of pharmacists. The Code applies to all registered pharmacists and is intended to provide support and guidance to pharmacists in the practice of their profession; breaches of the Code may be considered professional misconduct by a pharmacist. The primary principle of the Code requires that the practice by a pharmacist of his/her profession must be directed to maintaining and improving the health, wellbeing, care and safety of the patient. Every pharmacist is personally responsible under the Code of Conduct for his/her own acts or omissions, but they may also be responsible under the Code for the acts or omissions of persons operating in the area of pharmacy under their direction, control or supervision.

The Association of Occupational Therapists Ireland (AOTI) published their code of ethics in 2013. This calls for members to promote an understanding of OT and contribute to the strengthening of its evidence base through relevant research and critical evaluation. Treatment option and service delivery should be based on accurate evidence based information to ensure quality care for patients.

The discipline of Optometry is regulated by CORU and the Optical Registration Board, they published their standards of proficiency framework documents in 2015 requires registered Optometrists to use research, reasoning and problem-solving skills to determine and guide appropriate action. They also call for continued engagement in evidence based/informed practice, to evaluate practice systematically and participate in audit and review procedures.

The Irish Nutrition and Dietetic Institute published their 2014-2018 strategy framework outlining goals for the profession including a promise to grow its members through the improvement of service offerings including access to CPD and EBP tools and resources. It suggests its members be recognised as a trustworthy source of EBP information and support.

The Irish Association of Speech and Language Therapists (IASALT) published its competency framework in 2008 calling for members to be informed by guidelines for best practice and disseminate EBP within professional contexts, to initiate and actively collaborate in research.

Australia

A similar ethos is echoed by the Medical Board of Australia and the Australian Health Practitioner Regulation Agency. This board was established to protect public safety, facilitate high quality education and training of health practitioners and requires members of registered professions to engage in research and advocate for the provision of evidence based treatment for patients.

The Australian Dentistry Association published its policy document in 2008 and suggests for its members to be encouraged to use evidence based practices and have a cost structure that is sustainable. The Australian OT council define EBP as the integration of best research evidence with clinical expertise and patient's unique values and circumstances. The Australian Occupational Therapy board suggest to its members that EBP is critical to the sustainability and future development of the health profession, defined as the integration of best research, solid clinical expertise and values of clients.

Effective evidence-based programmes and services are developed to a standard commensurate with experience. Furthermore, a similar ethos is shared with the Australian Physiotherapy Society whose standards include a requirement of its member's practices to reflect the hallmark qualities of the physiotherapy profession and to acknowledge that EBP underpins the client centred approach. Australian

physiotherapists must be aware of EBP and to apply it to practice, furthermore they are required to discuss with colleagues and aim to continually apply new knowledge to improve practice.

Australian Nurses and Midwives are guided by their regulatory boards Scope of Nursing and Midwifery Practice Framework, which indicates that members should justify decision making on EBP. It also acknowledges that the patient relationship is fundamental and facilitates patient autonomy, informed choices and evidence based decision making. The Nursing and Midwifery Board of Australia and the Australian Nursing & Midwifery Accreditation Council through published Standards and Assessment Frameworks make specific reference to the requirement for evidence-based approaches to professional nursing practice and education.

United Kingdom

The Health and Care Professions Council (HCPC) in the UK is responsible for regulating and maintaining the standards of health care professional's practices. The role of the HCPC includes setting standards of education and training to ensure that newly qualified (and continuingly practising professionals) are fit to practice. Their policy documents necessitate for an integration of theory and practice to be central in curricula and that standards of education and training must be evidence based and encourage the use and participation in EBP (HCPC, 2016). This is also evident in documents published in 2013 and 2014 for Occupational Therapists, Physiotherapists and Speech and Language Therapists respectively. The Standards of Proficiency documents outline that registered members are required to engage in EBP actively, evaluate practices and participate in audit to improve healthcare provision. Furthermore, the Healthcare Quality Improvement Partnership (HQIP) exists as an independent organisation led by the Academy of Medical Royal Colleges tasked with increasing the impact of clinical audit on healthcare quality improvement. The General Medical Council also published a curriculum document on EBP and includes key messages such as; EBP healthcare means using scientific rigour to appraise evidence from a wide ranges of sources to provide best care for patients. In Podiatry, under the standard of Professional Autonomy and Accountability, in the Benchmark Statement as published by the Quality Assurance Agency for Higher Education (2001), podiatrists must contribute to the development and dissemination of EBP. In doing so they must provide continuing evaluation of treatment methods and use knowledge of appraisal to facilitate the EBP approach.

Similarly, the Nursing & Midwifery Council outline clearly in their code and standards for nursing and midwifery care that practice must always be conducted in line with best available evidence.

Tomorrow's Doctors, sets out the General Medical Council (GMC) requirements for the knowledge, skills and behaviours of undergraduate medical students, as well as the delivery of teaching, learning and assessment. Standards developed by Tomorrow's Doctor form the framework that UK Medical Schools use to design individual curricula and assessment methods. Their main recommendations that undergraduate curricula should provide medical students with learning opportunities to explore knowledge, evaluate and integrate evidence critically. They also recommend that curricula must motivate students and help them develop skills for self-directed learning and that curricular content should include evaluation of multiple sources of evidence (Tomorrow's Doctor, 2003).

New Zealand

As well as the Ministry of Health in NZ, most allied health care professions have their own regulatory bodies, each with publications requiring their members to demonstrate evidence based practice in treatment selection, competencies and that clinical standards are adhered to (Ministry of Health, NZ).

EBP is described within the competencies to practice by the Occupational Therapy Board of New Zealand (2011). Both the National Framework for Nursing Professional Development and Recognition Programmes and the New Zealand Physiotherapy code of ethics and professional conduct (2011) include EBP within their standards of practice. The Medical Council of New Zealand in their 2016 publication *"Good Medical Practice*" (Medical Council of NZ, 2016) also advocates for effective patient care based on EBP. Furthermore, the New Zealand Psychologists Board Core Competencies document requires members to have knowledge of and use EBP in decision making, where EBP is defined as the integration of research evidence, practitioner expertise and the lived experience of the learner and members of the team.

New Zealand's Dentistry Conditions of Practice Handbook requires registered members to practice evidence based dentistry, which includes the integration of best available evidence but that this should not replace clinical judgement and that members should critically evaluate and appraise all available literature.

The country's nursing body published a "Professional Development Framework" in 2015 and calls for nurses to practice using evidence based research in their assessment, treatment and evaluation skills. The Podiatry

Board of New Zealand published its Standards for Professional Practice in 2017 which includes criteria for registered podiatrists to use EBP to inform their practice and integrate it for the individual needs of patients.

Canada

The Canadian Health Professions Regulatory Advisory Council, Health Research Institute and Canadian Foundation for Healthcare Improvements promote the use of evidence based healthcare for patients. Initiatives to promote EBP education and implementation of same is strong within healthcare institutes and services within Canada, with many hospital settings and healthcare institutes such as the Toronto Rehabilitation Institute, Hamilton Health Service initiative designing multi-pronged initiatives and strategies to ensure "best practice" is undertaken. Further processes are designed to employ clinical best practice consistently across an organisation, including inter-professional skill development programmes. Healthcare departments are encouraged to implement the findings of new evidence based research within relevant areas where appropriate and are congratulated by their councils on doing so (Canadian Health Services Research Foundation, 2009).

The Royal College of Dental Surgeons of Ontario provides is members with EBP resources including their "Dispatch" publication, a member's magazine as well as providing its members with access to two EBP databases. It promotes the use of evidence based research in forming patient care decisions.

Professional competency frameworks by the Canadian physiotherapy boards suggest that essential competencies for Canadian physiotherapists include decisions made using evidence based research that is needs driven and outcome measured. "The Profile", the board's framework publication suggests physiotherapists use EBP assessment and treatment options, engage in scholarly inquiry and conduct systematic searches for evidence. They also acknowledge that the trend towards evidence informed practice is evolving.

Registered Canadian Nurses must acquire, maintain and continually enhance their knowledge and skills for all aspects of their practice while ensuring they use evidence informed decision making. A framework for Nurses suggests that various sources and combinations of evidence be used for decision asking. EBP is considered a continuous interactive process involving the explicit consideration of best available evidence to provide care.

2.5 Summary of Findings

It is evident from the narrative analysis of the review's findings that: (1) internationally, EBP is a fundamental requirement by professional regulators which can be found in their educational standards, professional frameworks or codes of conduct, and (2) participation in EBP education has beneficial effects on EBP competencies. The most apparent trend in positive changes in EBP competencies is seen from multi-modal EBP interventions which address two or more of the five EBP steps. What is not equivocally evident is what form or combination of EBP education components have the most beneficial *long-term* effects, particularly in terms of translating knowledge and skills into clinical application of EBP. Similarly, there is not sufficient evidence to suggest that an EBP intervention will have similar effects across a range of health professions. Due to the large range of instruments used to measure outcomes, changes post intervention must also be interpreted with caution.

Based on the evidence from the review, the following summarises what may work best for an EBP education intervention:

What: A multi-modal, multi-component, integrated EBP programme within health professional curricula.

Why: To develop and sustain EBP competencies including EBP knowledge, skills and attitude, for the improvement of service provision and patient outcomes.

How: To address all 5 EBP steps, with emphasis on the translation of EBP approaches into clinical practice (*Apply).*

Where: HEIs/ professional training bodies/centres and HSP / clinical workplace settings.

What is not clear: The optimal andragogic model of EBP education to follow, as well as the optimal breakdown (in terms of content and time allocation) of EBP components to be included within curricula.

2.6 Strengths and Limitations of Structured Review

The use of rapid review methodology is a strength as it follows a systematic approach with quality appraisal to provide synthesized evidence in a timely manner for informing emergent decisions faced by decision makers in health care settings (Haby *et al.,* 2016). Evidence across different academic levels and healthcare professions was included.

Limitations of the review include the lack of meta-analysis due to the heterogeneity of studies included. The use of the EPHPP as quality appraisal for all quantitative designs may be seen as a weakness but from a practical perspective, this was necessary. The methodological quality of empirical studies available included can also be a limitation, as a large amount (n=33) rated as weak. Similarly, only one of the ten systematic reviews included scored an 8 out of 11 on the AMSTAR. Most of the systematic reviews scored below a six, which can be considered moderate or poor quality.

2.7 Knowledge Gaps

Based on the findings of this rapid review of international literature, the following areas require further investigation:

- Longitudinal studies examining the impact of EBP education on sustaining EBP skills, knowledge and practice behaviour.
- The need for and development of a core EBP programme of study across healthcare professions.
- The efficacy of implementing specific andragogic strategies and education theory to direct health profession curricula in relation to the integration of EBP.

Chapter 3 –International EBP Expert Interviews

3.1 Aim

Expert interviews were conducted to ascertain current and nuanced information on EBP education for healthcare professionals in other English-speaking countries with comparable health care systems. Such expert discussions in the exploratory phase of a project is an efficient and concentrated method of gathering data particularly when experts are considered as surrogates for a wider circle of 'players' and can provide "crystallization points" for practical insider knowledge (Bogner *et al.,* 2009).

3.2 Methods

Experts from the UK, Canada, New Zealand and Australia were chosen based on their contribution to peer-reviewed literature on the subject area, monitoring role in EBP education and through personal networking contacts from the NCEC and project team. Contact with experts was initiated with a personalised e-mail request from the NCEC, DoH. This was then followed by an e-mail request from the Principal Investigator for a recorded telephone or 'Skype' interview. Project information details outlining the research purpose, methods and research integrity considerations (Appendix 7), a consent form (Appendix 8) and the interview schedule (Appendix 9) accompanied the e-mail request. Consent (written and verbal) was obtained from all participants. Ethical approval to conduct the interviews was granted by the Social Research Ethics Committee, University College Cork.

Over a two-month period (March and April 2017), individual 'Skype' interviews were conducted and recorded. Where 'Skype' connections proved inadequate causing disruption to the interview, phone contact was established. Interview duration ranged from 20 to 47 minutes. An interview schedule structured around the central dimensions of a planned conversation is recommended as the data collection method of choice for expert interviews (Bogner *et al.,* 2009). The interview schedule focused on the current practice and provision of EBP healthcare professional education with specific attention given to EBP curricula, core EBP competencies, assessment, teaching initiatives and key challenges to EBP education.

In the analysis of expert interviews attention is focused on thematic units, that is, passages with similar topics, which are derived from qualitative content analysis techniques (Bogner *et al.,* 2009). The individual steps of this process included;

1. Transcription: Interviews were transcribed. Transcription of expert interviews are usually less detailed than for example a narrative interview, as prosodic and paralinguistic elements are notated only to a certain extent (Bogner *et al.,* 2009).
2. Reading through / Paraphrasing: All transcribed materials were read through to get a general sense of the overall meaning of data. Paraphrasing, in the manner of common sense reasoning, was performed to prepare the text for identifying different thematic units.
3. Coding: The paraphrased passages were thematically ordered. The terminology of the interviewee was adhered to closely. The frame of reference at this stage remained within the realm of the single interview.
4. Thematic comparison: The analysis at this stage surpassed the single passage in the text and moved to 'tying together' thematically comparable passages from different interviews. Category formation close to the language of data was maintained. At this stage, the results of the thematic comparison were checked a number of times in the light of the other relevant passages in the interviews.
5. Sociological conceptualization: The text was reviewed in terms of shared and differing features from interview to interview.
6. Theoretical generalization: The categories were arranged according to their internal relations, with the results framed or integrated with information gleaned from empirical/theoretical literature.

To ensure trustworthiness of the findings a number of practices were performed. Explicit description of methods undertaken, participant profile and the extensive use of interview transcripts by way of representative quotations were detailed to establish dependability of the study process and credibility and transferability of findings. Peer review, with one other (PLW) member of the project team, was conducted to ensure accuracy of the data analysis process. (Appendix 10 Excerpt of Meaning Units, Codes, Sub-Categories, Categories).

3.3 EBP Expert Profile

Five EBP experts participated in the interviews (see Table 3.1). All experts waived their right to anonymity.

Table 3. 1 EBP Expert Profile

EBP Expert	Title	Affiliation	Country
Professor Leanne Togher	Professor of Communication Disorders following Traumatic Brain Injury	Faculty of Health Sciences University of Sydney	Australia
Professor Gordon Guyatt	Distinguished Professor	Department of Health Research Methods, Evidence, and Impact McMaster University	Canada
Professor Rodney Jackson	Professor of Epidemiology	School of Population Health, Faculty of Medical and Health Sciences University of Auckland	New Zealand
Professor Bruce Arroll	Professor of General Practice	General practice and Primary Healthcare Faculty of Medical and Health Sciences University of Auckland	New Zealand
Professor Carl Heneghan	Professor of Evidence-Based Medicine and Director, Centre for Evidence-Based Medicine	Department of Primary Care Health Sciences University of Oxford	United Kingdom

Professor Leanne Togher, a speech pathologist, has worked in the area of communication disorders following brain injury for 30 years. She is Associate Dean of Research, Senior Research Fellow of the National Health and Medical Research Council, Principal Research Fellow of the University of Sydney and Associate Dean of Research for the Faculty of Health Sciences. Professor Togher and her colleagues previously conducted a scoping study, the aim of which was to develop a clear understanding of EBP teaching and learning in Australian Speech Pathology programmes. The study findings provided key guidance for the development of core teaching and learning outcomes and resources for EBP education in Australia. Professor Togher leads an evidence-based practice initiative called speechBITE

(http://speechbite.com/) which provides a free and comprehensive web-based listing of the best evidence for speech pathologists nationally and internationally.

Professor Gordon Guyatt, Distinguished Professor in the Departments of Medicine and Clinical Epidemiology and Biostatistics, McMaster University, has played a pivotal role in developing EBP's underlying concepts and promoting its use. He has been a leading exponent of evidence-based approaches to clinical practice, having coined the term "evidence-based medicine" in 1990. Since then he has actively promoted the concept as a central part of clinical practice today. He has led the way in developing the methodology for randomised trials and systematic reviews and has also developed crucial tools for helping clinicians to implement evidence based practice. These include the very successful "Users' guides to the medical literature – A manual for Evidence Based Clinical Practice". He has championed the effective teaching of evidence based medicine, hosting annual workshops that have provided the models for similar workshops around the world.

Professor Rodney Jackson is Director of EPIQ (www.epiq.co.nz), an in-house group undertaking teaching, research and consultancies in EBP, Health Informatics and Quality Improvement, for healthcare services. He has over 25 years of teaching evidence-based medicine to undergraduate and postgraduate medical students in addition to healthcare educators. Professor Jackson has developed a 'Graphic Approach To Epidemiology' (GATE) which he and his colleagues use as the basis for courses in epidemiology and in evidence-based practice / critical appraisal. He is one of the architects of the New Zealand risk-based clinical guidelines for managing CVD risk which uses PREDICT – a web-based decision support system being used to help primary and secondary care practitioners across New Zealand systematically manage CVD and diabetes risk at the 'moment of care' for their practice populations.

Professor Bruce Arroll, Professor of General Practice at the University of Auckland, is a noted author on patient care within General Practice and primary author on a number of systematic reviews pertinent to primary care issues. In addition to having considerable experience in teaching EBP to undergraduate and postgraduate medical students and GP trainees, Professor Arroll practices at a family clinic, which is committed to teaching and practicing EBP.

Professor Carl Heneghan is Director of the Centre for Evidence-Based Medicine (CEBM), which is dedicated to the teaching and dissemination of high quality EBM. Professor Heneghan has co-authored the EBM

toolkit (BMJ-Blackwells), the Statistics Toolkit (BMJ-Blackwells) and is an editor of a series of BMJ-Blackwell's toolkits. He has considerable experience in teaching undergraduates, postgraduates and teachers of EBM, and is the Director of Programmes in Evidence-Based Health Care, University of Oxford. Professor Heneghan and his colleagues have previously conducted research determining practices in EBM undergraduate teaching in UK medical schools, the results of which were used to inform EBM teaching strategies of medical schools and the National Knowledge Service.

3.4 Findings

Three main categories emerged from interview data, namely:

(i) 'EBP Curriculum Considerations'

(ii) 'Teaching EBP'

(iii) 'Stakeholder Engagement in EBP Education'

These categories informed the overarching theme of 'Improving healthcare through enhanced teaching and application of EBP' (see Figure 3.1). The overarching theme, categories, subcategories, and abbreviated codes are presented in Table 3.2.

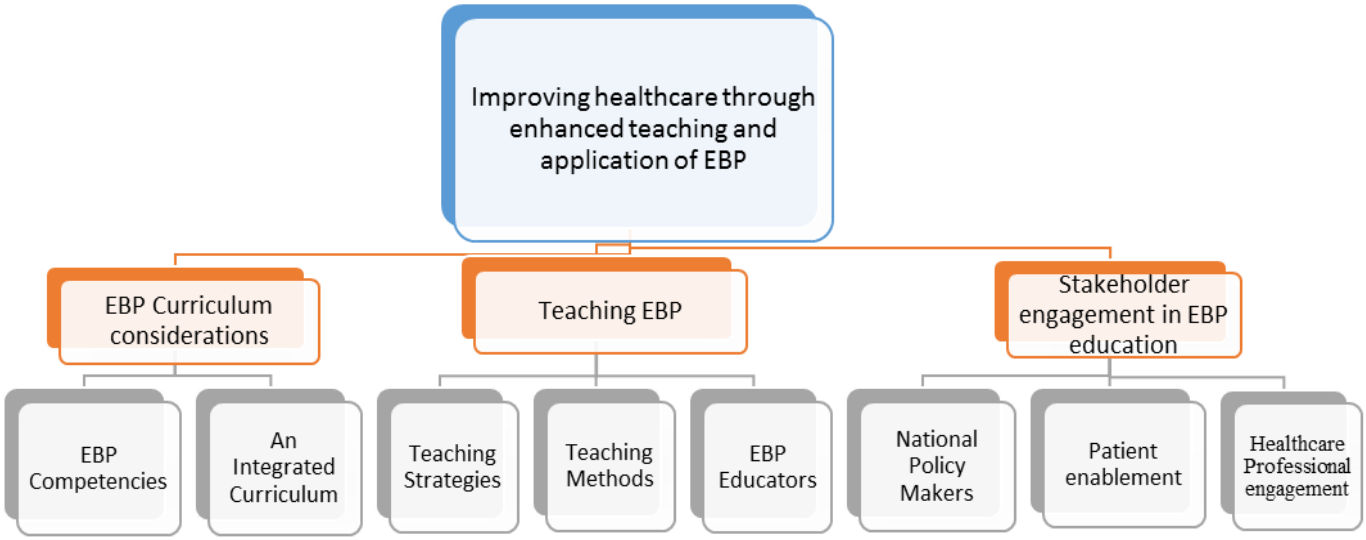


Figure 3. 1 Summary of Data Analysis Findings from EBP Expert Interviews - Theme, Categories and Sub-Categories

Theme	Improving healthcare through enhanced teaching and application of EBP							
Category	Curriculum Considerations		Teaching EBP			Stakeholder Engagement with EBP Education		
Sub-category	An Integrated Curriculum	EBP Competencies	Teaching Strategies	Teaching Methods	EBP Educators	National Policy Makers	Patient Enablement	Healthcare Professional Engagement
Codes	-Integration of EBP throughout academic and clinical curricula -Mapping EBP to professional standards and accrediting requirements -Embedding EBP resources explicitly into curricula -Learning levels associated with EBP competency achievement -	-Acquiring information -Asking answerable questions -Understanding evidence -Appraising evidence -Applying evidence in practice -Using evidence in shared decision-making -Communicate evidence	-Relevant to clinical care and decision-making -Dynamic combination of different teaching methods -Mandatory incorporation of teaching and assessment into clinical practice -Examination of skills not content	-Simplification of teaching -Accessible and specific EBP resources e.g. GATE frame -Searchable databases e.g. Speech bite -Case Bank of clinical cases -Problem Based Learning -No didactic teaching	-Training the educators -EBP Champions/ Leads/Role Models -'White coat vs Academic' - Academic and clinical educators working together -Conscious effort to incorporate EBP into all teaching -Clinicians with the 'X-factor'	-Investment in appropriate EBP resources -Recognition of value of EBP investment -Coordinated approach/policy to delivery of EBP education -Expert EBP groups	-Shared decision-making -Patient enablement through informed interactions	-EBP a core part of professional culture -Expert EBP groups -Embed structural EBP features in care

Table 3. 2 Summary of findings from EBP experts on the Teaching of EBP to Healthcare Professionals-Theme, Categories, Sub-categories and Codes

Improving healthcare through enhanced teaching and application of EBP

The overarching theme of 'Improving healthcare through enhanced teaching and application of EBP' represents the focus and purpose of the effort and attention given to optimal structuring of curricula, specification of key competencies, engagement of stakeholders in EBP education and EBP teaching and learning strategies. Improving healthcare for patients denotes the fundamental reason behind these efforts, as concisely noted in the following excerpt:

> *"… we think that everyone in training should be in the game of improving healthcare…. It's not just saying I want to do some evidence-based practice…it's ultimately about and I'm in the game of improving healthcare" (CH)*

Guidance by EBP experts on how to achieve this outcome of improved healthcare by way of EBP education is provided and described in the following categories; (i) 'EBP Curriculum Considerations', (ii) 'Teaching EBP' and (iii) 'Stakeholder Engagement with EBP'.

EBP Curriculum Considerations

An Integrated Curriculum

Healthcare curricula act as a fundamental medium for shaping students' professional knowledge, skills, attitudes and ultimately, delivery of patient care. Clear and unequivocal insight from experts was gained into the optimal structuring of healthcare professional curricula and key EBP competencies' requiring proficiency.

All experts advised that EBP principles should be embedded and integrated across all elements of health professional curricula. Both academic and clinical elements were emphasized as comprising of a 'whole' curriculum:

> *"…evidence-based practice is embedded in the curricula. It would be considered to be an essential element of academic teaching across the board and also it would be embedded in clinical education" (LT)*

> *"So you have to then think about how you embed it across the whole curriculum…It's something that needs to be reinforced in practice also and then people understand what it is" (CH)*

Integration of EBP was recommended to be also situated from the perspective of professional core competencies, as to do otherwise, for instance, in the case of drafting a separate EBP curricula outside of areas of professional priority, was considered pointless:

> *"I don't think there's a one size fits all approach to a curriculum because it has to be in line with what the priorities of the area are in terms of the competencies required. If you start to stick it outside, then you might as well go, well, in five years' time or whatever, you'll be wasting your time" (CH)*

By positioning EBP within the domain of professional requirements, consideration on how EBP skills can be mapped and taught throughout a curriculum is required:

> *"So any curriculum has to say, 'Ok, what's in the requirements for this? So if it was nurses, what are the core key competencies required?' And then map them across the EBM skills and say where do they link and how do we teach them?" (CH)*

Furthermore, situating EBP as a core element within professional curriculum and linking it to professional accreditation processes places further emphasis on the necessity of teaching EBP:

> *"… it is also core in residency programmes. So every residency programme has a curriculum on evidence-based practice where again, when the residency programmes are accredited, that's one thing they have to show the people who come around. They have to show that they're teaching evidence-based practice" (GG)*

Integration of EBP into clinical curricula in particular was considered essential to successful learning and practice outcomes. If students perceive a dichotomy between EBP and actual clinical care, then *'never the twain shall meet'* (GG). It must be integrated in such a way that it is *"seen as part of the basics of optimal clinical care"* (GG). Clinical educators leading or taking control of teaching and assessing was suggested as one way to effectively embed EBP teaching and learning in practice:

> *"The second biggest challenge is having taught them the skills is getting it integrated into clinical practice… And my way of dealing with that has been to get the clinicians to take control …I mean it's now integrated into our course…so the students do them as part of their clinical attachments and they are marked by their clinical teachers." (RJ)*

It was noted that educators, regardless of teaching setting, need to be aware of what students are learning to enable them to *"draw out evidence-based components"* from any and all aspects of curriculum content including its incorporation into assessments and examinations. In essence, EBP needs to be pervasive throughout all elements of HCP curricula. It is clear that integration of EBP into healthcare curricula in a variety of ways and levels is considered crucial to shaping professional educational outcomes and care practices.

EBP Competencies

The attainment of specific knowledge and skills is necessary for the capable performance of professional duties. Professional competence is gained in part through formal education and informal learning processes. When asked about key EBP competencies in terms of knowledge and skills, all experts emphasized the need for proficiency in understanding, appraising, and applying evidence to practice:

> *"…every health graduate should come out being able to critically appraise a randomised trial for example... your hierarchy of evidence …coming out with an understanding of that … I think if people feel they can critically appraise studies then they come away with a sense of mastery…" (BA)*

> *"…. we knew that we wanted our graduate-entry students to be proficient in knowing about how to develop an evidence-based practice approach to all their assessment and treatments. So we expected reasonable proficiency at graduation…" (LT)*

Asking relevant questions, identifying appropriate information sources and understanding retrieved evidence were also highlighted:

> *"So obviously, you know, students need to be competent at asking potentially answerable questions, and I think we probably underdo that…"(RJ)*

> *"….the key competencies would be to identify evidence-based sources of information, and one of the key things is there should be no expectation that clinicians are going to go to primary research and evaluate primary research. That is simply not a realistic expectation. In teaching it… they have to be able to identify the pre-processed sources*

and they have to be able to understand the evidence and they have to be able to use it…" (GG)

In addition to attaining proficiency in the fundamental skills of answering relevant clinical questions through information gathered and applying it to care decisions, developing competence in communicating evidence to others, including the patient, and facilitating shared decision-making was also emphasized:

"…So our ability to communicate risks, benefits, understand uncertainty is so poor, it's not even worth me saying them. But that's a key area we could improve…" (CH)

"…and a big emphasis [is needed] on the applicability of that information on patient care, how do you use and share the decision making, which is becoming a bigger and bigger deal" (GG)

In terms of achieving such knowledge and skills it was suggested that these EBP 'basics' can be taught *"from the start in very similar ways" (GG),* regardless of whether the student is at an undergraduate or postgraduate level. The concept of '*developmental milestones'* was raised by one expert with regard to the attainment of EBP competencies. This related to different levels of expectations in learning and assessing EBP skills and knowledge throughout a programme of study i.e. from novice to graduate:

"…in terms of developmental milestones. So for the novice…it's really just trying to get them aware of what the structure of evidence-based practice is and knowing what the process of asking a question and the PICO process and learning about that… in their final year …they're asked to do critically appraised topics and relate it to clinical cases. They do case studies throughout their candidature, but by the end ..[they're] given this complex case to be able to go and develop a clinical question, come up with a reasonable approach and know how to implement that into your clinical practice. It's a developmental process, you can't expect a second year to do that." (LT)

An incremental approach to EBP teaching and learning was advocated over a course of study.

Consensus in relation to key EBP competencies required for healthcare professionals was apparent with skills and knowledge in relation to asking relevant questions, acquiring appropriate information, appraising, understanding, and communicating evidence for its application to care via shared decision-making highlighted.

In summary, the experts were unambiguous in their advice surrounding curriculum considerations. EBP needs to be integrated throughout all elements of healthcare curricula with academic and clinical elements seen as inextricably linked. Embedding EBP within compulsory profession-specific competencies and/or accreditation processes can enhance opportunities for real integration. EBP competencies should centre on the oft-cited steps of asking questions, acquiring, appraising and applying evidence to patient care decisions. Additional attention to professionals' ability to communicate evidence effectively and participate in shared decision-making is required.

Teaching EBP

Similar to the impact that healthcare curricula can have on shaping professional knowledge, skills and practice, the approach and manner in which EBP is taught also carries significance. Recommendations in relation to overall teaching strategies, practical teaching methods and the role of educators (academic and clinical) in the delivery of EBP teaching were suggested.

Teaching Strategies

Teaching strategies are required to give a sense of the overall approach or plan of action to achieve a specific teaching aim. In terms of teaching strategies, three key approaches were evident. The concept of dynamism in teaching through the use of varied teaching methods was advocated to nurture students interest in and exploration of EBP in different ways;

> *"…ultimately trying to get people to teach in a way where they go, 'Look, this is really relevant, dynamic and interesting…so we use lots of different ways, you see, and we teach them in loads of different ways …. So tomorrow, there'll be a student medical going round. So it's much more... you're teaching and feeding the ideas as opposed to 'Here's a definitive course in this way'" (CH)*

The ability to demonstrate relevance to clinical practice was considered key to engaging students with learning about EBP. This is particularly apparent in the vivid language of the following excerpt;

> *"It's got to be clinical because they're hungry for clinical …. They want to touch patients. They want to put their hands on patients. They want to do that. And so with every minute that you are there, unless you can pack it in and give them something that's important…. you're going to put them off" (RJ)*

The integration of teaching into clinical practice supports the need for students to use all their senses to enhance learning about EBP, which can be a challenge within a classroom setting;

> *"…the big challenge is that if it is presented and seen as a classroom exercise, it never happens. So the challenge is to have it presented in such a way that it is actually integrated and seen as part of the basics of optimal clinical care" (GG)*

All experts were keen to emphasize these particular strategies as being fundamental to student engagement with EBP teaching.

Teaching Methods

Translating a teaching strategy to actual student learning requires practical application within a teaching setting. In the instance of practical teaching methods, the use of patient examples and clinical scenarios were repeatedly expressed as one of the most effective ways in teaching the essence of EBP.

Research evidence in particular can often be perceived as vague or obscure in its meaning and relevance when considered in isolation. Contextualizing such obscure information through the provision of practical and clinically based examples related to healthcare decision-making can assist student understanding;

> *"…It's pretty obscure stuff, but then I get them to do three examples. So they sit down and do their low prevalence, medium prevalence, high prevalence and when they have done that they have pretty well got their heads around it but you can talk to them until the cows come home and they don't sort of get it, they sort of have to do an exercise. So I build them lots of practical examples I think you have got to give them practical and clinical examples otherwise they think it's all didactic garbage…." (BA)*

"…here's an example right now in the last week where I've used this to help me make a better decision'. And this is how we've gone about it and this is what we did and this is what we didn't do…..the problem I see with a lot of people is they come along and they go, 'That's it. It's going to be a nightmare'. When you actually have a question about patient care, use some evidence and think about the way you do this or in trying to improve the service based on that. And you need loads of examples as a good teacher" (CH)

The value of using and applying evidence, in terms of assisting practitioners to make decisions or improve healthcare services, needs to be demonstrated by educators, the achievement of which can be facilitated through the use of real-life examples. Also common across interviews was the use of specific core EBP resources. For example, speechBITE, (Speech Pathology Database for Best Interventions and Treatment Efficacy) is the key resource used in Australia for Speech Pathology programmes. 'Users' guides to the medical literature – A manual for Evidence Based Clinical Practice' is employed across different health professions in Canada, particularly for medicine and nursing. The GATE (Graphic Appraisal Tool for Epidemiological Studies) framework, associated workbook and EPIQ (Effective Practice, Informatics and Quality Improvement) website is used throughout medical schools in New Zealand;

"I use the GATE frame. It's accessible ….so I now use it for teaching study design as well as study appraisal…. So I show the students how to critically appraise studies using the GATE workbooks, these GATE CAT workbooks" (RJ)

"Our user's guide to the medical literature is widely used and so when people use a core textbook, that's usually the one that they use. In nursing, there's an equivalent user's guide… we have a whole package that take people through based on real-life examples, where we have a patient scenario, an article from the medical literature and then it's attached to the relevant user's guides. So those materials are among those that are widely used" (GG)

"...speechBITE is probably one of the most commonly used and it's also used because we've got to incorporate it into our competency-based standards from our professional association…" (LT)

These resources are deemed valuable as they are considered to provide relevant information but are eminently accessible and simple to use. They are recognised as 'core' resources or in the case of SpeechBITE, a mandatory point of reference for EBP teaching and learning.

Real-life clinical examples which clearly illustrate valuable outcomes for patients, professionals and the healthcare service from engaging with EBP, in addition to the use of specific EBP resources, are considered essential practical methods of teaching EBP.

EBP Educators

Clinical and academic educators were identified as having a significant influence on the uptake of EBP through the quality of EBP teaching.

It was noted that EBP teaching requires *"a conscious effort on behalf of the educator"* (GG) to be engaged in evidence-based thinking and necessitates a number of people within an organisation to be interested in and recognize the value of EBP. Essentially EBP teaching should be considered a team effort rather than a lone endeavour. If interest is limited then engaging in EBP, regardless of setting, can prove a difficult undertaking:

> *"…. what you're trying to achieve is a difficult mission, and I think the most important is trying to get people around you who are really interested and engaged in the issue because doing it alone is really difficult" (CH)*

The provision of 'training' for EBP teaching was suggested as being helpful in assisting educators to enhance their skills, which in turn could be used to inform and standardize EBP teaching across their organisation;

> *"…so we choose the option to train people as really good teachers and give them really high level skills so that they can then sort of seed it across their organisation..." (CH)*

Attaining a critical mass of people who are 'trained' can make a difference in the way EBP teaching is conducted;

> *"…and it requires then getting the teachers trained and getting enough of them. You don't need everybody to be doing it to make an impression, but you need enough of them really doing it" (GG)*

It was also noted that such 'training' has the potential to overcome the 'academic vs. white coat' challenge to EBP teaching. Educators within an academic setting can be perceived as being somewhat detached from direct patient care and decision-making, which can impact their credibility as a person of authority on EBP. Being knowledgeable in relevant and useful EBP tools which can help to bridge this 'academic vs. white coat' gap, was noted by one expert as a useful way to enhance teaching:

> *"…so challenge number one is this whole thing of your someone who's an academic dealing with epidemiology and numbers and stuff and studies and you're up against someone either in a white coat or whatever, but who's seen a patient, who's talking about a patient…. And you can only get over that by developing good accessible memorable tools and not wasting their time…" (RJ)*

The majority of experts were keen to highlight the distinct importance of the EBP 'role model' or 'champion'. Role models were seen as a strategic resource in terms of contextualizing EBP within specific educational and clinical settings so that its relevance and significance can be brought to the fore:

> *"Well, I think the key for us has always been that where we've seen success is where organisations' have said, 'There's going to be two or three people who are going to be the champions and lead where we're going". Because the issue about evidence, as I said, is it's complex, it needs to be contextualized and it's different for each setting..." (CH)*

EBP role models in the clinical setting are needed to effectively demonstrate evidence-based decision-making to students or those less experienced in practice;

> *"…you really need role models of practitioners who are actually doing it, who are actually using evidence-based approaches to deliver the care… they have to role model evidence based practice and also role model how you access and use the evidence in decisions" (GG)*

One expert suggested that these healthcare professionals have the *'X-factor' required of EBP*. It was proposed that the acquisition of such expertise that enables a practitioner to integrate individual EBP components culminating in evidence-based decisions is the definitive target for all healthcare professionals.

> *"And we call it the X factor …the idea is that the clinician who has the X factor is the good clinician. It's actually integrating the evidence, the patient values, the*

patient's pathophysiology, etc. It could be behavioural issues, systems issues…. Those are the four quadrants and the clinical expertise is about integrating those together…You're not actually adding clinical expertise. It seems to me that the clinical expertise is the ability to integrate those four quadrants" (RJ)

EBP educators, through the quality of teaching, are an important influence on EBP uptake. Training a critical mass of interested individuals is key to enhancing and standardising EBP teaching across organisations. EBP role models and practitioners with the 'X-factor' are essential to effectively demonstrate evidence-based decision-making to healthcare students.

To surmise, teaching EBP requires consideration and adoption of certain strategies and practical methods to realise successful student learning and understanding. Of particular note was the grounding of teaching strategy and associated methods from a clinically relevant perspective. EBP role models or champions were emphasized as being integral to demonstrating the application of EBP in clinical decision-making and facilitating the contextualisation of EBP within a specific setting/organisation. The provision of training for educators across both academic and clinical 'coalfaces' was a common narrative thread, the purpose of which is to aid the further development of skills and use of resources necessary for effective EBP teaching.

Stakeholder engagement in EBP education

The development and implementation of EBP education concerns not only the individuals directly involved, that is, academic/clinical educators, healthcare professional students and clinicians, but also patients, health services and national policy makers. The necessity of engagement from these central stakeholders was highlighted, with each delivering different contributions.

National Policy Makers

Higher level policy initiatives have the potential to promote or impede EBP. The lack of a coherent government and national policy to EBP teaching was cited as a barrier to the implementation of the EBP agenda in the United Kingdom. The absence of such policy has resulted in a somewhat 'ad-hoc' approach, dependent on individual educational or research institutions:

"… there's no cohesive or coherent policy that exists… It's not been a consistent approach. What we've tended to see is that people have started to going around

particular initiatives…. but there's never been any coordinated approach even from a college perspective, to say we are about improving the uptake and use of evidence in practice and/or generating evidence in practice. And so largely, it's been left to research institutions …" (CH).

This inadequacy was contrasted with other successful initiatives which had a defined national driving force:

"…I've seen initiatives that have helped to develop the research [agenda], like the NIHR's been exceptional in the UK. That's been a huge step forward in trying to generate applied health research and it's only at the start of its mission 10 years in. So I think for research, that's been helpful…" (CH)

Policymakers that have recognised the contribution and value of EBP resources, both for clinicians and patient care and directed consistent investment in this area, was emphasised as key to the success of an EBP agenda:

"…I think it's a success because there has been some investment, you know…so I would advise if, you know, the powers that be in Ireland were able to recognise the value of investing in resources and you know... it's expensive. It's an ongoing expense. You can't start it today if you don't have a constant investment in it" (LT).

An example of a successful initiative between a national government body and speech pathology healthcare professionals was provided. In New South Wales (Australia), EBP networks, which are active in the appraisal, dissemination and practice of evidence-based healthcare decision-making, were formed. This venture was not driven by universities but led by healthcare professionals in conjunction with the NSW Department of Health:

"Evidence-based practice network, I mean it's completely voluntary…a number of special interest groups that meet and evidence-based practice is just a core part of what they do…. it's because it's sort of engrained in us all now. You know, it's just so part of our professional culture…so that's just an ongoing process and the network really grew out of … the universities didn't drive that. The government, you know, the health department, speech pathologists lead that process…" (LT)

A coherent national policy and co-ordinated approach to EBP education, in addition to the potential positive learning and practice outcomes derived from healthcare professional collaboration with government departments are highlighted as meaningful steps towards a more consistent realisation of EBP within healthcare.

Healthcare Professional Engagement and Patient Enablement

As noted previously, healthcare professionals are direct EBP stakeholders. To further engrain EBP within healthcare professional practice, it was suggested that EBP processes, whether related to developing, disseminating or implementing evidence, be embedded in a more structured way into everyday clinical care:

> *"…we think it should be embedding some structural features into care…. I think we've got to have people being active in developing, disseminating and implementing evidence…Developing can come in a number of formats. It can be an audit. It can be about a practice improvement. It can be about doing some aspect like a systematic review, but it's very clearly close to healthcare" (CH)*

The rationale for such a structured and embedded approach is that it promotes *active* engagement with EBP on a continuous basis at or close to the point of care.

While only one expert raised the issue of patients as stakeholders in EBP, it provides an additional perspective worthy of consideration:

> *"…And the other thing that I think we really need to put some energy into… is this whole idea of patient-driven care, patient-led care and putting some of these tools in the hands of the consumers so that they're enabled to be able to ask the right questions and to go into an interaction with some background knowledge about what treatments they should be expecting" (LT).*

If patients are considered as recipients of EBP rather than key stakeholders the premise of shared decision-making for care cannot be achieved.

