Supplementary Online Content


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This supplementary material has been provided by the authors to give readers additional information about their work.
eMethods

eMethods 1. Systematic Review of EBP educational studies for health professionals to identify competencies addressed.

Background and Objectives

Evidence-Based Practice (EBP) has the potential to improve the quality of healthcare as well as the patients’ outcomes. Thus, EBP is integrated in the curricula of undergraduate, postgraduate, and continuing healthcare education. However, there are huge variations in the content of EBP training programs and curricula. There is no agreement on the most essential core competencies in EBP that clinicians should learn in order to achieve the ultimate potential benefits of practicing EBP. We previously conducted a systematic review of studies which had evaluated the effect of EBP educational interventions. For this study, we identified EBP competencies addressed in included studies.

Eligibility criteria (Study design, population, intervention, and outcomes)

- **Design:** controlled trials (must have had a separate group for comparison, e.g. randomized controlled trials or non-randomized controlled trials);
- **Population:** any health professionals irrespective of the discipline or the level of training (undergraduate, postgraduate, or continuous professional development);
- **Intervention:** any format or mode of EBP educational intervention (e.g. workshop, course, journal club) which aimed to teach at least one component of the main EBP steps (ask, acquire, appraise, apply and assess), compared to either no intervention or other intervention (e.g. comparing different methods of EBP training);
- **Outcomes:** any measure of EBP knowledge or skills or attitudes or behaviors or practice.

Search strategy

We used the citation analysis technique to identify the studies of EBP educational interventions (until March 2017). Citation analysis is an alternative to the time-consuming and the complex nature of the standard search strategies, and has an acceptable accuracy rate. The index articles for our citation analysis were studies in a recent overview of the effect of EBP teaching - both the included systematic reviews and the included primary studies investigating the effect of evidence-based practice. We tracked forward and backward citations of these index articles using the Web of Science database. No language restrictions were applied. The Cochrane highly sensitive search filter for identifying controlled trials (sensitivity-maximizing version; 2008) was applied. In addition, the reference lists of included studies were also reviewed and additional eligible studies were included for full text assessment.

Selection of studies

Titles and abstracts were screened by one review author to identify potentially eligible studies and the full texts of these were assessed for inclusion. Any concerns about study eligibility were discussed by the authors and resolved by discussion.

Data extraction

Details of the study characteristics including authors, publication year, title, journal, country, sample size, design, population, intervention, and outcomes were extracted from each study. We contacted the corresponding author of the original study requesting further information regarding the EBP
educational intervention including any teaching materials. We reviewed the original publications, any other additionally relevant resources (searching reference list, and tracking the author’s relevant publications), and provided information and materials (by contacting the authors) to identify all EBP competencies delivered in these EBP educational interventions based on the most completed data available for each study. Three authors independently extracted EBP competencies from a random sample of 20 articles, and continued discussion until consensus was attained. We did not assess the risk of bias in included studies.

Results

Of 1682 articles identified by our search, 714 titles and abstract were screened for eligibility. Of these, 286 full text articles were obtained for review, 203 articles were excluded; 83 articles were included (eFigure 1). 42 (51%) studies were published after 2005 (ranged from 1986-2015), 35 (42%) were conducted in United States (the remainder were conducted in 16 different countries in all continents), and 45 (54%) were randomized controlled trials. 50 (60%) included postgraduate level participants, and 62 (75%) taught medical professionals. eTable 1 shows details about the characteristics of the included studies.

We identified 234 EBP competencies in included studies and other additional EBP curricula and key statements (Sicily statement on EBP, and informed health choice key concepts). The initial list of EBP competencies were reviewed for duplication, consistency, and comprehension; and eventually reduced to 86 competencies. We grouped/organized these competencies into the relevant EBP steps (Introductory, ask, acquire, appraise and interpret, apply, and reflect) (eTable 2).
eMethods 2. Modified Delphi Survey

Background and Objectives

Core competencies have been defined as “the essential minimal set of a combination of attributes such as applied knowledge, skills and attitudes which enable an individual to perform a set of tasks to an appropriate standard efficiently and effectively”. Core competencies offer a common shared language for all healthcare professions for defining what all clinicians are expected to be able to do in order to work optimally. Clearly specified core competencies can significantly enhance the individual learning performance, and provide an impetus for consistent quality healthcare education. Evidence-Based Practice (EBP) has the potential to improve the quality of healthcare as well as the patients’ outcomes, thus, it has been widely integrated into curricular educational activities and practised by clinicians from different healthcare disciplines working in various settings. However, there is a lack of clarity about the essential core competencies in EBP that clinicians should meet in order to achieve the ultimate potential benefits of practising EBP. We used a modified Delphi technique to achieve a consensus from a diverse group of international experts on the most essential core competencies in EBP.

Methods

Modified Delphi survey is a common approach used to solicit the opinions of experts through a series of structured iterative questionnaires (called rounds) which aim to obtain group consensus. A modified Delphi survey utilises pre-existing literature (e.g. systematic review) to develop the initial questionnaire rather than starting the first round with open-ended questions. We used a modified Delphi technique to achieve a consensus from a diverse group of international experts. Our Delphi study consisted of two sequential rounds of questionnaires.