It is evident that engagement of national policy makers, healthcare professionals and patients' with EBP has potential to advance its teaching and application in clinical care. Establishing a coherent national policy

and co-ordinated approach to healthcare education and recognising the value of EBP through investment in resources and related initiatives were deemed of merit by the experts to advance the EBP agenda. Enhanced healthcare professional engagement through more structured and embedded EBP activities relevant to clinical care was recommended. Finally, enabling patients to engage with evidence with a view to informing healthcare professional/patient interactions and care decisions was advocated.

3.5 Summary of EBP Expert Findings

Five international EBP experts were interviewed to ascertain current and nuanced information on the delivery of EBP healthcare professional education in the UK, Canada, New Zealand and Australia. The findings brought attention to the significance of three key categories, namely; (i) 'EBP Curriculum Considerations'; (ii) 'Teaching EBP' and (iii) 'Stakeholder Engagement in EBP Education'. Definitive advice in relation to curriculum considerations was provided with a clear emphasis on the need for EBP principles to be integrated throughout all elements of healthcare curricula. Embedding EBP within compulsory profession-specific competencies and/or accreditation processes can present opportunities for real integration of EBP, which should be reflected equally in both academic and clinical elements of curricula. EBP competencies should centre on the oft-cited steps of asking questions, acquiring, appraising and applying evidence to patient care decisions. Additional attention to professionals' ability to communicate evidence effectively and participate in shared decision-making is required.

The quality of teaching has potential to impact the uptake of EBP in practice. Adoption of effective strategies and practical methods to realise successful student learning and understanding is required. Of particular note was the grounding of teaching strategy and associated methods from a clinically relevant perspective with student exposure to EBP facilitated in such a way that it is dynamic and interesting. EBP role models and clinicians with the 'X-factor' were emphasized as being integral to demonstrating the application of EBP in clinical decision-making and facilitating the contextualisation of EBP within a specific setting/organisation. The provision of training for educators, the purpose of which is to aid the further development of skills and use of resources necessary for effective EBP teaching was recommended.

Engagement of national policy makers, healthcare professionals and patients with EBP also has potential to advance its teaching and application in clinical care. Establishing a coherent national policy on EBP education, investment in resources and related initiatives were deemed of merit to advance the EBP agenda. Providing structured and embedded EBP activities relevant to clinical care was recommended to improve healthcare professional consistency with EBP. Enabling patients to engage with evidence with a view to informing healthcare professional/patient interactions and care decisions was also advocated.

The implementation of successful EBP education serves the function of developing practitioners who value EBP and have the knowledge and skills to implement such practice. The ultimate goal of this agenda is to enhance the delivery of healthcare for improved patient outcomes. The overarching theme derived from

the analysis from these interviews, 'Improving healthcare through enhanced teaching and application of EBP', represents the focus and purpose of the effort required to optimally structure HCP curricula, promote effective EBP teaching and learning strategies and engage with key stakeholders for the overall advancement of EBP education.

3.6 'Bringing It All Together' - Synthesis of Structured Review and Expert Interview Findings

The aim of this synthesis of review and expert interview findings is to provide recommendations to inform the development of a core curriculum and standards/requirements for health professional programmes in Ireland. The evidence presented offer some consistent trends which address this aim which will be discussed under the following headings: 1. Core Curriculum and Competency Framework for EBP Education 2. EBP Programmes - Content, Delivery Mode, Teaching Methods and Assessment and 3. Overcoming Barriers to EBP Teaching. A summary table of key points is presented at the end of this section (see Table 3.3).

1. Curriculum Considerations and Competency Framework for EBP Education

Education programmes and associated curricula act as a key medium for shaping healthcare student professional knowledge, skills and attitude, and therefore play an essential role in determining the quality of care provided (Young *et al.,* 2014). With respect to professional curricula, educational theory advocates increased integration of theory and practice with respect to EBP (Aglen *et al.,* 2016). Unequivocal recommendations were made by EBP experts to integrate and embed EBP throughout academic and clinical curricula. Such integration is facilitated by the explicit inclusion of EBP as a core competency within professional standards and requirements (Frenk *et al.,* 2010) in addition to accreditation processes. From a curriculum development perspective, direction in relation to such integration is gained from looking to appropriate learning theory to underpin andragogic interventions. The empirical literature reviewed recommend that EBP curricula and teaching needs to be more closely aligned with educational theories that support 'real-time' integration of education with clinical practice. Adult learning theory, behaviour change theory and, from an undergraduate perspective, theories of cognitive maturity development and knowledge transfer, can assist in structuring curricula overall to facilitate the integration of EBP as a core component (Aglen 2016; Dizon 2012; Harris *et al.,* 2011). An additional suggestion derived from expert consultations is the development of learning objectives at novice, intermediate and entry levels to professional undergraduate programmes. While such a recommendation can only be tentative in nature

given the extent of evidence available, empirical review findings also provisionally advocate a 'spiral approach', whereby EBP concepts and application increase in complexity and are reinforced throughout the years of learning (Elcin *et al.,* 2014; Iliac and Maloney 2014).

From the empirical review, it is clear that the minimum standard educational requirements and core learning outcomes derive from the 5-step model of EBP as originally proposed by Guyatt *et al.,* (1992) and further explicated within the Sicily Statement by Dawes *et al.,* in 2005. These steps form the basis and are included in the majority of professional competency frameworks (Galbraith *et al.,* 2017). It is also clear that in the majority of cases, only some components of the model, namely the first three steps of Ask, Acquire, and Appraise are included in terms of EBP teaching assessment and research outcomes. Recommendations from expert consultation, while acknowledging the need for fundamental knowledge and skills in these 3 areas, highlight the need for a more effective and targeted approach to the teaching and assessment of steps 4 (Application of evidence in practice) and 5 (Assessment of outcomes from clinical EBP decision-making). Integrative interactive teaching and further development of and emphasis on communication skills are key to enhancing competency in these areas and particularly in relation to realising shared decision-making between patients and healthcare practitioners in making evidence-based decisions.

Findings from a recent systematic review by Galbraith *et al.,* (2017), which examined a 'real-world' approach to evidence-based medicine in general practice, corroborates this recommendation by calling for further attention to be given to communication skills of healthcare practitioners within the context of being an evidence based practitioner. The use of pre-processed and pre-appraised evidence sources was another key issue raised by EBP experts and increasingly more recently within empirical literature (Robeson and Dobbins 2010; Yost *et al.,* 2014). While again it is recognised that search and appraisal skills should be a fundamental element of healthcare curriculum and an essential skill, critical adeptness and competency in the navigation of pre-sourced and pre-appraised evidence sources is also required.

A healthcare professional curriculum which explicitly and consciously integrates EBP as a core professional competency throughout all academic and clinical curriculum domains is recommended. While the 5-step EBP model remains the foundation for building EBP skills and knowledge and therefore informs the majority of professional competency frameworks, a more pragmatic approach to steps 1-3 is required in terms of acquiring and appraising evidence, with a more targeted approach needed to improve competency and outcomes in relation to steps 4 and 5. Use of educational theories that support the practical integration of

theory with practice is recommended to facilitate this process (Flores and Matteos 2007; Dizon *et al.,* 2012; Aglen *et al.,* 2016).

2. EBP Programmes - Delivery Mode, Duration, Teaching Methods and Assessment

Similar to previous review findings on EBP healthcare professional education (Dizon *et al.,* 2012; Iliac *et al.,* 2014; Ahmadi *et al.,* 2015), participation in any structured form of EBP education regardless of whether it is taught at an undergraduate or postgraduate level, can have beneficial effects on EBP competencies in terms of knowledge, skills and attitudes. Evidence for the impact of EBP education on actual behaviour or clinical outcomes is more tentative (Dizon *et al.,* 2012; Young *et al.,* 2014; Ahmadi *et al.,* 2015). *However, considering the multitude of factors impacting on practice outcomes, it is difficult to design robust studies which can assess and attribute improved health outcomes to any single factor (Cook et al., 2013).* Progress in terms of 'prescribing' effective EBP education components, such as optimal duration of training, delivery modes and assessment strategies is hampered by the variable quality of research methods used to evaluate the effectiveness of EBP education interventions. While the evidence overall is not definitive, experts in EBP, together with trends throughout empirical research and recognised educational theory repeatedly make a number of recommendations for enhancing EBP programmes and associated teaching and learning strategies. These include; (1) clinical integration of EBP teaching and learning; (2) a conscious effort on behalf of educators to embed EBP throughout all elements of healthcare professional programmes; and (3) the use of multi-faceted, dynamic teaching and assessment strategies which are context-specific and relevant to the individual learner / professional cohort.

What do these recommendations mean at a practical level for policy-makers and educators charged with programme development? It requires a more concerted effort to move away from a predominant reliance on stand-alone didactic teaching towards clinically integrative and interactive teaching. In 2006, Khan and Coomarasany developed a hierarchy of effective educational strategies for EBP teaching based on empirical and theoretical evidence. Level 1, deemed the most effective strategies, represent interactive and clinically integrated teaching and learning activities. An example provided by one of the EBP experts represents this level in terms of the performance of GATE CATS while on clinical rotation with assessment conducted by a clinician in practice. Such an activity fulfils the criteria of being reflective of practice, facilitating the identification of gaps between current and desired levels of competence, identifying solutions for clinical issues and allowing re-evaluation and opportunity for reflection of decisions made with a practitioner. Such interactivity facilitates 'deeper' learning, which is essential for knowledge transfer (Aglen *et al.,* 2016). This

strategy level is of particular importance for providing enhanced learning opportunities to achieve competency in steps 4 and 5, which, as the review findings demonstrated are least addressed within EBP programmes.

At level 2, interactive, classroom-based teaching, or didactic, but clinically integrated teaching is recommended. Although classroom-based, a conscious effort is required to ensure teaching sessions are interactive, e.g. through the use of group work with defined outcomes or case discussions (Khan and Coomarasamy, 2006). From analysis of expert interviews, using clinical examples, simulation of clinical scenarios to replicate 'bedside' teaching, providing resources where students have to work through 'real-life' examples were repeatedly recommended as essential to demonstrating the relevance and application of EBP.

Level 3 encompasses traditional teaching activities, which are predominantly didactic in nature and presented as 'stand-alone' modules within a programme. The lack of activity or interactivity, in addition to the absence of a clinical context is suggested to limit students' interest and depth of learning both of which are required to effectively acquire competence in EBP skills (Khan and Coomarasamy, 2006; Iliac *et al.,* 2014).

The findings and propositions by Khan and Coomarasamy (2006) are reflected and corroborated in empirical work in the past decade which advocate for the implementation of multifaceted, clinically integrated approaches with relevant assessment (Ilic *et al.,* 2014; Kortekaas *et al.,* 2016; Ubbink *et al.,* 2013; Young *et al.,* 2014;).

Findings from EBP expert consultations recommend that EBP needs to be 'pervasive' throughout all elements of programme content with EBP teaching and learning not just within the remit of stand-alone EBP specific-modules. This recommendation presents challenges in terms of measuring or prescribing optimal 'duration' or allocation of time for EBP teaching if we are to move away from a 'stand-alone' module approach to EBP teaching. Rather than focus on time allocation, further attention should be concentrated on specifying sound and measurable EBP learning objectives that address all 5 steps of the EBP model throughout a programme. A comparable emphasis is also needed on the development of assessment strategies that can accurately assess EBP knowledge and skill attainment. Demonstrating EBP competence is a complex task therefore no single assessment method can provide all the necessary data

to assess complete EBP competence (Ilic *et al.,* 2009; Blanco *et al.,* 2014). Expanding assessments methods to include the use of an adapted and profession-specific Fresno test, OSCEs or simulation exercises and clinical CATS, would be of benefit in more comprehensively assessing different aspects of EBP competence and also useful for monitoring the vertical and horizontal integration of EBP throughout a programme. The Sicily Statement on the classification and development of evidence based practice learning assessment tools is an international consensus statement which offers direction for educators and researchers in developing and identifying the types of EBP learning assessment tools that are needed to promote more consistent evaluation of EBP teaching outcomes (Tilson *et al.,* 2011).

There is an immediate requirement for healthcare professional education to explicitly include EBP as a core professional competency, which is embedded throughout all aspects of undergraduate and postgraduate programmes. Operationalisation of this can be facilitated through the use of multi-faceted, interactive and clinically integrative teaching and learning strategies and assessments to effectively assist students in achieving EBP competency across all elements of the 5-step model.

3. Strategies to overcome barriers to the implementation of EBP teaching

While there is no 'magic bullet' that can readily address all factors impacting upon EBP education and its implementation in practice, identifying and overcoming potential barriers is recommended as effecting positive change (Baker 2010). In addition to addressing challenges such as curriculum organisation and programme content/structure, the following strategies were also highlighted within the review and expert interviews findings; (1) 'Training the trainers', (2) Development of and investment in a national coherent approach to EBP education; (3) Structural incorporation of EBP learning into workplace settings.

Comparable national surveys by Meats *et al.,* (2009) and Blanco *et al.,* (2014) found that a lack of academic and clinical staff, knowledgeable in teaching EBP was a barrier to effective and efficient student learning. This was echoed by findings from EBP expert interviews. Effective teacher education is required to improve EBP teaching quality (Ingvarson and Rowe 2007; Walczak *et al.,* 2010; Ubbink *et al.,* 2013; Young *et al.,* 2014,). Providing educators with formal training in teaching EBP can assist in identifying learning opportunities and accessing relevant resources in a variety of contexts and settings (Walczak *et al.,* 2010). Of note, such formal training should extend to academic and clinical educators equally. EBP role models and champions, through participation in such training, presents an opportunity for the promotion of 'best

practice' in EBP teaching throughout academic and clinical educational settings. Initiatives such as the EU-EBM project (Thangarantinam *et al.,* 2010), in addition to EBP teaching work-shop programmes held at Oxford (CEBM) and McMaster Universities recognise the necessity and value of such education for the advancement of the EBP agenda.

A national and coherent plan with associated investment in healthcare education specific to the integration of EBP was highlighted within the expert interviews as having an important impact on educational outcomes. The lack of a coordinated and cohesive approach and perceived value of EBP in the midst of competing interests, particularly within the context of the healthcare agenda, was suggested to lead to an 'ad-hoc' approach to the implementation of and investment in EBP education and related resources. Findings from a systematic scoping review of recommendations for the implementation of evidence-based practice by Ubbink *et al.,* (2014), draw attention to a number of interventions at a national level that have potential to further promote and facilitate EBP education. Such interventions include government level policy direction in relation to EBP education requirements across health profession programmes and the instalment and financing of a national institute for the development of evidence-based guidelines. A similar proposal by Togher *et al.,* (2011) was made as a result of the findings from a national scoping study on EBP education amongst Speech Pathologists in Australia which strongly recommended a national plan of action for EBP curricula and resources.

Structural incorporation[4] of EBP learning and its implementation in practice has potential to counter the barriers cited within this review that were associated with a lack of personal discipline in relation to participating and implementing evidence based practice in addition to facilitating the principles advocated by EBP experts with regard to making EBP learning accessible, simple, and relevant. Such structural incorporation can be facilitated at various different levels and settings. At a health service level, the provision of computer and internet facilities at the point of care with associated content management / decision support systems allowing access to guidelines, protocols, critically appraised topics and condensed recommendations was recommended. At a local workplace level, access to EBP mentors, implementation of consistent and regular journal clubs, grand rounds, audit, regular research meetings were all emphasized as important to embed within the healthcare or education environment. This in turn can nurture a culture which practically supports the actualization of EBP in day to day practice (Ubbink *et al.,* 2013).

[4] Structural Incorporation: Promotion and facilitation of EBP activities in daily practice, e.g. audit, accessing EBP resources at point of care

Strategies to overcomes barriers to EBP teaching and learning should not only focus on issues such as curricula structure and programme delivery but also look to interventions which support educators, education providers, health services and clinicians to have the capacity and competence to meet the challenge of providing such professional training.

Based on the findings of the empirical review and EBP expert interviews, the following table offers a summary of the suggested recommendations to help inform the development of EBP education in Ireland (see Table 3.3)

Table 3. 3 Summary of Recommendations & Key Observations from Review and Interview Findings Synthesis

EBP Education	Recommendations
Curricula (undergraduate / postgraduate)	i. Explicitly and consistently include, document and demonstrate EBP principles and processes throughout academic and clinical programme components. ii. Use educational theories, for example, adult learning theory and theories of cognitive maturity development and knowledge transfer, to guide curriculum development processes and enhance the integration of EBP as a core component. iii. Where not already present, explicit inclusion of EBP as a core competency within professional standards and requirements, with consideration given to the linking with professional accreditation processes. iv. Scaffold acquisition of learning outcomes across novice, intermediate and professional entry levels within undergraduate health education programmes. v. Gain national agreement on the minimum standard educational requirements and core EBP learning objectives with consideration given to international practices e.g. the Sicily Consensus Statement/CEBM(Oxford)/McMaster in the development of such requirements.
EBP Competencies/ Additional Skills	i. Increase emphasis on the attainment of learner competency in, and providing access to, pre-processed and pre-appraised EBP resources. ii. Provide additional opportunities for students and practitioners to engage with steps 4 and 5 (Apply and Assess) in practice through audit and associated activities. iii. Increase emphasis on skills relating to communication of evidence and shared decision-making processes with patients/clients.
Teaching and Learning Approach	i. Employ teaching and learning strategies based on the hierarchy of effective EBP teaching approaches, with a preference for levels 1 and 2 which are clinically integrative, interactive and multi-modal in terms of delivery.

	ii. Specify measurable EBP learning objectives that address all 5 steps of the EBP model throughout undergraduate and postgraduate programmes. iii. Use of a *wide range* of validated assessment strategies e.g. Fresno Test, Berlin questionnaire, GATECAT (where possible), that can accurately assess EBP competency attainment.
Strategies for Overcoming Barriers	i. Engage with relevant stakeholders to agree and direct the delivery and integration of EBP education across undergraduate, postgraduate and continuing professional programmes to advance the EBP agenda in a co-ordinated and cohesive manner. ii. Provide formal training in EBP and EBP teaching to educators (university /academic staff, regulatory body education officers, practice/health service clinical educators) charged with responsibility for the delivery of health professional education across all steps of EBP (ask, acquire, appraise, apply, assess) and facilitate these educators to undertake such training. iii. Promote the incorporation of EBP activities and resources e.g. journal clubs, grand rounds, audit, access to librarians/information specialists and EBP literature, within clinical/health service settings to facilitate enhanced engagement with evidence based practices.

Chapter 4 Survey Development, Validation, Data Collection and Findings

4.1 Aim

To capture and describe baseline data relating to the current provision and practice of EBP education to healthcare professionals at third level institutions and professional bodies in Ireland.

4.2 Methods

A descriptive, cross-sectional survey was undertaken. Survey research is particularly useful when little is known about the variable(s) of interest with data gathered predominantly used for further development of programmes or interventions (LoBionda –Wood and Harber, 2014). Similar research designs have been efficiently and effectively used in the US (Zelenikova *et al.,* 2014), UK (Meats *et al.,* 2009) and Australian (Togher *et al.,* 2011) studies investigating national third level EBP education and training in medical, nursing and speech pathology professions.

The sampling frame was derived from the project scope which specified the following training establishments in Ireland;

- Higher Education Institutions (HEIs) that provide undergraduate and postgraduate training to doctors, nurses/midwives and allied health professionals in Ireland (ROI).
- Postgraduate training bodies e.g. Irish postgraduate medical training bodies (which meet the Medical Council postgraduate accreditation standards) and the Centres for Nursing and Midwifery Education (for courses approved by the NMBI).

A purposive and targeted strategy was employed to ensure that stakeholders involved in the provision, oversight or regulation of healthcare professional education were therefore sampled. Specifically, Higher Education Institutes, *(Universities (n=6 UCC, UCD, DCU, TCD, UL, NUIG (including St. Angela's College)*, National University of Ireland Recognised Colleges *(n=1 RCSI),* and Institutes of Technology *(n=7 AIT, WIT, DKIT, GMIT, Letterkenny IT, DIT, ITT)* that offer undergraduate and postgraduate healthcare profession education courses (medicine, nursing, midwifery, dentistry, surgery, dietetics, pharmacy, physiotherapy, occupational therapy, speech and language therapy, podiatry, clinical psychology, optometry and radiography) were sampled. A number of professional training bodies and associated accredited training programmes were also targeted *(for example, Irish Postgraduate Medical Training Body (RCPI), Irish Postgraduate Surgical Training Body (RSCI), Irish Medical Council (IMC), Irish College of General Practitioners (ICGP), Centres for Nursing and Midwifery Education, The Pharmaceutical Society of Ireland (PSI), Irish*

Institute of Pharmacy (IIOP), Pharmacy Society of Ireland (PSI), Irish Pharmacy Union Academy, Irish Society of Chartered Physiotherapists (ISCP), Irish Association for Speech and Language Therapists, The Association of Occupational Therapists of Ireland (AOTI), the Irish Institution of Radiography and Radiation Therapy (IIRRT), Dental Council of Ireland, Irish Dental Association, Primary Dental Care and CORU). While not feasible to sample all postgraduate training bodies, the project aimed to recruit a representative sample *(See* Appendix 17 for a list of invitees).

The survey was developed following: (1) a review of literature specifically examining national third level EBP teaching to healthcare professionals and; (2) consultation with the NCEC, DoH. Items from surveys developed by Meats *et al.,* (2009) (*UK Undergraduate Medical Schools*), Togher *et al.,* (2011) (*Australian Undergraduate and Postgraduate Speech and Language Therapy Schools/Department*), and Blanco *et al.,* (2014) (*Canadian and US Medical Schools*) were of particular utility in informing the design of the current survey. Permission was obtained and granted to adapt the aforementioned surveys.

The survey incorporated Dawes *et al.,* (2005) Sicily Statement on: (1) the definition of EBP; (2) the teaching of EBP and; (3) the EBP process i.e. '5-step' model (see Appendix 11). The survey consisted of 4 sections with a total of 37 closed and open-ended questions.

Section 1 contained items relating to background information, specifically:

(a) Type and size (in terms of student numbers) of School/Department/Training Body.
(b) Academic level of student programmes/courses offered (Undergraduate/Postgraduate/CPD).
(c) Staff involved in the formal teaching of EBP/clinical audit.
(d) Principal teaching approach / methods used to deliver EBP/clinical audit education.
(e) Evidence of a dedicated EBP/clinical audit champion/lead.

Section 2 comprised of items relating to EBP teaching and curriculum considerations, including:

(a) Processes associated with the development, review and evaluation of curricula (e.g. contributors (academic and clinical), alignment to professional body core competency requirements, explicit EBP philosophy).
(b) Curriculum content (e.g. specific EBP learning outcomes according to the Sicily Statement, access to EBP resources).
(c) Type of EBP formative and summative assessments (including assessment of application in clinical settings).

(d) Evidence of educational activities in specific areas of clinical effectiveness (e.g. Quality improvement processes, patient safety, implementation science).

Section 3 gathered information in relation to:

(a) Staff attitudes towards EBP.
(b) Formal training (type and duration) received by staff in teaching EBP.
(c) Knowledge of and access to EBP resources (e.g. electronic online tools and databases).

Section 4 contained items in relation to barriers and facilitators to teaching EBP. Two open-ended questions requesting details of innovative examples of how EBP was/is taught by respondents and recommendations on the type of resources that could be provided/developed to enhance EBP teaching were also included. At the end of the questionnaire, participants were asked to provide a copy or an overview of their EBP curriculum to outline further detailed description and examples of current/best practice.

Surveys involving healthcare professionals are notably characterized by low response rates (Cho *et al.,* 2013). Researchers must therefore make every effort to increase response rates by implementing strategies demonstrated to improve completion and return of surveys. A number of methods, recommended from recent systematic reviews (Cho *et al.,* 2013; Fan *et al.,* 2010), to improve survey response rates were employed. These included rigorous instrument pre-testing, piloting of data collection mode and appropriately personalised reminders. Extensive pre-testing and piloting was conducted to ensure content validity, clarity of the survey items, and reliability of the data collection mode. The Questionnaire Appraisal System (QAS 99) (Willis and Lessler 1999), a tool used to aid systematic analysis of questionnaires prior to use in the field, was adopted for pre-testing the survey. The 8 specific areas examined included: (1) reading difficulty, (2) instructions, (3) item clarity, (4) assumptions, (5) knowledge/memory, (6) sensitivity/bias, (7) response categories and (8) overall comments. The QAS was distributed and completed by 5 team members (ES, PLW, JH, MC, JD). The results of this process were used to amend problematic areas identified, the majority of which centred on the clarity of instructions provided and the adequacy of the response categories. Following the required revisions, the survey was migrated to an electronic format using SurveyMonkey ©, and subsequently pilot-tested to ensure user-friendliness and accessibility through different online mediums. Over the 6-week data collection period (April –May 2017), two reminder e-mails were sent. An alternative option of returning the survey and/or the EBP curriculum documentation to the researchers via a stamped addressed envelope was also offered to participants.

HEIs and professional training bodies were contacted by email through the Dean (or equivalent e.g. Head of Education and Professional Development) of the respective Department/School/Centre/Training body. Each e-mail contained a cover letter detailing the project purpose and methods. If agreeable to participating in the study, each contact was asked to provide details of a nominated person representing both undergraduate and/or postgraduate programmes within their department for the research team to liaise with. They were also provided with the option of directly forwarding the e-mail, including the cover letter and a study-specific, secure and de-identified link to the web-based survey, to the identified member(s) of staff.

Prior to study recruitment procedures, ethical approval was sought and granted from the Social Research Ethics Committee, University College Cork (see Appendix 12). An information letter (see Appendix 13), explaining the aim of the research and addressing the voluntary nature of the study and procedures to guarantee confidentiality and privacy to the fullest extent possible was attached to all surveys. Completion and return of the survey was taken to infer consent to participate. The research team/tendering body is responsible for adhering to Irish data protection standards (www.dataprotection.ie).

As the survey was conducted through SurveyMonkey©, the survey routing and many of the survey logic checks were automated and completed during fieldwork. However, data checking was performed following data collection and appropriate editing and data coding was conducted to ensure the accuracy of the final dataset. Data was exported directly from SurveyMonkey into IBM SPSS Statistics (Version 22.0, IBM Corp, Armonk, NY, USA). From SPSS, the data was exported into Stata (Version 13.0, StataCorp LP, College Station, TX, USA) where all statistical analysis was performed. Data were analysed both quantitatively and qualitatively. Descriptive statistics were used to describe the responses to the study. Categorical data was described numerically using frequency and percents (%) and graphically using bar charts. Ordinal categorical data was also described using the mean and standard deviation (SD). Continuous data was described using the mean (SD), median (interquartile range, {IQR}) and minimum and maximum scores. Boxplots were used to describe the continuous data graphically. Qualitative analyses involved thematic groupings of open-ended survey responses.

4.3 Findings

These findings present baseline information on the current provision and practice of EBP to healthcare professionals in Ireland. For ease of interpretation, results are presented as per survey section question and divided by academic level where appropriate.

Survey Response Rate (Overall and by Healthcare Profession)

Eighty-One Deans (or equivalent) across health and social care professions, from Higher Education Institutes (HEIs) and professional training /regulatory bodies were contacted. An overall response rate of 67% (n=54 institutions) was achieved. Table 4.1 presents the response rates per HEI and professional training/regulatory body. Figures 4.2 and 4.3 provide graphical representation of response rates per healthcare profession.

Table 4. 1 Invitations sent to HEIs / Professional Training and Regulatory Bodies

Discipline	No. of HEI invites	HEIs	Response No. and %	No. of Prof Training/Regulatory Body Invites	Prof Training /Regulatory Body/ CPD Centres	Response No. and %
Dentistry	2	(UCD, TCD)	2 (100%)	4	(Dental Council of Ireland, Irish Dental Assoc., Primary Dental Care)	2 (50%)
Occupational Therapy	4	(UCC, TCD, NUIG, UL)	3 (75%)	1		0 (0%)
Nursing	11	(UCD, DCU, UL, TCD, UCC, WIT, ITT, UD, NUIG, AIT, GMIT, DKIT)	10 (90%)	23	(Centre for Nursing/Midwifery Education)	15 (65%)
Pharmacy	3	(UCC, TCD, RCSI)	3 (100%)	3	(Irish Institute of Pharmacy, PSI, Irish Pharmacy Union Academy)	2 (66%)
Physiotherapy	4	(UL, RCSI, TCD, UCD)	4 (100%)	2	(CORU, ISCP)	2 (100%)
Radiography	2	(UCD, TCD)	1 (50%)	1	(Breastcheck National Screening Centre)	1 (100%)
Dietetics/Optometry/Podiatry	4	(DIT, UCD, NUIG)	1 (50%)	0		0 (0%)
Psychology	5	(UCC, UCD, NUIG, TD, UL)	2(40%)	0		0 (0%)
Medicine	6	(UCC, UCD, NUIG, UL, TCD, RCSI)	2(40%)	See Appendix 17	See Appendix 17	2
Speech and Language Therapy	4	(TCD, UCC, UL, NUIG)	4(100%)	1	(CORU)	1 (100%)
Total Responses	45		29	37		25

Note: The response number for professional training/regulatory body specific to medicine includes responses on behalf of a number (n=17) of specialist training programmes

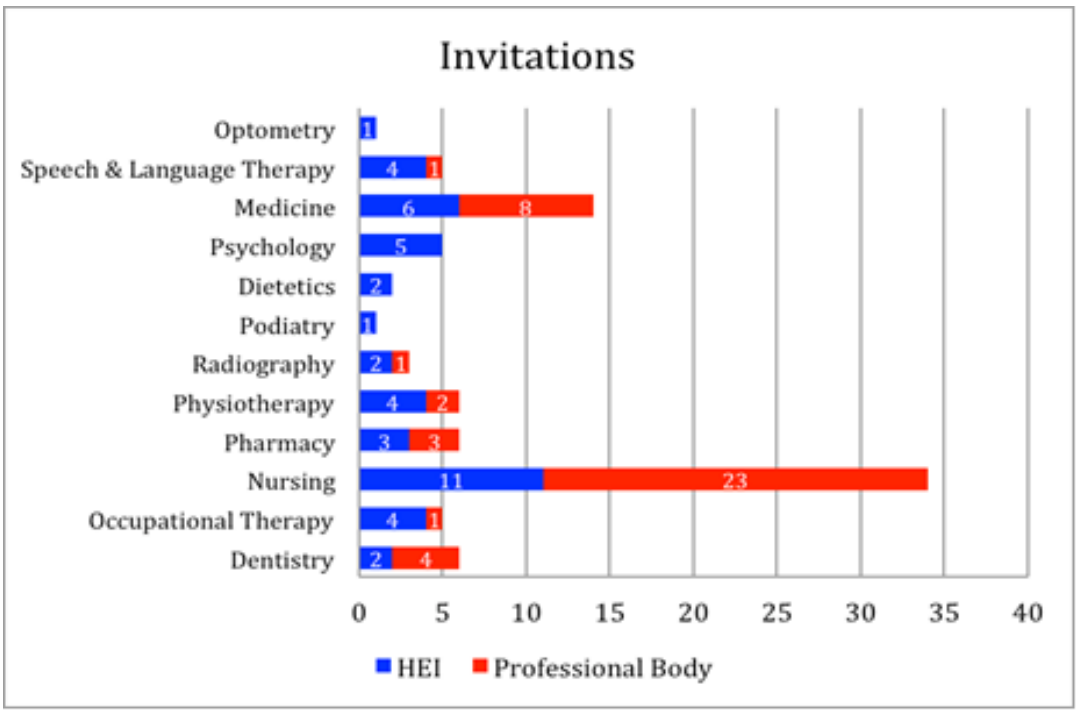


Figure 4. 1 Invitations

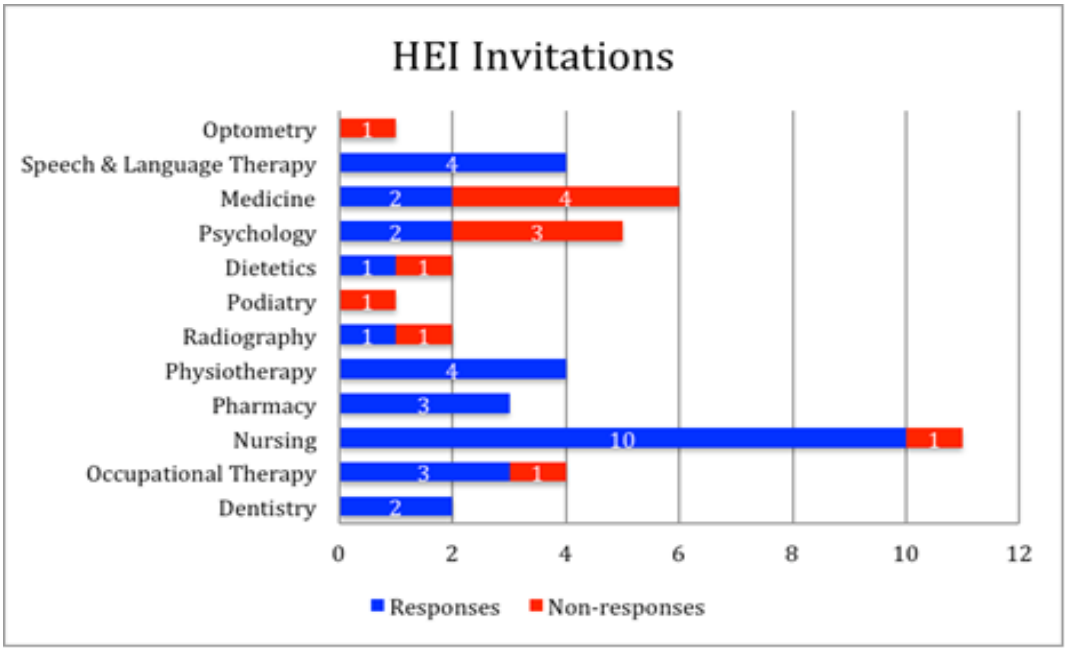
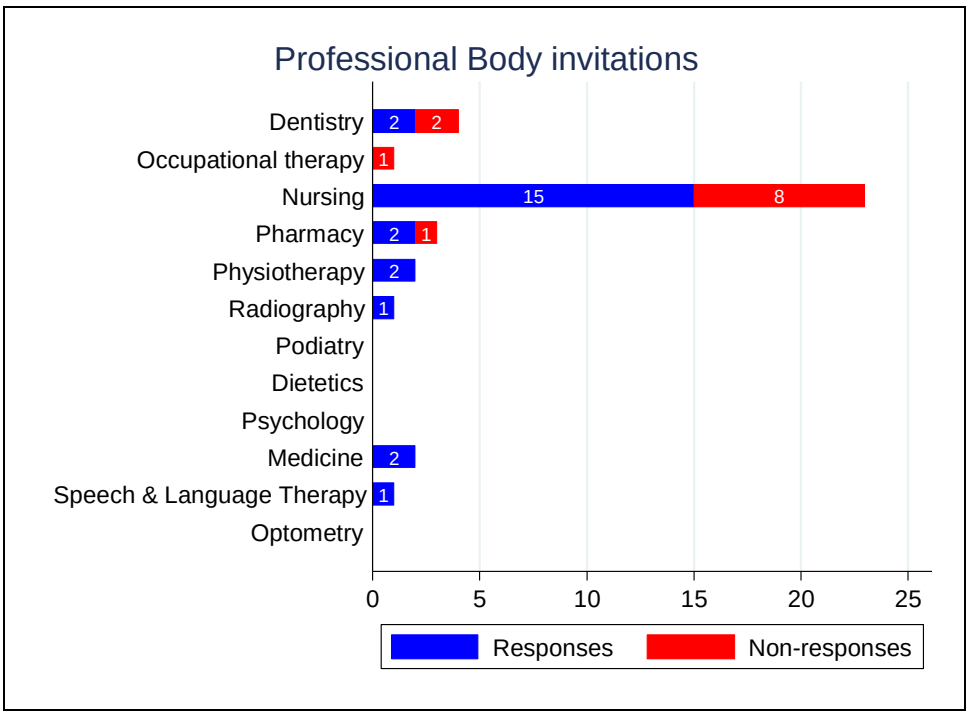


Figure 4. 2 Responses to HEI invitations



Note: The response number specific to medicine includes responses made on behalf of a number (n=17) of postgraduate specialist training programmes

Figure 4. 3 Responses to Professional Body Invitations.

Respondent and Educational Institution Characteristics

To characterise the participants and their respective institutions who completed the survey the following information is presented: (i) the predominant role of respondents; (ii) the healthcare profession(s) to whom institutions provided education; (iii) the academic level of student programmes/courses offered (Undergraduate/Postgraduate/CPD) and (iv) institution size (in terms of student numbers).

(i) Predominant Role of Survey Respondent

The majority (68%, n=45) stated that their main role was education provision to students, while 32 (48.5%) specified oversight/regulation of student education. 'Other' (19.7%, n=13) responses specified a variety of positions including; provision of CPD for specific qualified professional cohorts e.g. General Practice Dentists, nurses across the register (n=4), design, development and implementation of CPD programmes (n=1), education of practitioners / practice educators (n=1), manager (n=1), administration (n=1), QQI committee member (national and local) (n=1), Head of School (n=1), oversight of governance and quality in education delivery (n=1), research (n=1), and strategic development and oversight of the department (n=1).

(ii) Provision of Healthcare Professional Education

Figure 4.4 provides a breakdown of the specific healthcare profession for which the responding institution provided educational programmes.

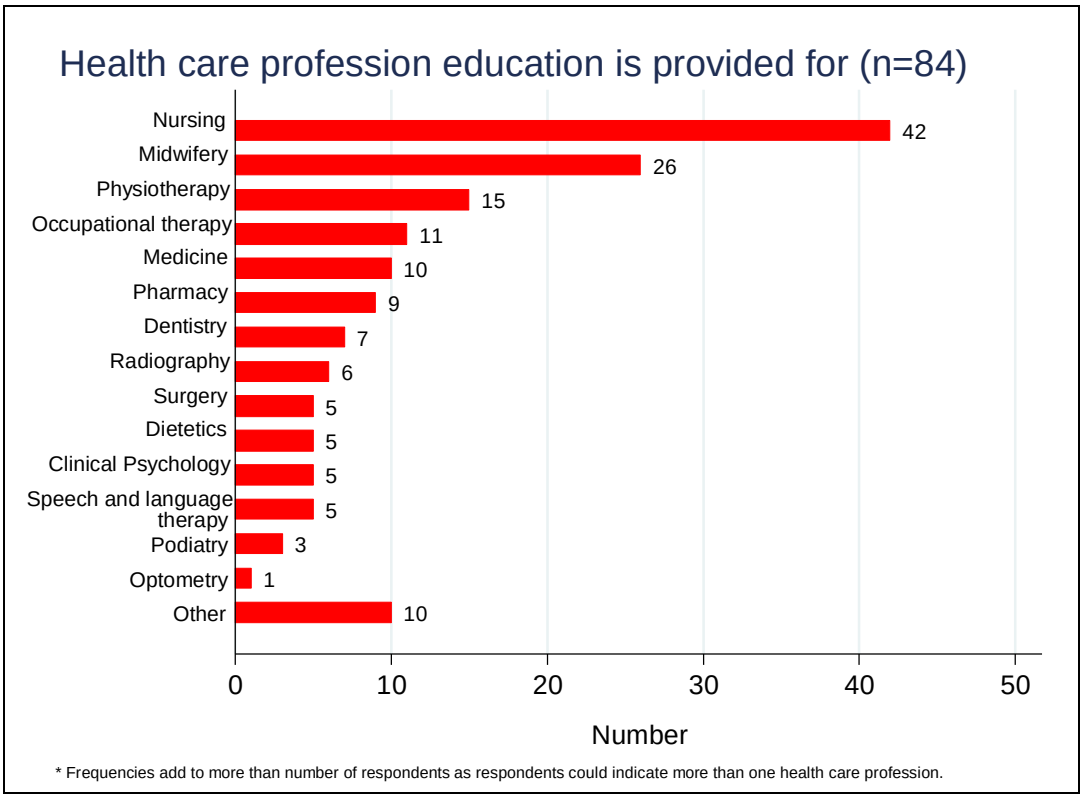


Figure 4. 4 Healthcare profession EBP education provided for

'Other' healthcare professionals referred to in Figure 4.4 for which responding institutions provided education included; Paramedics (n=3), Radiation Therapy (n=1), Social work (n=2), Dental Hygienist (n=1), Healthcare Assistants (n=1), Applied Healthcare students (n=1) and Ophthalmic Dispensing (n=1).

(iii) Academic Level of EBP Programmes

EBP programmes were taught across undergraduate, postgraduate and continuing professional development (CPD) levels.

Table 4. 2 Academic Level of EBP Programmes Taught

	n	(%)
Undergraduate	53	(63.1)
Postgraduate	68	(81.0)
CPD	40	(47.6)
Other	6	(7.1)

'Other' academic levels reported included; diploma, NMBI Category 1 (Level 8) and QQI Level 5.

(iv) Size of Institution (Per Enrolment Numbers)

Student enrolment numbers per annum divided by academic level are reported below. Data on total number of undergraduate students were available for 48 (out of 53) respondents. The median (IQR) total number of students was 140 (70 to 288) with a minimum of 25 and a maximum of 1000 students.