Participants

The diverse range of expertise within the Delphi participants is an important quality criterion and should reflect the population that is intended to use the EBP core competencies set. To facilitate the dissemination and implementation of the EBP core competencies set we have been inclusive of relevant healthcare professions, organisations or institutions, countries, research disciplines, and stakeholders. The ideal participant is a healthcare clinician who has a significant experience in teaching and practising EBP (both academic and practitioner). However, we also included participants who: (1) have a significant research contribution to the field of EBP (e.g. authors of EBP educational trials); (2) have a significant experience in practising EBP in the clinical practice; and (3) EBP teachers who have extensive experience in teaching EBP.

Selection of the participants

We used purposive and snowball sampling approach to select participants for the Delphi survey. We invited eligible participants to register their interests in our Delphi Survey by posting announcements in social media (e.g. Twitter, and Facebook), sending email invitations to EBHC listserv and other networks of national and international evidence-based societies, and personal invitations to a list of EBP experts (have credibility in this field, e.g. ISEHC board members, Sicly statements group members). National and international evidence-based societies that have been approached included: (1) International Society of Evidence Based Healthcare (ISEHC); (2) The German Network of Evidence based Medicine Society (Deutsches Netzwerk Evidenzbasierte Medizin DNebM) – Germany; (3) Taiwan Evidence-based Medicine Association (TEBMA) – Taiwan; (4) Iranian Center for Evidence-Based Medicine – Iran; (5) Centre Evidence Based Medicine – Oxford, UK; (6) Italian partner for evidence –

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based health care (GIMBE) – Italy; (7) Centre for Evidence-based Health Care – South Africa; (8) Center for Clinical Epidemiology and Evidence-Based Medicine (CEEBM) – Indonesia; (9) Chinese Cochrane Centre – China; and (10) Johns Hopkins Evidence-based Practice Center – US.

Sample size

There is no best practice guidance regarding the sample size of Delphi survey, however, having more participants will increase the reliability of group judgment. In addition, diversity among participants is important to ensure all views are considered in the consensus. We, therefore, undertook a broad approach to ensure there is a diverse and sufficient participation in this Delphi study. We aimed to invite a minimum of 120-150 participants for the first round.

Recruitment of participants and Delphi Procedures

We sent an email to invite all eligible participants who registered their interest in our Delphi. The invitation email included a clear explanatory statement outlining the objective of the Delphi survey, the procedure of the Delphi surveys (e.g. an estimate of the amount of time required to complete each questionnaire) and the importance of completing all Delphi rounds. Participation in the survey was optional and informed consent was assumed if a participant responded to the survey.

Attrition bias is a common problem in Delphi surveys which might overestimate the degree of consensus in the final results. Strategies to minimise attrition bias included providing reminders to participants and ensuring that each round is concise and easy to complete with minimal time commitment. Participants were encouraged to complete each Delphi Round within 4-6 weeks. Reminder emails have been sent at the end of week two, three, and four to prompt the completion of the survey.

All participants were allocated a unique identification number to allow the identification of individual responses and enable the tracking of attrition at each round. All participants who completed the first round of the Delphi were invited to participate in the second round. We used the web-based SurveyMonkey software to conduct the Delphi survey.

Data has been collected and analysed following each Delphi round using Microsoft Excel 2016. Additional items listed by participants were reviewed by the research team to ensure they represent new unique competencies.

Round 1 Delphi questionnaire

The Delphi questionnaire for the first round included three main sections: (i) introduction: a statement describing the main aims of the Delphi survey, the procedures, and timeline; (ii) the main questionnaire: based on the items generated from the systematic review and other sources (as described in eMethods 1); (iii) information about the participants (e.g. age group, country of residence, place of employment, their professional background and their level of experience in EBP).

EBP competencies were organised into 6 domains to reflect the main EBP steps (introductory, ask, acquire, appraise and interpret, apply, assess). Participants were asked to rate the relative importance of each competence item listed as “omitted”, “mentioned”, “explained”, or “practised (with exercises)”. Participants had the opportunity to suggest any other competencies that they believe should be added. Participants were also encouraged to comment on any of the competencies, and suggest possible rephrasing of any of them. The final draft of this questionnaire was piloted to ensure

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the feasibility, clarity of the competencies and rating format. eMethods 3 shows the round 1 Delphi questionnaire.

Round 2 Delphi questionnaire

EBP competencies from the first round were amended and merged, and those remained were organised into five groups for the second round. The first group included competencies attained the pre-defined consensus level (≥70%) at the same rating level (e.g. “explained”), and participants were advised that these would be included in the list of core competencies unless strong objection was received in the second round. The second group included competencies that did not achieve the consensus level but positively rated as “practised with exercises or explained” by the majority (≥85%). Participants were asked to rate competencies in this group as “practised with exercises” or “explained”; third group included competencies that did not achieve the consensus level but positively rated as “explained or mentioned” by the majority (≥85%). Participants were asked to rate competencies in this group as “explained” or “mentioned”; fourth group included competencies that did not achieve the consensus level but positively rated as “mentioned or omitted” by the majority (≥85%). Participants were asked to rate competencies in this group as “mentioned” or “omitted”; fifth Group included competencies that were suggested by participants, and they were asked to rate each competence as “omitted”, “mentioned”, “explained”, or “practised with exercises”.

Participants were also encouraged to suggest any other competencies that they believe should be added, comment on any of the competencies, and suggest possible rephrasing of any of them. The final draft of this questionnaire was piloted to ensure the feasibility, clarity of the competencies and rating format. eMethods 4 shows the round 2 Delphi questionnaire.

Results

A total of 234 participants have registered their interest to participate in our Delphi survey and were invited to round 1 Delphi questionnaire. Of those, 184 participants (79%) had participated in round 1 Delphi survey, and were invited for round 2 Delphi survey. 144 participants (78%) participated in round 2 Delphi questionnaire. Characteristics of participants in “registration of interest”, Delphi round 1, and Delphi round 2 are shown in eTable 3.

Delphi round 1 and 2 results

Of the 86 EBP competencies included in round 1 Delphi questionnaire, 11 reached the consensus level (≥70%) at the same rating level (e.g. “explained”); 27 were rated as “practised with exercises or explained” by the majority (≥85%); 28 were rated as “explained or mentioned” by the majority (≥85%); 4 were rated as “mentioned or omitted” by the majority (≥85%); and 9 additional competencies were identified in the first round and added to the questionnaire of the second round. eTable 4 shows summary of round 1 Delphi questionnaire results.

After second round, 48 EBP competencies had achieved the consensus level (>70%): 20 EBP competencies were rated as “practised with exercises”; 20 as “explained”; and 8 as “mentioned”. 29 EBP competencies did not achieve the consensus level, and were retained for further discussion at the consensus meeting. eTable 5 shows summary of round 2 Delphi questionnaire results.
eMethods 3. Round 1 Delphi survey

Developing a core set of EBP concepts - Delphi survey round 1

<table>
<thead>
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<th>Background</th>
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**What are the core concepts of Evidence-Based Practice (EBP)?**

Thank you for agreeing to participate in this Delphi survey on the core evidence-based practice (EBP) concepts. The goal of this two-round Delphi survey (and a third, if necessary) is to achieve consensus about the core concepts that should be delivered in EBP training programs.

Concept-based learning is being endorsed and required by major medical and health education entities; however, no previous systematic attempt has been made to develop a list of the core concepts that a clinician needs to learn in EBP. This list will contain the most essential EBP concepts that should be taught to any health discipline (e.g. medicine, nursing, allied health, pharmacy) as well as to any education level (e.g. undergraduate, postgraduate, or continuous professional education).

We hope that you will participate in both rounds (approximately 4-6 weeks apart). Each survey should take you about 15 minutes to complete. The structure of this questionnaire is based on the main five steps of EBP:

1. **Ask**: asking a clear clinical question.
2. **Acquire**: acquiring the best evidence which is relevant to our question.
3. **Appraise**: a) Critically appraising the evidence for its validity and usefulness; b) Interpretation of the results.
4. **Apply**: applying the evidence to the clinical practice.
5. **Assess**: assessing the performance of this process.

In these surveys, you will be asked your opinion on priorities of teaching various EBP concepts.

**Please rate whether each concept in this survey should be included in a core set of EBP teaching concepts.**

_For each of the numbered concepts, please check the basic box that corresponds to your rating._

- **Omitted**: a concept that is not a priority to be included in an EBP training program.
- **Mentioned**: a concept that should be just mentioned in an EBP training program (i.e. provide common knowledge about this concept).
- **Explained**: a concept that should be briefly explained in an EBP training program (i.e. provide understanding of the concept but without practical exercises).
- **Practised (with exercises)**: a concept that should be practised with exercises in an EBP training program (i.e. provide a detailed understanding of the concept, enhanced with practical exercises).

Where appropriate, a textbox is also provided for you to comment on the reasons for your responses, suggestions for the precise wording, and description of the concepts. Suggestions of new concepts are also welcome, but please first consider the concepts already listed at the end of this survey. These are concepts that have been covered in published education interventions and EBP curriculum statements, but were not included in the main survey questions.

Thank you
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### Introductory and Background Concepts

Which of the following concepts should be included in a priority set of core EBP teaching concepts?

1. **The definition of evidence-based practice (EBP):** “the integration of the best research evidence with our clinical expertise and our patient’s unique values and circumstances[1]”.
   - [Omitted](#)
   - [Mentioned](#)
   - [Explained](#)
   - **Practiced (with exercises)**

2. **The distinction between the mechanistic vs. empiricism approach of dealing with what is effective** (a common example is Dr. Spock's advice to put infants on fronts to sleep to avoid chocking on vomit [mechanistic] while this led to avoidable cot death [empiric evidence])
   - [Omitted](#)
   - [Mentioned](#)
   - [Explained](#)
   - **Practiced (with exercises)**

3. **Hierarchy of levels of evidence** (i.e. hierarchy for each clinical question type, primary research vs. secondary research).
   - [Omitted](#)
   - [Mentioned](#)
   - [Explained](#)
   - **Practiced (with exercises)**

4. **The history and origin of EBP**
   - [Omitted](#)
   - [Mentioned](#)
   - [Explained](#)
   - **Practiced (with exercises)**

5. **The rationale for EBP** (e.g. there is a huge amount of literature that clinicians cannot read all: an expanding amount of publications vs. clinicians' workload and the need to keep up-to-date).
   - [Omitted](#)
   - [Mentioned](#)
   - [Explained](#)
   - **Practiced (with exercises)**
6. The five steps of EBP: ask, acquire, appraise, apply and assess.