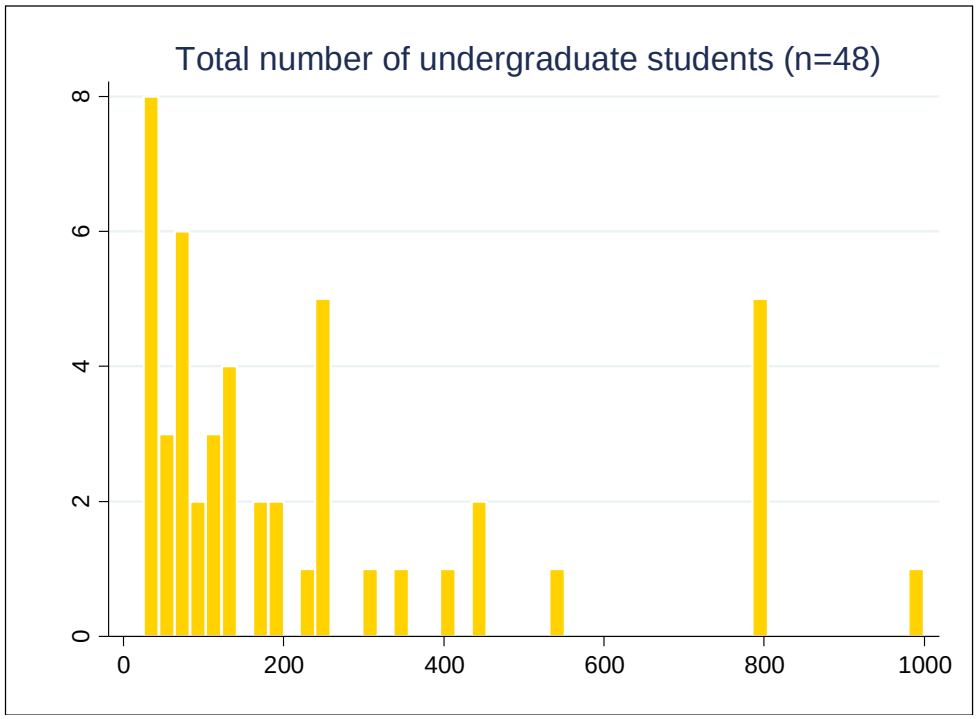


Figure 4. 5 Total number of undergraduate students per responding institution

Data on total number of postgraduate students was available for 57 (out of 68) respondents. The median (IQR) total number of students was 40 (12 to 118) with a minimum of 2 and a maximum of 3000 students.

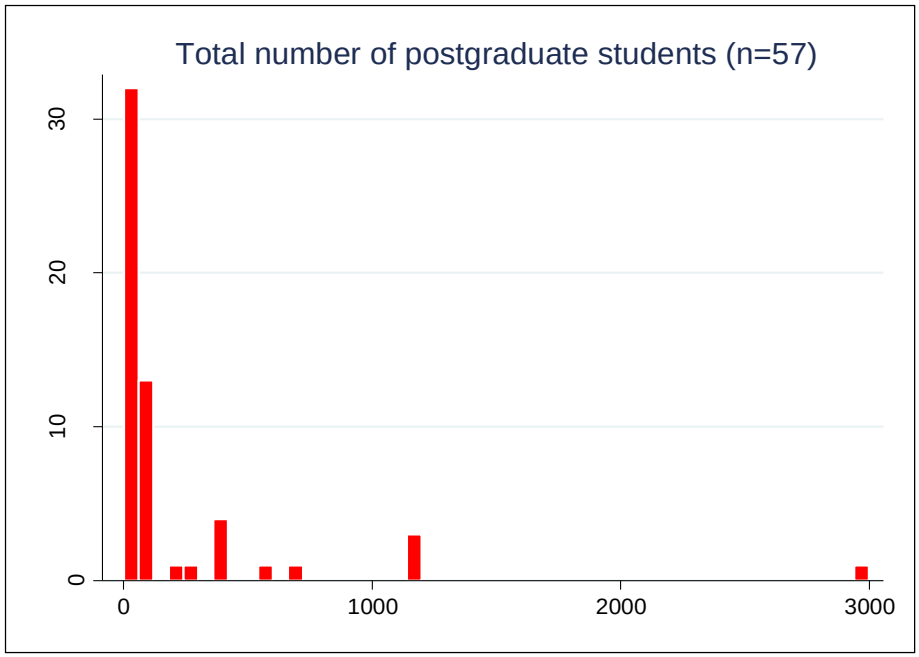


Figure 4. 6 Total number of postgraduate students per responding institution

Data on total number of CPD students was available for 35 (out of 40) respondents. The median (IQR) total number of students was 600 (100 to 1842) with a minimum of 5 and a maximum of 10,000 students.

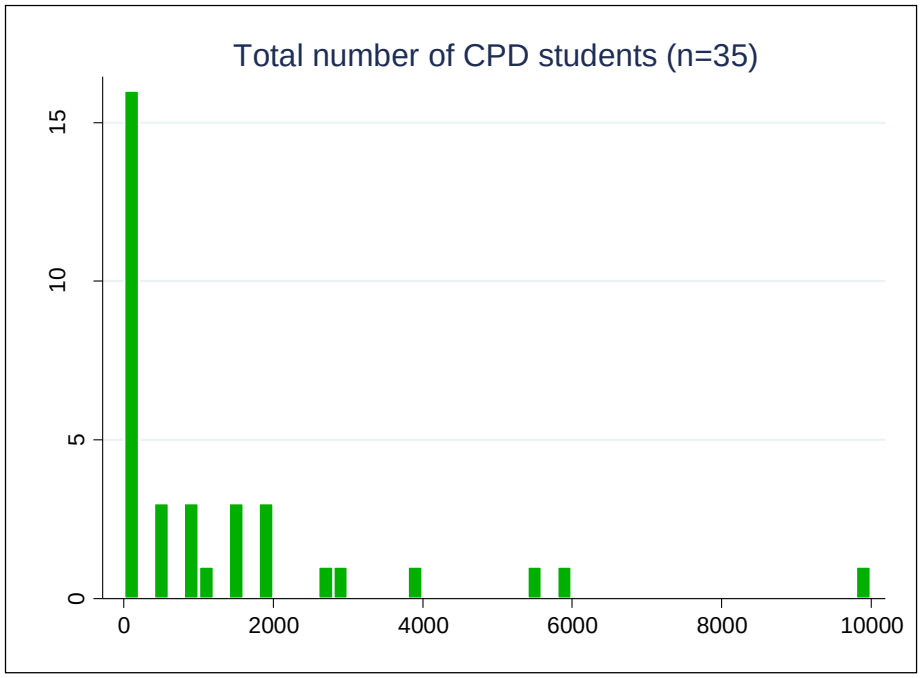


Figure 4. 7 Total number of CPD student per responding institution

(v) Comparisons Between Professions / Academic Level (Undergraduate / Postgraduate /CPD)

To note, results were not split by discipline as information on discipline was only available for 57 out of 84 (68%) respondents. Also, as responses were available for ten (out of 12) disciplines, the reporting of results split by discipline would have been problematic to read and interpret. In addition, the number of responses varied by discipline - nine of the ten disciplines had 6 or fewer responses while nursing had 25 responses.

Teaching EBP

Specific contextual information relating to EBP teaching within participating educational institutions was gathered and included: (i) length of time since the formal introduction of EBP; (ii) staff involved in teaching EBP; (iii) principal teaching approach used throughout curriculum; (iv) EBP teaching methods and percentage of time allocated to such methods, and (v) presence of a named EBP lead / champion.

(i) Introduction of Formal EBP Teaching

Over half of respondents stated that the formal teaching of EBP had been introduced more than 10 years previously with 12 stating that it had been introduced 5 years or less (see Table 4.3).

Table 4. 3 Length of time since formal teaching of EBP was introduced, n=80

	n (%)
Less than 1 year	1 (1.3)
1-2 years	3 (3.8)
3-5 years	8 (10.0)
6-10 years	24 (30.0)
Greater than 10 years	44 (55.0)

(ii) Staff Teaching EBP

For undergraduate and postgraduate programmes, academics (defined as "a teacher or scholar in a university or other institute of higher education" Oxford Dictionary) and librarians were the staff predominantly involved in the formal teaching of EBP (see Figures 4.8 and 4.9).

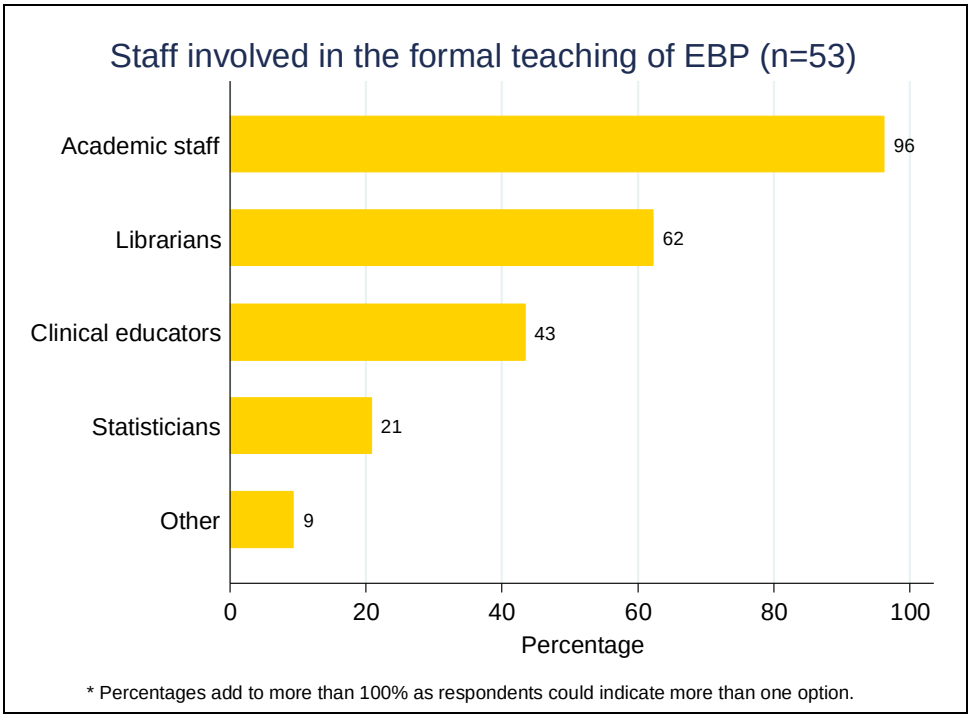


Figure 4. 8 Staff involved in the formal teaching of EBP across responding institutions (U/G)

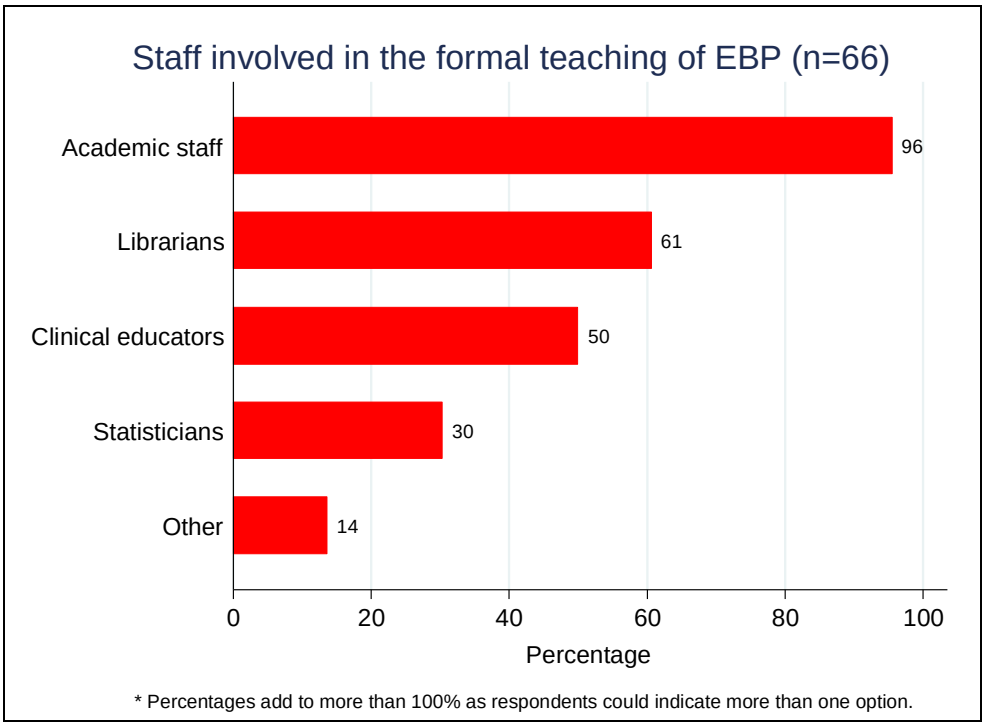


Figure 4. 9 Staff involved in the formal teaching of EBP across responding institutions (P/G)

'Other' staff involved in teaching at these levels included: adjunct lecturers, postgraduate students and postdoctoral researchers/fellows, specialist nurses and topic experts, teacher practitioners, clinicians, external clinical specialists and nurse tutors.

The trend for staff involved in CPD EBP teaching differed slightly in that clinical educators were the second most frequent provider of EBP teaching (see Figure 4.10). 'Other' staff involved in teaching at CPD level included: Advanced Midwife Practitioners (AMP)/Clinical Midwife Specialists (CMS), external experts, faculty from Schools contracted for specific projects, researchers, Registered Nurse Tutors (RNTs), UK dental specialists working on the high street.

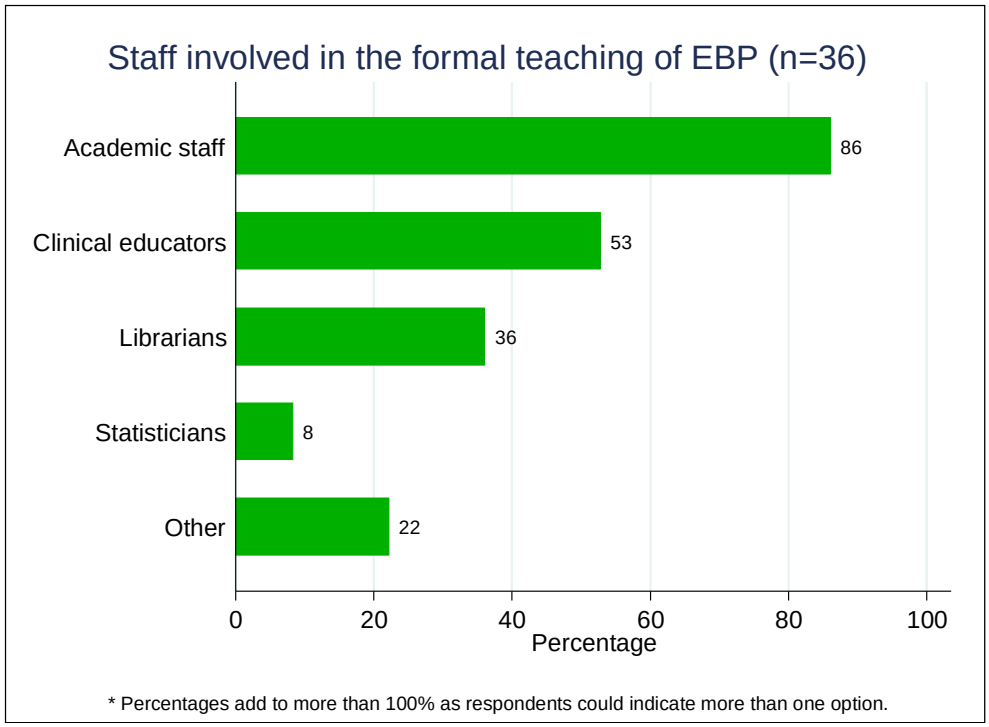


Figure 4. 10 Staff involved in the formal teaching of EBP across responding institutions (CPD)

(iii) Principal Teaching Approach used to Deliver Overall Curriculum

The majority of respondents stated that blended learning (a combination of traditional and problem/inquiry based learning) was the most frequently used approach throughout the curriculum, of which, teaching EBP was a component (see Table 4.4).

Table 4. 4 Principal teaching approach used to deliver overall curriculum n=74

	n (%)
Blended (Traditional & Problem/Inquiry Based Learning)	50 (67.6)
Traditional (basic science then clinical applications)	19 (25.7)
Problem/Inquiry Based Learning	3 (4.1)
Other (please specify)	2 (2.7)

(iv) EBP Teaching Methods and Percentage of Time Allocated to such Methods

Across the professions, stand-alone didactic lectures and tutorial group sessions were the most frequently used methods to teach EBP in undergraduate programmes. The least amount of time was allocated to non-face-to-face methods, practice-based workshops and the application of evidence into clinical settings (see Figure 4.11 below).

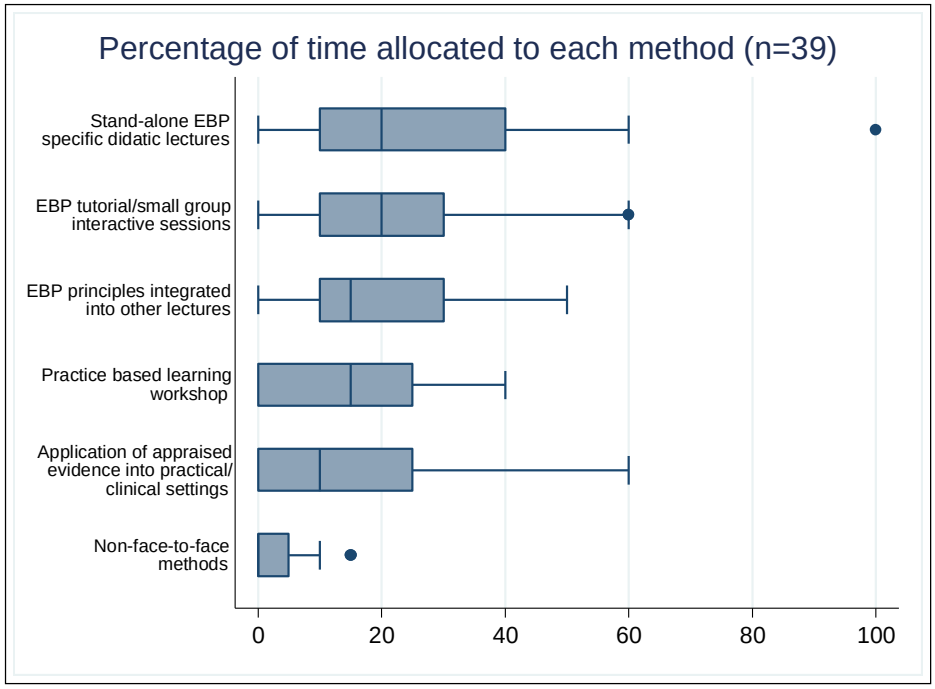


Figure 4. 11 Percentage of time allocated to each method across responding institutions (U/G)

Figure 4.12 shows that for postgraduate programmes, stand-alone didactic lectures and the application of appraised evidence into clinical settings were the most frequently used methods to teach EBP. The least amount of teaching time was allocated to practice-based learning workshops and non-face-to-face methods.

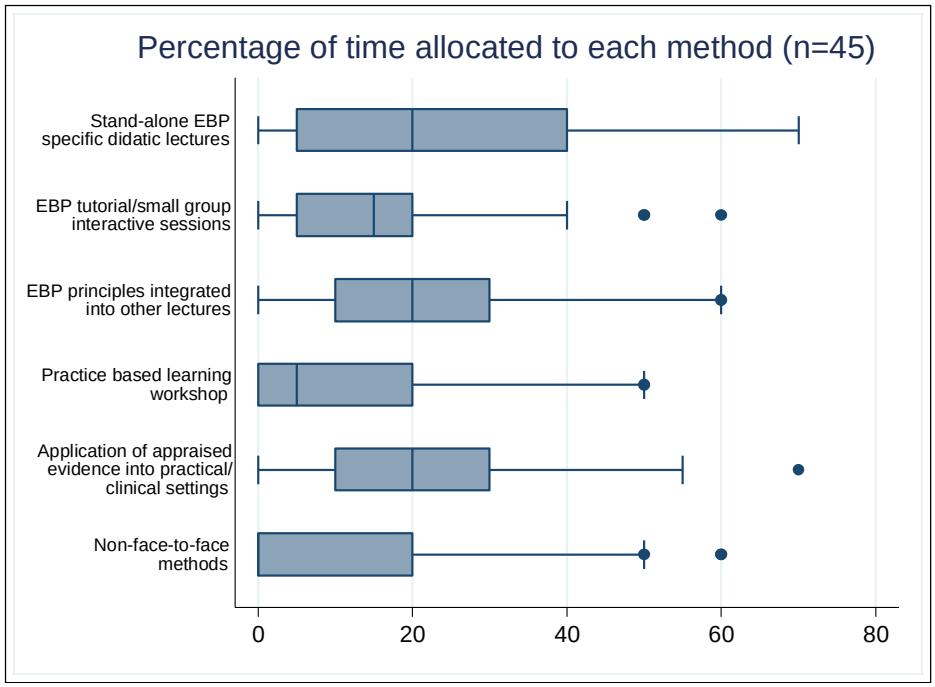


Figure 4. 12 Percentage of time allocated to each method across responding institutions (P/G)

For CPD programmes, the integration of EBP principles into other lectures and stand-alone didactic lectures were the most frequently used teaching methods. Similar to postgraduate findings, the least amount of teaching time was allocated to practice-based learning workshops and non-face-to-face methods (see Figure 4.13).

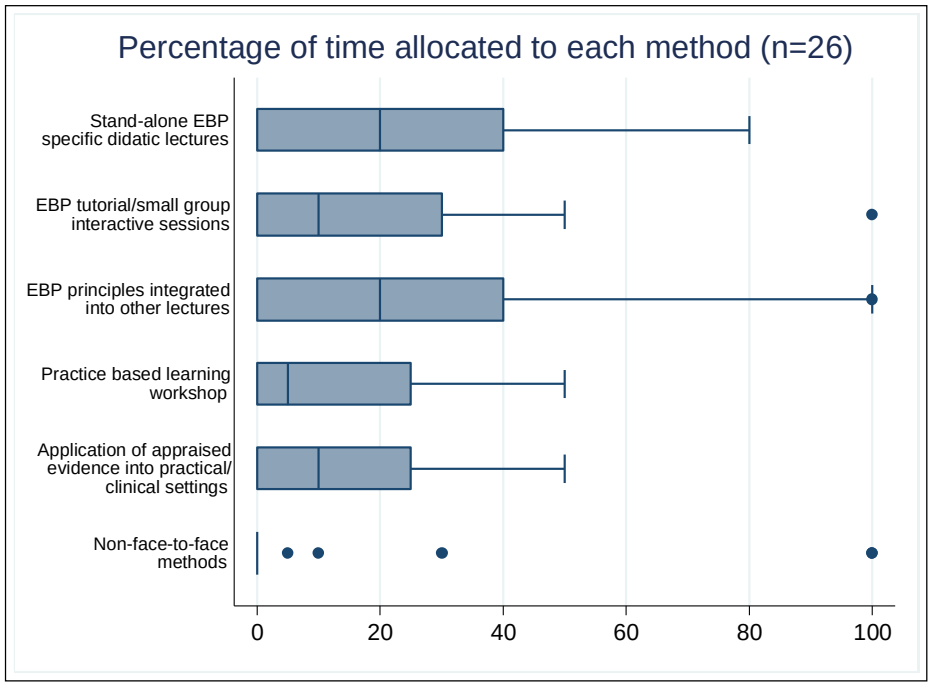


Figure 4. 13 Percentage of time allocated to each method across responding institutions (CPD)

(v) Named EBP Lead /Champion

Sixty-six percent of respondents (n=43) stated there was no named EBP Lead/Champion, with 26% (n=17) identifying a Lead/Champion at their institution. Seven percent (n=5) reported that did not know.

General EBP Curriculum Considerations

On a 5-point Likert scale, where 1= 'Strongly Disagree' and 5 = 'Strongly Agree', respondents were asked to rate their level of agreement/disagreement with a number of statements in relation to EBP curriculum issues. Baseline data in relation to the following areas was collected: (i) presence of an explicit EBP philosophy; (ii) development and review processes associated with academic and clinical curricula; (iii) depth of study related to applied research methods; (iv) overall EBP assessment strategies and (v) evaluation processes associated with health profession programmes.

(i) Explicit EBP Philosophy

Almost half of respondents (48%) 'agreed' or 'strongly agreed' that their School (or equivalent) had an explicit EBP philosophy. Thirty-one percent indicated that they did not know whether there was an EBP philosophy by choosing 'neither agree nor disagree'. The majority of respondents either 'agreed' or 'strongly agreed' that the written curricula for undergraduate (66%) and postgraduate programmes (77%) reflected an EBP philosophy (see Table 4.5).

Table 4. 5 EBP Philosophy

	No. of responses	Strongly Disagree (score=1)		Disagree		Neither Agree or Disagree		Agree		Strongly Agree (score=5)			
		n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	mean	(SD)
The written curriculum for postgraduate programmes reflects EBP philosophy	52	1	(1.9)	0	(0.0)	11	(21.2)	21	(40.4)	19	(36.5)	4.1	(0.9)
The written curriculum for undergraduate programmes reflects EBP philosophy	50	2	(4.0)	3	(6.0)	12	(24.0)	15	(30.0)	18	(36.0)	3.9	(1.1)
School/Dept./Centre/Training Body has an explicit EBP philosophy	58	1	(1.7)	11	(19.0)	18	(31.0)	20	(34.5)	8	(13.8)	3.4	(1.0)

(ii) Development and Review Processes associated with Academic and Clinical Curricula

When asked about developing and reviewing curricula, 81% of respondents 'agreed' or 'strongly agreed' that academic staff had input into which subjects were appropriate for teaching EBP. Only half (50%) of respondents agreed that clinical educators had such input (see Table 4.6).

Table 4. 6 Developing and Reviewing Curricula

	No. of responses	Strongly Disagree (score=1)		Disagree		Neither Agree or Disagree		Agree		Strongly Agree (score=5)			
		n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	mean	(SD)
When developing and reviewing curricula, academic staff decide which subjects are appropriate for teaching the EBP process	57	2	(3.5)	2	(3.5)	7	(12.3)	31	(54.4)	15	(26.3)	4.0	(0.9)
When developing and reviewing curricula, clinical educators decide which subjects are appropriate for teaching the EBP process	58	6	(10.3)	10	(17.2)	13	(22.4)	25	(43.1)	4	(6.9)	3.2	(1.1)

(iii) Depth of Study related to Applied Research Methods

Three quarters of respondents 'agreed' or 'strongly agreed' that academic curricula reflected adequate depth of study of applied research methods which are necessary to support EBP. While 62% of respondents 'agreed' or 'strongly agreed' with this statement in relation to clinical curricula a higher proportion of respondents (24%) were unsure by choosing 'neither agree or disagree' (see Table 4.7).

Table 4. 7 Applied Clinical Research Methods to Support EBP

	No. of responses	Strongly Disagree (score=1)		Disagree		Neither Agree or Disagree		Agree		Strongly Agree (score=5)			
		n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	mean	(SD)
The academic curriculum reflects adequate depth of study of applied clinical research methods to support EBP	57	0	(0.0)	6	(10.5)	8	(14.0)	32	(56.1)	11	(19.3)	3.8	(0.9)
The clinical curriculum reflects adequate depth of study of applied clinical research methods to support EBP	58	0	(0.0)	8	(13.8)	14	(24.1)	29	(50.0)	7	(12.1)	3.6	(0.9)

(iv) Overall EBP Assessment Strategies

When asked about the use of formative and summative assessments to determine EBP learning by academic staff, the majority of respondents 'agreed' or 'strongly agreed' (76%). This proportion was lower (47%) for clinical educator use of such assessments which can be attributed to more respondents' choosing the 'neither agree or disagree' option (see Table 4.8).

Table 4. 8 EBP Assessment Strategy

	No. of responses	Strongly Disagree (score=1)		Disagree		Neither Agree or Disagree		Agree		Strongly Agree (score=5)			
		n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	mean	(SD)
Academic staff use both formative and summative assessments to determine student learning in EBP	58	1	(1.7)	3	(5.2)	10	(17.2)	27	(46.6)	17	(29.3)	4.0	(0.9)
Clinical educators use both formative and summative assessments to determine student learning in EBP	57	2	(3.5)	5	(8.8)	23	(40.4)	17	(29.8)	10	(17.5)	3.5	(1.0)

(v) Evaluation of Health Profession Programmes

Over half of respondents either 'agreed' or 'strongly agreed' that undergraduate (53%) and postgraduate programmes (58%) are evaluated by curriculum committees to ensure that EBP processes are presented to students. However, over a third of respondents chose 'neither agree or disagree' indicating that they did not know the answer to this question (see table 4.9).

Table 4. 9 Curriculum Evaluation of EBP within Programmes

	No. of responses	Strongly Disagree (score=1)		Disagree		Neither Agree or Disagree		Agree		Strongly Agree (score=5)			
		n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	mean	(SD)
Postgraduate syllabi are evaluated by curriculum committees to determine that EBP processes are being presented to students	55	3	(5.5)	1	(1.8)	19	(34.5)	21	(38.2)	11	(20.0)	3.7	(1.0)
Undergraduate syllabi are evaluated by curriculum committees to determine that EBP processes are being presented to students	49	2	(4.1)	1	(2.0)	20	(40.8)	16	(32.7)	10	(20.4)	3.6	(1.0)

(vi) Professional Competencies and EBP

One question enquired as to whether EBP principles are embedded within curricula to achieve core professional competencies. Of 57 valid responses, 51 (90%) either 'agreed' or 'strongly agreed' with this statement.

To gain an overall impression of the data in relation to general EBP curriculum considerations, Table 4.10 presents the response categorizations and associated means in descending order. Of note, embedding EBP principles within curricula for the achievement of core professional competencies was assigned the highest mean value while items relating to clinical curricula and clinical educators recorded the lowest mean scores.

Table 4. 10 General EBP Curriculum Considerations

	No. of responses	Strongly Disagree (score=1)	Disagree	Neither Agree or Disagree	Agree	Strongly Agree (score=5)	
		n (%)	n (%)	n (%)	n (%)	n (%)	mean (SD)
EBP principles are embedded within the curriculum for achieving core professional competencies	57	0 (0.0)	1 (1.8)	5 (8.8)	29 (50.9)	22 (38.6)	4.3 (0.7)
The written curriculum for postgraduate programmes reflects EBP philosophy	52	1 (1.9)	0 (0.0)	11 (21.2)	21 (40.4)	19 (36.5)	4.1 (0.9)
Academic staff use both formative and summative assessments to determine student learning in EBP	58	1 (1.7)	3 (5.2)	10 (17.2)	27 (46.6)	17 (29.3)	4.0 (0.9)
When developing and reviewing curricula, academic staff decide which subjects are appropriate for teaching the EBP process	57	2 (3.5)	2 (3.5)	7 (12.3)	31 (54.4)	15 (26.3)	4.0 (0.9)
The written curriculum for undergraduate programmes reflects EBP philosophy	50	2 (4.0)	3 (6.0)	12 (24.0)	15 (30.0)	18 (36.0)	3.9 (1.1)
The academic curriculum reflects adequate depth of study of applied clinical research methods to support EBP	57	0 (0.0)	6 (10.5)	8 (14.0)	32 (56.1)	11 (19.3)	3.8 (0.9)
Postgraduate syllabi are evaluated by curriculum committees to determine that EBP processes are being presented to students	55	3 (5.5)	1 (1.8)	19 (34.5)	21 (38.2)	11 (20.0)	3.7 (1.0)
Undergraduate syllabi are evaluated by curriculum committees to determine that EBP processes are being presented to students	49	2 (4.1)	1 (2.0)	20 (40.8)	16 (32.7)	10 (20.4)	3.6 (1.0)
The clinical curriculum reflects adequate depth of study of applied clinical research methods to support EBP	58	0 (0.0)	8 (13.8)	14 (24.1)	29 (50.0)	7 (12.1)	3.6 (0.9)
Clinical educators use both formative and summative assessments to determine student learning in EBP	57	2 (3.5)	5 (8.8)	23 (40.4)	17 (29.8)	10 (17.5)	3.5 (1.0)
The School/Department/Centre/Training Body has an explicit EBP philosophy	58	1 (1.7)	11 (19.0)	18 (31.0)	20 (34.5)	8 (13.8)	3.4 (1.0)
When developing and reviewing curricula, clinical educators decide which subjects are appropriate for teaching the EBP process	58	6 (10.3)	10 (17.2)	13 (22.4)	25 (43.1)	4 (6.9)	3.2 (1.1)

EBP Curriculum Content and Assessment

On a 5–point Likert scale, where 1= 'Strongly Disagree' and 5 = 'Strongly Agree' respondents were asked to rate their levels of agreement or disagreement with a number of statements in relation to EBP curriculum content and assessment. The following specific information was collected: (i) EBP learning activities according to the Sicily Statement; (ii) methods used to assess EBP learning; (iii) evidence of educational activities in specific areas of clinical effectiveness and; (iv) clinical audit.

(i) EBP Learning Activities According to Sicily Statement

Table 4.11 lists EBP learning activities. Activities in relation to searching and retrieving of evidence, accessing electronic resources for finding appropriate evidence and critically appraising evidence had the highest mean scores denoting agreement with the questions posed. The lowest mean score was assigned to the following statement: "Students participate in evaluating the effectiveness of the EBP process", with 23% of respondents choosing 'neither agree or disagree'.

Table 4. 11. EBP Learning Activities

	No. of responses	Strongly Disagree (score=1)		Disagree		Neither Agree or Disagree		Agree		Strongly Agree (score=5)			
		n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	mean	(SD)
Students have access to electronic tools (e.g. electronic databases, Cochrane library, etc.) necessary for efficiently finding appropriate evidence	58	0	(0.0)	1	(1.7)	4	(6.9)	12	(20.7)	41	(70.7)	4.6	(0.7)
Students participate in searching and retrieving evidence that can answer clinical question(s)	59	0	(0.0)	2	(3.4)	3	(5.1)	20	(33.9)	34	(57.6)	4.5	(0.8)
Students participate in critically appraising a body of evidence to address clinical question(s)	58	0	(0.0)	2	(3.4)	3	(5.2)	20	(34.5)	33	(56.9)	4.4	(0.8)
Your programme/course sets out specific readings which focus on integrating clinical research into clinical practice	58	0	(0.0)	2	(3.4)	5	(8.6)	22	(37.9)	29	(50.0)	4.3	(0.8)
Students complete a task involving the application of evidence using case scenarios	59	0	(0.0)	1	(1.7)	5	(8.5)	27	(45.8)	26	(44.1)	4.3	(0.7)
Students participate in formulating searchable, answerable clinical question(s)	59	0	(0.0)	4	(6.8)	6	(10.2)	20	(33.9)	29	(49.2)	4.3	(0.9)
Case studies are used to teach students to analyse research and apply findings to clinical questions	59	0	(0.0)	0	(0.0)	6	(10.2)	32	(54.2)	21	(35.6)	4.3	(0.6)
Students complete a task involving application of evidence into practice (i.e. within a healthcare setting).	59	0	(0.0)	3	(5.1)	7	(11.9)	26	(44.1)	23	(39.0)	4.2	(0.8)
Students consider patient preference when implementing EBP	59	0	(0.0)	2	(3.4)	12	(20.3)	23	(39.0)	22	(37.3)	4.1	(0.8)
Students participate in evaluating the effectiveness of the EBP process	57	0	(0.0)	8	(14.0)	13	(22.8)	24	(42.1)	12	(21.1)	3.7	(1.0)

(ii) Methods Used to Assess EBP Learning

The majority of respondents 'agreed' or 'strongly agreed' that students were assessed both in terms of EBP knowledge (66%) and skills (66%). A certain proportion of respondents were unsure about assessment practices as indicated by choosing the 'neither agree or disagree' option (see Table 4.12)

Table 4. 12 Assessment of EBP Learning

	No. of responses	Strongly Disagree (score=1)		Disagree		Neither Agree or Disagree		Agree		Strongly Agree (score=5)			
		n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	mean	(SD)
Students are assessed regarding their EBP knowledge (e.g. understands steps of EBP, knowledge of different appraisal tools etc.)	59	0	(.0)	7	(11.9)	13	(22.0)	18	(30.5)	21	(35.6)	3.90	(1.0)
Students are assessed regarding their EBP skills (e.g. formulating a PICO question, searching databases, applying appraisal tools to literature etc.)	59	1	(1.7)	8	(13.6)	11	(18.6)	8	(13.6)	31	(52.5)	4.02	(1.2)

As shown in Figure 4.14, the most common assessment method of EBP knowledge and skills is the written examination followed by Critically Appraised Topics (CATs) and Observed Structured Clinical Examinations (OSCEs). Application of CATs in a clinical setting and global written assessments by educators were the methods least used, with 10% of respondents noting that student EBP learning was not evaluated. 'Other' methods of assessment included: final year projects consisting of a systematic review on a question formulated by the student in collaboration with supervisor, identification of client priorities through EBP assessment tools/self-report measures, presentations/posters, reflection on activity, research audit-type projects, and EBP specific evaluation forms.

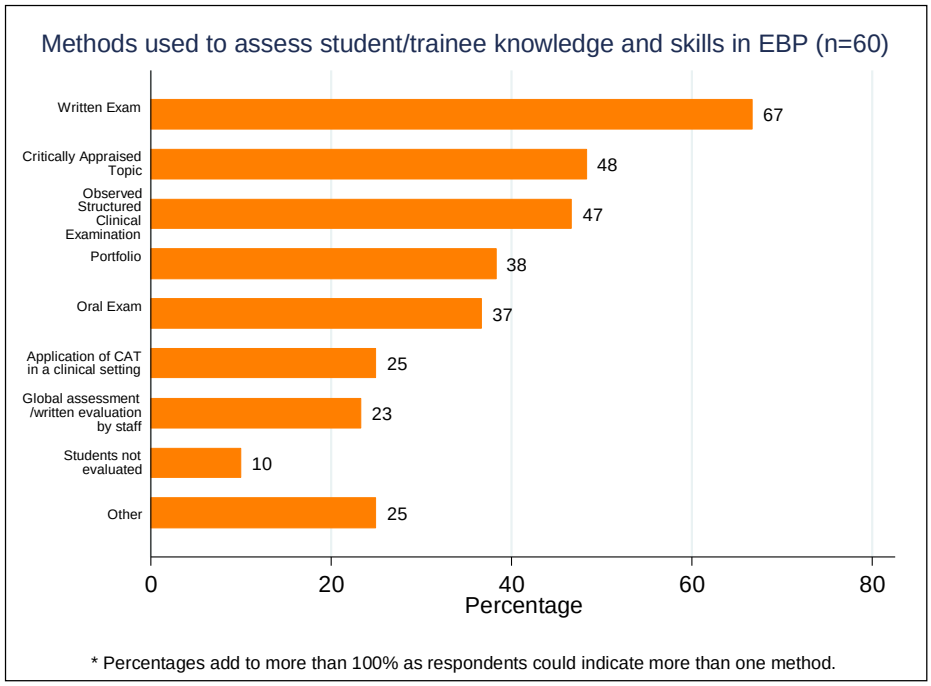


Figure 4. 14 Methods used to assess student/trainee knowledge and skills in EBP

(iii) Educational Activities in Clinical Effectiveness.

When asked about student participation in educational activities specific to clinical effectiveness and patient safety respondents provided the following information as presented in Figure 4.15. 'Other' activities noted were 'service evaluation and development plans'.

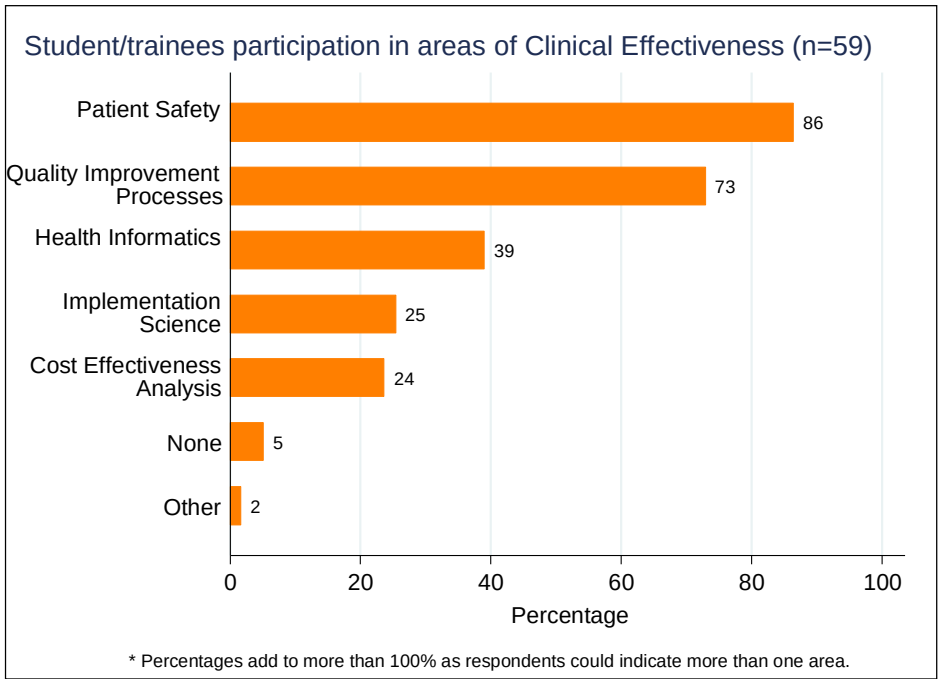


Figure 4. 15 Student/trainees participation in areas of Clinical Effectiveness

Teaching Clinical Audit

The following information specific to the teaching of clinical audit was collected: (a) the extent of clinical audit education provision: (b) the academic level at which clinical audit is taught; (c) principal methods used to teach clinical audit; and (d) the extent to which content related to clinical audit and assessment activities were evident within healthcare professional programmes.

(a) Clinical Audit Education Provision

In answer to the question "Does your School/Dept./Centre/Training Body provide education on clinical audit specifically?", 75% (n=73) stated that education on clinical audit was provided, 18% (n=13) responded that education in this area was not delivered and 7% (n=5) were unsure.