- [ ] Omitted
- [ ] Mentioned
- [ ] Explained
- [ ] Practiced (with exercises)

7. The distinction between using research (that is, search for pre-appraised evidence to apply in practice or follow the five steps of EBP) vs. conducting research (that is, conducting primary or secondary research).

- [ ] Omitted
- [ ] Mentioned
- [ ] Explained
- [ ] Practiced (with exercises)

8. New, brand‐named, or more expensive treatments are not necessarily better than current alternatives.

- [ ] Omitted
- [ ] Mentioned
- [ ] Explained
- [ ] Practiced (with exercises)

9. Earlier detection of disease is not necessarily better.

- [ ] Omitted
- [ ] Mentioned
- [ ] Explained
- [ ] Practiced (with exercises)

10. Are there any other concepts relevant to the introduction and background of EBP that you think should be included?

11. Are there any suggestions you would like to make on the wording or content of the concepts?

Developing a core set of EBP concepts - Delphi survey round 1

**EBP Step 1: Ask**

Omitted: a concept that is not a priority to be included in an EBP training program.

Mentioned: a concept that should be just mentioned in an EBP training program (i.e. provide common knowledge about this concept).

Explained: a concept that should be briefly explained in an EBP training program (i.e. provide understanding of the concept but without practical exercises).

Practised (with exercises): a concept that should be practised with exercises in an EBP training program (i.e. provide a detailed understanding of the concept, enhanced with practical exercises).

**EBP Step 1: Ask**

Which of the following concepts should be included in a priority set of core EBP teaching concepts?

* 1. How to identify and prioritise personal uncertainties or knowledge gaps in practice
   - Omitted
   - Mentioned
   - Explained
   - Practiced (with exercises)

* 2. The difference between background and foreground questions (e.g. “What is myocardial infarction?” versus “In adult patients with myocardial infarction, does aspirin intake improve patients’ survival?”).
   - Omitted
   - Mentioned
   - Explained
   - Practiced (with exercises)

* 3. Type of foreground clinical question (Frequency vs. Aetiology vs. Therapeutic vs. Prognosis vs. Diagnosis).
   - Omitted
   - Mentioned
   - Explained
   - Practiced (with exercises)

* 4. Using PICO to structure answerable clinical questions (includes: PICO elements, how to translate clinical problems into structured clinical questions, advantages of structured clinical questions).
   - Omitted
   - Mentioned
   - Explained
   - Practiced (with exercises)

5. Are there any other concepts relevant to the introduction and background of EBP that you think should be included?

6. Are there any suggestions you would like to make on the wording or content of the concepts?
## Developing a core set of EBP concepts - Delphi survey round 1

### EBP Step 2: Acquire

**Omitted**: a concept that is not a priority to be included in an EBP training program.

**Mentioned**: a concept that should be just mentioned in an EBP training program (i.e. provide common knowledge about this concept).

**Explained**: a concept that should be briefly explained in an EBP training program (i.e. provide understanding of the concept but without practical exercises).

**Practised (with exercises)**: a concept that should be practised with exercises in an EBP training program (i.e. provide a detailed understanding of the concept, enhanced with practical exercises).

### EBP Step 2: Acquire

Which of the following concepts should be included in a priority set of core EBP teaching concepts?

* 1. 5S/(or)6S model/pyramid of evidence resources.
  - [ ] Omitted
  - [ ] Mentioned
  - [ ] Explained
  - [ ] Practiced (with exercises)

* 2. Categories of sources of information (original primary databases vs. filtered resources vs. pre-appraised clinical evidence).
  - [ ] Omitted
  - [ ] Mentioned
  - [ ] Explained
  - [ ] Practiced (with exercises)

* 3. The difference in topic covered between databases (e.g. PubMed: medical, CINAHL: nursing and allied health, PsycINFO: psychiatry and mental health).
  - [ ] Omitted
  - [ ] Mentioned
  - [ ] Explained
  - [ ] Practiced (with exercises)

* 4. How to use different databases (e.g. PubMed, EMBASE, and Cochrane).
  - [ ] Omitted
  - [ ] Mentioned
  - [ ] Explained
  - [ ] Practiced (with exercises)

* 5. General search strategy: How to develop one (e.g. search terms: free text vs. Key words or MeSH terms) and Boolean operations: e.g. AND, OR, NOT.
  - [ ] Omitted
  - [ ] Mentioned
  - [ ] Explained
  - [ ] Practiced (with exercises)

* 6. Role of search filters (e.g. limit to language, human, year or study design).
  - [ ] Omitted
  - [ ] Mentioned
  - [ ] Explained
  - [ ] Practiced (with exercises)
7. The importance of designing a search strategy that reflects the purpose of the search (e.g. a narrow “the best” search for answering a quick clinical question vs. a broad search “everything” for conducting a systematic review.

- Omitted
- Mentioned
- Explained
- Practiced (with exercises)

8. How to find full text articles.

- Omitted
- Mentioned
- Explained
- Practiced (with exercises)

9. Are there any other concepts relevant to the introduction and background of EBP that you think should be included?

10. Are there any suggestions you would like to make on the wording or content of the concepts?
Developing a core set of EBP concepts - Delphi survey round 1

**EBP Step 3: Appraise – Epidemiological**

Omitted: a concept that is not a priority to be included in an EBP training program.

Mentioned: a concept that should be just mentioned in an EBP training program (i.e. provide common knowledge about this concept).

Explained: a concept that should be briefly explained in an EBP training program (i.e. provide understanding of the concept but without practical exercises).

Practised (with exercises): a concept that should be practised with exercises in an EBP training program (i.e. provide a detailed understanding of the concept, enhanced with practical exercises).

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**EBP Step 3: Appraise – Epidemiological**

Which of the following concepts should be included in a priority set of core EBP teaching concepts?

* 1. Randomisation (the importance and methods of randomisation).
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* 2. Allocation concealment.
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* 4. Loss to follow up/Attrition.
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* 5. Intention-To-Treat analysis (vs. Per Protocol analysis).
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* 6. The difference between Causation and Association.
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* 7. Confounding (methods to detect and adjust for confounders).
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

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8. The definition and calculation of incidence and prevalence.
   - Omitted
   - Mentioned
   - Explained
   - Practiced (with exercises)

9. The importance of considering conflict of interest/funding sources in appraising articles.
   - Omitted
   - Mentioned
   - Explained
   - Practiced (with exercises)

10. Are there any other concepts relevant to the introduction and background of EBP that you think should be included?

11. Are there any suggestions you would like to make on the wording or content of the concepts?
<table>
<thead>
<tr>
<th>EBP Step 3: Appraise – Appraisal</th>
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**Omitted**: a concept that is not a priority to be included in an EBP training program.

**Mentioned**: a concept that should be just mentioned in an EBP training program (i.e. provide common knowledge about this concept).

**Explained**: a concept that should be briefly explained in an EBP training program (i.e. provide understanding of the concept but without practical exercises).

**Practised (with exercises)**: a concept that should be practised with exercises in an EBP training program (i.e. provide a detailed understanding of the concept, enhanced with practical exercises).

**EBP Step 3: Appraise – Appraisal**

Which of the following concepts should be included in a priority set of core EBP teaching concepts?

* 1. The anatomy of a scientific paper (IMRD: Introduction, Methods, Results, and Discussion, identifying the “must read” sections).
  - [ ] Omitted
  - [ ] Mentioned
  - [ ] Explained
  - [ ] Practiced (with exercises)

* 2. Classifications of study designs: e.g. Interventional vs. observational; systematic reviews, RCTs, Non-RCTs, cohort, case-control, cross-sectional, etc.
  - [ ] Omitted
  - [ ] Mentioned
  - [ ] Explained
  - [ ] Practiced (with exercises)

* 3. The Pros & Cons of each study design for different types of research questions.
  - [ ] Omitted
  - [ ] Mentioned
  - [ ] Explained
  - [ ] Practiced (with exercises)

* 4. Systematic reviews & Meta-analysis (definitions and their importance).
  - [ ] Omitted
  - [ ] Mentioned
  - [ ] Explained
  - [ ] Practiced (with exercises)

* 5. Level of evidence and grade of recommendations (GRADE).
  - [ ] Omitted
  - [ ] Mentioned
  - [ ] Explained
  - [ ] Practiced (with exercises)

* 6. How to critical appraise a systematic review.
  - [ ] Omitted
  - [ ] Mentioned
  - [ ] Explained
  - [ ] Practiced (with exercises)
7. How to critical appraise a treatment study.
   - Omitted
   - Mentioned
   - Explained
   - Practiced (with exercises)

8. How to critical appraise a diagnostic study.
   - Omitted
   - Mentioned
   - Explained
   - Practiced (with exercises)

9. How to critical appraise a prognostic study.
   - Omitted
   - Mentioned
   - Explained
   - Practiced (with exercises)

10. How to critical appraise a harm study.
    - Omitted
    - Mentioned
    - Explained
    - Practiced (with exercises)

11. How to critical appraise a qualitative study.
    - Omitted
    - Mentioned
    - Explained
    - Practiced (with exercises)

12. How to critical appraise a clinical practice guideline.
    - Omitted
    - Mentioned
    - Explained
    - Practiced (with exercises)

13. Are there any other concepts relevant to the introduction and background of EBP that you think should be included?

14. Are there any suggestions you would like to make on the wording or content of the concepts?
### EBP Step 3: Appraise – Statistical

Which of the following concepts should be included in a priority set of core EBP teaching concepts?