(b) Academic Level at which Clinical Audit is Taught

Clinical audit was taught across undergraduate, postgraduate and continuing professional development (CPD) levels (see Table 4.13)

Table 4. 13 Academic level at which Clinical Audit is taught, n=54

	n (%)
Undergraduate	30 (55.6)
Postgraduate	39 (72.2)
CPD	21 (38.9)
Other	1 (1.9)

'Other' academic levels reported included an NMBI Category 1 (Level 8) programme.

(c) Principal Methods used to Teach Clinical Audit

Across the professions, the top three methods used to teach clinical audit were: (1) audit integrated into other lecture: (2) audit tutorials/small groups; and (3) application of audit methods into practice settings. The least used methods included practice based learning audit workshops and non-face-to-face methods. (see Figure 4.16 below). 'Other' methods cited included clinical audit as being a component of undergraduate and postgraduate dissertations.

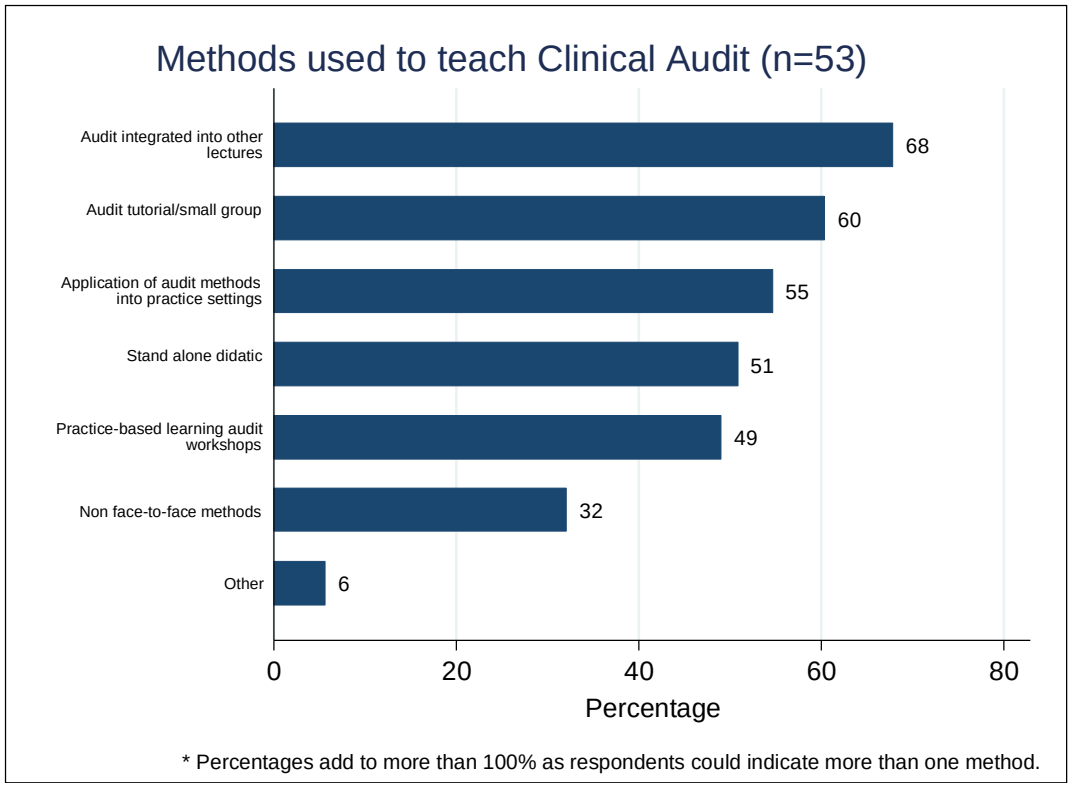


Figure 4. 16 Methods used to teach Clinical Audit

(d) Content and Assessment related to Clinical Audit

On a 5-point Likert scale with 5= 'Strongly Agree' and 1= 'Strongly Disagree', the majority (59%, n=34) either 'agreed' or 'strongly agreed' with the statement "*Your programme/course sets out activities that focus on the Clinical Audit Process*". Fifteen percent (n=9) disagreed with the statement while 26% (n=15) indicated that they did not know by choosing option 3 'neither agree or disagree'.

In relation to the extent of clinical audit assessment activities, almost half (47%, n=28) of respondents 'agreed' or 'strongly agreed' with the statement "Students are assessed regarding their knowledge of clinical audit". Twenty-five percent (n=15), 'disagreed' or 'strongly disagreed' with the statement, with 27% (n=16) indicating that they did not know by choosing 'neither agree or disagree' (see Table 4.14).

Table 4. 14 Clinical Audit Content and Assessment

	No. of responses	Strongly Disagree (score=1)		Disagree		Neither Agree or Disagree		Agree		Strongly Agree (score=5)			
		n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	mean	(SD)
Your program/ course sets out activities that focus on the Clinical Audit Process	58	0	(0.0)	9	(15.5)	15	(25.9)	23	(39.7)	11	(19.0)	3.6	(1.0)
Students are assessed regarding their knowledge of Clinical Audit	59	4	(6.8)	11	(18.6)	16	(27.1)	14	(23.7)	14	(23.7)	3.4	(1.2)

Staff Attitudes Towards EBP

Attitudes towards EBP were investigated from the perspective of those staff teaching EBP at their respective institutions. Figure 4.17 shows that respondents overall had very positive attitudes towards EBP with only two items – *'There is definite divide between research and practice'* and *'EBP does not take into account patient/client preferences'* assigned mean scores lower than 4 on a 5-point scale.

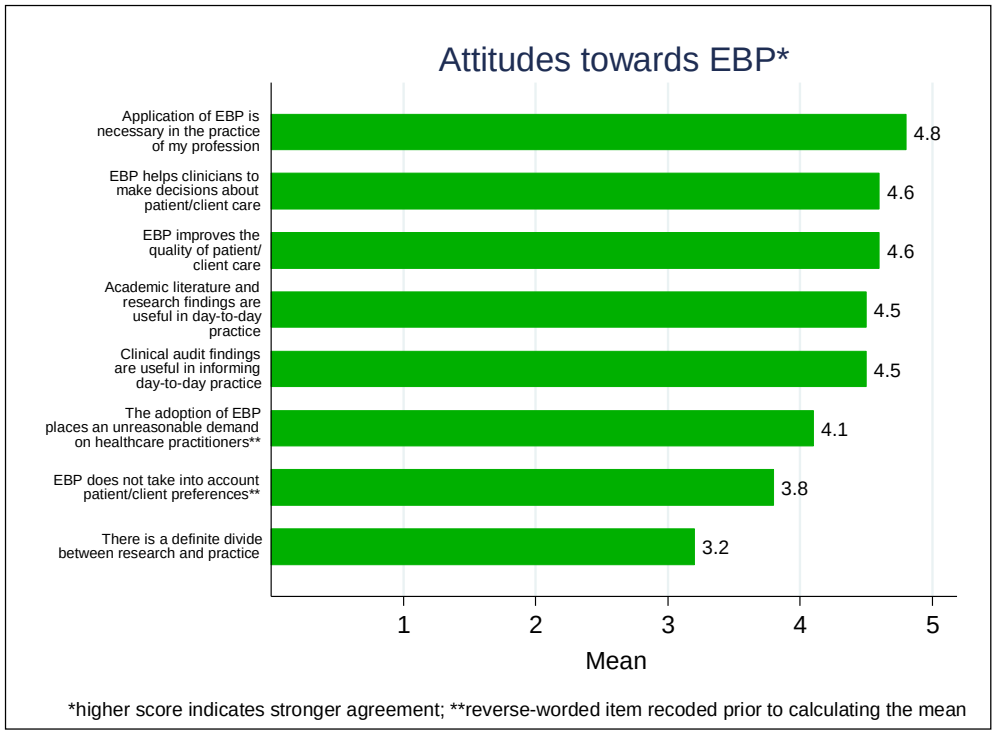


Figure 4. 17 Mean scores for items describing attitudes towards EBP.

EBP Training and Resources

Respondents were asked to consider training and access to resources from the perspective of staff involved in EBP teaching. When asked whether staff received formal educational training in *teaching* EBP, 56% (n=33) answered 'yes'. The percentage of staff within an institution that had received educational training was also examined. Twenty-two respondents answered this question. The median (IQR) percentage of staff that received formal educational training in teaching EBP was 25 (20 to 85) with a range from 0% to 100% (see Figure 4.18).

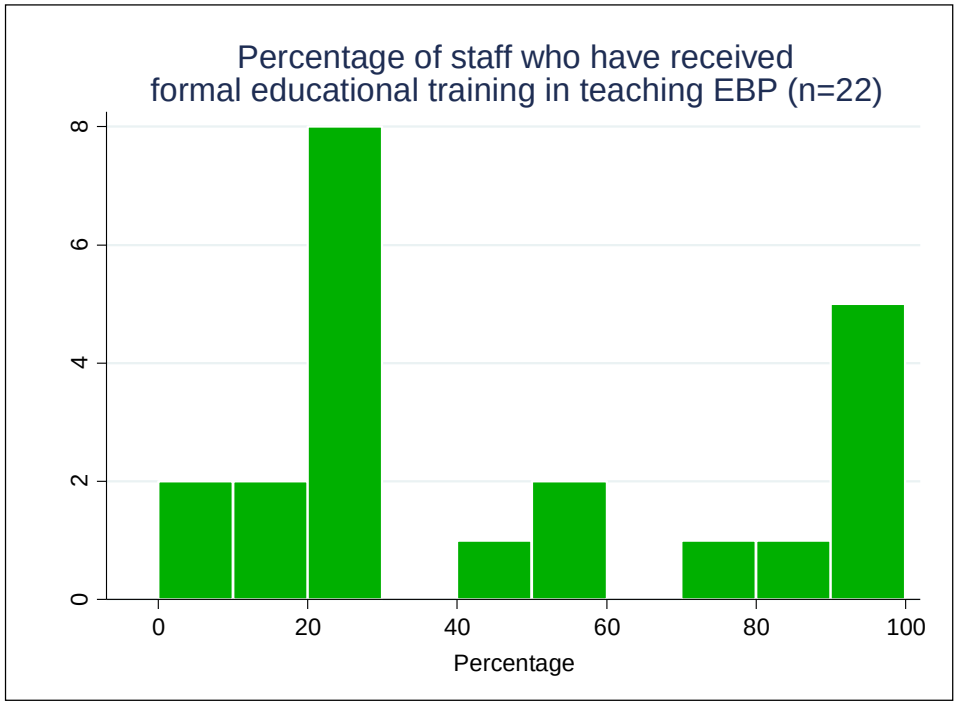


Figure 4. 18 Percentage of staff who have received formal educational training in teaching EBP.

Table 4.15 presents the response to the type of formal training staff participated in, with the majority attending EBP teaching workshops (e.g. Centre of Evidence Based Medicine (Oxford) EBP teaching workshop).

Table 4. 15 Type of formal training in EBP teaching (n=29)

	n (%)
Attendance at EBP teaching workshops	21 (72.4)
In-service education/training sessions	20 (69.0)
Online education/training sessions	8 (27.6)
Other	3 (10.3)

Additional information on *informal* training activities that have assisted EBP teaching which staff have availed of was also gathered through an open-ended question. The responses were collated and are presented in Table 4.16 below.

Table 4. 16 Informal Training/Activities for EBP Teaching

1. Being once a student of a healthcare professional programme and receiving training in undertaking EBP helps to teach EBP to current students.
2. Completing third level teaching courses. While not specifically focused on teaching EBP incorporating educational principles helps teaching practice in this area.
3. Completion of systematic review courses / Cochrane training.
4. Research methods courses and professional research experience (grants / publications).
5. Opportunity to work with librarians.
6. Experience of teaching. Commitment to ensuring best evidence informs teaching and provision of clinical care.
7. Learning from self-development and personal research learning through mentoring and supervision from experienced lecturers and academics
8. EBP is part of the ethos of the centre and staff have an obligation to stay up to date.
9. Peer discussion with other academic staff.
10. Self-directed learning in relation to accessing information, appraisal (CASP / CAT) and conference attendance
11. Teaching students how to use the best evidence is common sense and doesn't necessarily need specialized training. Students should be taught how to implement the best evidence throughout courses.
12. Training in professional issues is outsourced to ensure that the appropriate subject matter expertise is in place.

In terms of accessing and using resources for EBP teaching, Table 4.17 demonstrates that the majority of respondents had access to electronic sources necessary for finding appropriate evidence and to undertake

training in this area. The majority of respondents also reported that they had used EBP resources such as Cochrane library, Centre for Reviews and Dissemination and professional journals for EBP teaching.

Table 4. 17 Access to resources and training for staff

	Yes	No	Don't know
	n (%)	n (%)	n (%)
Staff has access to electronic resources necessary for finding appropriate evidence	54 (96.4)	2 (3.6)	0 (0.0)
Staff access EBP resources for teaching	52 (92.9)	1 (1.8)	3 (5.4)
Staff have attended training in the use of electronic resources necessary for finding appropriate evidence (n=55)	50 (90.9)	5 (9.1)	0 (0.0)

*unless otherwise stated

In addition to considering staff access to EBP resources, staff expectations in terms of students accessing resources was also examined. Figure 4.19 shows that all respondents have an expectation that students access databases and professional journals as EBP resources.

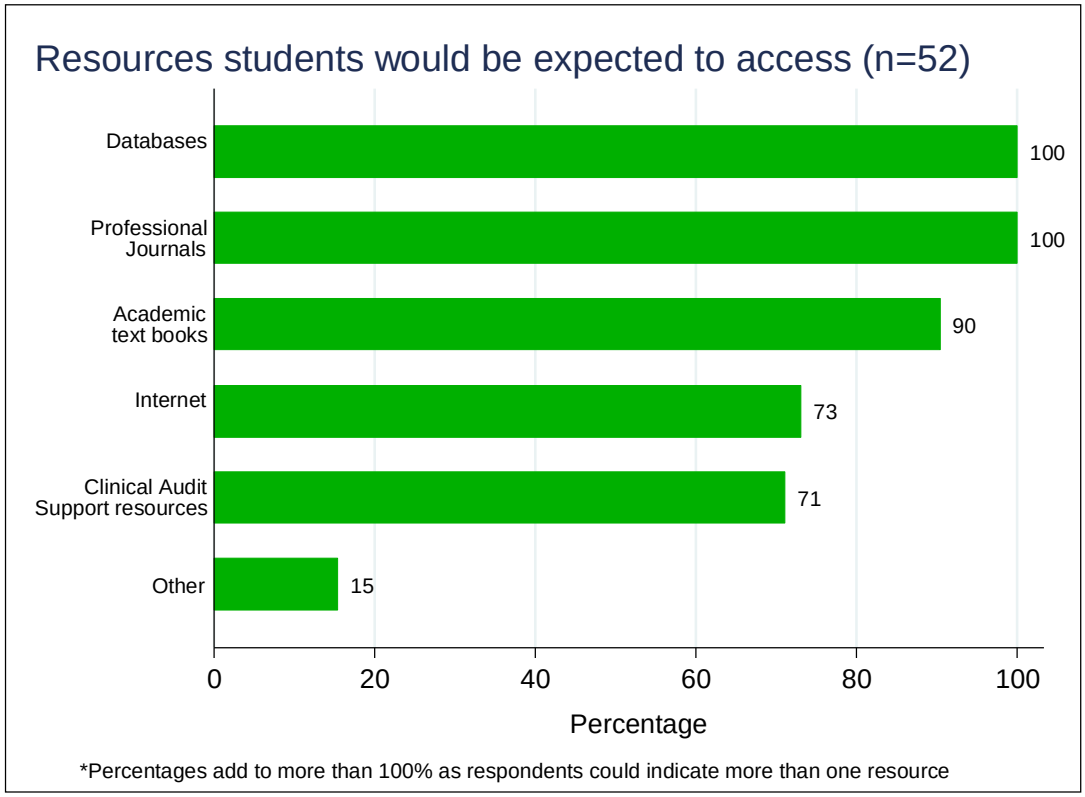


Figure 4. 19 Resources students expected to access.

'Other' resources which students were expected to access included; Clinical EBP guidelines (e.g. NICE/SIGN/ NCEC guidelines), CEBM website, reporting guides for research e.g. PRISMA, CONSORT, STROBE; Critical

appraisal tools, discipline specific best practice guidelines for different client groups, professional position statements, Uptodate.com.

Barriers to EBP Teaching

On a 5-point Likert scale, where 1= 'Not Significant' and 5 = 'Extremely Significant' respondents were asked to rate the significance of a number of statements in relation to EBP teaching. The top three rated barriers included: (1) difficulty integrating evidence into practice; (2) lack of time for EBP in curriculum; and (3) student perceived importance of EBP education provision. Over three quarters of respondents indicated that poor access to computers/technology or a lack of library staff knowledgeable in EBP processes/resources were not barriers that were encountered (see Figures 4.20 and 4.21).

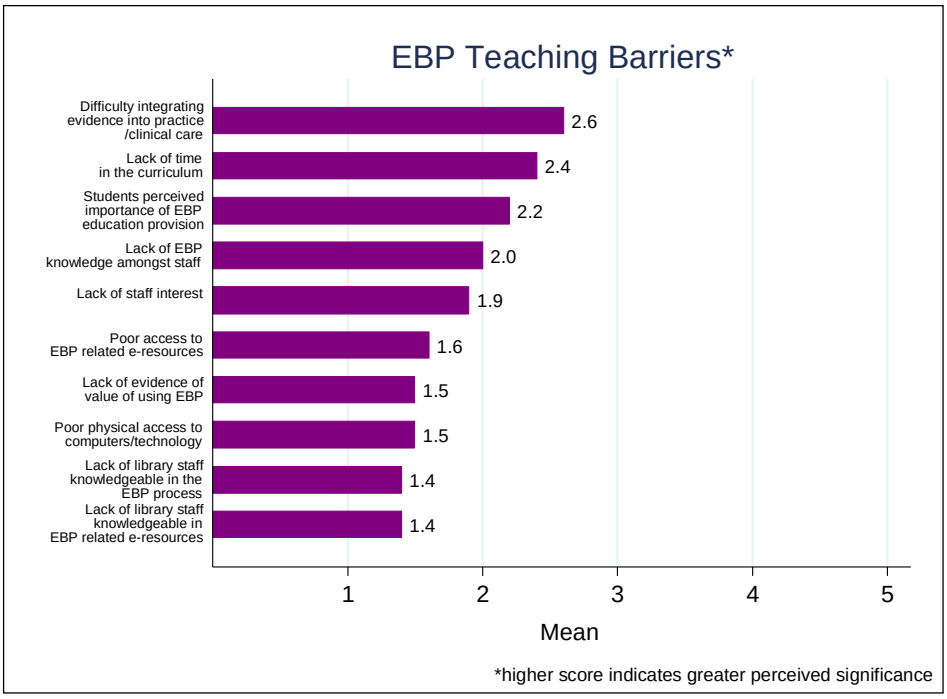


Figure 4. 20 Mean scores for items describing EBP teaching barriers

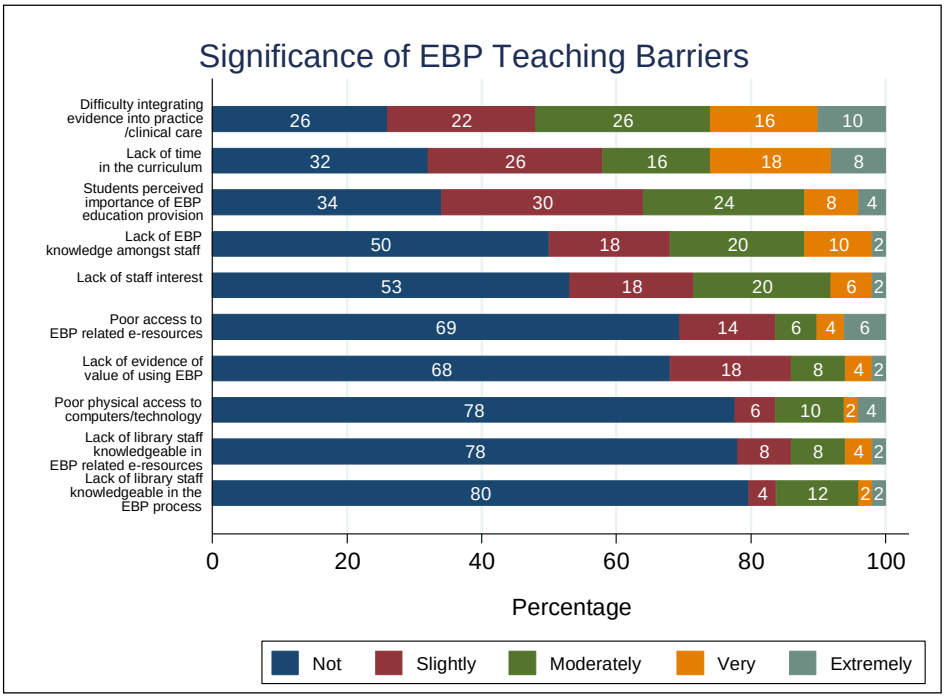


Figure 4. 21 Responses to items measuring significance to EBP teaching barriers

Information on any additional barriers was also requested. As presented in Table 4.18 below such barriers ranged from negative attitudes of other staff towards EBP / EBP teaching to the perceived lack of ownership of EBP / EBP teaching within clinical practice.

Table 4. 18 Barriers to EBP Teaching

1. Attitudes of other clinical colleagues can be negative.
2. Even though it is deemed a priority area by our key stakeholders (Regulator, DoH, HSE), there are too many competing priorities for limited resources to help its implementation.
3. Sometimes a contradiction between what is learned in the classroom and what is observed in practice, e.g. administering intramuscular injections into the ventro-gluteal muscle is currently best evidence, however, students consistently observe dorso-gluteal injections being administered.
4. Staff/ Students perceive that building/implementing evidence is very challenging in the absence of national / professional role models with teams who have a track record in securing funding and advancing EBP.
5. Students often do not see the relevance of EBP to clinical practice. There is a lack of ownership of EBP in clinical practice and a widening chasm between research/academia and clinical practice. There is likewise a frustration from clinicians when practice is unable to be influenced by EBP despite robust empirical evidence to support such change.
6. Age. Resistance to change amongst practitioners who have been practicing for longer.
7. Accessing training funding for EBP specific workshops / courses
8. Limited amount of experiential placements within undergraduate programmes. The lack of experiential components to professional training, and the competing competencies to be achieved in that training limits the amount of teaching, learning and assessment that can exclusively and explicitly be allocated to EBP, although it is implicitly integrated in multiple areas.

Strategies to Enhance EBP Teaching

On a 5 point Likert scale where '1=Not Helpful' and '5=Extremely Helpful', respondents were asked to rate the extent to which a number of strategies may be helpful in teaching EBP. Figures 4.22 and 4.23 describe the level of agreement with the listed strategies and the extent of perceived 'helpfulness' for each strategy. While all listed strategies were deemed helpful, over 75% rated the following as either 'very or extremely helpful': (1) 'evidence of improved patient outcomes from use of EBP; (2) 'staff access to courses to enhance their knowledge of EBP; and (3) 'staff access to courses to enhance their knowledge of teaching EBP.

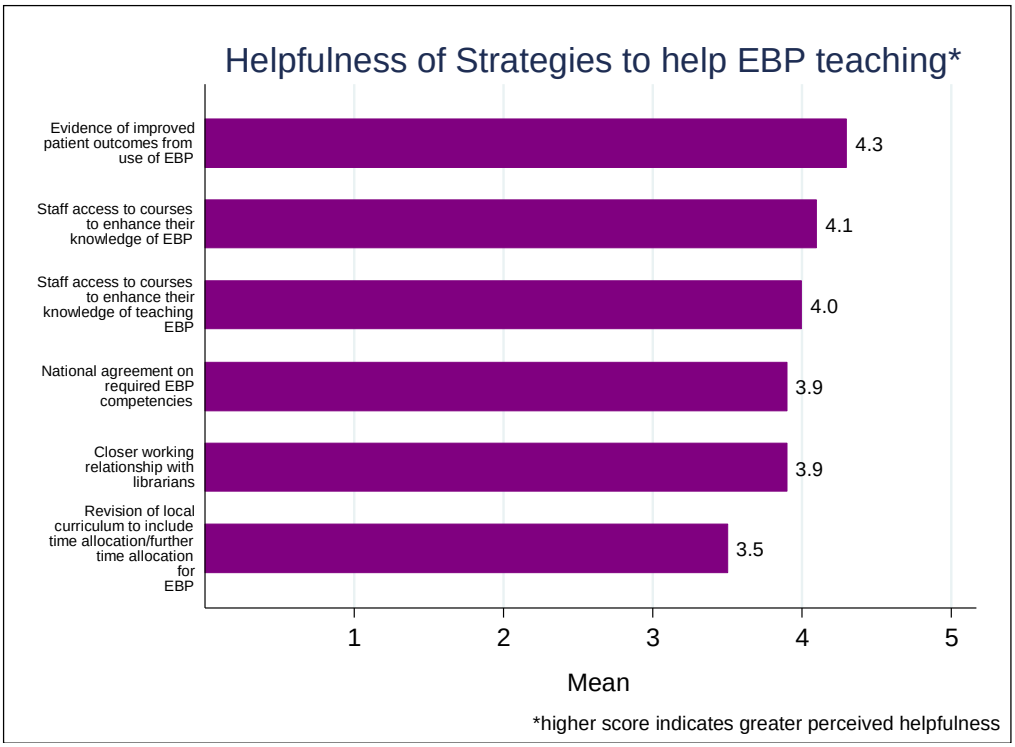


Figure 4. 22 Mean scores for items describing helpful strategies for EBP teaching

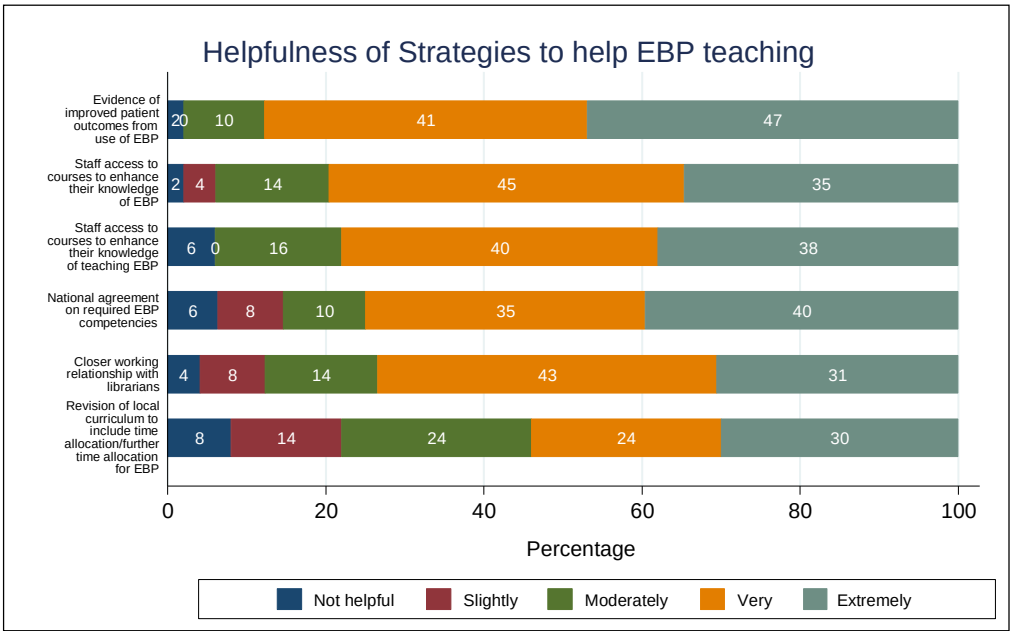


Figure 4. 23 Response to items measuring helpfulness of strategies for EBP teaching

Additional suggestions on other strategies or resources which may be helpful for EBP teaching were also gathered through an open-ended question. As presented in Table 4.19, these suggestions ranged from multidisciplinary teaching with shared learning and common resources across the professions to developing more effective relationships between staff at third level institutes and health service providers.

Table 4. 19 Other resources that may help in improving current EBP teaching.

1. A whole College (not dept./school specific) approach to EBP teaching with shared learning and resources
2. Access to clinical skills departments for virtual learning (simulated clinical scenarios)
3. CPD opportunities for staff on EBP teaching
4. Developing a central, common training resource which can be accessed by multiple professions. On-line learning resources would help increase access.
5. Disciplinary involvement at a national level in developing good practice guidelines - this would help provide a framework for teaching EBP more easily, and would support an integrated approach to EBP for clients or service users.
6. Establish on a National Basis the link between EBP and improved Patient outcomes.
7. Greater linking in relation to practice development that is between practice development officers in health care facilities and lecturers in third level partnership groups.
8. Helping staff to demystify EBP for novice and late learners. How to adapt methods and use meaningful assessments matched to module learning outcomes and teaching and learning strategies for EBP.
9. Integration of EBP within existing curriculum.
10. Greater access to bio statistical and health economics expertise across faculties.
11. Specific training in more focused clinical effectiveness topics e.g. Implementation Science
12. The development of more innovative and inclusive methods of implementing EBP e.g. experienced based co-design to facilitate service user involvement e.g. https://www.kingsfund.org.uk/sites/files/kf/media/experience-based-co-design-toolkit-further-reading.pdf

Innovation in EBP teaching

Respondents were asked to share details of innovative ways in which EBP was being taught within their institution. Integration of EBP throughout all aspects of a professional curriculum, the use of technology and virtual learning environments, educators who can "Walk the Walk" in imparting 'practical' evidence-based clinical knowledge and providing students with opportunities to experience the value of EBP in 'the real world' were some of the innovations presented (see Table 4.20).

Table 4. 20 Innovation in EBP Teaching

1. An integrated approach to teaching the application of EBP in every aspect of SLT professional practice.
2. Clarity Informatics the clinical summary authors of the NICE Guidelines write an evidence based article in the INMO World of Nursing Journal with an MCQ. These articles are collated and in addition to the monthly articles published we have them collected into a publication call the Clarity Informatics Article Collection
3. Delivering national educational workshops to practitioners on EBP and working as a research hub for local service settings, so that we support EBP in real-world situations, and hopefully build local EBP confidence and practices.
4. Introduction of the FRESNO exam into curriculum for undergraduates, with pre- and post-evaluation.
5. One example of innovation in the teaching of EBP is in a module Evidence-Based Practice for Midwives for students undertaking the Higher Diploma in Midwifery. I worked with the Health Service Provider Practice Development Coordinator to identify local clinical policies that required updating. Students undertaking this module used these existing policies as the basis for their EBP learning. They critiqued the existing policy, its development, search strategy and assessment criteria. They developed a PICO statement; conducted a search of relevant databases; reviewed the current evidence and made recommendations for updating the policy. With the student's permission, their work can be utilized by the services to inform the development of updated policies on these topics.
6. Offering opportunities to help students to see the value of EBP e.g. summer research or being involved in conducting evidence reviews.
7. Formation of a research group consisting of project officer and representatives from practice development, advanced practice and librarians. We organize research symposiums, assist with publications, promote EBP in newsletters. Integrate quality improvement projects into CPD programmes which are then presented to management.
8. Students on a Masters programme are charged with developing an app that relates to evidence-based practice and enhanced patient outcomes.
9. Undergraduate: Module on Evidence Based Practice in 3rd year. 12 hours lectures and 24 hours journal club facilitated by member of academic staff.
10. Via hands-on courses in clinical setting from presenters who "Walk the Walk" and can impart practical knowledge
11. We are teaching aspects of EBP, but not as a discipline in its own right. We teach through e-learning, blended learning and have accreditation processes to ensure quality of content and delivery. Having profession-wide access to a VLE and aligning courses with CPD requirements help with uptake of courses.
12. We use Enquiry Based Learning on some of our programmes. Simulation forms an important part of our undergraduate and postgraduate nursing and midwifery programmes.

At the end of the survey respondents were asked for any additional comments and requested to upload relevant curriculum or teaching / learning documents. In terms of overall comments, the need for seamless integration of EBP throughout all elements of teaching and learning was emphasised. It was suggested that teaching efforts should focus on providing students with practical and applicable opportunities to engage with EBP to nurture practitioners who are critical thinkers and value EBP. The importance of terminology used to reflect evidence in practice across all the health and social care professions was also raised (see Table 4.21)

Table 4. 21 General overall comments relating to EBP / EBP Teaching

"It (EBP) should inform all our teaching and practice. EPB is applying the best knowledge to optimize the treatment for patient care. Much of this does not require major training but this concept needs to be throughout a student's training. There is so much peripheral noise surrounding this whole concept, which has led to the development of care pathways etc. that have removed clinical reasoning from the individual and allowed them to hide behind the excuse 'I am only following the protocol'. This has been an unwanted by product of the EPB industry. There is a need to be very careful that we do not produce a generation of technicians that cannot think for themselves"
Undergraduates need to get a feel for real life interactions with the public. Experienced practitioners could follow a definitive curriculum and impart a great deal of practical knowledge, clinical application and business acumen.
EBP needs to be a core part of our teaching and integrated into different areas seamlessly.
EBP curriculum is threaded through various stages and modules throughout our programmes …mapping it specifically is difficult
EBP has to underpin everything taught to meet academic and accreditation requirements.
As we are dealing with a number of professions, language can be very important. To satisfy the wide range of professions we typically use the term evidence informed practice. The term evidence informed typically reflects the person-centred approach we promote across all professions whereas evidence based can be more based on the rigor and quality of evidence available relating to the practice of the profession. Furthermore, evidence informed is more reflective of the psychosocial professions we regulate that may not have 'valid' research available to based practice on. Although these terms are often used interchangeably, we could consider there to be a difference and consciously use the term evidence informed rather than evidence based.

Two documents related to the teaching of EBP/EBP curriculums were uploaded (see Appendix 14). A further written response to the EBP survey from one professional training body was uploaded (see Appendix 15).

4.4 Summary of Findings from National Baseline Survey

To capture baseline data on the current provision and practice of EBP education in Ireland, a cross-sectional national online survey of Higher Education Institutions, and Professional/Regulatory Bodies was undertaken. Representation from 11 health and social care professions (dentistry, occupational therapy, nursing, midwifery, pharmacy, physiotherapy, radiography, dietetics, psychology, medicine and speech and language therapy) across undergraduate, postgraduate and continuing professional development academic levels was obtained and underscores the scope of responses received.

The findings indicated that for the majority of respondents, formal teaching of EBP was introduced within their respective institutions more than 10 years previously and is predominantly taught by academic staff. 'Blended learning', that is a combination of traditional and problem based learning, is the principal teaching approach used to deliver healthcare curricula overall, of which EBP is a component. 'Stand-alone' didactic lectures are the most frequently used method of teaching EBP across all academic programme levels, with non-face-to-face methods and practice based learning workshops allocated the least amount of teaching time. A named EBP Lead/Champion is not identifiable within the majority of institutions.

In relation to curriculum issues specific to EBP teaching and learning, overall, there was strong agreement that EBP principles are embedded within curricula to achieve core professional competencies, with undergraduate and postgraduate written curricula reflecting an EBP philosophy. There was also strong agreement that academic staff decide which subjects are appropriate for teaching EBP with a lower proportion of respondents agreeing that clinical educators have such an input. Evaluation of undergraduate and postgraduate programmes to ensure the inclusion of EBP principles is conducted in the majority of cases. However, over one third of respondents were unsure if such evaluative processes were implemented.

The findings indicate that all EBP learning activities as outlined by the Sicily Statement (Dawes *et al.*, 2005) (ask, acquire, appraise, apply and assess) are included as key content areas across healthcare profession programmes with activities in relation to the retrieval, accessing and appraisal of evidence classified as the most common activities. While over 75% of respondents indicated strong agreement that formative and summative assessments are used by academic staff to determine the extent of EBP learning, agreement on the use of such assessment strategies by clinical educators was considerably less. The most common methods used to assess EBP learning include Critically Appraised Topics (CATS) and Observed Structured Clinical Examinations (OSCEs). The assessment method least used is the application of CATs within a clinical setting. With regard to current teaching practices in the area of

clinical effectiveness, findings indicate that patient safety and quality improvement processes are the subjects most frequently taught.

Education on clinical audit was provided by the majority of represented institutions and across all academic programme levels, although notably less so at a continuing professional development level. Methods of teaching include small group tutorials, integration into audit material into other lecture topics and the application of audit methods into practice settings. Just under half of respondents indicated that learning outcomes in relation to clinical audit were assessed.

Overall, attitudes towards EBP are very positive with the vast majority acknowledging EBP as necessary for improved clinical decision-making and quality of patient/client care. Just over half of respondents indicated that staff have received formal training in teaching EBP namely through attendance at EBP teaching workshops or in-service training sessions. Informal activities undertaken to assist in teaching EBP ranged from drawing on personal professional experiences of being an evidence-based practitioner to self-directed learning in relation to accessing and appraising information.

The top three rated barriers to EBP teaching include difficulties integrating evidence into practice, the lack of time for EBP within curricula and the lack of importance or the perceived relevance by students of EBP education provision. Access to courses to enhance knowledge of EBP/teaching of EBP, in addition to evidence of improved patient outcomes from the use of EBP are seen as potentially helpful strategies to enhance EBP teaching.

While only one HEI and two professional regulatory bodies provided further EBP relevant materials, examples of innovative teaching practices and recommendations for the future development of EBP education were made. Of note, the seamless integration of EBP throughout all aspects of professional curriculum was emphasized. It was suggested that EBP should not be perceived as a discipline or 'subject' in its own right but rather embedded within education programmes.

4.5 Conclusions from National Baseline Survey

This is the first survey to report on EBP teaching for healthcare professionals across different professions and academic levels within the Republic of Ireland. Similar to national surveys of EBP teaching conducted in the UK (Meats *et al.* 2009), North America (Aiyer *et al.,* 2002; Blanco *et al.,* 2014; McDonald *et al.,* 2014;) and Australia (Togher *et al.,* 2011), a considerable amount of EBP activity throughout health profession education programmes was identified, with strong recognition of the need for EBP principles and processes within curricula to achieve core professional competencies. Despite this acknowledgement, an identifiable individual to champion or take a lead role for the EBP agenda was lacking within the majority of institutions. Evidence of the effectiveness of EBP champions as change agents within clinical settings is reported (Wallen *et al.,* 2010), with a comparable role within health professional education recommended. Overall, very positive attitudes towards EBP were reported, which provides additional empirical validation to similar international EBP education survey results.

Consistent with the structured review findings (Brangan *et al.,* 2014; Khader *et al.,* 2011; Shuval *et al.*, 2017), the first three steps of the 5-step model (Ask, Acquire, Appraise) were most frequently taught, particularly within undergraduate and postgraduate programmes. Learning opportunities for steps 4 and 5 (Apply and Assess) were less frequently reported which is in line with national survey findings by Meats *et al.,* (2009) and McDonald *et al.,* (2014), but less so for the medical and speech pathology programmes surveyed in North America (Blanco *et al.* 2014) and Australia (Togher *et al.,* 2009). The latter study findings reported proportionally more time spent on the application of the EBP process compared to teaching specific EBP concepts. Both programmes illustrated a developmental progression of EBP knowledge and skills throughout the duration of programme study. Similar to Elcin *et al.,* (2014) adoption of a spiral approach to curriculum organisation of EBP learning, Meats *et al.* (2009) recommend the application of a vertical mapping tool to ensure EBP as an identifiable theme throughout medical education curricula. A reasonable suggestion by McDonald *et al.,* (2014) in relation to the difficulty of learning engagement or opportunity with step 4 (Apply) is the need for clinician-based activity to inform such teaching and assessment. A reported lack of engagement in step 5 (Assess) (with the exception of engagement with clinical audit), also evident throughout previous survey findings, is suggested to reflect curriculum time constraints, a lack of teaching methods, or the assumption that it occurs automatically (McDonald *et al.,* 2014). Without participation in this step, students are unlikely to learn how to review and refine EBP processes, making knowledge transfer to practice challenging.

A trend, demonstrating the lack of integration of EBP teaching and assessment into practice was seen throughout these survey findings. Teaching was delivered through a 'blended' approach, which predominantly relied on 'stand-alone' EBP didactic lectures and small group tutorials. Lectures, as a teaching method, are not particularly effective in changing practice behaviour particularly within postgraduate education (Coomarasamy and Khan 2004). Clinical Appraised Topics and OSCEs were the most common assessment methods applied, while practice-based EBP workshops and clinically orientated formative or summative assessments were least reported. McDonald *et al.,* (2014) note that assessment of EBP learning is often organised around a series of assignments and reports that focus on the various steps (Burns and Foley 2005; Shlonsky and Stern 2007). Active application through the use of vignettes and standardised patients (Rutten *et al.,* 2006; Waxman, 2010) has value in its potential to assess the 'Apply' and 'Assess' steps within an academic setting. Similarly, while use of CAT reports is well documented in the literature as a valuable method to help novices learn and participate in the first three EBP model steps (Straus *et al.* 2011), increased use of the 'clinical CAT' as adopted in New Zealand undergraduate medical schools should be promoted to encompass knowledge and skill development in steps 4 and 5.

Continuing with the aforementioned trend, survey findings also indicated that academic, rather than clinical staff, were stronger in their agreement that they had input into curriculum development processes relating to EBP. Togher *et al.,* (2011) reported on the dissonance between academic and clinical educators in terms of EBP teaching. It was recommended that extra consideration be given as a priority to the nature and frequency of communication between academic and clinical educators, both during times of curriculum renewal and instances where students experience difficulty with translating evidence into practice. Advances in such collaboration is required if the challenge of effectively teaching EBP is to be met.