* 1. The importance of the reporting quality of studies: EQUATOR Network reporting guidelines (e.g. STROBE, CONSORT, and PRISMA) and how to assess the quality of reporting of an article.
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* 2. Classifications of the types of data: categorical (dichotomous, nominal, ordinal) vs. continuous data
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* 3. P-values: what they are and how to interpret.
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* 4. Confidence Intervals: what they are and how to interpret.
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* 5. The difference between clinical and statistical significance.
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* 6. The difference between random error and systematic error (Bias).
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)
7. Classifications of the types bias (sources, types and how to deal with): e.g. performance bias; reporting bias; detection bias; recall bias; selection bias; publication bias (funnel plot, egger’s test).
   - Omitted
   - Mentioned
   - Explained
   - Practiced (with exercises)

8. Meaning and types of validity (internal vs. external validity).
   - Omitted
   - Mentioned
   - Explained
   - Practiced (with exercises)

   - Omitted
   - Mentioned
   - Explained
   - Practiced (with exercises)

10. Subgroup analysis: what is it and how to interpret its results.
    - Omitted
    - Mentioned
    - Explained
    - Practiced (with exercises)

11. Meta-analysis: what is it and how to interpret its results.
    - Omitted
    - Mentioned
    - Explained
    - Practiced (with exercises)

12. Heterogeneity: what is it, methods to detect it and how to interpret it.
    - Omitted
    - Mentioned
    - Explained
    - Practiced (with exercises)

13. Are there any other concepts relevant to the introduction and background of EBP that you think should be included?

14. Are there any suggestions you would like to make on the wording or content of the concepts?
## Developing a core set of EBP concepts - Delphi survey round 1

### EBP Step 3: Appraise – Results Interpretation

Omitted: a concept that is not a priority to be included in an EBP training program.

**Mentioned**: a concept that should be just mentioned in an EBP training program (i.e. provide common knowledge about this concept).

**Explained**: a concept that should be briefly explained in an EBP training program (i.e. provide understanding of the concept but without practical exercises).

**Practised (with exercises)**: a concept that should be practised with exercises in an EBP training program (i.e. provide a detailed understanding of the concept, enhanced with practical exercises).

## EBP Step 3: Appraise – Results Interpretation

Which of the following concepts should be included in a priority set of core EBP teaching concepts?

* 1. Types of measures of association and effect for binary outcomes (how to interpret): e.g. effect size in general, odds ratio, relative risk reduction/increase, absolute risk difference, relative risk /risk ratio, hazard ratio, NNT/NNH.

  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* 2. Measures for continuous outcomes (how to interpret): e.g. difference of means, ratio of means.

  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* 3. A 2x2 or contingency table (how to interpret and construct).

  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* 4. Measures to evaluate diagnostic accuracy (how to interpret): e.g. sensitivity, specificity, positive and negative predictive value, positive and negative likelihood ratio.

  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

5. Are there any other concepts relevant to the introduction and background of EBP that you think should be included?

6. Are there any suggestions you would like to make on the wording or content of the concepts?
### EBP Step 4: Apply

Which of the following concepts should be included in a priority set of core EBP teaching concepts?

  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* **2. Management of uncertainty in decision making in clinical practice.**
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* **3. The purpose and use of clinical prediction rules.**
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* **4. Shared decision making** (importance of and strategies including communicating benefit and harms to patients, and sharing decision with patients) and the role of decision support tools.
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* **5. Baseline risk of individual patient affects expected benefit** (and calculation of individual expected benefit).
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)

* **6. Barriers of knowledge translation:** individual versus organizational level and strategies to overcome these barriers.
  - Omitted
  - Mentioned
  - Explained
  - Practiced (with exercises)
7. Are there any other concepts relevant to the introduction and background of EBP that you think should be included?

8. Are there any suggestions you would like to make on the wording or content of the concepts?
Developing a core set of EBP concepts - Delphi survey round 1

<table>
<thead>
<tr>
<th>EBP Step 5: Assess</th>
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<tbody>
<tr>
<td><strong>Omitted</strong>: a concept that is not a priority to be included in an EBP training program.</td>
</tr>
<tr>
<td><strong>Mentioned</strong>: a concept that should be just mentioned in an EBP training program (i.e. provide common knowledge about this concept).</td>
</tr>
<tr>
<td><strong>Explained</strong>: a concept that should be briefly explained in an EBP training program (i.e. provide understanding of the concept but without practical exercises).</td>
</tr>
<tr>
<td><strong>Practised (with exercises)</strong>: a concept that should be practised with exercises in an EBP training program (i.e. provide a detailed understanding of the concept, enhanced with practical exercises).</td>
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</tbody>
</table>

**EBP Step 5: Assess**

Which of the following concepts should be included in a priority set of core EBP teaching concepts?

* 1. The leaky evidence pipeline (aware, accept, decide, do, recall, adhere, agree with patient, done).
  - [ ] Omitted
  - [ ] Mentioned
  - [ ] Explained
  - [ ] Practiced (with exercises)

* 2. Clinical Audit (its importance and how to conduct).
  - [ ] Omitted
  - [ ] Mentioned
  - [ ] Explained
  - [ ] Practiced (with exercises)

* 3. Reflective clinical practice (what is it and how to practice it).
  - [ ] Omitted
  - [ ] Mentioned
  - [ ] Explained
  - [ ] Practiced (with exercises)

4. Are there any other concepts relevant to the introduction and background of EBP that you think should be included?

5. Are there any suggestions you would like to make on the wording or content of the concepts?
Developing a core set of EBP concepts - Delphi survey round 1

Additional concepts

This is a list of additional concepts that have been also addressed in published education interventions and EBP curriculum statements. However, the steering committee have not included these additional concepts in the main survey questions. If you feel strongly, that one or more of these should be included in the next round, please indicate which and give a brief justification. Please review this list before suggesting new concepts.

**Additional concepts**

1. **ACQUIRE**
   - Citations tracking (forward/backward).

2. **APPRAISE**
   - Types of outcome measures (surrogate vs. composite end points measures).
   - Types of summary measures (proportion, mean, mode, median, SD, range, IQ ranges).
   - Graphical presentation of data (e.g. scatter plot, distribution curve, Kaplan-Meier curve, Bland-Altman plot, forest plot).
   - Tabular presentation of data (e.g. summary of finding tables in Cochrane reviews).
   - Clinical Practice Guidelines (development, sources, advantages and limitations).
   - Critical appraisal of cost-effectiveness paper + economic analysis.
   - Type I & Type II Error.
   - Sampling: techniques (probability vs. non-probability sampling) and sample size calculation.
   - Descriptive vs. Inferential statistical tests.
   - Parametric vs. Non-parametric tests.
   - Regression analysis: types (logistic, linear), independent vs. dependent variables.
   - Survival analysis (life table).
   - Random vs. Fixed effect models.
   - Equivalence vs. Non-inferiority vs. Superiority trials.
   - Reliability: reliability coefficients (e.g. intra-class correlation coefficient, kappa statistics).
3- APPLY
  ○ Cultural competence.

4- ASSESS
  ○ Academic detailing.
  ○ Supervision and training EBP to students.

5- Please give a reason for each concept you believe should be included in the next round.

6- Any other additional concepts that have not been mentioned anywhere in this survey.
### Developing a core set of EBP concepts - Delphi survey round 1

#### About You

1. **What is your age?**
   - Under 18
   - 18 - 29
   - 30 - 44
   - 45 - 59
   - 60+

2. **What is your gender?**
   - Female
   - Male

3. **In what country do you live?**

4. **Please indicate your health discipline**
   - Medicine
   - Nursing
   - Allied health (e.g. physiotherapy, occupational therapy)
   - Pharmacy
   - Other (please specify)

5. **Please indicate which of the following describes your place of employment (more than one may apply)**
   - Hospital
   - Private health practice
   - University
   - Non-profit organisation (e.g. non-governmental organisation, charity)
   - Governmental organisation
   - For-profit organisation (e.g. pharmaceutical or training company)
   - Other (please specify)
6- Please indicate which of the following describes your role or position (more than one may apply)
   ○ Teaching role
   ○ Clinical role
   ○ Research role
   ○ Other (please specify)

7- Are you currently responsible for teaching EBP
   ○ Yes
   ○ No

8- Please indicate the number of years of EBP teaching experience.

9- Please indicate here if you do NOT want to participate in the next round of the survey
   ○ I do NOT want to participate

10- At what email address would you like to be contacted?
Thank you very much for your participation
Developing a core set of EBP concepts - Delphi survey round 2

<table>
<thead>
<tr>
<th>Background</th>
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</table>

Thank you for your participation in the first round of this modified Delphi survey on the core evidence-based practice (EBP) concepts. This is the second round and hopefully the final one. We are aiming to develop a minimum list of the core concepts that a clinician needs to learn in EBP.

Based on your responses to the first round, the potential EBP core concepts have been divided into 5 main parts:

**Part 1 (DEFINITELY INCLUDE):** concepts that will be included in the list of EBP core concepts unless strong objection is received in this round.

**Part 2 (POSSIBLY INCLUDE – PRACTISED):** concepts that were positively rated as should be ‘Practised with exercise’ by the majority but did not reach the predefined level of consensus.

**Part 3 (POSSIBLY INCLUDE – EXPLAINED):** concepts that were positively rated as should be ‘Explained’ by the majority but did not reach the predefined level of consensus.

**Part 4 (POSSIBLY INCLUDE – MENTIONED):** concepts that were positively rated as should be ‘Mentioned’ by the majority but did not reach the predefined level of consensus.

**Part 5 (ADDITIONAL):** concepts that were either on the additional list or suggested by participants.

Thank you for the many free-text comments from Round 1. We have incorporated those comments into this round where applicable, or added them to the agenda for discussion at the consensus meeting.

This round of the survey should take 10 minutes to complete and will close on 4th June 2017.

Thank you for your participation.

Loai Albarqouni, Paul Glasziou, Tammy Hoffmann, Dragan Ilic, Taryn Young and Nina Rydland Olsen

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### Part 1: DEFINITELY INCLUDE

Part 1 These are concepts that reached the predefined level of consensus and will be included in the EBP core concepts list, unless strong objection is received in this round. You do not need to rate these items again, but can provide comment.