Altogether, these findings reflect the main barrier reported within this study, that being of the difficulties encountered in trying to clinically integrate EBP teaching and learning. As noted within the synthesis of review and interview findings, there is an essential need and increased recognition for EBP teaching and learning to be further clinically-based or clinically-integrated (Commarasamy and Khan, 2004; Khader *et al.,* 2011; Shuval *et al.,* 2007). Answering patient-specific questions arising during clinical care has been shown to increase knowledge and change clinical decisions among medical residents (Schilling *et al.,* 2005) as well as medical students (McGinn *et al.,* 2002). Expanding teaching of EBP in these ways should be encouraged (McDonald *et al.,* 2014).

Helpful strategies suggested for enhancing EBP teaching and learning included staff development (both within academic and clinical settings), and a multi-disciplinary approach and access to core resources for EBP teaching across health professions. These strategies are echoed within international EBP teaching survey study recommendations (Blanco *et al.,* 2014; Meats *et al.,* 2009; McDonald *et al.,* 2014; Togher *et al.,* 2011). Supporting staff to have confidence and competence in teaching EBP and providing opportunities for 'real' learning throughout education programmes is necessary to facilitate tangible change in this area. Designated core EBP resources and a 'whole college' or multi-disciplinary approach to EBP education more accurately reflects the interdisciplinary nature of evidence-based health care which remains a fundamental premise of patient/client care delivery.

From the survey findings, recommendations suggested by respondents for the future development of EBP education in Ireland centred around the need for the seamless integration of EBP throughout all aspects of professional curricula. It was suggested that EBP should not be perceived as a discipline or 'subject' in its own right but rather embedded within education programmes. While there was strong agreement that EBP principles and processes were incorporated into undergraduate and postgraduate programmes, the degree of actual formal integration is unreported and requires further study.

The findings and recommendations highlighted in the following chapter must be considered in light of the following limitations. Due to recruitment methods employed, the survey respondents had very positive attitudes towards EBP and are likely to be strong EBP advocates, which may not be reflective of all educators with responsibility for teaching health professionals. Even though response rates across professions were good overall, the requirement to provide identifying information may have discouraged participation or completion of all survey items. However, feedback to this effect was received from only one School. Similar to the UK national EBM teaching survey, the remit of this project was to capture EBP teaching and learning across HEIs and professional/regulatory bodies. Accurate representative of teaching, learning and assessment within and throughout clinical settings e.g. hospitals, primary care etc., may not be as accurately reported.

Chapter 5 Overall Report Summary & Key Observations

Introduction

To highlight and advance the clinical effectiveness and evidence-based practice agendas internationally, the Institute of Medicine (IOM) set a goal that by 2020, 90% of clinical decisions will be supported by accurate, timely and up to date clinical information and will reflect the best available evidence to achieve the best patient outcomes (IOM, 2009). To ensure that future health care users can be assured of receiving such care it is recommended that the healthcare professions incorporate the necessary knowledge, skills and attitudes of EBP into their professional education programmes and registration requirements.

This report was commissioned by the NCEC to capture baseline data on the provision and practice of evidence-based practice education in Irish third level educational organisations' and professional bodies across the health professions. Specific research objectives were to:

1. Determine current provision, practice and variation in evidence based practice (EBP) education in Irish third level education.
2. Describe current practice in other English speaking countries (to include UK, Canada, New Zealand and Australia) of how they are delivering EBP education to health care professionals (undergraduate and postgraduate).
3. Inform the development of a core syllabus/curriculum and competencies/competency framework for EBP education in Ireland.
4. Inform standards and requirements for education programmes in evidence based practice for health professionals at Ireland's Higher Level Institutions (HEIs) /courses leading to an award on the National Framework of Qualifications.
5. Act as a baseline study which can be repeated in the future.
6. Contribute to evidence for 'best practice' in national clinical effectiveness education.
7. Inform the content and optimum delivery mode for training programme(s) for the competency and skills required by all relevant stakeholders.
8. Support the NCEC and the Department of Health to provide strategic leadership for the national clinical effectiveness agenda.

Such information is required to lay the foundation to inform standards and requirements for healthcare professional education programmes in Ireland and to contribute to 'best practice' in national clinical effectiveness education. To meet the research aims and objectives, the following three distinct, but interlinked phases of research were conducted.

Phase 1 – Desktop Structured Rapid Review of International Literature

The aim of the review was to provide a summary of current international literature, including grey literature on the standards of education in evidence based practice (EBP) e.g. syllabus/curriculum, competencies, methods of assessment, teaching methods and effectiveness for teaching of evidence based practice. Specific review questions included:

1. What is the current practice of teaching EBP at undergraduate and postgraduate level across the healthcare professions?
2. What are the most effective components of EBP education for healthcare professionals (i.e. mode of delivery, programme components, programme duration, outcome assessment, and effect on EBP competencies)?
3. What are the effective components of EBP curriculum development processes?

A rapid structured review was undertaken, following the Knowledge to Action (KTA) evidence summary approach. Rapid reviews take a streamlined approach to synthesizing evidence in a timely manner and are considered a contextualized resource that succinctly and methodically address a broader scope of scientific evidence quickly. Rapid reviews are typically for the purpose of informing decisions faced by policymakers, decision makers, stakeholders and other knowledge users in healthcare settings (Khangura *et al.,* 2012). An eight-step approach to evidence summary methodology was adopted to ensure adherence to systematic principles associated with rapid reviews. The eight steps included: 1) Needs Assessment, 2) Question development and refinement, 3) Proposal development and approval, 4) Systematic literature review, 5) Screening and selection of studies, 6) Narrative synthesis of including studies (including assignment of evidence level), 7) Report production, and 8) Ongoing follow up and dialogue with knowledge users.

Narrative analysis and synthesis of 83 empirical studies revealed that participation in any form of EBP education has beneficial effects across all EBP competencies. The most apparent trend in positive changes in EBP competencies is seen from multi-modal EBP interventions which address two or more of the five EBP steps. What is not equivocally evident is what form or combination of EBP education components have the most beneficial *long-term* effects, particularly in terms of translating knowledge and skills into clinical application of EBP. Similarly, there is insufficient evidence to suggest that an EBP intervention will have similar effects across a range of health professions. Due to the large range of instruments used to measure outcomes, changes post intervention must also be interpreted with caution.

Based on the evidence from the review, the following summarises what may work best for an EBP education intervention:

What: A multi-modal, multi-component, integrated EBP programme within health professional curricula.

Why: To develop and sustain EBP competencies including EBP knowledge, skills and attitude, for the improvement of service provision and patient outcomes.

How: To address all 5 EBP steps, with emphasis on the translation of EBP approaches into clinical practice (*Apply).*

Where: HEIs/ professional training bodies/centres and HSP / clinical workplace settings.

What is not clear: The optimal andragogic model of EBP education to follow, as well as the optimal breakdown (in terms of content and time allocation) of EBP components to be included within curricula.

Within a search of 'grey' literature (see Appendix 16), the Lancet Commission emphasise the importance of knowledge, skills and attitudes acquired through applying the principles of EBP. The report, 'Education of Health Professionals for the 21st century', highlights the need for healthcare professional training to be transformative. Transformative learning aligns well with the 5 steps of EBP, in particular the shift from memorisation of facts to critical reasoning, which guides the capacity to search analyse, assess and synthesis information to aid decision making (Frenk *et al.,* 2010). Publications by regulatory bodies of healthcare disciplines internationally highlight a strong commitment to the need for engagement with EBP principles to advance healthcare disciplines and improve patient care/ healthcare service provision.

Phase 2 – EBP International Expert Interviews

Expert interviews were conducted to ascertain current and nuanced information on EBP education for healthcare professionals in other English-speaking countries. Experts from the UK, Canada, New Zealand and Australia were chosen based on their contribution to peer-reviewed literature on the subject area, monitoring role in EBP education and through personal networking contacts from the NCEC and project team. Over a two-month period (March and April 2017), individual 'Skype' / telephone interviews were conducted and recorded. An interview schedule structured around the current practice and provision of EBP healthcare professional education with specific attention given to EBP curricula, core EBP competencies, teaching initiatives and key challenges to EBP education was used. Qualitative content analysis techniques were applied to categorise data. Steps to ensure trustworthiness of the research process and data analysis were undertaken.

Five EBP experts participated in the interviews. All experts waived their right to anonymity.

EBP Expert Profile

EBP Expert	Title	Affiliation	Country
Professor Leanne Togher	Professor of Communication Disorders following Traumatic Brain Injury	Faculty of Health Sciences University of Sydney	Australia
Professor Gordon Guyatt	Distinguished Professor	Department of Health Research Methods, Evidence, and Impact McMaster University	Canada
Professor Rodney Jackson	Professor of Epidemiology	School of Population Health, Faculty of Medical and Health Sciences University of Auckland	New Zealand
Professor Bruce Arroll	Professor of General Practice	General practice and Primary Healthcare Faculty of Medical and Health Sciences University of Auckland	New Zealand
Professor Carl Heneghan	Professor of Evidence-Based Medicine and Director, Centre for Evidence-Based Medicine	Department of Primary Care Health Sciences University of Oxford	United Kingdom

The interview findings brought attention to the significance of three key categories, namely; (i) 'EBP Curriculum Considerations'; (ii) 'Teaching EBP' and (iii) 'Stakeholder Engagement in EBP Education'. Definitive advice in relation to curriculum considerations was provided with a clear emphasis on the need for EBP principles to be integrated throughout all elements of healthcare professional curricula. Embedding EBP within compulsory profession-specific competencies and/or accreditation processes can present opportunities for real integration of EBP, which should be reflected equally in both academic and clinical elements of curricula. EBP competencies should centre on the oft-cited steps of asking questions, acquiring, appraising, and applying evidence to patient care decisions. Additional

attention to professionals' ability to communicate evidence effectively and participate in shared decision-making is required.

The quality of teaching has potential to impact the uptake of EBP in practice. Adoption of effective strategies and practical methods to realise successful student learning and understanding is required. Of particular note was the grounding of teaching strategy and associated methods from a clinically relevant perspective with student exposure to EBP facilitated in such a way that it is dynamic and interesting. EBP role models and clinicians with the 'X-factor' were emphasized as being integral to demonstrating the application of EBP in clinical decision-making and facilitating the contextualisation of EBP within a specific setting/organisation. The provision of training for educators, the purpose of which is to aid the further development of skills and use of resources necessary for effective EBP teaching was recommended.

Engagement of national policy makers, healthcare professionals and patients' with EBP also has potential to advance its teaching and application in clinical care. Establishing a coherent national policy on EBP education, investment in resources and related initiatives were deemed of merit to advance the EBP agenda. Providing structured and embedded EBP activities relevant to clinical care was recommended to improve healthcare professional consistency with EBP. Enabling patients to engage with evidence with a view to informing healthcare professional/patient interactions and care decisions was also advocated.

The implementation of successful EBP education serves the function of developing practitioners who value EBP and have the knowledge and skills to implement such practice. The ultimate goal of this agenda is to enhance the delivery of healthcare for improved patient outcomes. The overarching theme derived from the analysis from these interviews, 'Improving healthcare through enhanced teaching and application of EBP', represents the focus and purpose of the effort required to optimally structure HCP curricula, promote effective EBP teaching and learning strategies and engage with key stakeholders for the overall advancement of EBP education.

Discussion of Structured Review and Expert Interview Findings

The evidence derived from the desk-top review and expert interviews offer some consistent trends in EBP education which are discussed under the following headings: 1. Core Curriculum and Competency Framework for EBP Education 2. EBP Programmes - Content, Delivery Mode, Teaching Methods and Assessment and 3. Overcoming Barriers to EBP Teaching.

1. Curriculum Considerations and Competency Framework for EBP Education

Education programmes and associated curricula act as a key medium for shaping healthcare student professional knowledge, skills and attitude, and therefore play an essential role in determining the quality of care provided (Young *et al.,* 2014). With respect to professional curricula, educational theory advocates increased integration of theory and practice with respect to EBP (Aglen *et al.,* 2016). Unequivocal recommendations were made by EBP experts to integrate and embed EBP throughout academic and clinical curricula. Such integration is facilitated by the explicit inclusion of EBP as a core competency within professional standards and requirements (Frenk *et al.,* 2010) in addition to accreditation processes. From a curriculum development perspective, direction in relation to such integration is gained from looking to appropriate learning theory to underpin andragogic interventions. The empirical literature reviewed recommend that EBP curricula and teaching needs to be more closely aligned with educational theories that support 'real-time' integration of education with clinical practice. Adult learning theory, behaviour change theory and, from an undergraduate perspective, theories of cognitive maturity development and knowledge transfer, can assist in structuring curricula overall to facilitate the integration of EBP as a core component (Aglen 2016; Dizon 2012; Harris *et al.,* 2011). An additional suggestion derived from expert consultations is the development of learning objectives at novice, intermediate and entry levels to professional undergraduate programmes. While such a recommendation can only be tentative in nature given the extent of evidence available, empirical review findings also provisionally advocate a 'spiral approach', whereby EBP concepts and application increase in complexity and are reinforced throughout the years of learning (Elcin *et al.,* 2014; Iliac and Maloney 2014).

From the empirical review, it is clear that the minimum standard educational requirements and core learning outcomes derive from the 5-step model of EBP as originally proposed by Guyatt *et al.,* (1992) and further explicated within the Sicily Statement by Dawes *et al.,* in 2005. These steps form the basis and are included in the majority of professional competency frameworks (Galbraith *et al.,* 2017). It is also clear that in the majority of cases, only some components of the model, namely the first three steps of Ask, Acquire, and Appraise are included in terms of EBP teaching assessment and research outcomes. Recommendations from expert consultation, while acknowledging the need for fundamental knowledge and skills in these 3 areas, highlight the need for a more effective and targeted approach to the teaching and assessment of steps 4 (Application of evidence in practice) and 5 (Assessment of outcomes from clinical EBP decision-making). Integrative interactive teaching and further development of and emphasis on communication skills are key to enhancing competency in

these areas and particularly in relation to realising shared decision-making between patients and healthcare practitioners in making evidence-based decisions.

Findings from a recent systematic review by Galbraith *et al.,* (2017), which examined a 'real-world' approach to evidence-based medicine in general practice, corroborates this recommendation by calling for further attention to be given to communication skills of healthcare practitioners within the context of being an evidence based practitioner. The use of pre-processed and pre-appraised evidence sources was another key issue raised by EBP experts and increasingly more recently within empirical literature (Robeson and Dobbins 2010; Yost *et al.,* 2014). While again it is recognised that search and appraisal skills should be a fundamental element of healthcare curriculum and an essential skill, critical adeptness and competency in the navigation of pre-sourced and pre-appraised evidence sources is also required.

A healthcare professional curriculum which explicitly and consciously integrates EBP as a core professional competency throughout all academic and clinical curriculum domains is recommended. While the 5-step EBP model remains the foundation for building EBP skills and knowledge and therefore informs the majority of professional competency frameworks, a more pragmatic approach to steps 1-3 is required in terms of acquiring and appraising evidence, with a more targeted approach needed to improve competency and outcomes in relation to steps 4 and 5. Use of educational theories that support the practical integration of theory with practice is recommended to facilitate this process (Flores and Matteos 2007; Dizon *et al.,* 2012; Aglen *et al.,* 2016).

2. EBP Programmes - Delivery Mode, Duration, Teaching Methods and Assessment

Similar to previous review findings on EBP healthcare professional education (Dizon *et al.,* 2012; Iliac *et al.,* 2014; Ahmadi *et al.,* 2015), participation in any structured form of EBP education regardless of whether it is taught at an undergraduate or postgraduate level, can have beneficial effects on EBP competencies in terms of knowledge, skills and attitudes. Evidence for the impact of EBP education on actual behaviour or clinical outcomes is more tentative (Dizon *et al.,* 2012; Young *et al.,* 2014; Ahmadi *et al.,* 2015). However, considering the multitude of factors impacting on practice outcomes, it is difficult to design robust studies which can assess and attribute improved health outcomes to any single factor (Cook et al., 2013). Progress in terms of 'prescribing' effective EBP education components, such as optimal duration of training, delivery modes and assessment strategies is hampered by the variable quality of research methods used to evaluate the effectiveness of EBP education interventions. While the evidence overall is not definitive, experts in EBP, together with trends throughout empirical research and recognised educational theory repeatedly make a number of recommendations for

enhancing EBP programmes and associated teaching and learning strategies. These include; (1) clinical integration of EBP teaching and learning; (2) a conscious effort on behalf of educators to embed EBP throughout all elements of healthcare professional programmes; and (3) the use of multi-faceted, dynamic teaching and assessment strategies which are context-specific and relevant to the individual learner / professional cohort.

What do these recommendations mean at a practical level for policy-makers and educators charged with programme development? It requires a more concerted effort to move away from a predominant reliance on stand-alone didactic teaching towards clinically integrative and interactive teaching. In 2006, Khan and Coomarasany developed a hierarchy of effective educational strategies for EBP teaching based on empirical and theoretical evidence. Level 1, deemed the most effective strategies, represent interactive and clinically integrated teaching and learning activities. An example provided by one of the EBP experts represents this level in terms of the performance of GATE CATS while on clinical rotation with assessment conducted by a clinician in practice. Such an activity fulfils the criteria of being reflective of practice, facilitating the identification of gaps between current and desired levels of competence, identifying solutions for clinical issues and allowing re-evaluation and opportunity for reflection of decisions made with a practitioner. Such interactivity facilitates 'deeper' learning, which is essential for knowledge transfer (Aglen *et al.,* 2016). This strategy level is of particular importance for providing enhanced learning opportunities to achieve competency in steps 4 and 5, which, as the review findings demonstrated are least addressed within EBP programmes.

At level 2, interactive, classroom-based teaching, or didactic, but clinically integrated teaching is recommended. Although classroom-based, a conscious effort is required to ensure teaching sessions are interactive, e.g. through the use of group work with defined outcomes or case discussions (Khan and Coomarasamy, 2006). From analysis of expert interviews, using clinical examples, simulation of clinical scenarios to replicate 'bedside' teaching, providing resources where students have to work through 'real-life' examples were repeatedly recommended as essential to demonstrating the relevance and application of EBP.

Level 3 encompasses traditional teaching activities, which are predominantly didactic in nature and presented as 'stand-alone' modules within a programme. The lack of activity or interactivity, in addition to the absence of a clinical context is suggested to limit students' interest and depth of learning both of which are required to effectively acquire competence in EBP skills (Khan and Coomarasamy, 2006; Iliac *et al.,* 2014).

The findings and propositions by Khan and Coomarasamy (2006) are reflected and corroborated in empirical work in the past decade which advocate for the implementation of multifaceted, clinically integrated approaches with relevant assessment (Ilic *et al.,* 2014; Kortekaas *et al.,* 2016; Ubbink *et al.,* 2013; Young *et al.,* 2014;).

Findings from EBP expert consultations recommend that EBP needs to be 'pervasive' throughout all elements of programme content with EBP teaching and learning not just within the remit of stand-alone EBP specific-modules. This recommendation presents challenges in terms of measuring or prescribing optimal 'duration' or allocation of time for EBP teaching if we are to move away from a 'stand-alone' module approach to EBP teaching. Rather than focus on time allocation, further attention should be concentrated on specifying sound and measurable EBP learning objectives that address all 5 steps of the EBP model throughout a programme. A comparable emphasis is also needed on the development of assessment strategies that can accurately assess EBP knowledge and skill attainment. Demonstrating EBP competence is a complex task therefore no single assessment method can provide all the necessary data to assess complete EBP competence (Ilic *et al.,* 2009; Blanco *et al.,* 2014). Expanding assessments methods to include the use of an adapted and profession-specific Fresno test, OSCEs or simulation exercises and clinical CATS, would be of benefit in more comprehensively assessing different aspects of EBP competence and also useful for monitoring the vertical and horizontal integration of EBP throughout a programme. The Sicily Statement on the classification and development of evidence based practice learning assessment tools is an international consensus statement which offers direction for educators and researchers in developing and identifying the types of EBP learning assessment tools that are needed to promote more consistent evaluation of EBP teaching outcomes (Tilson *et al.,* 2011).

Where not already present, there is an immediate requirement for healthcare professional education providers and regulators to explicitly include EBP as a core professional competency, which is embedded throughout all aspects of undergraduate and postgraduate programmes. Operationalisation of this can be facilitated through the use of multi-faceted, interactive and clinically integrative teaching and learning strategies and assessments to effectively assist students in achieving EBP competency across all elements of the 5-step model.

3. Strategies to overcome barriers to the implementation of EBP teaching

While there is no 'magic bullet' that can readily address all factors impacting upon EBP education and its implementation in practice, identifying and overcoming potential barriers is recommended as effecting positive change (Baker 2010). In addition to addressing challenges such as curriculum organisation and programme content/structure, the following strategies were also highlighted within the review and expert interviews findings; (1) 'Training the trainers', (2) Development of and investment in a national coherent approach to EBP education; (3) Structural incorporation of EBP learning into workplace settings.

Comparable national surveys by Meats *et al.,* (2009) and Blanco *et al.,* (2014) found that a lack of academic and clinical staff knowledgeable in teaching EBP was a barrier to effective and efficient student learning. This was echoed by findings from EBP expert interviews. Effective teacher education is required to improve EBP teaching quality (Ingvarson and Rowe 2007; Walczak *et al.,* 2010; Ubbink *et al.,* 2013; Young *et al.,* 2014,). Providing educators with formal training in teaching EBP can assist in identifying learning opportunities and accessing relevant resources in a variety of contexts and settings (Walczak *et al.,* 2010). Of note, such formal training should extend to academic and clinical educators equally. EBP role models and champions, through participation in such training, presents an opportunity for the promotion of 'best practice' in EBP teaching throughout academic and clinical educational settings. Initiatives such as the EU-EBM project (Thangarantinam *et al.,* 2010), in addition to EBP teaching work-shop programmes held at Oxford (CEBM) and McMaster Universities recognise the necessity and value of such education for the advancement of the EBP agenda.

A national and coherent plan with associated investment in healthcare education specific to the integration of EBP was highlighted within the expert interviews as having an important impact on educational outcomes. The lack of a coordinated and cohesive approach and perceived value of EBP in the midst of competing interests, particularly within the context of the healthcare agenda, was suggested to lead to an 'ad-hoc' approach to the implementation of and investment in EBP education and related resources. Findings from a systematic scoping review of recommendations for the implementation of evidence-based practice by Ubbink *et al.,* (2014), draw attention to a number of interventions at a national level that have potential to further promote and facilitate EBP education. Such interventions include government level policy direction in relation to EBP education requirements across health profession programmes and the instalment and financing of a national institute for the development of evidence-based guidelines. A similar proposal by Togher *et al.,* (2011) was made as a result of the findings from a national scoping study on EBP education amongst Speech Pathologists in Australia which strongly recommended a national plan of action for EBP curricula and resources.

Structural incorporation[5] of EBP learning and its implementation in practice has potential to counter the barriers cited within this review that were associated with a lack of personal discipline in relation to participating and implementing evidence based practice in addition to facilitating the principles advocated by EBP experts with regard to making EBP learning accessible, simple, and relevant. Such structural incorporation can be facilitated at various different levels and settings. At a health service level, the provision of computer and internet facilities at the point of care with associated content management / decision support systems allowing access to guidelines, protocols, critically appraised topics and condensed recommendations was recommended. At a local workplace level, access to EBP mentors, implementation of consistent and regular journal clubs, grand rounds, audit, regular research meetings were all emphasized as important to embed within the healthcare or education environment. This in turn can nurture a culture which practically supports the actualization of EBP in day to day practice (Ubbink *et al.,* 2013).

Phase 3 – National EBP Teaching Survey

To capture and describe baseline data relating to the current provision and practice of EBP education to healthcare professionals at third level institutions and professional bodies in Ireland, a descriptive, cross-sectional survey was undertaken.

A purposive and targeted strategy was employed to ensure that key stakeholders involved in the provision, oversight or regulation of healthcare professional education were sampled. Specifically, all Higher Education Institutes, *(Universities (n=6 UCC, UCD, DCU, TCD, UL, NUIG (including St. Angela's College)*, National University of Ireland Recognised Colleges *(n=1 RCSI),* and Institutes of Technology *(n=7 AIT, WIT, DKIT, GMIT, Letterkenny IT, DIT, ITT)* that offer undergraduate and postgraduate healthcare profession education courses (medicine, nursing, midwifery, dentistry, surgery, dietetics, pharmacy, physiotherapy, occupational therapy, speech and language therapy, podiatry, clinical psychology, optometry and radiography) were sampled. Professional training bodies and associated accredited training programmes were also targeted *(Irish Postgraduate Medical Training Body (RCPI), Irish Postgraduate Surgical Training Body (RSCI), Irish Medical Council (IMC), Irish College of General Practitioners (ICGP), Centres for Nursing and Midwifery Education, The Pharmaceutical Society of Ireland (PSI), Irish Institute of Pharmacy (IIOP), Pharmacy Society of Ireland (PSI), Irish Pharmacy Union Academy, Irish Society of Chartered Physiotherapists (ISCP), Irish Association for Speech and Language Therapists, The Association of Occupational Therapists of Ireland (AOTI), the Irish Institution of*

[5] Structural Incorporation: Promotion and facilitation of EBP activities in daily practice, e.g. audit, accessing EBP resources at point of care.

Radiography and Radiation Therapy (IIRRT), Dental Council of Ireland, Irish Dental Association, Primary Dental Care and CORU) (see Appendix 17).

The survey was developed following: (1) a review of literature specifically examining national third level EBP teaching to healthcare professionals and; (2) consultation with the NCEC, DoH. Items from surveys developed by Meats *et al.,* (2009) (*UK Undergraduate Medical Schools*), Togher *et al.,* (2011) (*Australian Undergraduate and Postgraduate Speech and Language Therapy Schools/Department*), and Blanco *et al.,* (2014) (*Canadian and US Medical Schools*) were of particular utility in informing the design of the current survey. The survey incorporated Dawes *et al.,* (2005) Sicily Statement on: (1) the definition of EBP; (2) the teaching of EBP and; (3) the EBP process i.e. '5-step' model (see Appendix 11). The survey consisted of 4 sections with a total of 37 closed and open-ended questions.

Section 1 contained items relating to background information, specifically:

(a) Type and size (in terms of student numbers) of School/Department/Training Body.
(b) Academic level of student programmes/courses offered (Undergraduate/Postgraduate/CPD).
(c) Staff involved in the formal teaching of EBP/clinical audit.
(d) Principal teaching approach / methods used to deliver EBP/clinical audit education.
(e) Evidence of a dedicated EBP/clinical audit champion/lead.

Section 2 comprised of items relating to EBP teaching and curriculum considerations, including:

(a) Processes associated with the development, review and evaluation of curricula (e.g. contributors (academic and clinical), alignment to professional body core competency requirements, explicit EBP philosophy).
(b) Curriculum content (e.g. specific EBP learning outcomes according to the Sicily Statement, access to EBP resources).
(c) Type of EBP formative and summative assessments (including assessment of application in clinical settings).
(d) Evidence of educational activities in specific areas of clinical effectiveness (e.g. Quality improvement processes, patient safety, implementation science).

Section 3 gathered information in relation to:

(a) Staff attitudes towards EBP.
(b) Formal training (type and duration) received by staff in teaching EBP.
(c) Knowledge of and access to EBP resources (e.g. electronic online tools and databases).

Section 4 contained items in relation to barriers and facilitators to teaching EBP. Two open-ended questions requesting details of innovative examples of how EBP was/is taught by respondents and recommendations on the type of resources that could be provided/developed to enhance EBP teaching were also included. At the end of the questionnaire, participants were asked to provide a copy or an overview of their EBP curriculum to outline further detailed description and examples of current/best practice. Extensive pre-testing and piloting was conducted to ensure content validity, clarity of the survey items, and reliability of the data collection mode. The Questionnaire Appraisal System (QAS 99) (Willis and Lessler 1999), a tool used to aid systematic analysis of questionnaires prior to use in the field, was adopted for pre-testing the survey. Following the required revisions, the survey was migrated to an electronic format using SurveyMonkey ©.

HEIs and professional training bodies were contacted by email through the Dean (or equivalent) of the respective Department/School/Centre/Training body. Each e-mail contained a cover letter detailing the project purpose and methods. If agreeable to participating in the study, each contact was asked to either provide details of a nominated person within their department for the research team to liaise with. They were also provided with the option of directly forwarding the e-mail, including the cover letter and a study-specific, secure and de-identified link to the web-based survey, to the identified member(s) of staff. Over the 6-week data collection period (April –May 2017), three reminder e-mails were sent. Data were analysed both quantitatively and qualitatively. Descriptive statistics were used to describe the responses to the study. Qualitative analyses involved thematic groupings of open-ended survey responses.

Representation from 11 health and social care professions (dentistry, occupational therapy, nursing, midwifery, pharmacy, physiotherapy, radiography, dietetics, psychology, medicine and speech and language therapy) across undergraduate, postgraduate and continuing professional development academic levels was obtained and underscores the scope of responses received. The findings indicated that for the majority of respondents, formal teaching of EBP was introduced within their respective institutions more than 10 years previously and is predominantly taught by academic staff. 'Blended learning', that is a combination of traditional and problem based learning, is the principal teaching approach used to deliver healthcare curricula overall, of which EBP is a component. 'Stand-alone' didactic lectures are the most frequently used method of teaching EBP across all academic programme levels, with non-face-to-face methods and practice based learning workshops allocated the least amount of teaching time. A named EBP Lead/Champion is not identifiable within the majority of institutions.

In relation to curriculum issues specific to EBP teaching and learning, overall, there was strong agreement that EBP principles are embedded within curricula to achieve core professional competencies, with undergraduate and postgraduate written curricula reflecting an EBP philosophy. There was also strong agreement that academic staff decide which subjects are appropriate for teaching EBP with a lower proportion of respondents agreeing that clinical educators have such an input. Evaluation of undergraduate and postgraduate programmes to ensure the inclusion of EBP principles is conducted in the majority of cases. However, over one third of respondents were unsure if such evaluative processes were implemented.

The findings indicate that all EBP learning activities as outlined by the Sicily Statement (Dawes *et al*., 2005) (ask, acquire, appraise, apply and assess) are included as key content areas across healthcare profession programmes with activities in relation to the retrieval, accessing and appraisal of evidence classified as the most common activities. While over 75% of respondents indicated strong agreement that formative and summative assessments are used by academic staff to determine the extent of EBP learning, agreement on the use of such assessment strategies by clinical educators was considerably less. The most common methods used to assess EBP learning include Critically Appraised Topics (CATS) and Observed Structured Clinical Examinations (OSCEs). The assessment method least used is the application of CATs within a clinical setting. With regard to current teaching practices in the area of clinical effectiveness, findings indicate that patient safety and quality improvement processes are the subjects most frequently taught.

Education on clinical audit was provided by the majority of represented institutions and across all academic programme levels, although notably less so at a continuing professional development level. Methods of teaching include small group tutorials, integration into audit material into other lecture topics and the application of audit methods into practice settings. Just under half of respondents indicated that learning outcomes in relation to clinical audit were assessed.

Overall, attitudes towards EBP were very positive with the vast majority acknowledging EBP as necessary for improved clinical decision-making and quality of patient/client care. Just over half of respondents indicated that staff have received formal training in teaching EBP namely through attendance at EBP teaching workshops or in-service training sessions. Informal activities undertaken to assist in teaching EBP ranged from drawing on personal professional experiences of being an evidence-based practitioner to self-directed learning in relation to accessing and appraising information.

The top three rated barriers to EBP teaching included difficulties integrating evidence into practice, the lack of time for EBP within curricula and the lack of importance or the perceived relevance by students of EBP education provision. Access to courses to enhance knowledge of EBP/teaching of EBP, in addition to evidence of improved patient outcomes from the use of EBP are seen as potentially helpful strategies to enhance EBP teaching.

While only one HEI and two professional regulatory bodies provided further EBP relevant materials, examples of innovative teaching practices and recommendations for the future development of EBP education were made. Of note, the seamless integration of EBP throughout all aspects of professional curriculum was emphasized. It was suggested that EBP should not be perceived as a discipline or 'subject' in its own right but rather embedded within education programmes.

Conclusions & Key Observations

This body of work is the first of its kind to investigate the teaching of EBP to healthcare students and professionals across a multitude of healthcare disciplines in Ireland using a national survey. Similar to other national EBP teaching surveys in the UK, USA and Australia (Blanco *et al*., 2014, Meats *et al.,* 2009, Togher *et al*., 2011), the attitude to the teaching of EBP in Ireland is positive and a considerable level of EBP activity in University curricula and CPD programmes is evident. Furthermore, publications by regulatory bodies of healthcare disciplines in Ireland highlight a strong commitment to the need for engagement with EBP principles to advance healthcare disciplines and improve patient care/ healthcare service provision. In keeping with international findings from the rapid review, the first three steps of EBP are taught most frequently in Ireland across disciplines, both at academic level (UG/PG/CPD) and in workplace settings (i.e. Ask, Acquire, Appraise) while steps four and five appear to be taught less frequently (i.e. Asses, Apply). Findings from the national survey indicate that Clinical Audit appears to be taught as a stand-alone component and not usually integrated into the EBP steps, despite its implicit inclusion in the 5 EBP steps (Dawes *et al.,* 2005). Similarly, Implementation Science also seemed to be predominantly taught as a stand-alone component. There is considerable overlap between the EBP steps (particularly 4 and 5), Clinical Audit and Implementation Science. Further explicit inclusion of these areas within the EBP steps is warranted, with Clinical Audit within the domain of 'Assess' and Implementation Science with the domain of 'Apply'. In general, a reported lack of engagement in steps 4 and 5 (Apply and Assess) (with the exception of engagement in clinical audit), also evident throughout previous survey findings, is suggested to reflect curriculum time constraints, a lack of teaching methods, or the assumption that it occurs automatically (McDonald *et al.,* 2014). Without participation in this

step, students are unlikely to learn how to review and refine EBP processes, making knowledge transfer to practice challenging. This should be addressed for future enhancement of EBP teaching in Ireland and internationally. Future EBP developments as outlined by respondents in the national survey suggest that seamless integration of EBP throughout all aspects of the academic curricula is embedded as a core component and not a standalone "subject". Helpful strategies suggested for enhancing EBP teaching and learning included staff development (both within academic and clinical settings), and a multi-disciplinary approach and access to core resources for EBP teaching across health professions. These strategies are echoed within international EBP teaching survey study recommendations (Blanco *et al.,* 2014; Meats *et al.,* 2009; McDonald *et al.,* 2014; Togher *et al.,* 2011). Supporting staff to have confidence and competence in teaching EBP and providing opportunities for 'real' learning throughout education programmes is necessary to facilitate tangible change in this area. Designated core EBP resources and a 'whole college' or multi-disciplinary approach to EBP education more accurately reflects the interdisciplinary nature of evidence-based health care which remains a fundamental premise of patient/client care delivery.

To achieve 'best practice' in national clinical effectiveness and evidence-based practice health professional education in Ireland, the following key observations are formed on the basis of the salient findings from the structured review, expert interview and national survey.

Key Observations to Inform Recommendations

Healthcare Profession Education Domain	Key Observations to Inform Recommendations	For reflection and action by key stakeholders
Curricula (undergraduate/ postgraduate)	1. Explicit and consistent inclusion, documentation and demonstration of EBP principles and processes[6] throughout academic and clinical programme components is advocated to focus curricula development and associated learning activities.	Academic and clinical educators[7] within Higher Education Institutes (HEIs), Health Service Providers (HSPs) and professional training bodies.
	2. Educational theories, for example, adult learning theory and theories of cognitive maturity development and knowledge transfer, offer guidance in structuring curricula, with a particular utility in facilitating the integration of EBP as a core curriculum component.	Academic and clinical educators within HEIs, HSPs and professional training bodies.
	3. Where not already present, explicit inclusion of EBP as a core competency within professional standards and requirements, with consideration given to linking with professional accreditation processes is recommended to facilitate improved integration of EBP within academic and clinical curricula.	Professional Regulator & Training Bodies
	4. The application of mapping tools to health education curricula is valuable to ensure the vertical and horizontal integration of EBP throughout all programme elements.	Academic and clinical educators within HEIs, HSPs and professional training bodies
	5. Scaffolding acquisition of EBP learning outcomes across novice, intermediate and professional entry levels within undergraduate programmes has gained increased attention as a potentially effective method of structuring learning and	Academic and clinical educators within HEIs, HSPs and professional training bodies

[6] EBP Principles and Process: As defined by the Sicily statement (Dawes et al., 2005).
[7] Clinical Educators: Teachers/Trainers/Role Models of EBP in health sector but not in University/Academic settings.

		application of EBP throughout the duration of a programme of study.	
	6.	National agreement among key stakeholders of the minimum standard educational requirements and core EBP learning objectives is advocated with consideration given to international models i.e. Sicily Statement/Oxford/McMaster in the development of such requirements.	NCEC, Professional Regulatory & Training Bodies, HEIs/HSPs and other stakeholders.
EBP Competencies/ Additional Skills	7.	Increased emphasis is needed on developing competency in, and providing access to, pre-appraised evidence resources to facilitate a more 'real-world' and pragmatic approach to the acquisition and appraisal of evidence to inform practice (see also Key Observation No. 15).	Academic and clinical educators, in addition to library providers and information specialists within HEIs and HSPs.
	8.	Additional opportunities for students and practitioners to engage in the application of EBP and the assessment of its impact in practice through audit and associated activities is advised.	Academic and clinical educators within HEIs and HSPs.
	9.	Further emphasis on skills relating to communication of evidence and shared decision-making processes with patients/clients is increasingly recognised as key to EBP competency.	Academic and clinical educators within HEIs and HSPs.
Teaching and Learning Approach	10.	An interdisciplinary teaching approach to the delivery of core common components of EBP education across undergraduate and postgraduate programmes is suggested as a helpful strategy for enhancing EBP teaching and learning.	Academic and clinical educators within HEIs, HSPs and professional training bodies.
	11.	Employment of effective teaching strategies which are clinically integrative, interactive and multi-modal in terms of delivery are considered essential for enhanced	Academic and clinical educators within HEIs, HSPs and professional training bodies.

		EBP competence and knowledge transfer.	
	12.	The use of a *wide range* of validated assessment strategies (where possible, e.g. Fresno Test, Berlin Questionnaire, GATECAT, OSCE), that can accurately assess EBP competency attainment is advised to promote a consistent evaluation of EBP teaching outcomes.	Academic and clinical educators within HEIs, HSPs and professional training bodies.
Strategies for Overcoming Teaching and Learning Barriers	13.	Engagement with stakeholders to agree and direct the delivery and integration of EBP education across undergraduate, postgraduate and continuing professional programmes is advised to advance the EBP agenda in a co-ordinated and cohesive manner.	NCEC, Academic and clinical educators within HEIs & HSPs Professional Regulatory and Training Bodies
	14.	Achieving 'best practice' in EBP teaching - EBP educators charged with responsibility for health professional education (university/academic staff, regulatory body education officers and practice/health service clinical educators) should have formal training in EBP and EBP teaching across all steps of EBP (ask, acquire, appraise, apply, assess) and be facilitated to undertake such training.	Academic and clinical educators within HEIs, HSPs, and professional training bodies.
	15.	The incorporation and promotion of EBP activities and resources e.g. journal clubs, grand rounds, audit, access to clinical librarians/information specialists and EBP literature within clinical/health service settings is advocated to facilitate enhanced engagement with evidence based practices.	Health Service Providers
	16.	Increased discourse between academic and clinical educators through curriculum development and evaluation processes presents	Academic and clinical educators within HEIs, HSPs and professional body educators.

		an effective opportunity to enable further integration of EBP teaching into practice.	
Research (Overall Observation) Research Recommendations (International) Research Recommendations (National)	17.	Research and funding agencies (national & international) to consider allocation of grants to develop and support this area of capacity building specifically in relation to researching teaching & learning of EBP	Academic and clinical educators within HEIs, HSPs and professional body educators and other key stakeholders.
	18.	Develop and evaluate a common core programme of study using standardised outcome measures across healthcare professions in relation to the achievement of EBP competency.	
	19.	Investigate the efficacy of implementing specific andragogic learning strategies to direct health profession curricula in relation to the integration of EBP.	
	20.	Evaluate, through longitudinal studies, the impact of current health professional education on developing EBP skills and knowledge in addition to changing and sustaining practice behaviour.	
	21.	EBP educators should be encouraged to form collaborations with educational researchers in order to design and develop rigorous studies to successfully compete for research funds and increase the evidence base for EBP teaching and practice.	
	22.	Conduct a follow-up national survey following the implementation of overall recommendations/key observations to allow for comparison with repeat data.	
	23.	Conduct a baseline study examining communication and collaboration practices between academic/HEI, clinical (HSP) and professional body educators in relation to EBP	

		education, particularly its integration and assessment in clinical settings.	
Report Implementation/ Knowledge Transfer Acquisition	24.	Consult with stakeholders with responsibility for the delivery of healthcare professional education (i.e. HEI, HEA, DoE, Interdepartmental Workforce Planning group, Professional Training/ Regulatory bodies, Health Service Providers, Forum of Postgraduate Training Bodies (as required)) to address report findings.	NCEC and all stakeholders
	25.	NCEC to continue to engage key stakeholder groups to progress the development of standards and core competency framework for EBP in Ireland.	NCEC and all stakeholders

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Appendix 1: Empirical Literature Search Strategy

EBSCOhost Search Terms and Combinations

EBSCOhost search included; Academic Search *Complete, CINAHL (the Cumulative Index to Nursing and Allied Health Literature), Medline, PsycARTICLES, Psychology* and *Behavioral Science Collection, ERIC and UK/Eire Reference Centre).* The Cochrane Library was also searched to identify relevant publications within the Cochrane Database of Systematic Reviews. The Campbell Collaboration OT Seeker and PEDro were also searched.

S1 (in title/abstract or keyword)

educat* OR teach* OR cours* OR workshop* OR learn* OR instruct* OR curricul* OR "critical apprais*" OR "journal club*" OR programm* OR competenc*
AND

S2
"Evidence-based medic*" OR "evidence based medic*" OR "evidence-based practic*" OR "evidence based practic*" OR "evidence-based healthcare" OR "evidence based healthcare" OR "evidence-based care" OR "evidence based care"

AND
S3 student* OR undergraduate OR postgraduate OR graduate OR nurs* OR midwi* OR medic* OR dentist* OR pharmac* OR "occupational therap*" OR ergotherap* OR "speech therap*" OR "speech patholog*" OR Radiograph* OR "radiation therapist" OR physiotherap* OR "physical therap*" OR dietetic* OR podiatr* OR paramedic* OR audiolog*

Appendix 2: Grey Literature Search Strategy

Source and Link	Search terms (No. of hits)	Retrieved for screening/extraction
Open Grey http://www.opengrey.eu/search in Subject: Education and Training in Subject: Medicine Limited to 2007-2017	Educat* or teach* AND "evidence-based practice"	174
	Educat* or teach*AND "evidence-based practice"	38
WHO http://www.who.int/en/ within Publications Limited to title search and English language. Published 2007-2017	Educat* AND "evidence based medicine" OR "evidence-based practice" AND student*	0
Lenus, the Irish Health Repository	Educat* OR teach* AND "evidence-based practice*" OR "evidence based medic*" AND student* OR undergraduate*	894/0
NICE/NHS Evidence Database	Educat* AND "evidence-based healthcare" OR "evidence-based medic" AND student*	114/ 0
SumSearch2	Educat* AND "evidence-based medicine"	82/0
HRB (0) IPH (0) TRIP (1) JPI (0) EPPI (0) Tuning Project (1) Tuning education in English Erasmus (0)	Educat* or teach* AND "evidence-based practice* OR "evidence based medicine" AND student	0
Regulatory Bodies/ Ireland (CORU) United Kingdom (HCPC) Canada Australia New Zealand (Ministry of Health)	Educate* AND evidence-based practice	3 1 3 3

Appendix 3: Data Extraction Empirical Literature

1. Author **2. Country**	**3. Aim** **4. Study Design**	**5. Population** **5a. Sample Size** **5b. Discipline** **5c. Level (u/g, p/g.CPD)**	**6. EBP Intervention** **6a. Delivery Mode** **6b. Content (EBP steps-ask, acquire, appraise, apply, assess)** **6c. Duration and Frequency** **6d. Measurement**	**7. Impact on EBP Competencies** **7a. Knowledge** **7b. Attitude** **7c. Skills**	**8. EBP Teaching Barriers/Enablers** **8a. Barriers** **8b. Enablers**	**9. Quality Assessment Rating as per the EPHPP.**
1.Aitken *et al.*, .2011 2. Canada	3.Effect/benefit of clinical librarian on HC team 4. RCT	5a. 46 5b. Physicians, residents, pharmacist 5c. CPD	6a.MI: Group/classroom teaching- 6b. EBP steps; literature search and retrieval guidance, group discussion on information search, one-to one tutorial, formal classroom teaching 6c. Daily, 10-12 hours weekly x 6mnths 6d. Non-validated pre-post intervention (rotation) surveys comparing confidence, awareness of resources, use of evidence.	7a. NR 7b. Responses show literature search skills acquired led to a change in Rx plan for 88%, change in diagnosis for 14%. Librarian conducted searches changed 79% of Rx plans, 36% of diagnosis 7c. NR	8a.NR 8b. NR	9. Weak
1.Amini *et al.*, 2016 2. USA	3.Effectiveness of standardised EBM OSCE 4. Cross-sectional	5a. 104 5b. Medical Students 5c. U/G	6a. 2 yrs of EBM curriculum, 15 hrs EBM didactic lecture, 9 hrs of term learning of literature critical appraisal, 3hr hands on EBM search training with librarian 6b. 25 min OSCE (15 min literature search), 10 mins patient discussion 6c. Once off examination 6d. Pass rate, literature search and search question formation	7a. 89% pass rate for OSCE 7b. NR 7c. Search strategy; 4 tools used; google, uptodate.com, 69% of students able to locate appropriate meta-analyses, 52% able to explain recurrence rate of migraines. 7d NR	8a NR 8b.NR	9.Weak

1. Author **2. Country**	**3. Aim** **4. Study Design**	**5. Population** **5a. Sample Size** **5b. Discipline** **5c. Level (u/g, p/g. CPD)**	**6. EBP Intervention** **6a. Delivery Mode** **6b. Content (EBP steps-ask, acquire, apprai**	**7. Impact on EBP Competencies** **7a. Knowledge** **7b. Attitude** **7c. Skills**	**8. EBP Teaching Barriers/Enablers** **8a. Barriers** **8b. Enablers**	**9.. Quality Assessment Rating as per the EPHPP.**
1.Allen *et al.*, 2015 2. USA	3: Evaluate the effectiveness of web-course to increase EBP knowledge 4. Pre-post test study design	5a. 225 5b. Oncology Nurses 5c. CPD	6a. Web-based EBP MI course 6b. 6c. 2.75 years 6d. Validated EBPQ survey	7a. Pre-test (x=52.6, SD=5.6). Post-test (x=87.6, SD=3.8)	8a. NR 8b. NR	9.Weak
1.Argimon-Pallás 2011 2. USA	3. Show the effectiveness of a short EBP course 4. Pre-post test study design.	5a.158 5b. 2nd yr medical student 5c. U/G	6a. MI: interactive lectures, workshops and case-based studies. 6b. Topics included: (a) writing a clinical question; (b) searching the medical literature; (c) selecting and obtaining evidence; (d) critical appraisal of systematic reviews, RCT; (e) Interpreting clinical relevance and precision of results (f) application of evidence to clinical care. 6c. 4 x .5 days 6d. Fresno test	7a. Mean diff Fresno test scores 47.7, CI 42.8-52.5, p= 0.0001	8a. NR 8b. NR	9. Weak
1. Amsallem *et al.*,. 2007 2. France	3. Investigate the benefits of 2 modes of EBP transfer. 4. RCT	5a. 72 5b. Cardiologists 5c. CPD	6a. "Passive" and "Active" knowledge transfer. 6b. Passive; Web-access to educational material. Active; 2 knowledge brokers visit to discuss pre-sent journal articles, critical appraisal and group discussion 6c. Passive; weekly, Active; every 2 months for a year, 2hrs per visit. 6d. Un-validated Questionnaire	6a. "Active' Gp: Primary outcome (answers to clinical simulated cases) more improved than that in the control, p=0.031. Absolute mean improvement was of 5 points/100. 2nd outcome (answers to MCQ) was also significant (p= 0.039 with an absolute	8. NR	9.Weak

				mean improvement of 6 points/100.		
1.Aronoff 2010 2. USA	3.Determine effectiveness of new EBM method 4. Pre-post test study design.	5a. 153 (final data from 139) 5b. Medical Students 5c.UG	6a. Online web course 6b. 6 didactic modules- focused practicum; formulate clinical questions, use of critical appraisal tool, and validation of appropriate evidence from medical literature. 6c. 48 weeks (term period) 6d. Validated Fresno test	7a. Mean diff pre-post (mean and SD) 11.1 ±20.0pts (66.6-77.7 pts)	8a. NR 8b. NR	9. Moderate
1.Barghouti *et al.*, 2013 2. Jordan	3. Assess effectiveness of a short course in EBP to change knowledge and skills and possible integration to EBM curriculum. 4. Pre-post test study design.	5a. 54 5b. Medical Students 5c. U/G	6a. MI- lectures, online search 6b. Lectures, seminars, online search exercises, and worksheets. Intro to EBM and PICO formation, how to ask relevant questions.2nd Session: study design and methodology. 3rd session: Tutor and librarian outlined how to acquire the best evidence for a clinical question, online search practice. Final sessions; critical appraisal of therapy studies, diagnostic studiesand prognostic studies. Then the authors applied real-life clinical case scenarios. 6c.7 sessions, 15 hours over a 2 week period. 6d. Fresno test	7a. Pre-test: 26.7/200, Post-test 119.5/200. Mean diff: 92.8, (95% CI 84.7, 101.0), p <0.001. 7b. NR 7c. NR	8. NR	9. Moderate

1. Author **2. Country**	**3. Aim** **4. Study Design**	**5. Population** **5a. Sample Size** **5b. Discipline** **5c. Level (u/g, p/g.CPD)**	**6. EBP Intervention** **6a. Delivery Mode** **6b. Content (EBP steps-ask, acquire, appraise, apply, assess)** **6c. Duration and Frequency** **6d. Measurement**	**7. Impact on EBP Competencies** **7a. Knowledge** **7b. Attitude** **7c. Skills**	**8. EBP Teaching Barriers/Enablers** **8a. Barriers** **8b. Enablers**	**9. Quality Assessment Rating as per the EPHPP.**
1.Bennett *et al*.. 2011 2. Australia	3. Evaluate the effectiveness of a semester long multi-professional university teaching of EBP principles. 4. Pre-post test study design.	5a. 91 5b. OT's/ PT's 5c. U/G and P/G	6a .Muli-intervention 6b. Didactic lectures, tutorials, workshop format; asking a question, retrieving information, appraisal of evidence. 6c. 2 hours weekly for 13 weeks 6d. Non-validated pre-post questionnaire	7a. Pre-course mean 4.14 (SD 2.37), post-course 7.69 (SD 2.31), mean diff 3.56 (SD 2.81), 95% CI (2.83, 4.29), p<0.001 mean diff 30.71 (SD 4.07), mean diff 14.15 (6.14_, 95% CI 7b. Pre-course mean 19.80 (SD 2.01), post-course mean 2 (SD 1.99), mean diff 0.22 (SD 2.85), 95% CI (-/96, 0.52), p=0.56	8a. NR	9.Weak
1.Berthelsen and Holdge-Hazelton, 2016. 2. Denmark	3. Describe orthopaedic nurses' experiences regarding relevance of an education intervention, personal and contextual barriers to participation in the intervention. 4. Triangulation, convergence mixed-methods model	5a.32 5b. Orthopaedic Nurse 5c. CPD	6a. Multi-intervention 6b. Teaching/lecture based content, research project, group discussion; including barriers and enablers to EBP. 6c. 6 sessions, one weekly x 2 hours. 6d. Non-validated questionnaire	7a NR. 7b. NR 7c. NR	8a.11.1% of responses couldn't see relevance of EBP teaching in daily clinical practice. Main barriers to EBP teaching; 50% responses; absence from work. 38.9% uncomfortable leaving work station for research. 22.2% didn't want to burden colleagues with extra duties.27.8% lack of time for research. Focus group themes emerged as research not being a priority over work duties.	9. Weak

					Personal barriers included; difficulty maintaining work responsibilities and commitments to EBP teaching.	
1. Bookstaver *et al.*, 2011. 2. USA	3. Implement and evaluate impact of an elective EBM course on student performance during advanced pharmacy practice experience. 4. Pre-post test study design.	5a. 38 5b. Pharmacy Students 5c. U/G	6a. Multi-intervention 6b. Group discussions and active-learning methods incorporating multiple clinical faculty members, which enabled the students to maximize application of learned skill sets and evidence-based medicine principles 6c. 2 hour elective class weekly x 1 semester. 6d. Non-validated questionnaire	7a. 83% improvement in core EBP concepts. 7b. NR 7c. 86.9% of responses agreed that stronger skills in applying EBP confidence in using medical literature	8a. NR 8b. NR	9.Weak
1.Bozzolan *et al.*, 2014. 2. Italy	3. Explore perceptions/attitudes to evaluate knowledge, skills and clinical behaviours. 4. Mixed-methods; triangulation convergence model	5a. 73 5b. Physiotherapy students 5c. U/G	6a. Multi-intervention (formal and informal) 6b. Formal lessons, group discussion, online resources and simulations. First years: EBP format (step 1 and 2), second and third year placement; case study/patient file creation- describe treatment intervention, describe literature, how it influences decision making and explain clinical reasoning. 6c. Over a 3 year period 6d. Validated Fresno Test	7a. NR 7b. NR 7c. NR	8a "Difficulties perceived by the students': knowledge, applying EBM to clinical practice (linking theory to practice), time. 2. ''Methodology of EBP process'': perception of the usefulness and importance of EBP was strongly linked to the motivation of the individual. 3. ''Transition from theory to practice in internship'': EBP does not generate visible changes either to their practice in the	9. Weak

					internship (10 citations) Tutor as a barrier (16 citations). 8b. Journal club- satisfactory means of learning/ implementing EBM skills. Increased participant satisfaction post participation in journal club.	
1.Brangan *et al.*, 2014 2. Ireland	3. Evaluate the effectiveness of an EBP training course. 4. Pre-post test study design.	5a. 137 5b. Occupational Therapists 5c. CPD	6a. Multi-modal (individual and small group work) 6b. Didactic lectures, interactive online lessons, case studies related to roots of EBP, PICO method, 5 EBP steps, formulating clinical questions, literature searches. 6c. 7 one day training courses. 6d. EPIC scale	7a. NR 7b. NR 7c. Skills; Critically appraising study methods; Pre course mean rank 90.36 (136), Post course 191.31 (134), Mann whitney U 2973.5 (<0.001). Ability to decide on a course of action: Pre-course mean rank 103.55 (135), post course rank 167.45 (135), Mann U 4799.5 p<0.001.	8a. NR 8b. NR	9. Weak

1. Author **2. Country**	**3. Aim** **4. Study Design**	**5. Population** **5a. Sample Size** **5b. Discipline** **5c. Level (u/g, p/g.CPD)**	**6. EBP Intervention** **6a. Delivery Mode** **6b. Content (EBP steps-ask, acquire, appraise, apply, assess)** **6c. Duration and Frequency** **6d. Measurement**	**7. Impact on EBP Competencies** **7a. Knowledge** **7b. Attitude** **7c. Skills**	**8. EBP Teaching Barriers/Enablers** **8a. Barriers** **8b. Enablers**	**9. Quality Assessment Rating as per the EPHPP.**
1.Campbell *et al.* 2013 2. Australia	3. Measure the effectiveness of a multifaceted knowledge to action transfer intervention including a customised KT-tool on change to EBP behaviour, knowledge and attitude. 4. RCT	5a. 135 5b. Multi-discipline 5c. CPD	6a. Multi-modal 6b. KT group: 3 day skills training workshop and multifaceted workplace supports to reduce barriers (paid EBP time, mentoring system). Intervention included clinical case studies, evidence level training, clinical decision making. Presentation of case study, small group discussion. CG: communication skills with no EBP content. 3 day workshop about allied health professional/client communication 6c. 8 week intervention 6d. Self-rated/peer rated EBP behaviour. Goal attainment scale (GAS)	7a. KT Gr: T1 mean 7.51 (SD 3.05), @ 8 weeks mean 10.69 (SD 2.23), CG T1 mean 8.09 (SD 3.52), T2 mean 8.02 (3.73), p<0.001 7b. Behaviour: self-rated GAS scores increased more in KT GR compared to CG but no significantly. Peer-rated GAS also increased in KT G, p=0.57 Attitude: self-rated KT GR @ T1 mean 2.67 (SD 0.75), @ T2 2.63 (SD 0.74), CG, T1 (mean) 2.57 (SD 0.70), @ T2 (mean) 2.77 (SD 0.61), p=0.08.	8a. NR 8b. NR	9.Moderate
1.Chang *et al.*, .2013. 2. Taiwan	3.Evalutaion of a critical appraisal education program to increase nurse's knowledge and critical appraisal skills. 4. Pre-post test study design.	5a. 49 5b. Nurses 5c. CPD	6a. Multi-modal- lecture and group discussion. 6b. Lecture by tutor on topic choice. Pre-approved articles for appraisal were sent to participants. In each session, participants individually appraised articles, and then worked in groups, results shared with all groups. Tutor led consensus on appraisal techniques. 6c. 3 sessions, 2.5 hours each. 6d. Evidence based nursing questionnaire on critical appraisal.	7a. Knowledge (of critical appraisal), score Pre-course:14 (SD 2.0) Post-course; 15.8 (SD 1.4) 7b. NR 7c. Skills (confidence in EBP) improved self-reported confidence in appraising systematic reviews (M= 33.9, SD 6.6), clinical practice guidelines (M=27.1, SD 4.8).	8a. Nurses who were recommended to take the EBP course showed greater improvement than those who took it out of interest. 8b. NR	9. Weak

1. Author **2. Country**	**3. Aim** **4. Study Design**	**5. Population** **5a. Sample Size** **5b. Discipline** **5c. Level (u/g, p/g.CPD)**	**6. EBP Intervention** **6a. Delivery Mode** **6b. Content (EBP steps-ask, acquire, appraise, apply, assess)** **6c. Duration and Frequency** **6d. Measurement**	**7. Impact on EBP Competencies** **7a. Knowledge** **7b. Attitude** **7c. Skills**	**8. EBP Teaching Barriers/Enablers** **8a. Barriers** **8b. Enablers**	**9. Quality Assessment Rating as per the EPHPP.**
1.Cimoli, 2012 2. Australia	3. Evaluate whether participation in an EBP professional development workshop is an effective strategy to enhance knowledge, attitude and behaviour associated with EBP in a rehabilitation setting. 4. Pre-post test study design. (survey method)	5a. 17 5b. Physiotherapists 5c. CPD	6a. Workshop based intervention 6b. Clinical question formulation, evidence search and sources, search strategies for EBP, critical appraisal and application of EBP into clinical practice. 6c. 3 hour workshop, didactic presentation (90 mins), group discussion (45 mins), practical skills exercises (45 mins) 6a. Un-validated survey	7aand.b Self rated EBP knowledge; change from 6 to 12% as "excellent", 41% to 65% as "good". 7b. "EBP improves patient care": change from 53% to 76% as "strongly agree".	8a. Insufficient time to use EBP in clinical practice as a barrier to use of EBP. 77% pre-course to 94% post course. 8b. NR	9.Weak
1.Chang *et al.*, 2012 2. Taiwan	3. Compare the effects of 2 clinically integrated educational strategies on final year medical students. 4. RCT	5a. 94 (47 per group). 5b. Medical Students (final year) 5c. UG	6a. Multi-modal (case-conferences, web resources) 6b. Formulating PICO questions, steps of appraising evidence 6c. Gp 1: Week 1 hour EBP, x 2 weeks. Gr 2: 1 hr didactic lecture x 2 weeks 6d. Validated Questionnaire	7a. EBP-K Follow-up score (confidence interval) Gp 1: 21.2 ± 3.5 (14.3~28.1) % change 57.8 ± 72.9%, Gp2 19.0 ± 4.6, (10.0~28.0) % change 29.1 ± 39.1% p=0.009. 7b. NR 7c. Follow-up score (confidence interval) Gp 1: 25.6 ± 3.8 (18.2~33.0), % change 6.2 ± 14.9%. Gp 2 25.7 ± 3.9 (18.1~33.3) %change 6.2 ± 11.6%, p=0.89.	8a. NR 8b. NR	9.Weak

1. Crabtree *et al.*, 2012. 2. USA	3. Report students' knowledge and skills gained from an entry-level MSc in OT course in EBP. 4. Pre-post test study design.	5a. 30 5b. OT 5c. UG	6a. Lecture based, small group work 6b. Lectures from Law's evidence based rehab, classroom discussions, groups of 4 completed critical appraisal of a paper and groups of two completed a CAT. 6c. 45 hours of lectures over 16 weeks. 6d. Adapted Fresno Test	7a. Knowledge: pre-post-test intervention T= -7.98, p< 0.001. Statistically significant increases in Q2, 3, 4, 7. No change in 1 and6. Post-test to follow up; mean scores @ follow-up declined significantly from post test scores.	8a. Barriers to successful implementation of EBP highlighted included; -lack of organisational support. -difficulty using e-database. -lack of resources to find articles. -lack of practicality of applying EBP from study intervention into clinical practice.	9. Moderate
1.Crist 2010 2. USA	3. Investigate the effectiveness of an instructional approach that engaged the scholarship of practice and the function of a practice- scholar. 4.Reterospective study	5a. 39 students, 14 practitioners 5b. Occupational therapists 5c. PG	6a. Muti-modal 6b. Introduction to research and the concept of "practice-scholar". Students selected a project and were assigned a scholar and an experimental study to undertake. Final presentations of EBP self-selected task, simulated a meeting with the board of the facility to overview the outcome study proposal and answer questions, with the aim of convincing others regarding the quality and need for the outcomes study during a time limited session. 6c. One semester. Every 3 weeks teams met for 1.5 h ours to accomplish team activities 6d. Two surveys; Practice Scholar self- efficacy survey (PSS) and an outcome survey	7a. Enhanced knowledge in doing Practice Based Research (Mean and SD): 5.6±0.9206 7b. Increased appreciation of practice based scholarship: (Mean and SD) 5.7143 ±1.0556 7c. Increased ability to implement PBR (Mean and SD) 5.57±0.5974	8a. NR 8b. NR	9. Weak

1.Cyrus *et al.*, 2013 2. USA	3. Assess the impact of the FACCT course on students understanding. 4. Retrospective-one group pre-post test study design.	5a. 298 5b. Medical Students 5c. UG	6a. Library based session 6b. Literature search and statistics. Critical appraisal of preselected articles to emphasize research design. 6c. 8 times each year, 4 times per semester 6d. Questionnaire	7a, b, c: Overall difference pre-post p=0.001. Number of students to score a maximum 13 increased from 10% to 17.7%. Number of students to score < 5 , reduced from 31.0% to 26.9%.	8a. NR 8b. NR	9. Weak
1. Author 2. Country	3. Aim 4. Study Design	5. Population 5a. Sample Size 5b. Discipline 5c. Level (u/g, p/g.CPD)	6. EBP Intervention 6a. Delivery Mode 6b. Content (EBP steps-ask, acquire, appraise, apply, assess) 6c. Duration and Frequency 6d. Measurement	7. Impact on EBP Competencies 7a. Knowledge 7b. Attitude 7c. Skills	8. EBP Teaching Barriers/Enablers 8a. Barriers 8b. Enablers	9. Quality Assessment Rating as per the EPHPP.
1.Davis *et al.*, 2007 2. UK	3. Assessing in UG medical education the educational effectiveness of a short computer based session compared to standard EBM teaching. 4. RCT	5a. NR 5b. Medical Students 5c. UG	6a. Multi-modal (computer based/lectures) 6b. EBM teaching on question framing, literature searching, critical appraisal of systematic review and meta-analyse, application of findings from systematic reviews to problem based learning approach. 6c. 40 minute sessions 6d. KAB questionnaire	7a. change in CB gr (Mean and SD) 0.8±3.2, DD gr 1.3±2.4, diff between group -0.5 (95% CI -1.3, 0.01), p=0.24 7b. Change in attitude in importance of study design selection: non-significant change in attitude p=0.078 7c.	8a. Dropout rate higher in the computer based group as there was no supervision. 8b. NR	9. Moderate
1.Evans *et al.*, 2014 2.Canada	3.Explore how a community of practice promoted the creation and sharing of new knowledge in EB manual therapy using Wengers constructs manual. 4. Qualitative longitudinal study	5a. 19 5b. Physiotherapists 5c. CPD	6a. Online EBM delivery method. 6b. Critical appraisal, integration of research evidence of MT into teaching practices. PT's introduced to new topics, guided discussions amongst peers, assignments to promote collaboration and collective knowledge, facilitated by experienced MT physios. 6c. 10 week duration 6d. Thematic analysis of qualitative responses.	7a. NR 7b. Qualitative Themes; 1.Mutual engagement: supportive learning environment. 2. Joint expertise to build knowledge 3. shared repertoire/collaborative learning. 4. Application to practice.	8a. NR 8b. NR	9. Weak

			Assignment: develop a research question, perform online literature search, critically appraise literature and write a review articles suitable for publication.			
1.Evanson, 2013. 2. USA	3. Explore students' perceptions of their confidence to use research evidence to compile a client case analysis assignment in preparation for participation in fieldwork and future practice. 4. Quasi-experimental pre-test post-test design.	5a. 42 5b. Occupational Therapist 5c. PG	6a. Multi-modal (group work/fieldwork/web-based support) 6b. Students participated in a fieldwork seminar course. Problem based EBP case analysis assignments were given. Lectures on content resources, accessing and using web environments, writing clinical questions, literature search strategies, critical appraisal skills. Presentation of an EBP assignment followed by group discussion. 6c. 1 academic semester 6d. Questionnaire	7a. Statistically significant improvement in pre-post survey scores $p<0.05$. 7b. NR 7c. Significant increase in verbal and written communication of descriptive, assessment and intervention evidence, the use of assessment evidence and confidence in using same.	8a. EBP is time consuming. Finding relevant research for a client case is difficult. Difficulty in finding evidence specific to the client. Challenges in integrating learning across the curriculum	9. Weak
1.Feldstein *et al.*, 2010. 2. USA	3. Determine if an EBM workshop improved internal medicine residents EBM knowledge and skills. 4. RCT	5a.48 5b. Medical Residents 5c. UG	6a. Workshop based 6b. Addressed 4 steps in the EBM process a) developing a question, b) literature search c) evaluating evidence d) applying evidence to a patient case. 6c. 4 hours of contact time. 6d. EBM test covering 7 EBM focus areas. EBM journal club, each resident met an advisor to develop a question and presented to the group	7a. Workshop Gr (Mean andSD) PSG 1 13.65 ± 3.88, PSG 2 15.52 ±3.95, p change 1.87 Control Gr (mean and SD), PSG 1 15.28 3.22, PSG 2 16.16±3.20, p 0.88. Difference in change in mean test scores from PGY 1 to PGY 2 between the workshop group (mean score increase of 1.87) and control group (mean score test increase was 0.88), 0.99 (95% CI -0.62, 2.60), p=0.221 7b. NR	8a. NR 8b. NR	9. Moderate

				7c. Self-efficacy: better understanding of how to ask a question (Mean and SD) 4.5 ± 0.5.		
1.Fernandez *et al.*,.2014. 2. Australia	3. Compare 4 teaching methods on the EBP knowledge and skills of postgrad nurse students, 4. Prospective quantitative study design	5a. 187 5b. Nurses. 5c. UG	6a. Multi-modal 6b. Standard distance model: received only common resources, available on internet, self-directed. Computer Lab Teaching Method (CLTM):. Each student developed a clinical question, searched health databases and appraised evidence. c. 3 x 2 hr practice workshops d. Assignment based	7a. NR 7b. 7c. Development of a clinical question: EBP DvD gr 8.13± =0.8 compared to distance learning 7.03±1.2. Didactic teaching methods 5.9±1.4, computer lab teaching 7.3±1.9, p=0.001; difference between distance learning and EBP-DVD teaching method. Identifying level of evidence EBP-DVD higher 4.6±0.7 compared to distance learning 2.7±1., computer based 3.6±1.1, didactic classroom 3.0±0.8, p<0.003. Results significantly higher among students receiving EBP-DVD teaching methods. Literature appraisal skills; EBP-DVD 32.6±3.4, compared to distance learning	8a. NR 8b. NR	9. Moderate

				24.6±4.7, computer based learning 24.8±4.3, P<0.001.		
1.Gagnon *et al.*, 2015 2. Spain/Canada	3. Evaluate online self-directed learning modules on critical appraisal skills to promote use of research in clinical practice. 4. Two group, preand post	5a. 100 5b. Nursing Staff 5c. CPD	6a. Online self- directed learning modules 6b. Information acquisition skills to efficiently select medical information. Critical appraisal of systematic reviews, meta-analysis, experimental and qualitative study designs. 6c. 6 modules completed within 5 months (Canada), 4 modules completed within 3 months.	7a. Significant increases in knowledge in pre-post course scores p<0.001, for modules 1-3, but not 4-6. 7b. Self-direct learning readiness (SDLRSNE), pre-course mean score 157.92, post-course score 163.06, p<0.001.	8a. NR 8b. NR	9. Moderate
1.Gagliardi *et al.*, 2012 2. USA	3. Evaluate the effect of an innovative online EBM tool on knowledge and skill/ 4. Pre-post test study design.	5a. 30 5b. Medical Students 5c. UG	6a. Interactive EBM course 6b. Intro EBM session, subsequent retrieval, appraisal and application of studies of therapy, diagnosis, harm and systematic reviews. PICO question development, evidence research and retrieval, appraisal and application. Clinical integration of EBM. 6c. 6 x 120 mins sessions, weekly. 6d. Berlin Questionnaire.	7a. Form A median score 53%, Form B median score 80%. 5 students performed worse in the post test, 3 student scores didn't change, 21 demonstrated improvement. Median difference was 13and, p<0.001. 7b. NR 7c. 5 months post- test, 16 students returned follow up survey (confidence in formulating a question p=0.002).	8a. NR 8b. NR	9. Moderate

1. Author **2. Country**	**3. Aim** **4. Study Design**	**5. Population** **5a. Sample Size** **5b. Discipline** **5c. Level (u/g, p/g.CPD)**	**6. EBP Intervention** **6a. Delivery Mode** **6b. Content (EBP steps-ask, acquire, appraise, apply, assess)** **6c. Duration and Frequency** **6d. Measurement**	**7. Impact on EBP Competencies** **7a. Knowledge** **7b. Attitude** **7c. Skills**	**8. EBP Teaching Barriers/Enablers** **8a. Barriers** **8b. Enablers**	**9. Quality Assessment Rating as per the EPHPP.**
1.Geum Oh *et al.*, 2010. 2.Korea	3. Examine the effects of integrating EBP into clinical practicum on EBP efficacy and barriers to research utilization. 4. One group pre-test, post-test study design.	5a. 81 (74 returned surveys) 5b. Nurses 5c. CPD	6a. Multi-modal 6b. Lectures, individual mentoring on EBP practicum, small group, and wrap-up conferences were provided. 6c. 6 full days of clinical practicum in one semester. 6d. EBP efficiency questionnaire and a measure of perceived barriers to research utilization.	7a.NR 7b. Participants reported being "a little confident", mean 2.30 (range 2.09-2.54) for EBP efficacy, post-test 3.05 (range 2.82-3.31), $p<0.005$. 7c. Formulation of EBP question (Mean and SD) pre-test 2.09 (0.4), post-test 3.06 (0.53), mean diff -.97, $p<0.001$.	8a. Barriers to research utilization, mean 2.02 (SD 0.39), reduced to 1.67 (SD 0.37), $p<0.005$.	9. Weak
1.Grillo *et al.*, 2015 2. USA	3. Assess the effectiveness of teaching modules designed to enhance the use of critical thinking (CT), EBP, and professional writing (PW) skills by graduate students in communication sciences and disorders. 4. Longitudinal pre and post test design	5a. 24 5b. SALT 5c. PG (graduate program)	6a. Single session teaching modules 6b. Participant's received sessions on CT, EBP, and PW, including introductions of same, descriptions. EPB module included its application to clinical practice. PW included an introduction to APA style of writing and discipline specific writing styles. 6c. 2hr 45 min teaching sessions, over the Fall semester of a two year programme. 6d. Assessment was analysis of 4 written responses to clinical based scenarios.	7a. Significant increase in EBP $F(2.57, 48.79)= 13.44$, $p<0.00$ and PW $F(2.78, 52.72) =7.04$, $p=0.01$. CT not significant $F(2.14, 40.62) =1.41$, $p=0.257$. Findings suggest teaching of EBP was effective but not CT or PW	8a. NR 8b. NR	9.. Weak

1.Hadley *et al.*, 2010 2. UK	3. To evaluate the educational effectiveness of a clinically integrated e-learning course for teaching basic evidence-based medicine (EBM) among postgraduate medical trainees compared to a traditional lecture-based course of equivalent content. 4. RCT	5a.237 5b. Medical students 5c. PG	6a. Clinically integrated e- learning EBM course or a standalone lecture based course. 6b. The teaching sessions (standalone and e-learning) were divided into three separate modules. The module contents covered the topics: asking and formulating clinical questions, searching for research evidence and critical appraisal of systematic reviews and their constituent studies. 6c. 1x 3 hr lectures (standalone group). The e-learning group were granted unlimited for 6 weeks to the e-learning materials via a project specific website. 6d. Un-validated questionnaire.	7a. Similar improvements in both methods, Module 1: Framing questions control group pre- course 8.9 (1.8) control group post course 10.5 (1.8) e-learning pre-course 8.4 (3.9) e learning post course 9.7 (4.3) 95% CI −0.3 (−1.1;0.4) 0.42 Module 2: Searching literature control pre-course 4.2 (1.4), control post-course 6.0 (1.5), e-learning pre-course 4.7 (1.6) e-learning post-course 6.1 (1.9), 95% CI −0.2 (−0.3;0.0) 0.03 Module 3: Critical appraisal; control pre-course 11.7 (2.4), control post-course 11.7 (3.8), e-learning pre-course 9.9 (4.2, e-learning post course 11.1 (4.6) 0.6, 95% CI (−0.4;1.7) 0.24 Overall: control pre-course 24.7 (3.9), control post- course 28.2 (6.0) e-learning pre-course 22.9 (7.0), e-learning post course 27.0 (7.5), 95% CI 0.1 (−1.2;1.4) 0.89	8a. NR 8b. NR	9. Weak

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1. Harewood and Hendrick, 2010. 2. Ireland	3. Evaluation of the impact of a 6-h EBM Workshop on the critical appraisal skills of medical trainees. 4. Prospective Controlled	5a.19 5b. Medical students 5c. UG	6a. Workshops 6b. Didactic lectures in statistics, clinical trial design, evidence appraisal and practical examples delivered. 6c. 3 x 2hr workshops, over 3 weeks. 6d. Appraisal skills were assessed pre- and post-training based on grading the quality of randomised control studies (level 1 evidence), cohort studies (level 2 evidence) and case–control studies (level 3 evidence)	7a. NR 7b. NR 7c. Grading improved from 39% (pre-course) to 74% (post-course), P = 0.002, with grading of levels 1, 2 and 3 studies improving from 42 to 75%, 53 to 61% and 21 to 84%, respectively.	8a. NR 8b. NR	9. Weak
1.Hart *et al.*, 2008 2. USA	3. Examine the effectiveness of a computer-based educational program on nurses' perceptions of knowledge, attitude, and skill level related to EBP and research utilisation 4. One group pre-post test study design. quasi-experimental design.	5a. 744 (pre-course surveys, 314 post-course surveys) 5b. Nurses 5c. CPD	6a. Computer based modules 6b. Module I; defining EBP, literature searches and literature reviews. Module II included defining and comparing varying types of research, Module III; application of EBP into clinical practice, with clinical examples. 6c. 3 modules to be completed between May and November 2006. 6d. Evidence Based Nursing Questionnaire	7a. Knowledge (mean and SD) pre-intervention 3.43 (±0.74), post-intervention 3.52 (±0.78), p=0.022. 7b. Attitude (mean and SD), 3.83 (±0.46), post-intervention 3.95 (±0.48), p=0.000. 7c. Skills (mean and SD), pre-intervention 3.30(±0.67), post-intervention 3.43 (±0.63), p=0.00	8a. NR 8b. NR	9.Weak

1. Hatmi *et al.*, 2010 2. Iran	3. Compare effect of small EBP discussion groups with traditional conference methods 4.RCT	5a. 170 5b. Medical faculty staff 5c. CPD	6a. MI: Conference and small group activities 6b. EBP steps: information mastery, critical appraisal of evidence, designing focused questions, patients' values. 6c. 12 x 2 day courses x 6 hrs each 6d. Fresno / Standardised inventories of EBM knowledge, attitude, competency.	7a. IG: 17.84±12.85, CG 10.35±1.80, p=0.001 7b. IG: 18.62±7.80, CG;6.10±0.73, p=0.001 7c. IG: 40.29±25.92, CG: 12.50±1.67, p=0.001	8a. NR 8b. NR	9. Moderate
1. Heiwe *et al.*,.2013. 2. Sweden	3. Evaluate the outcome of an educational intervention on healthcare professionals' perceived skills in finding, reviewing, and using research evidence in clinical practice. 4. One group pre-test, post-test design.	5a.274 (264 pre-test questionnaire, 194 post-test). 5b. Nurses, medical social workers, physiotherapists, occupational therapists, and dieticians. 5c. CPD	6a. Multi-modal (lecture and small group discussion) 6b. Basic knowledge of EBP, concepts of the EBP process, i.e. creating a clinical question, conducting relevant literature searches, appraisal and interpretation of evidence, implementing EBP into clinical practice 6c. 3 day course 6d .EBP questionnaire	7a. Main effect of EBP intervention; overall odds ratio of 3.6, p=0.005, 95% CI (1.75, 7.48). 7c. Change in capacity to review evidence; overall odds ratio 2.18, p-0.0005, 95% CI (1.4`, 3.39). Implementation of EBP into practice, not significant, overall odds ratio 1.30, p=.18, 95% CI (0.89, 1.89).	8a. NR 8b. NR	9.Weak.

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1.Hugenholtz *et al.*, 2008. 2. The Netherlands	3. Evaluation of combined EBM and case method learning sessions (CMLSs) designed to enhance the professional performance, self-efficacy and job satisfaction of occupational therapists. 4. RCT	5a. 108 5b. Occupational Therapists. 5c. CPD	6a. Multi-modal (lecture and group work) 6b. The basics of EBM: an introduction to EBM, instructions on searching for literature using PubMed, and techniques for critical appraisal of the literature. A member of each peer group volunteered to be the chairperson and received training in chairing case method learning sessions (CMLSs). 6c. 4 month long duration. EBM course was over 3 half days in a 2 week period. Biweekly CMLS group sessions which lasted 1- 1.5 hours. 6d. Attendance at CMLS sessions. Questionnaire to measure professional performance, self-efficacy, job satisfaction and perceived utility of CMLS.	7a. NR 7b. Professional Performance: (Mean and 95% CI) Int Gr @ T0 20.53, +(19.67-21.39), T2 22.97 (22.32-23.61). CG 21.17 (20.36-21.95), T2 20.37 (19.39-21.35). Self-efficacy (Mean and 95% CI) T0 3.01 (3.77-4.04), T2 4.04 (3.90-4.18), CG 3.99 (3.87-4.11), 3.97 (3.85-4.08). 7c. NR	8a. NR 8b. NR	9.. Moderate
1.Ilic *et al.*, .2013 2. Australia	3. The objective of this study was to identify whether a blended-learning approach to teaching EBM is more effective a didactic-based approach at increasing medical student competency in EBM.	5a. 61 5b. Medical Students 5c. UG	6a. Multi-modal 6b. BL (blending learning): workshop on EBP concepts plus group discussion on patient based EBM scenarios using peer-to-peer learning, quasi journal-club delivery method. Didactic (DL G) learning group- intro to EBM, literature searches, critical appraisal 6c.BL group; 10 hours of tutorial time, DG 10 x 2 hr lectures. 6d. Berlin Questionnaire	7a. Mean Score and 95% CI 6.08 (5.18-6.98), DD Gr 6.77 (5.51-8.04), p=0.29 7b and 7c. Increased confidence in identifying PICO question, appraising evidence and applying same to clinical context (p values =0.01-0.04). Qualitative feedback from focus groups	8a. NR 8b. NR	9.Moderate

	4. Mixed methods (controlled study and focus groups)			identified that students in the EBM BL group had varying views on satisfaction of its approach, dependant on the students' style of learning. Students demonstrated a preference for "block style learning" of EBM. Students preferred the facilitator role of tutors as opposed to a teaching role.		
1.Ilic *et al.* 2012b) 2. Australia	3. Compared the effectiveness of a BL v DL approach of teaching EBM to medical students with respect to competency, self-efficacy, attitudes and behaviour toward EBM. 4, RCT	5a. 147 5b. Medical Students 5c. UG/Graduate	6a. Multi-modal 6b. BL: same theoretical concepts taught in the control group. The BL approach to teaching EBM integrated (i) classroom activities (lecture/tutorial) with (ii) online and (iii) mobile learning. The online component was provided through specific resources delivered via the Monash library website, as well as specifically designed online lectures, made available through YouTube, Mobile learning component delivered on the wards, students were interacting with patients during their existing day-to-day 'bedside teaching' schedule. Detailed history applied to weekly EBM content. Subsequent presentation of case study @ tutorial. DL group formal lectures on EBM concepts, presentation followed by group discussion/activity. 6c. DL group 10 x2 hour lectures, BL 6d. Berlin Questionnaire and ACE tool.	7a. No significant difference in EBM competency between students within those sites regarding method of EBM delivery (Berlin Questionnaire p=0.58; ACE tool p=0.26). 7b. Perceived self-efficacy, attitudes and behaviour toward EBM was significantly higher in students who received the BL approach. Students who received the BL approach had significantly higher scores in 5 out of 6 behaviour domains, 3 out of 4 attitude domains and 10 out of 14 self-efficacy domains. Students who received the BL approach also reported significantly higher scores relating to the implementation of the 5	8a. The most common barrier reported in implementing the BL approach was the method of implementation by tutors across the 14 teaching hospitals involved in this study. 8b. NR	9. Weak

				steps relating to EBM (p=<0.05).		
1.Ilic *et al.*, 2012a) 2. Australia	3. Identify the effectiveness of delivering a single workshop in EBM literature searching skills to medical students entering their first clinical years of study. 4. RCT	5a. 121 5b. Medical Students 4. UG	6a. Workshop 6b. Formal presentation; (i) how to construct an answerable question from the clinical environment, (ii) major sources of medical information, and (iii) how to effectively and efficiently search the medical literature to identify the best available evidence to answer the question. The studies, syntheses, synopses, summaries, and systems (5S) model was used to compare and contrast the content and structure of the medical information sources. Students completed an interactive, computer-based searching session and concluded the workshop by completing self-directed learning tasks (with the subject librarian providing support when requested). 6c. 2 hour workshop 6d. Fresno Test	7a. NR 7b. Confidence in formulating a PICO question, 45.5% "excellent", Performing a literature search 25.7% "excellent". 7c. Research skills (Mean/ SD) IG; 4.72 (0.94), CG: 4.45 (1.14), mean diff 0.269, p=0.21 Ability to identify gap in professional practice; IG 5.10, (0.98), CG 4.69 (1.12), mean diff 0.461, p=0.03.	8a. NR 8b. NR	9. Strong

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1.Jalali-Nia *et al.*, 2011. 2. Iran	3. Investigating the impact of evidence-based education on the knowledge and attitude of nursing students. 4.Quasi-experimental post-test design.	5a. 41 5b. Nurses 5c. UG	6a. Multi-modal 6b. 4 phases: Phase 1, pre-semester, tutor training. Phase 2; EBP approach to education. Phase 3: Academic term; two medical-surgical courses (musculoskeletal and gastrointestinal systems) were taught concurrently for 12 weeks. IG and CG taught through an evidence-based and traditional approach (lectures, questions and answers). EB approach, learning activities included developing a clinical question using the PICO format, searching for evidence, reading and critiquing nursing research, discussing articles, synthesizing the evidence, and developing a summary of findings. Clinical question given to students at each session. Groups formed and met weekly for 2 h with a tutor and the main researcher to review assignments and guidance, For the following session, each student group prepared a paper summarizing the search process, a specific evaluation of each study and its application to practice and presented same. Phase 4; evaluation of the final course grade based on the post-meeting assignments (30%), oral presentation (10%), tutorial performance (20%) and final examination (40%). Evaluation of tutorial performance	7a. (Mean and SD by course) Musculoskeletal; IG: 21.70 (3.1), CG 21.66 (3.9), p>0.05. Gastro: IG 24.75 (4.2), CG 26.94 (5.0), p> 0.05. Intervention group pre-post intervention knowledge score change p=0.001. 7b. Attitude to EBP, rates as positive by 90.5% of the IG and 9.5% by CG. 7c. NR	8a. NR 8b. NR	9. Moderate

			was based on the student's preparation for class, ability to seek clarification about methodological issues and group participation skills. 6c. Phase 1: Two 3 day and 2 day workshops, 14 days apart. Phase 3: 12 week intervention. 6d. Five Questionnaires.			
1.Johnston *et al.*, 2009 2. China	3. Investigate the effectiveness and learning satisfaction with two different EBM teaching methods (usual teaching vs. problem based learning (PBL)) for undergraduate medical students. 4. RCT	5a. 129 5b. Medical students 5c. UG	6a. Multi-modal 6b. PICO question formulated from watching patient case study video. PBL group- a paper case format, small groups met with tutor and conducted online literature search. Usual teaching arm undertook similar session, both groups undertook critical appraisal of selected research paper. 6c. 2 x 2 hour sessions 6d. Knowledge, Attitude and Behaviour Questionnaire (KAB)	7a. 2nd half associated with improvements in scores for "EBM knowledge". UC (mean diff and 95% CI) 0.63 (0.19, 1.07). 7b. NR 7c. UT associated with significant improvement in scores for 'attitudes towards EBM' compared with PBL (Mean and 95% CI) 0.51, 0.19 to 0.83. 2nd half of assessment the improvement in 'attitudes towards EBM' was not significant, the response remained strong.	Focus group themes identified "learning skills and concepts", "group process as a learning aid", "role of the tutor". 8a. Students found the EBM PBL sessions difficult as they lacked the statistical knowledge necessary to support discussion, failed to understand the core concepts. -Although the PBL environment enhanced communications between members of the group, students used what was taught in lectures to direct their problem solving. -EBM PBL defaulted to the tutor for in depth explanation and support more than in 'usual teaching', and were also more tutor dependent. 8b. NR	9. Moderate

1.Jones *et al.*, 2011 2. Australia	3, Delivery and evaluation of the effect of quality driven health subject to improve critical thinking and appraisal. 4. Pre-post test study design.	5a.NR 5b. Nurses 5c. UG and CPD	6a. Online and face -to face subject delivery. 6b. Subject content developed through pre- intervention survey of students and supervisors, learning needs identified from same and through a literature research. Content included skills on how to undertake a critical literature search and appraisal of experiment studies to systematic reviews. 6c. 4 x .5 day blocks split over two weeks (Aus), 7 seminars over 5 days (Hong Kong) 6d. Unvalidated questionnaire	7a. NR 7b. NR 7c. Purpose of critical appraisal: Wollongong (mean and SD) pre 2.6 (0.5), post 3.3 (0.6), Hong Kong pre 2.2 (0.5), 3.1 (0.4). Evaluating qualitative research: Wollongong pre 2.4 (.5) post 3.3 Hong Kong pre (.6) 2.1(.3), post 3.0 (.3). Evaluating statistics; Wollongong pre 1.2 (.5) post 2.3 (.6) Hong Kong pre 1.8 (.6), post 2.8 (.5)	8a. NR 8b. NR	9. Weak
1.Karimian *et al.*, 2013 2. Iran	3. 4. Quasi-experimental, pre-post intervention	5a. 110 5b. Medical Residents 5c. CPD	6a. Workshop 6b. Active learning, raising advanced clinical questions, searching data sources, assessing the retrieved articles, selecting options, final decision making and ultimately assessing of performance. 6c. 30 hours of educational program over 5 days. 6d. Validated questionnaire	7a. NR 7b. EBM workshop significantly affected decision making approaches $p< 0.001$. 7c. Pre-work shop decision making based on principles, reference based evidence, and routine-models, post-workshop, EBM decision making processes significantly increased. Critical appraisal article and evidence: Pre-workshop “usually” 4(6.7), “sometimes” 14(23.3), post-workshop	8a. NR 8b. NR	9. Moderate

				"usually", 9(14.5), "sometimes". 45(72.6)		
1.Khabbazi *et al.*, 2013. 2. Iran	3. The aim of this study was to compare the traditional and evidence based medicine (EBM) type of journal clubs (JC). 4.Qusi-experimental	5a. 40 5b. Medical Interns/ Residents 5c. CPD	6a. Journal club 6b. 3 journal clubs, two papers presented in each session. The first with traditional method and the second with EBM methods. In EBM presentation, participants were divided into small groups with 2-3 members. Each group studied one part of the paper and then critical appraisal was done on different parts of paper. 6c. Journal club held over 3 month period. 6d. 10 Multiple choice questions at the end of each paper.	7a. Knowledge: Traditional method Topic and purpose 0.98±0.16, EBM methods 0.98 ±0.16, p< 0.1. Methods and Materials; Traditional 0.66±0.19, EBM 0.658± 0.20, p< 0.847, Results; Traditional 0.31±0.42, EBM 0.57±0.26, P<0.006	8a. NR 8b. NR	9. Weak

1.Khader *et al.*, 2011. 2. Jordan	3, Evaluate the effect of integration of EBM training seminars into the curriculum of the community medicine course in changing the knowledge and attitudes of 4th year medical students towards EBM. 4. Quasi-experiemental	5a. 256 5b. Medical Students 5c. UG	6a. Multi-modal 6b. Part 1; simulated case studies presented to students. Part 2; Field practice of community medicine. Day 1; basics of EBM, 5 steps of EBM practice, formulation of PICO question, 5 steps to the practice of EBM, the formulation of clinical questions on the basis of standardized case scenario, and identification and review of the search strategies of EBM and resources. Day 2; critical evaluation skills wit a focus on treatment, diagnosis and meta-analysis. Day 3; practice session where students critically appraised topics based on typical patient care problems encountered during the clerkship to consolidate and demonstrate the learned skills 6c. 5 days a week for 8 weeks. 6d. Likert- scale questionnaire.	7a. Post course 91.8% of aware of the presence of guidelines and protocols for diseases compared with 59.0% who were aware of that before ($p < 0.005$). Post- course, a higher proportion of students became aware of Medline, Cochrane and other Bibliographic databases (87.1% vs. 34.4%, $p< 0.005$). The proportion of students who were able to correctly identify that the evidence from meta-analysis is the strongest increased from 16.4% to 72.2% ($p < 0.005$). 7b. 90.6% of students before and 91.6% after welcomed the promotion of EBM. Before the course 90.2% of students agreed that research findings are helpful in daily management and 94.1% after ($p>0.05$).	8a. NR 8b. NR	9.Weak

1.Kim *et al.*, 2008 2. USA	3. To investigate the impact of an EBM curriculum on residents' use of evidence-based resources in a simulated clinical experience. 4. RCT	5a. 50 5b. Medical Residents 5c. PG	6a. Multi-modal 6b. Session 1 and 2; PICO question formation, introduction to evidence based e-literature searching. Remaining sessions focused on topics of therapy, prevention, diagnosis, and prognosis using real patient encounter case studies. Case study findings presented and appraised. Control group received some EBM education using journal clubs with no explicit curriculum. 6c. 6 x 2 hour workshops 6d. Fresno Test	7a. EBM knowledge increased significantly more in EBM group (mean score increase 22 vs. 12, p=0.012). 7b. NR 7c. In the simulated clinical experience, the most commonly accessed resources were Ovid (71% of residents accessed) and InfoPOEMs (62%) for the EBM group and UptoDate (67%) and MDConsult (58%) for the control group. Residents in the EBM group were more likely to use evidence-based resources than the control group.	8a. NR 8b. NR	9. Moderate
1.Kim *et al.*, 2009 2. USA	3. Evaluate the effectiveness of the (EBP)-focused interactive teaching (E-FIT) strategy. 4. A quasi-experimental, controlled, pre- and post-test study	5a. 208 5b. Nursing students 5c. UG	6a. Multi-modal 6b. Introduction lecture on EBP principles, why EBP matters, EBP steps and supporting resources. Small student groups identified a nursing practice problem, planned an EBP implementation strategy and disseminated findings using a clinical site presentation. 6c. 2 hour lecture, smaller group work 6d. KAB questionnaire	7a. Post -test EBP knowledge (range 1-6): Exp Gr (mean and SEM): 5.68 (0.05), CG 5.43 (0.06), mean diff 0.25, p=0.001. 7b. EBP Attitude (range 1-6), Exp Gr (mean and SEM): 4.78 (0.11), CG 4.90 (0.09), mean diff= -0.12, p=0.398 Use of EBP (range 1-5) Exp G (mean and SEM) 2.62 (0.09), CG 2.36 (0.06), mean diff=0.26, p=0.015.	8a. NR 8b. NR	9. Moderate

1.Kortekaas *et al.*, 2016 2.Netherlands	3. Investigating if integrated training in evidence based medicine (EBM) in the general practice (GP) specialty training improvesEBM behaviour in daily clinical practice? 4. RCT	5a.79 5b. GP trainees 5c. PG	6a. Multi-modal integrated EBM training. 6b. 5 steps of EBM as described in Sicily statement with focus on clinical relevance. Standalone program differed for last 2 steps of EBM. 6c. 4 days clinic practice, 1 day institute, weekly. 6d. EBM behaviour including guideline adherence and information seeking behaviour. McColl Questionnaire (attitude and knowledge)	7a. NR 7b. Guideline Adherence (95% CI) Baseline: IG 0.47 (0.42 to 0.53), CG 0.68 (0.62 to 0.74) T1 (end of 3rd year) IG 0.62 (0.59 to 0.66), CG 0.64 (0.60 to 0.70), T2 (1 yr post graduation): IG 0.67 (0.60 to 0.74), CG 0.60 (0.56 to 0.65). Information Seeking Behaviour: Queries per patient (95% CI) Baseline: IG: 0.25 (0.21 to 0.29), CG 0.17 (0.15 to 0.20) T1 (End of 3rd year) 0.14 (0.13 to 0.16), CG 0.15 (0.15 to 0.17). T2 (1sy aftr graduation) 0.12 (0.19 to 0.23), CG 0.19 (0.16 to 0.22)	8a. NR 8b. NR	9 Strong
1.Kulier *et al.*, 2009 2. Netherlands/UK	3. To evaluate the educational effects of a clinically integrated e-learning course for teaching basic EBM among postgraduates compared to a traditional lecture-based course of equivalent content. 4.RCT	5a. 61 5b. Ob and Gyn Trainee 5c. PG	6a. E-learning modules 6b. 5 modules comprised of self-directed e-learning components and clinically related activities under the guidance of a facilitator. Control group; material covered in the e-learning modules presented by a tutor. 6c. 4-6 week period. 6d. Knowledge and attitude questionnaire	7a. Knowledge; IG achieved slightly higher scores for knowledge gain compared to the CG difference in knowledge gain: 3.5 points, 95% CI -2.7 to 9.8, p = 0.27		9. Moderate

1.Liabsuekrakul *et al.*, 2013. 2. Thailand	3. To assess the effect of the integration of EBM in a medical curriculum using small-group discussions with case scenario and problem-based learning on the knowledge, attitudes and skills of medical students 4. Quasi-experimental cohort study.	5a. 114 5b. Medical Students 5c. UG	6a. Multi- modal (PBL and case-based scenario learning). 6b. 4th year; 3 day short course @ end of 4th year, small groupwork to create a PICO, literature search and appraisal of evidence, using critical appraisal worksheets to undertake same, 5th year; learner- centred training. PICO question development based on clinical practice. 5 steps of EBM review, appraisal of relevant articles, EBM integrated to clinical practice and comparison of evidence and practices clinically observed. 6c. 4th and 5th years of medical training. 6d. Assessment of knowledge, attitude and skills.	7a. Case- scenario knowledge (Mean and SD) Pre-test 4.93 (±1.31). post-test 7.43 (±0.74), p<0.001. 7b. Change in attitude; T1 coefficient 4.28, SE .006, p<0.01. T5 -0.18, SE 0.07, p=0.007. 7c. Skills; T1 coefficient 4.09, SE 0.05, p<0.01, T5 coefficient -0.18, SE 0.006, p=0.003.	8a. NR 8b. NR	9.. Weak
1.Long *et al.*, 2016 2. USA (and Middle East)	3. Determine effectiveness of a technology based intervention to teach EBP: The EBR tool. 4. RCT	5a. 159 5b. Nutritionists, Pharmacists. 5c. UG	6a. EBR tool (online tool) 6b. Subjects received a 30 min video EBR took training, standardising the study protocol and explaining how to access and use the tool. Those using the EBR tool- were asked to work through the 10 step tool Subjects were asked to complete 4 demographic questions, the pre-test questions and 3 embedded questions while completing their online search assignment. CG: completed online search assignment in their classes with standard online methods. 6c. NR 6d. EBR tool	7a. NR 7b. NR 7c. EBR- nutritionists; significant difference between mean pre and post test scores. T1-T2: 2.85-2.44, compared to control group 3.60-3.21, p=0.02. For the pharmacists; both the EBR tool and control groups improved (p=0.02, p=0.001 respectively). 72% of the EBR tool group could correctly apply PICOTs to clinical question, 36% could correctly identify key elements in the critical appraisal of a research article.	8a. NR 8b. EBR tool as an enabler: Qualitative responses highlighted that the EBR tool was simple, clear and made the online search process “under-whelming”	9. Weak

1.Manspeaker *et al.*, 2011. 2. USA	3. Evaluate the effectiveness of EBTM in increasing student knowledge, attitudes and use of EB concepts. 4. One group pre-post-test design.	5a. 82 5b. NR 5c. UG	6a. Multi-modal 6b. 6c. course delivered over 2-3 days. 6d. Evidence Based Concepts, Knowledge, Attitudes and Use Survey (EBAKAU).	7a. Pre-EBTM; 50% mean knowledge score, increased to 68% post intervention, p<0.001, 95% CI (-1.50, 0.79). 7b. NR 7c. Confidence increased significantly p<0.001. Confidence in EBM use increased from (mean and SD) 12.96±2.95 to 15.59±2.05, p<0.001.	8a. Time available, resource availability, relevance of literature.	9. Moderate
1.Mohr *et al.*, 2015 2. USA	3. Evaluate learning of EBM principles with an EBM curriculum implemented as a component of journal club. 4. Cross-sectional pre and post –test	5a. 45 (14 completed both years) 5b. Emergency Medicine Resident Trainees 5c. PG	6a. EBM Journal Club 6b. A dedicated 20-min monthly discussion led by a faculty member during monthly journal club focused on an EBM-focused topic. 2) A single faculty member was grouped with three coordinating residents to review selected articles from an EBM perspective prior to journal club to discuss the teaching points of each in detail. 3) A period of peer-to-peer teaching during journal club during which coordinating residents lead small group discussions with peer trainees on the teaching points from each of the selected articles, and 4) A dedicated core of EBM faculty dedicated to directing the journal club curriculum and establishing expertise in EBM concepts 6c. 6d. Fresno test	7a. The mean score on the Fresno test did not significantly increase (105.4 vs. 120.9, p = 0.058 residents who attended journal club more than six times scored 28.2 points higher (p = 0.003), and those attending fewer than six times scored 1.9 points higher (p = 0.81) 7b. NR 7c. NR	8a. NR 8b. NR	9. Weak

1.Nicholson *et al.*, 2007. 2. USA	3. Investigate if EBM workshops for clinical educators has an effect on student knowledge and EBM resource use and literature appraisal skills. 4. One group pre – test post-test.	5a. 26 5b. Physicians (clinical educators) 5c. CPD	6a. Workshop 6b. Core didactic content was based on the "5 As" approach outlining the steps for practicing EBM. Instructor provided real patient case study, e.g. patient's care might require a search of therapeutic options or of diagnostic test alternatives.in this way participants built focused clinical questions and then performed parallel real-time computer searches at their workstations. Evidence appraisal as group activity using "Users Guides criteria" and application back to the patient's care was discussed. Participants also used their own patient cases. 6c. 9 x 90 min workshops, every 4-6 weeks over a 1 year period. 6d. Fresno Test	7a. Fresno Score Pre to Post (Mean and SD) 57.9±17.2, 78.4±13.3. p<0.005. 7b. 7c. Use of online resource to support EBM, Pre t- post-test (Mean and SD) 2.9±0.9, 4.1±0.06, p<0.01. Ability to access medical knowledge (Pre v Post Mean and SD) 3.9±0.8, 4.3±0.8, ==0.02.	8a. NR 8b. NR	9. Weak
1 Parrish and Rubin 2011. 2. USA	3. Evaluate the impact of a one-day continuing education training on the EBP process with community practitioners 4. One group pre-test post-test design.	5a. 69 5b. Community Practitioners (medical) 5c. CPD	6a. Workshop 6b. Practising posing a question, how to answer a question, literature search and critical appraisal. Integration of the EBP process. Group discussion on the feasibility of EBP. 6c. 1 day workshop over 7 hours 6d. EBPAS	7a. Post-test mean score (M= 167.60) from the 1st training group in significantly higher than the pre-test mean score (M ¼ 138.95) of the s2nd training group (t =4.43, df =25, p < .001, d= 1.71). The post-test score of the second training group (M= 166.73) was significantly larger than the pre-test mean score (M= 132.65) of the 3rd (t =5.76, df =25, p < .001, d =2.23). Finally, the post-test mean score of the third training group (M=158.83) was significantly greater than the pre-test mean score (M= 138.00)	8a. NR 8b. NR	9.Weak

1.Ramos *et al.*, 2015 2. Spain	3. Evaluate the effectiveness of a brief basic online and face-to-face educational intervention to promote EBP attitudes, knowledge and skills, and practice in clinical care nurses. 4.Quasi-experimental pre-test post-test design.	5a. 109 5b. Nurses 5c. CPD	6a. Multi-modal 6b. Brief and basic EBP course with online and face-to-face learning. The comparison group received an educational intervention with different content. Face-to-face sessions developed attitudes, cognitive aspects, and skills related to EBP issues, including the formulation of a clinical question in PICO. 6c. 2 face to face session, 5 hours each and 30 hours online learning. 6d. Evidence-based practice questionnaire (EBPQ)	7a. Knowledge: Mean and 95% CI: IG T1: 3.65 (3.19, 4.01), T3 4.92 (4.69, 5.15). CG: T1 3.61 (3.88, 3.93), T3 4.3 (4.02, 4.59). 7b. Attitude: Mean and 95% CI; IG T1 5.88 (5.63, 6.13), T3 5.85 (5.58, 6.11). CG T1 5.97 (5.73, 6.21), T3 5.99 (5.78, 6.21). 7c. Practice Mean and 95% CI: IG T1 3.56 (3.13, 3.98) T3 4.72 (4.36, 5.08) CGL T1 3.77 (3.37, 4.17), T3 4.47 (4.11, 4.82).	8a. NR 8b. NR	9. Moderate
1.Ruzafa-Martinez *et al.*, 2016. 2. Spain	3. To evaluate the effectiveness of an EBP course on the EBP competence undergraduate nursing students. 4. Prospective, quasi-experimental.	5a. 148 5b. Nursing 5c. UG	6a. Multi-modal 6b. Introduction to EBP, PICO question formation, designing and conducting search for evidence in multiple databases. Critical appraisal of various study designs, final assignment clinical scenario; combining all previous components. 6c. 15 week educational intervention: 60 hours of in class, 90hours student work. 6d. EBP Competence Questionnaire (EBP-COQ)	Mean and 95% CI 7a. IG pre: 2.82 (2.62-3.02), Post 3.92 (3.77-4.06). CG Pre: 2.51 (2.32-2.71) Post: 3.01 (2.87-3.15). p<0.001 7b. Attitude IG Pre: 3.33 (3.14-3.52), Post 4.28 (4.16-4.41). CG Pre: 3.84 (3.65-4.08), Post 3.92 (3.80-4.05). p<0.001 7c. IG Pre: 2.75 (2.56-2.94), Post 4.01 (3.85-4.18). CG Pre: 3.20 (3.01-3.38), Post 3.49 (3.32-3.65). p< 0.001	8a. NR 8b. NR	9. Moderate

1.Sastre *et al.*, 2011. 2. USA	3. Impact of a brief workshop designed to teach literature searching skills to medical students on utilization of EBM resources during their clinical rotation and the quality of EBM integration in inpatient notes. 4.Pre and post- test study design.	5a. 100 5b. Medical Students 5c. UG	6a. Workshop 6b. Focus on 1st 2 steps of EBM, clinical question formation and literature retrieval skills, strengths and weaknesses of pre-appraised resources including systematic reviews and clinical guidelines. 6c. One off 3 hour workshop 6d. Pre and Post workshop questionnaire.	7a. NR 7b. Attitude: EBM useful in daily basis; pre-workshop 80% (agree/strongly agree), post- workshop (agree/strongly agree) 95%, p=0.010. 7c. Confidence in performing a literature search and retrieving the best evidence, pre-workshop (agree/strongly agree), 73%, post-workshop 96%, p<0.001.	8a. Pre-workshop 29% (agreed/strongly agreed) that EBM was time consuming. 8b. Post-workshop only 7% (agreed/strongly agreed) EBM was time consuming.	9. Weak
1.Schriber *et al.*, 2009. 2. USA	3.Report the effectiveness of a First Phase Clinical Partners program on enhancing clinicians' ability to gather relevant scientific literature and integrate it into clinical decision making. 4. Mixed methods: pre and post test survey design	5a. 21 5b. Physiotherapists 5c. CPD	6a. EBM Workshop 6b. Defining EBM, writing PICO question, identifying and accessing resources for obtaining research evidence, utilizing internet resources to develop a PICO>. Undertaking a CAT and applying results into clinical research. 6c. Stand-alone workshop session. 6d. Connolly survey, interviews	7a. Comfortable with knowledge level (mean/ median/mode range) 3.33, 4/4, 2-5, P<0.05. 8b. Research relevant to practice (mean/median/mode range) 2.52, 2/2, 2-5. P>0.05 Practice should be based on research 1.95, 2/2, 1-3, p>0.05. 79% of participants agreed clinical practice should be based on outcome measure research.	8a. > 80% cited insufficient time as a barrier to EBM. Lack of skill, difficulty with technology and lack of workplace resources also cited as barriers.	9. Weak
1.Shuval *et al.*, 2007a). 2. Israel	3. Assess the impact of an EBP intervention on attitudes towards EBP and knowledge. 4. CCT	5a. 175 5b. Medicine 5c. CPD	6a. Workshop 6b. 6c. 2part workshop, 12 hours. Additional 3.5 hour was held 3 months into the academic detailing of participants. 6d. Questionnaire (pre and post) EBM knowledge, attitude to and barriers to EBM utilization.	7a. EBM workshops enhanced intervention doctors' EBM knowledge scores from 22.4/100 before workshops to 40.8/100 after workshops (P = 0.000).	8a. No statistically significant change in barriers pre to post intervention. *Lack of time during consultation was considered more of a barrier after the intervention than	9. Strong

				Doctors improved their ability to formulate clinical questions while enhancing their search strategy using Medline. No statistically significant differences were found between intervention and control doctors' test ordering performances, and their patients' drug utilization. 7b. Pre-intervention 4.0/5 vs. post-intervention 4.1/5; p= 0.410. 7c. NR	before the intervention (pre 84.1% vs. post 94.1%; P = 0.020). B Pre-intervention: 42.9% of the doctors in the intervention group were aware that they had access to the Cochrane Library on their desktops compared with 82.9% after the intervention (p = 0.007). IG doctors more aware of the availability of the Cochrane Library than the control group after the intervention (post-intervention control group 62.2%; p = 0.006 8b. NR	
1.Shuval *et al.*, 2007b). 2. Israel	3. Gain insight into behavioural and attitudinal changes of facilitators and participants during a multifaceted EBM educational intervention. 4. Prospective study (set within a CT)	5a. 144 5b. Medical Physicians 5c. CPD	6a. Multi-intervention 6b. Teaching EBM via "user's mode" emphasizing forming clinical questions, information retrieval and integrating evidence into practice. 6c. 3 x 5hr workshop and 6 didactic sessions. (Facilitators undertook 12 hour EBM course). 6d. Focus groups and semi-structured interviews.	7a. NR 7b.Perceptions of EBM: -Facilitators and participants enhanced quality of their practice. -EBM approach helped deal with questions regarding complimentary medicine. -EBM is a "fad likely to disappear" 7c. NR	8a. 1) time constraints, 2) work overload, 3) busy urban setting, 4) constantly changing evidence; hindering practice of EBM, 5) Frequent changing in treatment recommendations creates uncertainty for patients, 6) textbooks bereft of EBM jargon, 7) lack of technology skills 8) slow computers 9) Doctors advanced age. 8b. 1) Ease of use of medication databases, 2) HMO incentives for better quality of care 3)	9. Moderate

					using EBM requires users to maintain up to date skills and knowledge	
1.Tian *et al.*, 2013 2. China	3.Assess the effect and learning satisfaction of PBL in EBM in postgrad medical students. 4. RCT	5a. 103 5b. Medical Students 5c. PG	6a. Multi-modal 6b. 2 groups: 9 subgroups of PBL group given clinical conduction project to provide a clinical question, appropriate search of and evaluation of the relevant evidence, apply evidence to practice and convey results to peers, and pass exam. LBL (lecture based learning): received lecture from teacher, presentation and solution to similar clinical cases. 6c. 2nd semester, 18 weeks (once a week). 6d. Knowledge and attitude test, seminar workshop and satisfaction.	7a. PBL v LBL, 80.48±6.84 v 67.63±9.38, p=0.000. 7b. 94.2% of PGs in the PBL group thought PBL method was currently best teaching method. 74% of PGs in LBL groups thought the teacher/university should reform the teaching methods.	8a. Cost associated with implementing PBL EBM learning. PBL requires more resources including space and personnel. Adopting PBL requires radical adoption by facilitators.	9. Moderate
1.Underhill *et al.*, 2010 2. USA	3.Compare and describe oncology nurse beliefs, perceived implementation of EBP and explore beliefs and implementation before and after an institutional EBP initiative. 4. Pre and Post test.	5a. 350 5b. Nurses 5c. CPD	6a. Multimodal (advancing research and clinical practice-ARCC model). 6b. Face to face discussions, introducing EBM information and resources. PICO formation. Use of travelling educational EBP poster. Day long events including oral presentations. Formal online EBP module. 6c. Initiative took place over 24 month period. 6d. EBP-belief EBPI	7a. NR. 7b. EBP-B T1 mean 56.5 (range 37-77). T2 mean 57 (range 38-76). P> 0.05 7c. EBP-I, T1 median 11 (range 0-70), T2 12 (0-56). P >0.05 *significant difference in EBP-B and EPI-I score distribution at T2 for those who had not received formal EBP education (nurses who received formal EBP had higher perceived levels of EBP beliefs and implementation)	8a. NR 8b. NR	9.Moderate

1.Varnell *et al.*, 2008. 2.USA	3. Evaluate the effectiveness of an accelerated education program on the attitudes toward and implementation of EBP amongst nurses. 4. Quasi-experiment survey design	5a. 49 5b. Nurses 5c. CPD	6a. Multi-modal (didactic lectures, group discussion, hands on practice) 6b. History of EBP, asking clinical questions, conducting literature searches, research designs, evaluating qualitative and quantitative research, implanting EBP change. 6c. 2 hour class each week for 8 weeks. 6d, Melnyk and Fineout-Overholts EBP belief scale and EBPI (implementation) scale.	7a. Significant difference between pre and post test scores for both EBP Belief ($p<0.01$) and EBPI ($p<0.001$) among nurses familiar with EBP. Those with previous EBP exposure had significantly higher scores on the EBPB @ post-test. 7b. Belief Score (Mean and SD) pre and post respectively: Unfamiliar with EBP 55.17±5.18, post-test 63.37±5.18. Familiar with EBP: 59.52±6.01, post-test 64.12±4.29. 7c. Implementing EBP (mean and SD) Unfamiliar with EBP pre-test 10.08±9.25, post-test 22.01±12.77. familiar with EBP pre 20.95±15.69, post-test 24.24±15.69.	8a. NR 8b. NR	9. Strong
1.Wallen *et al.*, 2010. 2.USA	3. Effectiveness of a structured multi-faceted mentorship programme designed to implement EBP in a clinical research intensive environment. 4. Quasi-experimental mixed methods	5a. 159 5b. Nurses 5c. CPD	6a. Multi-modal 6b. Two day intensive workshop; foundation in EBP, promotion of EBP knowledge. Luncheon workshops, holiday tea parties, interactive lectures on EBP basics. 6c. NR 6d. Organisational Culture and Readiness for System Wide EBP implementation (OCRSIEP). EBP Belief scale and EBPI scale.	7a. NR 7b. EBP mentorship significantly increased culture/readiness for EBP and EBP beliefs (77.2 to 89.5 v 80.9 to 82.9, $p=0.025$). Combined EBP culture and readiness score for the entire group increased from 78.7 to 86.9 $p=0.002$. EBM mentorship group EBP beliefs increased 7.4 points v 0.2 points (57.2 to 62.6 v 58.0 to 58.2)	8a. NR 8b. NR	9.Weak

1. Author 2. Country	3. Aim 4. Study Design	5. Population 5a. Sample Size 5b. Discipline 5c. Level (u/g, p/g.CPD)	6. EBP Intervention 6a. Delivery Mode 6b. Content (EBP steps-ask, acquire, appraise, apply, assess) 6c. Duration and Frequency 6d. Measurement	7. Impact on EBP Competencies 7a. Knowledge 7b. Attitude 7c. Skills	8. EBP Teaching Barriers/Enablers 8a. Barriers 8b. Enablers	9. Quality Assessment Rating as per the EPHPP.
1.Webershock *et al.*, 2013. 2. Germany	3. Evaluate a web-based educational course for clinical trainers to confidently teach EBM principles in every day practice. 4. Pre-post study design	5a. 47 5b. Multi-discipline (not defined) 5c. CPD/ PG	6a. Web- based course 6b. 6 e-learning modules based on acquisition, appraisal and application of findings from research in various clinical settings including ward rounds, journal clubs, outpatient clinics. 6c. 15 minute modules, 6 modules over a 2 month period. 6d. Questionnaire	7a. Mean score and SD: Pre-test 69.2±10.4 v 77.3±11.7, mean diff 8.1, $p<0.001$. Effect size $d=0.73$.	8a. NR 8b. NR	9.Moderate
1.Widyahening *et al.*, 2012. 2.Indonesia and Netherlands	3. Short term effects of a clinical epidemiology and EBM (CE-EBM) on knowledge, attitude and behaviour of students. 4. Pre and post test design.	5a. 526 5b. Medical Students 5c. UG	6a. Multi-modal (across 3 universities UMCI, UM, UI). 6b. Lectures on design and conduct of diagnostic, therapeutic, prognostic and etiologic studies, computer practices on literature search and data analysis, tutor supervised group discussion on EBM assignments. Small groups worked to develop EBM case report, submitted written report and gave oral presentation. 6c.	7a. UMCU significantly higher scores then UI and UM respectively in knowledge (mean and SD) 5.35±0.51 compared to 4.73±0.75 and 4.53±0.72, $p<0.001$ 7b. Attitude: (Mean and SD), UMCU: 4.42±0.58, UI 3.83±0.85, UM 3.58±0.72.	8a. NR 8b. NR	9. Moderate

Appendix 4: Data Extraction Systematic Reviews

1. Author/Year **2. Country**	**3. Aim/Scope of SR** **4. No of studies included** **5. Type of Study**	**6. Search Strategy** **7. Methodological Quality Assessment** **8.Meta Analyses (if reported)**	**9a. Population** **9b. Discipline** **9c.. Level (U/G, P/G. CPD)**	**10. Main conclusions of review**	**11.Quality Score (AMSTAR)**
1.Aglen, B (2016) 2. Norway	3.To investigate andragogic strategies to teach nursing students at Bachelor degree EBP 4. 39 5. Cohort, Quasi-experimental, Qualitative and Quantitative descriptive.	6.Medline, Cinahl, SweMed+ Search terms provided English and Scandinavian language 7. No 8. No (Qualitative narrative analysis)	9a. Bachelor degree nursing students 9b. Nursing 9c. U/G	10. Students failing to see relevance of evidence for practice is the main teaching challenge. Students need competencies in how to use evidence as a precursor to attaining EBP knowledge and skills. Recommendation: Cognitive maturity development, knowledge transfer and professional discretion are alternative ways of designing andragogic strategies for EBP	11. 2

1. Author/Year **2. Country**	**3. Aim/Scope of SR** **4. No of studies included** **5. Type of Study**	**6. Search Strategy** **7. Methodological Quality Assessment** **8.Meta Analyses (if reported)**	**9a. Population** **9b. Discipline** **9c. . Level (U/G, P/G. CPD)**	**10. Main conclusions of review**	**11.Quality Score (AMSTAR)**
1.Ahmadi *et al.*, (2015) 2. Iran	3. To evaluate the impact of teaching EBM to medical students on their EBM knowledge, attitudes, skills, and behaviours. 4. 27 5.Comparative studies (RCT's, non-RCT's, self-controlled trials)	6. MEDLINE, Scopus, Web of Science, ERIC, CINAHL Search terms provided. No language restriction. 7. Yes (Cochrane Effective Practice and Organisation of Care group criteria / Reed *et al.*, criteria). 8. No (Qualitative narrative analysis)	9a. Medical Students 9b. Medicine 9c. U/G	10. Twenty-two studies deemed as having a high risk of bias. Evidence base for EBM teaching strategies does not demonstrate superiority of one method. High quality evidence (n=4) to support the assertion that computer assisted instruction is as effective as traditional education strategies to improve knowledge and attitudes. Overall, insufficient evidence supporting the effect of EBM teaching on behaviour in practice.	11. 7

1. Author/Year **2. Country**	**3. Aim/Scope of SR** **4. No of studies included** **5. Type of Study**	**6. Search Strategy** **7. Methodological Quality Assessment** **8.Meta Analyses (if reported)**	**9a. Population** **9b. Discipline** **9c. Level (U/G, P/G. CPD)**	**10. Main conclusions of review**	**11.Quality Score (AMSTAR)**
1.Dizon *et al.*, (2012) 2. Australia	3.To identify effectiveness of EBP training programmes and their components for allied health professionals. 4. 6 5. Experimental (RCT / Before-after)	6. Clinical Evidence, Cochrane Library, Current Contents Connect, Current Controlled Trials, DARE, EMBASE, ERIC, MEDLINE, CINAHL, PEDro, TRIP Search terms provided No language restriction 7. Yes (JBI Critical Appraisal of Evidence Effectiveness and McMaster Appraisal Tool 8. No (Qualitative narrative analysis)	9a. Allied Health Professionals 9b. Allied Health 9c. CPD	10. Overall strength of evidence for 6 studies classified as 'satisfactory' for outcomes relating to knowledge skills and attitudes and 'weak' for behaviour. Consistency across all studies of *improved* EBP learning outcomes with any form of training specific to knowledge, skills and attitudes. *Equivalent* evidence only in relation to EBP behaviour. No single component of EBP training which significantly improves learning outcomes could be recommended based evidence reviewed. Adult learning theory the most common theory underpinning the design of training programmes.	11. 8

1. Author/Year **2. Country**	**3. Aim/Scope of SR** **4. No of studies included** **5. Type of Study**	**6. Search Strategy** **7. Methodological Quality Assessment** **8.Meta Analyses (if reported)**	**9a. Population** **9b. Discipline** **9c. Level (U/G, P/G. CPD)**	**10. Main conclusions of review**	**11.Quality Score (AMSTAR)**
1.Flores-Mateo and Argimon (2007) 2. Spain	3. To assess the effectiveness of EBP teaching to improve knowledge, skills, attitudes and behaviours of P/G healthcare workers and to describe instruments available to evaluate EBP teaching. 4. 24 5. Experimental (RCT, non-RCT, before-after)	6. Medline, Cochrane Library, EMBASE, CINAHL, ERIC, Search terms provided No language restriction 7. Yes (Reed *et al.*, 2005 criteria) 8. No (Effect size (ES) calculated)	9a. HCP 9b. HCP (majority were medical residents) 9c. P/G	10. Improvement (ES "small to moderate (95% CI 0.2 – 0.5) in knowledge, skills, attitudes or behaviour were noted throughout EBP interventions reviewed. The quality of evidence (classified as 'poor') precludes practical recommendations to be introduced in EBP postgraduate education. Recommendation: Integrating theories of behaviour change into EBP education programmes and measurement of consequent impact on clinical competence recommended.	11.6

1. Author/Year **2. Country**	**3. Aim/Scope of SR** **4. No of studies included** **5. Type of Study**	**6. Search Strategy** **7. Methodological Quality Assessment** **8.Meta Analyses (if reported)**	**9a. Population** **9b. Discipline** **9c. Level (U/G, P/G. CPD)**	**10. Main conclusions of review**	**11.Quality Score (AMSTAR)**
1. Haggman-Laitila *et al.*, (2016) 2. Finland	3. To assess current evidence on implementation of journal clubs, the influencing factors and outcomes in promoting EB Nursing, 4. 10 5. Quasi-experimental, descriptive survey, qualitative descriptive.	6. Cochrane Library, MEDLINE, CINAHL. Search terms provided English language restriction. Date restriction (2008-2015) 7. Yes (Gifford *et al.*, 2007 quality criteria) 8. No (Qualitative narrative analysis)	9a. Nurses and other HCPs 9b. Nurses and other HCPs 9c. CPD	10. Three (of 10) studies classified in terms of publication quality as 'excellent', with remaining seven classified as having 'some limitations' There is a lack of evidence on journal club impact (particularly long-term) on the implementation of EBN which should be addressed by using RCT's to evaluate efficacy of journal club outcomes particularly in terms of the impact on patient care.	11.3

1. Author/Year **2. Country**	**3. Aim/Scope of SR** **4. No of studies included** **5. Type of Study**	**6. Search Strategy** **7. Methodological Quality Assessment** **8.Meta Analyses (if reported)**	**9a. Population** **9b. Discipline** **9c. Level (U/G, P/G. CPD)**	**10. Main conclusions of review**	**11.Quality Score (AMSTAR)**
1. Harris *et al.*, (2011) 2. United Kingdom	3. To determine whether the journal club is an effective intervention in supporting decision-making. 4. 18 5. Cohort (pre-post), survey, Observational, Case-control, Controlled trial, RCT.	6. Medline only Search terms provided No language restriction 7. Yes (Reed *et al.*, 2005) 8. No (Qualitative Realist Synthesis)	9a. HCPs 9b. HCPs 9c. U/G, P/G, CPD.	10. The effectiveness of journal clubs in terms of decision-making is not clear due to poor quality of evidence derived from varied study designs. No ideal format identified for journal clubs (JC). JC's need tailoring to learner needs and level of training (Dreyfus model of progression). 'Active educational ingredients' of JC's identified. Recommendation: The effectiveness of EB teaching needs more alignment with andragogic theory (e.g. adult learning principles) that support real-time integration of education with clinical practice.	11. 6

1. Author/Year **2. Country**	**3. Aim/Scope of SR** **4. No of studies included** **5. Type of Study**	**6. Search Strategy** **7. Methodological Quality Assessment** **8.Meta Analyses (if reported)**	**9a. Population** **9b. Discipline** **9c. Level (U/G, P/G. CPD)**	**10. Main conclusions of review**	**11.Quality Score (AMSTAR)**
1.Honey and Baker (2011) 2. United Kingdom	3. To identify and synthesise evidence r/t effective components of journal clubs (JC) with a view to establishing an effective work based journal club in the clinical setting. 4. 18 5. Quasi-experimental, descriptive survey, qualitative descriptive.	6. AMED, BNI, EMBASE, HMIC, MEDLINE, Psych INFO, CINAHL, Health Business Elite. Search terms provided English language restriction 7. No 8. No (Qualitative narrative analysis)	9a. HCPs 9b. HCPs 9c. CPD	10. Thirteen component parts of a successful journal club proposed. 14 of 15 studies reviewed demonstrated (*through self-report measures only*) improvements in knowledge, skills (critical appraisal) and / or behaviour (reading habit) The impact of JC's upon actual clinical care could not be determined.	11. 1

1. Author/Year **2. Country**	**3. Aim/Scope of SR** **4. No of studies included** **5. Type of Study**	**6. Search Strategy** **7. Methodological Quality Assessment** **8.Meta Analyses (if reported)**	**9a. Population** **9b. Discipline** **9c. Level (U/G, P/G. CPD)**	**10. Main conclusions of review**	**11.Quality Score (AMSTAR)**
1.Iliac *et al.*, (2014) 2.Australia	3. To identify what type of educational method is most effective at increasing medical trainees' competency in EBM. 4. 9 5. RCT's	6. MEDLINE, ERIC, CENTRAL Search terms provided No language restrictions 7. Yes (Cochrane Collaboration risk of bias assessment) 8. No (Qualitative descriptive analysis)	9a. Medical trainees 9b. Medicine 9c. U/G and P/G	10. Overall quality of evidence classified as 'good' with 6 of 9 studies having a 'low risk of bias'. Learner competency (Skills/knowledge/attitude/behaviour) in EBM increased post intervention across all studies. No one teaching method / educational mode demonstrated superiority. Recommendation: A flexible EBP curriculum required which adopts a 'spiral approach' to teaching to best suit the learning spectrum (i.e. novice, intermediate, advanced).	11.5

1. Author/Year **2. Country**	**3. Aim/Scope of SR** **4. No of studies included** **5. Type of Study**	**6. Search Strategy** **7. Methodological Quality Assessment** **8.Meta Analyses (if reported)**	**9a. Population** **9b. Discipline** **9c. Level (U/G, P/G. CPD)**	**10. Main conclusions of review**	**11.Quality Score (AMSTAR)**
1.Swanberg *et al.*, (2016) 2. Canada	3. To determine the methods employed by librarians for teaching EBP and which instructional method is most effective in promoting successful learning. 4. 27 5. RCT, Non-RCT, Cohort	6. (17 index databases) Search terms provided No language restrictions 7. Yes (Glasgow checklist Morrison *et al.*, 2009) 8. No (Qualitative descriptive analysis)	9a. HCPs 9b. HCPs 9c. U/G, P/G	10. No consensus reached on which instructional methods are most effective in teaching EBP Weakly significant findings for positive change in search performance for the majority of studies, however large variability in study design made quantifying this significance across studies not possible.	11.7

1. Author/Year **2. Country**	**3. Aim/Scope of SR** **4. No of studies included** **5. Type of Study**	**6. Search Strategy** **7. Methodological Quality Assessment** **8.Meta Analyses (if reported)**	**9a. Population** **9b. Discipline** **9c. Level (U/G, P/G. CPD)**	**10. Main conclusions of review**	**11.Quality Score (AMSTAR)**
1. Coomarasamy and Khan (2004) 2. United Kingdom	3. To evaluate the effects of stand-alone vs. clinically integrated teaching in EBM on various outcomes in postgraduates 4.23 5. RCT's / non-RCT's (with or without a control group)	6. MEDLINE, Embase, ERIC, CCTR, CDSR, DARE, HTA, BEME, SCI Search terms provided No language restrictions. 7. No 8. No	9a. Medical 9b. Medicine 9c. P/G	10. Four of 23 studies classified as level 1 evidence (RCT) and the remaining (19) as level 2 (non-RCT). Stand-alone teaching improved knowledge *but not* skills, attitudes, or behaviour. Clinically integrated teaching improved knowledge, skills, attitudes and behaviour. Recommendation: Greater effort and resources afforded to 'real-time' or clinically integrated teaching of EBM.	11. 2

Appendix 5: Data Extraction Curriculum Models

1. Author **2. Country**	**3. Aim** **4. Study Design**	**5. Population** **5a. Sample Size** **5b. Discipline** **5c. Level (u/g, p/g.CPD)**	**6. EBP Intervention** **6a. Delivery Mode** **6b. Content (EBP steps-ask, acquire, appraise, apply, assess)** **6c. Duration and Frequency** **6d. Measurement**	**7. Impact on EBP Competencies** **7a. Knowledge** **7b. Attitude** **7c. Skills**	**8. EBP Teaching Barriers/Enablers** **8a. Barriers** **8b. Enablers**
1.Aitken *et al.*, 2011 2.Australia	3. Describe multi-dimensional EPB program to incorporate evidence into practice and improve patient outcomes. 4. Curriculum Developmental Process	5a. >200 5b. Nursing staff 5c. CPD	6a. Multi-modal 6b. A multi-dimensional EBP program incorporating EBP champions and mentors, provision of resources, creation of a culture to foster EBP and use of practical EBP strategies was implemented in a 22-bed intensive care unit (ICU) in a public, tertiary hospital in Brisbane, Australia. The practical EBP strategies included workgroups, journal club and nursing rounds 6c. 3 years with 6d. Qualitative	EBP program has been successfully implemented over 3 year years. EBP champions and mentors are now active. Two EBP workgroups have investigated specific aspects of practice, with one resulting in an associated research project. Journal club is a routine component of the education days that all ICU nurses attend. Nursing rounds are conducted twice a week, with between one and seven short-term issues identified for each patient.	8a. NR 8b. Nurse-to-nurse collaboration and associated autonomy that was inherent in the EBP workgroups and journal clubs appeared to be significant in promoting increased research use (anecdotal nursing reports) Members of the EBP workgroups identified as beneficial the decision to incorporate Iowa Model of Evidence Based Practice to Promote Quality Care framework- it provides an overall guide for progression from one phase to the next and enables clear development of specific goals and associated timelines for each of the workgroup members.

1.*Allan et al.*, 2008 2. Canada	3. Development of an integrated EBM curriculum for GP medicine 4. Curriculum Development Process	5a. 60 5b. Medical Residents 5c. P/G	6a. Multi-component. 6b.4 main curricular components; Workshop- 1st year residents, focused on evidence appraisal (therapy, diagnosis and meta-analysis), importance of EBM and statistics. 2- Family Medicine Desktop, 2nd yr residents had access to online source to reduce search time, identify information sources and develop skills as an EBM user, including literature databases and presentations. 3-BEAR; to integrate EBM into clinical practice, residents identified daily clinical questions, and prepared monthly assignments on same. 4- monthly journal club with established theme, small group work on journal paper appraisal and presentation. 6c. 2 years. Monthly journal club, 2 day workshops (x 4 .5 days including 1 hr lecture and 2 hour group discussion). BEAR 15 min presentation during rounds weekly. Use of family medicine desktop; for 3-4 month rotation 6d. Un-validated questionnaire	7a. NR 7b. Attitude: Positive attitude to EBM promotion, Pre- course mean 3.77, post- course mean 4.17, p=0.004. 7c. Skills. Comfort accessing literature, pre-course mean 2.95, post-course 3.97, p< 0.001. Appraisal ability, pre-course mean 2.51, post-course mean 3.69, p<0.001.	7a. NR 7b. This program focused on reducing barriers such as time; the workshop and journal club did not include pre-reading papers, because it is not realistic to read papers entirely and then spend another hour discussing them. The Family Medicine Desktop provides easily accessible evidence-based resources, and the BEAR promotes the use of the resources and helps users gain familiarity with this pre-appraised, filtered, and summarised site.
1.Chitkara *et al.*, 2016 2.USA	3. EBP curriculum development for paediatric residents. 4. Curriculum Development Process-Longitudinal study	5a. NR 5b. Paediatric Residents 5c. UG	6a. Multi modal 6b.-Problems with current curriculum identified (residents reported difficulty with basic problem, interventions, comparison group and outcome question formation and literature searching). Small group work and individual practice. Year 1: PICO question formation, literature search skills, critical appraisal. Year 2: Application of EBP, clinical informed PICO question, CAT presentations, CAT abstract publication. Year 3: Integration of EBP teaching and mentorship; peer mentorship, teaching assistant for Year 1 students. 6c. 3 year EBP program 6d. Year 1-3 assessment/evaluation: Knowledge questionnaires, self-assessment surveys, CAT session evaluation, focus group.	7a. Knowledge Year 1 new curriculum scored higher than control group mean scores 3.8±0.4 v 3.2±0.05, p=0.03. Year 3; self-assessment improved literature search, appraisal and clinical application. 7b. Self-Assessment surveys in Year 2, showed increased confidence with EBM principles and reflective change in practice. Mean score=2, SD 0.6±1.6.	7a. Small groups with longitudinal practices is effective with implementation of "see one, do one, teach one" methods. 7b. NR

1.Cohn *et al.*, 2014 2. USA	3. MSc OT curriculum and co-ordinated sequence of EBP courses that incorporated systematic, pragmatic teaching strategies and develop students EBP skills and habits of reasoning. 4. Curriculum development.	5a.NR 5b. Occupational Therapy Students 5c. UG	6a. Multi-intervention integrated approach. 6b. Semester 1; Framing clinical questions, appraising and applying evidence, case studies, literature searches. Semester Internal and external, statistical validity of evidence related to intervention effectiveness. Develop a PICO question, CAT, development of a research proposal to address a major limitation identified in a CAT. Semester III: Systematic generation of evidence from one's own practice to answer clinical questions. Completion of a CAT to address a clinical question. Semester IV: Application of EBP with context, integrate and apply knowledge and practice EBP skills and habits. Design and co-lead an EBP focus group in the community for 10-12 weeks. Create and present research poster at national/international conference. 6c. 4 semesters of MSc program. 6d. Final exam outcomes. Exit satisfaction survey	7a. NR 7b. 80% of students "extremely" or "very satisfied" with the EBP course. Self-reported application of EBP in clinical work: 45% used descriptive evidence, 16% assessment evidence, 47% intervention evidence. High % of students all 3 types of evidence for self-study during fieldwork.	8a. NR 8b. NR
1.Elcin *et al.*, 2014. 2. Turkey	3. Evaluate the EBM program implemented at the Hacettepe University school of Medicine. 4. "Spiral program" curriculum/course development	5a.20 5b. Medical students 5c. UG	6a. Multi-modal; Sprial EBM program for 1-3 years of medical school and integration into clinical experience. 6b. 1st year lecture and practicum information seeking. 2nd year; a lecture and homework based method for the practice of EBM principles, using case studies in collaborative teams. 3rd; group discussion sessions for different types of studies. Clinical year: Development of critical appraisal with emphasis on diagnosis and treatment, using actual patient case studies. 6c. 8 hours (contact) each year, year 1-3. 10 hours (contact) in clinical years. 6d. Exit questionnaires	7a. 77.1% of students specified that they utilised the knowledge and information 7b. Year 2: 50% of students reported that the practice of EBM was moderately sufficient. Clinical years; content of the course was "sufficient" 66.7%	8a. Students reported that the EBM curriculum should have more practical emphasis in the pre-clinical years.

1.Larmon and Varner, 2011. 2. USA *	3. To meet changes in nursing education the Mississippi University for Women medical school for nursing education worked to incorporate research use and EBP into program curriculum. 4. Curriculum Development	5a. NA 5b. Nurses 5c. UG	6a. Multi-modal 6b.EBP curriculum included: Incorporate current nursing knowledge and EBP in performing basic nursing skills. Provide nursing care where policies and procedures reflect current nursing standards of care and practice. Article critique. Demonstrate knowledge concerning responsibility and accountability for the professional nurse. Literature review. Group poster/presentation. Incorporate concepts specific to current trends and issues in nursing relative to the manager of client care role. Provide therapeutic nursing intervention, including client instruction, which reflects decisions based on critical thinking, nutrition, pharmacology, communication theory, research findings, and the assessment of client needs. Participation in research day 6b. 6c. NR 6d. Article critique rubric (grammar/ referencing/critique content)	7a.NR 7b. NR 7c. NR	8a. NR 8b.
1.Moch and Cronje, 2012. 2. USA	3. Curriculum model to foster UG student practice change. 4. Curriculum model.	5a. NR 5b. Nursing students 5c. UG	6a. Multi-modal 6b. New knowledge discussion groups, student-staff partnerships, peer- learning and sharing of research 6c. 3 years 6d. Self-rated satisfaction, process summaries, exist questionnaires.	7a.NR 7b. Increased enthusiasm for “new knowledge discussion groups” amongst students and nursing staff who participated. Increased enthusiasm for research participation. Meaningful engagement between students and nursing staff. Increased understanding of the role of students in learning/teaching. 7c. NR	8a. NR 8b. NR

1.Ryce and Dodson 2007. 2. USA	3. Description of current University of Washington approach to teaching EBM to medicine interns. 4. Curriculum Description.	5a. NR 5b. Medical Students 5c. UG	6a. Multi-modal 6b. Four themes 1) overview of EBM 2) therapy 3) prognosis 4) diagnosis. Including topics of PICO formation, efficient search strategies, therapy and diagnosis. Each session included a short lecture on the topic, individual work and small group work, with a CAT formatted from each session 6c. 8 week course, 24 hours of faculty contact, 3 hour sessions. 6d. Pre and post-course survey	Increased confidence in using Medical Subject Headings, increased confidence in search PubMed and increased comfort in teaching EBM to teams. Qualitative responses identified that students felt the focus on literature searching and critical appraisal was useful. The exposure to new resources was also useful.	8a. NR 8b. NR

Appendix 6: EPHPP Quality Appraisal Tool

(please contact Lead Investigator Dr Elaine Lehane (e.lehane@ucc.ie) for further details/access)

Appendix 7: EBP Expert Interview Information Sheet

UCC University College Cork, Ireland Coláiste na hOllscoile Corcaigh	*International EBP Expert Information Sheet*

Project Purpose: To determine current practice and provision of EBP education to healthcare professionals at University/Professional level in Ireland and specified English speaking countries (UK, Canada, New Zealand, Australia).

What will the study involve? The study will involve participating in a tele/video conference with the Principal Investigator (Dr Elaine Lehane), to discuss your experience of the provision of EBP education nationally. The tele/video conference will be at a time convenient to you and is estimated to take approximately 30-45 minutes.

Why have you been asked to take part? You have been asked because you are an internationally recognized expert in EBP education.

Do you have to take part? No, participation is completely voluntary and even if you do initially agree to participate you can withdraw from the study at any time. If you wish to withdraw any or all data after the interview this can be facilitated within two weeks of completion of the interview. You will be asked to sign and return a consent form and a copy of this and the information sheet will be available to you.

Will your participation in the study be kept confidential? Yes. I will ensure that any extracts from what you say that are quoted in the report will be anonymized *unless explicitly stated otherwise (Please tick appropriate box on consent form).*

What will happen to the information that you give? The data will be kept confidential for the duration of the study, available only to the PI's, Research Support Officer and tender contractor (National Clinical Effectiveness Committee (NCEC). All data will be stored in the PI's office (Rm 3.29, School of Nursing and Midwifery, BHSC, UCC) with hard copies stored in a locked cabinet which only the PI/Research assistant will have access to. Associated electronic data (audio/text files) will be stored on the

PI/Research assistant password protected computer which is managed by the School's IT manager and which has automatic capacity for back up of all records. On completion of the project, they will be retained for minimum of a further ten years and then destroyed.

What will happen to the results? The results will be presented in a report to the NCEC. The project team and NCEC personnel will see them. There is potential that the project findings will be presented at conferences and published in a research journal.

What are the possible disadvantages of taking part? I do not envisage any negative consequences for you in participating in this project.

What if there is a problem? If you have any queries relating to the project after the interview is completed I will be available to discuss same.

Who has reviewed this study? The Social Research Ethics Committee of UCC *(Approved January 2017).*

Any further queries? If you need any further information, you can contact me:

Dr Elaine Lehane, e.lehane@ucc.ie, (00353214901476 / 00353877724177).

Thank you for taking the time to read this information. If you agree to take part, please sign and return the consent form.

Appendix 8: EBP Expert Interview Consent form

UCC University College Cork, Ireland Coláiste na hOllscoile Corcaigh	*International EBP Expert Interview Consent*

I……agree to participate in the research study entitled "Research on Teaching of Evidence Based Practice in Ireland".

The purpose and nature of the study has been explained to me in writing.

I am participating voluntarily.

I give permission for my interview with the Principal Investigator, Dr. Elaine Lehane to be audio-recorded.

I understand that I can withdraw from the study, without repercussions, at any time, whether before it starts or while I am participating.

I understand that I can withdraw permission to use the data within two weeks of the interview, in which case the material will be deleted.

I understand that anonymity will be ensured in the write-up by disguising my identity (unless explicitly stated otherwise).

I understand that disguised extracts from my interview may be quoted in the project report and any subsequent publications if I give permission below:

I waive my right to anonymity ☐
I agree to quotation/publication of extracts from my interview ☐
I do not agree to quotation/publication of extracts from my interview ☐

Signed: …….
Date: …….
PRINT NAME: …….

Appendix 9: International EBP Expert Interview Schedule

UCC University College Cork, Ireland Coláiste na hOllscoile Corcaigh	International EBP Expert Interview Schedule *Approved by University Social Research Ethics Committee (SREC)*

1. What is the current practice nationally with regard to the teaching of EBP to healthcare professional students at university/professional level?

2. From your experience, what are the existing resources/initiatives/methods that are effective in helping to incorporate EBP into academic curricula and clinical education?

3. What are the key challenges of incorporating EBP into academic curricula and clinical education?

4. If you were developing a new EBP curriculum for healthcare professionals what would it include? (Note: with a particular focus on core competencies/entrustable professional activities and in the context of a clinical effectiveness agenda).

5. For future healthcare professional education programmes, what key resources /processes need to be developed / put in place to enhance EBP teaching and learning?

6. To finish, are there any further recommendations/ insights you wish to impart that would be useful in the context of this national study?

Thank you for taking the time to talk with us. It is sincerely appreciated.
(Dr Elaine Lehane and Professor Josephine Hegarty)

Appendix 10: Excerpt of Meaning Units, Codes, Sub-Categories, Categories

(please contact Lead Investigator Dr Elaine Lehane (e.lehane@ucc.ie) for further details/access)

Appendix 11: Survey Monkey EBP Survey

(please contact Lead Investigator Dr Elaine Lehane (e.lehane@ucc.ie) for further details/access)

Appendix 12: Ethical Approval

(please contact Lead Investigator Dr Elaine Lehane (e.lehane@ucc.ie) for further details/access)

Appendix 13: Information Letter EBP Survey

Research on Teaching Evidence Based Practice to Healthcare Professionals in Ireland

Study Purpose: To determine current practice and provision of EBP education to healthcare professionals at third level institutions and professional bodies in Ireland.
What will the study involve? The completion of a survey consisting of items relating to EBP education within your profession. It will take approximately 15 minutes to complete.
Why have you been asked to take part? You have been identified as the person most knowledgeable/familiar with current EBP educational and curricula issues at your School/Dept./Centre.
Do you have to take part? No, participation is completely voluntary and even if you do initially agree to participate you can withdraw from the study at any time. If you wish to amend/withdraw any or all data after submission, this can be facilitated within two weeks of survey completion. By completing and returning the survey and any associated material, it will be considered that you have fully consented to participate. Please retain this information sheet.
Will your participation in the study be kept confidential? Yes. Anonymization of data will be performed. Any direct identifiers of Schools/Dept./Centre will be de-identified and results reported in aggregate form.
What will happen to the information that you give? The data will be kept confidential, available only to the Principal Investigators(PI's), research team and tender contractor (National Clinical Effectiveness Committee NCEC). All data will be stored in the PI's office with hard copies stored in a locked cabinet which only the PI will have access to. Associated electronic data will be stored on the PI's password protected computer which is managed by the School's IT manager and which has automatic capacity for back up of all records. Data storage requirements will be adhered to i.e. retained for a minimum of 10 years.
What will happen to the results? The results will be presented in a report to the NCEC. There is potential that the project findings will be presented at conferences and published in academic journals, however, no individual responses will be identifiable.
What are the possible disadvantages of taking part? I do not envisage any negative consequences for you in taking part.
What if there is a problem? If you have any queries relating to the project after survey completion, I will be available to discuss same.
Who has reviewed this study? The Social Research Ethics Committee of University College Cork.
Any further queries? If you need any further information, or if you would prefer to post a hard copy of the survey, my contact details are as follows:
Dr Elaine Lehane, School of Nursing and Midwifery, Brookfield Health Sciences Complex
e.lehane@ucc.ie, 00353-21-4901476

Thank you for taking the time to read this project information.

Appendix 14: Overview of EBP at CORU

(please contact Lead Investigator Dr Elaine Lehane (e.lehane@ucc.ie) for further details/access)

Appendix 15: Pharmaceutical Society of Ireland Response

(please contact Lead Investigator Dr Elaine Lehane (e.lehane@ucc.ie) for further details/access)

Appendix 16: Grey Literature Search: Regulatory Body/Council Search Output

	Ireland	
	Document Title/ Pg. No	Link
Dentistry	Dental Council Professional Behaviour and Ethical Conduct	http://www.dentalcouncil.ie/files/Professional%20Behaviour%20and%20Ethical%20Conduct%20-%20final%20-%20%2020120116.pdf
Occupational Therapy	AOTI Code of Ethics. Occupational Therapy Competencies. Pg. 8	https://www.aoti.ie/attachments/a4e97af7-3a2a-48dd-b3df-c63e1bcaf6e9.PDF https://www.aoti.ie/attachments/d29104b3-c369-4309-89bd-ebbb3e972019.PDF
Nursing	Code of Professional Conduct and Ethics for Registered Nurses and Registered Midwives. Pg. 3	https://www.nmbi.ie/nmbi/media/NMBI/Publications/Code-of-professional-Conduct-and-Ethics.pdf?ext=.pdf
Medicine	Guide to professional conduct and ethics for registered medical practitioners. Pg 10, 39, 51 Medical Education Training and Practice in Ireland	https://www.medicalcouncil.ie/News-and-Publications/Publications/Professional-Conduct-Ethics/Guide-to-Professional-Conduct-and-Behaviour-for-Registered-Medical-Practitioners-pdf.pdf http://www.medicalcouncil.ie/Education/Career-Stage/Medical-Education-Training-and-Practice-in-Ireland-.pdf
Physiotherapy	CORU- Standards of Proficiency and Practice Placement Criteria. Pg 7-14.	http://coru.ie/uploads/documents/PRB_SOPs_for_recognition_website.pdf
Speech & Language Therapy	HSE- Speech and Language Therapy Competencies Pg 17.	https://www.tcd.ie/slscs/assets/documents/undergraduate/clinical-speech/Therapy%20Group%20Details/Speech%20and%20Language%20Therapy%20Competencies.pdf
Radiography	Radiographers Registration Board Code of Professional Conduct and Ethics. Pg 17.	http://coru.ie/uploads/documents/RRB_Code_of_Professional_Conduct_and_Ethics.pdf
Podiatry		Nil
Dietetics	Dietitians Registration Board Code of Professional Conduct and Ethics. Pg 18 INDI Strategy Document 2014-2018	http://coru.ie/uploads/documents/DRB_Code_of_Professional_Conduct_and_Ethics_2014.pdf https://www.indi.ie/about/public-documents/491-indi-5-year-strategy-document-2013-2018/file.html
Psychology		NIl
Optometry	A community based model for eye-care	http://coru.ie/uploads/documents/SOP_Optometrist_30_10_15.pdf
Pharmacy	Code of Conduct for Pharmacists	http://www.thepsi.ie/Libraries/Publications/Code_of_Conduct_for_pharmacists.sflb.ashx

Australia		
	Document Title/Pg. No	Link:
Dentistry	Australian Dental Association Policy Statement 5.10 – Dental Practice Accreditation. Pg.1	https://www.ada.org.au/Dental-Professionals/Policies/Third-Parties/5-10-Dental-Practice-Accreditation/ADAPolicies_5-10_DentalPracticeAccreditation_V1
Occupational Therapy	Australian Minimum Competency Standards for New Graduate OT (ASCOT 2010). Pg. 12	https://www.otaus.com.au/sitebuilder/aboutus/knowledge/asset/files/16/australian_minimum_competency_standards_for_new_grad_occupational_therapists.pdf
Nursing	National Practice Standards Australian Nursing and Midwifery.	http://www.anmf.org.au/documents/National_Practice_Standards_for_Nurses_in_General_Practice.pdf
Medicine	Competence-based medical education AMC consultation paper	http://www.amc.org.au/joomla-files/images/publications/CBEWG_20110822.pdf
Physiotherapy	Physiotherapy Standards of Practice. Pg 51. Australian Standards of Physiotherapy	https://www.physiotherapy.asn.au/DocumentsFolder/Resources_Private_Practice_Standards_for_physiotherapy_practices_2011.pdf https://physiocouncil.com.au/media/1021/the-australian-standards-for-physiotherapy-2006.pdf
Speech & Language Therapy	Speech Pathology Australia-Code of Ethics	http://www.speechpathologyaustralia.org.au/SPAweb/Members/Ethics/SPAweb/Members/Ethics/Ethics.aspx?hkey=f825eff3-d6f5-4d65-8b6b-0d59d8414b20
Radiography	Australian Institute of Radiology - Professional Practice Standards for the Accredited Practitioner. Pg 54.	http://www.asmirt.org/cms_files/10_Publications/policies_guidelines/pps_air_dec2013.pdf
Podiatry	Podiatry Board of Australia-Code of Conduct. Pg 8.	file:///C:/Users/nursingvisitor/Downloads/Podiatry-Board---Code-of-conduct.PDF
Dietetics	National Competency Standards for Dietitians in Australia. Pg 2.	https://daa.asn.au/wp-content/uploads/2017/01/NCS-Dietitians-Australia-with-guide-1.0.pdf
Psychology	Graduate Attributes of the Four-Year Australian Undergraduate Psychology Program. Pg 2.	https://www.psychologycouncil.org.au/Assets/Files/Feb22_2008__Draft_Guidelines_Aust_UG_Psych.pdf
Optometry	Accreditation Standards and Evidence Guide for Programmes of Study in Ocular Therapeutics. Pg 7	http://www.ocanz.org/documents/accreditation-1/138-ocular-therapeutics-accreditation-standards-and-evidence-guide-final-march-2017/file
Pharmacy	Pharmacy and Pharmacology: Evidence-based practice. Online web resource	http://guides.library.uq.edu.au/c.php?g=210385&p=3023407

United Kingdom		
	Document/Pg No.	Link
Dentistry	General Dental Council- Preparing for practice	https://www.gdc-uk.org/api/files/**Preparing for Practice** (2012 v1).pdf
Occupational Therapy	HCPC Standards of Proficiency. Pg 11	http://www.hpc-uk.org/assets/documents/10000512Standards_of_Proficiency_Occupational_Therapists.pdf
Nursing	DoH- The evidence base of the public health contribution of nurses and midwives NMC – Code for Nursing / Midwifery	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/208842/Evidence.pdf https://www.nmc.org.uk/standards/code/
Medicine	General Medical Council- Tomorrow's Doctors The state of medical education and practice in the UK 2016	http://www.gmc-uk.org/Tomorrow_s_Doctors_1214.pdf_48905759.pdf http://www.gmc-uk.org/GMC_SOMEP_2016___Executive_summary.pdf_68137466.pdf
Physiotherapy	HCPC Standards of Proficiency. Pg 10	https://www.hcpc-uk.org/assets/documents/10000DBCStandards_of_Proficiency_Physiotherapists.pdf
Speech & Language Therapy	HCPC Standards of Proficiency. Pg 11	http://www.hpc-uk.org/assets/documents/10000529Standards_of_Proficiency_SLTs.pdf
Radiography	HCPC Standards of Proficiency. Pg 11	http://www.hpc-uk.org/assets/documents/10000DBDStandards_of_Proficiency_Radiographers.pdf
Podiatry	The Quality Assurance Agency for Higher Education- Benchmark Statement	http://www.qaa.ac.uk/en/Publications/Documents/Subject-benchmark-statement-Health-care-programmes---Podiatry.pdf
Dietetics	HCPC Standards of Proficiency. Pg 11	http://www.hcpc-uk.org/assets/documents/1000050CStandards_of_Proficiency_Dietitians.pdf
Psychology	HCPC Standards of Proficiency. Pg 6-27.	http://www.hcpc-uk.co.uk/assets/documents/10002963SOP_Practitioner_psychologists.pdf
Optometry	Quality, safety and clinical governance in ophthalmology: an overview Pg. 6-10.	https://www.rcophth.ac.uk/wp-content/uploads/2016/07/Quality-safety-and-clinical-governance-in-ophthalmology-An-overview.pdf
Pharmacy	Standards for pharmacy professionals	https://www.pharmacyregulation.org/sites/default/files/standards_for_pharmacy_professionals_may_2017_0.pdf

New Zealand		
	Document Title/Relevant Pg. No's	Link
Dentistry	Handbook for the New Zealand Conditions of Practice (NZCOP) pg.70	http://www.dcnz.org.nz/assets/Uploads/Practice-standards/New-Zealand-Conditions-of-Practice-handbook.pdf
Occupational Therapy	Accreditation of Entry-Level Occupational Therapy Education Programmes Guidelines for Education Providers	http://otcouncil.com.au/wp-content/uploads/2012/09/OTC-Accreditation-Guidelines-March-2015.pdf
Nursing	Framework for the approval of professional development and recognition programmes to meet the continuing competence requirements for nurses	http://www.countiesmanukau.health.nz/assets/For-health-professionals/PDRP-Policy-2015.pdf
Medicine	Good Medical Practice	https://www.mcnz.org.nz/assets/News-and-Publications/good-medical-practice.pdf
Physiotherapy	Physiotherapy Competencies Pg 5-20	https://www.physioboard.org.nz/sites/default/files/PHYSIO_Competencies_09_for_web_0.pdf
Speech & Language Therapy	NZSTA Principles and Rules of Ethics. Pg. 2 'twenty twenty' The NZSTA Strategic Plan Pg. 1	https://speechtherapy.org.nz/wp-content/uploads/2016/03/NZSTA-Principles-_-Rules-of-Ethics-June-2015.pdf https://speechtherapy.org.nz/wp-content/uploads/2016/03/NZSTAStrategicPlantwentytwentyformembers.docx.pdf
Radiography	Standards of Practice for Diagnostic & Interventional Radiology.	https://www.ranzcr.com/college/document-library/standards-of-practice-for-diagnostic-and-interventional-radiology
Podiatry	Podiatrist Board of NZ, Standards of Practice. Pg 6.	https://www.podiatry.org.nz/assets/Podiatry_competency_framework_for_consultation.pdf
Psychology	Core Competencies for the Practice of Psychology in New Zealand. Pg 4.	http://www.psychologistsboard.org.nz/cms_show_download.php?id=41
Optometry	Scopes of Practice and Related Qualifications Prescribed by the Optometrists and Dispensing Opticians Board. Pg 1.	https://www.odob.health.nz/cms_show_download.php?id=858
Pharmacy	Pharmacy Council of NZ Code of Ethics	https://flexiblelearning.auckland.ac.nz/pharmacy-legislation/module5/menu/1/files/code_of_ethics_2011.pdf

Canada		
	Document Title/Pg No.	Link
Dentistry	Royal College of Dental Surgeons of Ontario. Competencies for a beginning Dental Practitioner in Canada.	http://www.rcdso.org/ https://ndeb-bned.ca/en/resources/competencies
Occupational Therapy	Occupational Therapy Council of Canada-Strategic Mission.	http://www.acotup-acpue.ca/pdfs/memberarea/otcc.pdf
Nursing	Framework for the practice of registered nurse in Canada Pg 16-27.	https://www.cna-aiic.ca/~/media/cna/page-content/pdf-en/framework-for-the-pracice-of-registered-nurses-in-canada.pdf?la=en
Medicine		
Physiotherapy	Essential Competency Profile for Physiotherapists in Canada. Pg 4	http://www.physiotherapyeducation.ca/Resources/Essential%20Comp%20PT%20Profile%202009.pdf
Speech & Language Therapy	Scope of Practice for Speech-Language Pathology	http://www.sac-oac.ca/sites/default/files/resources/speech-language_pathology_scope_of_practice_november_2016_draft.pdf
Radiography	Member Code of Ethics and Professional Conduct	http://www.camrt.ca/wp-content/uploads/2016/10/CAMRT_Poster_85x11_FINAL.pdf
Podiatry	A Rapid Literature Review on Education, Regulation, Collaboration, Safety, and Economics of Foot Care in Other Jurisdictions	http://www.hprac.org/en/reports/resources/Chiropody_Podiatry_Literature_Review_2.pdf
Dietetics	The Integrated Competencies for Dietetic Education and Practice , Pg. 7-31	http://www.pdep.ca/files/final_icdep_april_2013.pdf
Psychology	CPA's Definition of Evidence-Based Practice of Psychological Treatments	http://www.cpa.ca/docs/File/Science/CPA_Definition_of_Evidence-Based_Practice_of_Psychological_Treatments.pdf
Optometry	Evidence-Based Decision-Making in Optometry. Pg. 1.	https://opto.ca/sites/default/files/resources/documents/cao_position_statement_evidence-based_decision-making_in_optometry_may_2017.pdf

Appendix 17: List of EBP Teaching Survey Invitees

Dentistry		
H.E.I/Equivalent	**UG/PG**	**Course/EBP Education Network**
UCC	UG	B.Dent.SC
UCC	UG	Dip. Dent. Nursing
UCC	UG	Dip. Dent. Hygiene
UCC	PG	PhD in Clinical Dentistry
UCC	PG	MSc in Dent. Publ Health
TCD	UG	B.Dent.SC
TCD	UG	Dip. Dent. Nursing
TCD	UG	Dip.Dent Hygiene
TCD	PG	P.Grad Dip (Clinical dental technology)
TCD	PG	Conscious Sedation in Dentistry
TCD	PG	Dental Surgery (D.CH.Dent)
TCD	PG	Special Care Dentistry
TCD	PG	Clinical Doctorate in Orthodontics
	CPD	Dental Council of Ireland
	CPD	Irish Faculty of Primary Dental Care
	CPD	Irish Dental Association
	CPD	Faculty of Dentistry, RCSI

Occupational Therapy		
H.E.I/Equivalent	**UG/PG**	**Course/EBP Education Network**
UCC	UG	BSc OT
TCD	UG	BSc OT
NUIG	UG	BSc OT
UL	PG	MSc in OT
	CPD	Association of OT in Ireland

Nursing		
H.E.I/Equivalent	**UG/PG**	**Course/EBP Education Network**
RCSI	UG PG	Nursing
UL	UG	BSc General Nursing
UL	UG	BSc Nursing ID
UL	UG	BSc Mental Health
UL	PG	MSc General Nursing
UL	UG	BSc Midwifery
UL	PG	Higher Dip in Midwifery
TCD	UG PG	Nursing
TCD	UG	BSc in General nursing
TCD	UG	BSc In Intellectual Disability Nursing
TCD	UG	BSc Midwifery

UCC	UG & PG	BSc General Nursing PG Diplomas / Masters
WIT	UG	BSc General Nursing
WIT	UG	BSc Nursing
WIT	UG	BSc ID Nursing
WIT	UG	BSc Psychiatric Nursing
WIT	PG	MSc/Grad Dip nursing
ITT	UG	BSc in General nursing
UCD	UG	Nursing Studies
NUIG	UG	Nursing Studies
DCU	UG PG	Nursing Studies
DCU	UG	BSc Mental Health Nursing
DCU	UG	ID Nursing
AIT	UG	BSc Nursing
GMIT	UG	BSc Nursing studies
DKIT	UG	BSc Nursing Studies
	CPD	Centres for Nurse/Midwifery Education (23)

Pharmacy		
H.E.I/Equivalent	UG/PG	Course/EBP Education Network
UCC	UG	Mpharm
TCD	UG	Mpharm
RCSI	UG	Mpharm
UCC	UG	MSc Clinical Pharmacy
TCD	UG/PG	MSc in Hospital Pharmacy
TCD	PG	MSc/Dip/Cert in Community Pharmacy
	CPD	Irish Institute of Pharmacy
	CPD	Irish Pharmacy Union Academy
	CPD	Pharmaceutical Society of Ireland
RCSI		School of Pharmacy

Physiotherapy		
H.E.I/Equivalent	UG/PG	Course/EBP Education Network
RCSI	UG	BSc Physiotherapy
UL	UG	BSc Physiotherapy
UCD	UG	BSc Physiotherapy
TCD	UG	BSC Physiotherapy
UL	PG	MSc Physiotherapy
UL	PG	MSc Clinical Therapies
RCSI	PG	MSc in Neurology & Gerontology
UCD	PG	MSc Physiotherapy
UCD	PG	MSc Neuromusculoskeletal Physiotherapy
UCD	PG	MSc Musculoskeletal Physiotherapy
UCD	PG	MSc Sports Physiotherapy
UCD	PG	MSc Advanced Physiotherapy Practice
TCD	PG	Online Postgrad Cert in Clinical Exercise
		ISCP
		CORU

Radiation Therapy/Radiography		
H.E.I/Equivalent	UG/PG	Course/EBP Education Network
UCD	UG	BSc Diagnostic Radiography
TCD	UG	BSc Radiation Therapy
UCD	PG	MSc Diagnostic Radiography
	CPD	Irish Institute of Radiography and Radiation Therapy
	CPD	CORU

Podiatry		
H.E.I/Equivalent	**UG/PG**	**Course/EBP Education Network**
NUIG	UG	BSc Podiatry
NUIG	UG	Podiatric Medicine

Dietetics		
H.E.I/Equivalent	**UG/PG**	**Course/EBP Education Network**
DIT	UG/PG	BSc in Human Nutrition and Dietetics
UCD	UG	BSc in Human Nutrition and Dietetics

Psychology		
H.E.I/Equivalent	**UG/PG**	**Course/EBP Education Network**
UCC	PG	Doctor of Clinical Psychology
UCD	PG	Doctor of Clinical Psychology
NUIG	PG	Doctor of Clinical Psychology
TCD	PG	Doctor of Clinical Psychology
UL	PG	Doctor of Clinical Psychology

Speech & Language Therapy		
H.E.I/Equivalent	**UG/PG**	**Course/EBP Education Network**
TCD	UG	BSc in SALT
TCD	UG	BSc in SALT
TCD	UG	BSc in SALT
TCD	PG	MSc in SALT
UCC	UG	BSc in SALT
NUIG	UG	BSc in SALT
UL	PG	MSc in SALT

Optometry		
H.E.I/Equivalent	UG/PG	Course/EBP Education Network
DIT	UG	BSc. Optometry

Medicine		
H.E.I/Equivalent	**UG/PG**	**Course/EBP Education Network**
UCC	UG	MB, BCh, BAO
UCC	UG	BSc Paramedic Studies
NUIG	UG	MB, BCh, BAO
UL	PG	BM, BS (Grad entry)
UL	PG	BSc Paramedic Studies
UCD	UG	BMMB, BCh, BAO
TCD	UG	MB, BCh, BAO
RCSI	UG	MSc, Bch, BAO (grad entry)
UCC	PG	MRes in Health Professions Education
UCC	PG	MCh in Surgical Science
UCC	PG	MMedSc in Sports and Exercise Medicine
UCC	PG	MSc in Obstetrics & Gynaecology
NUIG	PG	MSc in Advanced Healthcare Practice & Research
NUIG	PG	MSc/Dip/Cert in Health Sciences (Clinical Education)
NUIG	PG	MSc in Medical Science
NUIG	PG	Medical & Healthcare Simulation Cert/Dip/MSc
NUIG	PG	Dip/Cert Health Sciences (Clinical Primary Care)
NUIG	PG	MSc Clinical Research
NUIG	PG	MA (Health Promotion)
TCD	PG	Master in Medicine
TCD	PG	MSc in Cardiology
RCSI	PG	Prof Dip in clinical Leadership
UCD	PG	Grad Dip in Dermatology
		Irish Network of Medical Educators (INMED)

Sampled Irish Postgraduate Medical Education Bodies		
H.E.I/Equivalent	**UG/PG**	**Course/EBP Education Network**
RCSI	PG	Core Surgical Training
RCSI	PG	Cardiothoracic speciality training
RCSI	PG	General Surgery Speciality Training
RCSI	PG	Neurosurgery Speciality Training
RCSI	PG	Oral & Maxfac Speciality Training
RCSI	PG	Otolarynology Speciality Training
RCSI	PG	Paediatric Speciality Training
RCSI	PG	Plastic & Reconstruction
RCSI	PG	Trauma & Orthopaedic
RCSI	PG	Urology Speciality Training
RCSI	PG	Surgical Informatics/Vascular

Sampled Irish Postgraduate Medical Education Bodies		
H.E.I/Equivalent	**UG/PG/CPD**	**Course/EBP Education Network**
RCPI	CPD	Head of Education & Professional Development
		Director of Paediatrics
		Director of Obs & Gynae
		Director of Research
		Director of Professional Competence
		Director of Exams
		President Elect, RCPI
		Dean of Public Health
		Dean of Pathology
		Director of Training site Accreditation
		Assoc. Prof for specialist division of the register
		Director of Education and Prof Development
		Dean PG Specialist Training
		Dean of Occupational Medicine
		Director of Quality and critical care

Sampled Forum of Postgraduate Training Bodies
Irish College of General Practitioners
Irish College of Ophthalmologists
College of Psychiatrists
Royal College of Physicians
Royal College of Surgeons
Faculty of Dentistry, RSCI
Irish Committee for Higher Medical Training
Irish Surgical Postgraduate Training Committee