1.1. The five steps of EBP: ask, acquire, appraise, apply and assess. *(Practised)*

1.2. Using PICO to structure answerable clinical questions (includes: PICO elements, how to translate clinical problems into structured clinical questions, advantages of structured clinical questions). *(Practised)*

1.3. How to use different databases (e.g. PubMed, EMBASE, Cochrane). *(Practised)*

1.4. General search strategy: How to develop one (e.g. search terms: free text vs. Key words or MeSH terms) and Boolean operators: e.g. AND, OR, NOT. *(Practised)*

1.5. Systematic reviews & Meta-analysis (definitions and their importance). *(Explained)*

1.6. Critical appraisal of a systematic review. *(Practised)*

1.7. Critical appraisal of a treatment study. *(Practised)*

1.8. Critical appraisal of a clinical practice guideline. *(Practised)*

1.9. Critical appraisal of a diagnostic study. *(Practised)*

1.10. How to interpret measures of effect for binary outcomes: e.g. effect size in general, odds ratio, relative risk reduction/increase, absolute risk difference, relative risk /risk ratio, hazard ratio, NNT/NNH. *(Practised)*

1.11. The history and origin of EBP. *(Mentioned)*

1. Are there any suggestions you would like to make on the wording or content or incorporation of any of these concepts?
## Developing a core set of EBP concepts - Delphi survey round 2

### Part 2: POSSIBLY INCLUDE – PRACTISED

**Part 2** These are concepts that were rated as should be ‘Practised with exercise’ by the majority, but did not reach the predefined level of consensus.

Please rate each concept as to whether it should be ‘Practised with exercise’ or ‘Explained’. These concepts are mapped to the concepts in part 1.

**Explained**: a concept that should be briefly explained in an EBP training program (i.e. provide understanding of the concept but without practical exercises).

**Practised (with exercises)**: a concept that should be practised with exercises in an EBP training program (i.e. provide a detailed understanding of the concept, enhanced with practical exercises).

### * 1. Additional concepts relevant to concept 1.1: "The five steps of EBP: ask, acquire, appraise, apply and assess."

<table>
<thead>
<tr>
<th>Practised with exercise</th>
<th>Explained</th>
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</thead>
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</tbody>
</table>

- Shared decision making (importance of and strategies including communicating benefit and harms to patients, and sharing decision with patients) and the role of decision support tools.

### * 2. Additional concepts relevant to concept 1.2: "Using PICO to structure answerable clinical questions (includes: PICO elements, how to translate clinical problems into structured clinical questions, advantages of structured clinical questions)."

<table>
<thead>
<tr>
<th>Practised with exercise</th>
<th>Explained</th>
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</tbody>
</table>

- Types of clinical questions (e.g. frequency, aetiology, therapeutic)

- Major types of study designs: e.g. Interventional vs. observational; systematic reviews, RCTs, Non-RCTs, cohort, case-control, cross-sectional, etc.

- Hierarchy of levels of evidence (i.e. hierarchy for each clinical question type, primary research vs. secondary research).

- The pros & cons of major study designs for different types of research questions.
**3. Additional concepts relevant to concept 1.3: "How to use different databases (e.g. PubMed, EMBASE, Cochrane)."

<table>
<thead>
<tr>
<th>Practised with exercise</th>
<th>Explained</th>
</tr>
</thead>
<tbody>
<tr>
<td>How to find full text articles.</td>
<td>☐</td>
</tr>
<tr>
<td>Role of search filters (e.g. limit to language, human, year or study design).</td>
<td>☐</td>
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<tr>
<td>The importance of designing a search strategy that reflects the purpose of the search (e.g. a narrow “the best” search for answering a quick clinical question vs. a broad search “everything” for conducting a systematic review.)</td>
<td>☐</td>
</tr>
</tbody>
</table>

**4. Additional concepts relevant to concept 1.6: "Critical appraisal of a systematic review."

<table>
<thead>
<tr>
<th>Practised with exercise</th>
<th>Explained</th>
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</thead>
<tbody>
<tr>
<td>Heterogeneity: what it is, methods to detect it and how to interpret it.</td>
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<tr>
<td>A 2x2 or contingency table (how to interpret and construct).</td>
<td>☐</td>
</tr>
<tr>
<td>Meta-analysis: what it is and how to interpret its results.</td>
<td>☐</td>
</tr>
</tbody>
</table>

**5. Additional relevant to concept 1.7: "Critical appraisal of a treatment study."

<table>
<thead>
<tr>
<th>Practised with exercise</th>
<th>Explained</th>
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<tbody>
<tr>
<td>Allocation concealment.</td>
<td>☐</td>
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<td>Blinding.</td>
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<tr>
<td>Intention-To-Treat analysis (vs. Per Protocol analysis).</td>
<td>☐</td>
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<tr>
<td>Randomisation (the importance and methods of randomisation).</td>
<td>☐</td>
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<tr>
<td>Loss to follow up/Attrition.</td>
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<tr>
<td>The difference between causation and association.</td>
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<td>6. Additional relevant to concept 1.9: &quot;Critical appraisal of a diagnostic study.&quot;</td>
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<tr>
<td></td>
<td>Practised with exercise</td>
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<td></td>
<td>How to interpret measures to evaluate diagnostic accuracy: e.g. sensitivity, specificity, positive and negative predictive value, positive and negative likelihood ratio.</td>
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<td>7. Concepts relevant to concept 1.10: &quot;How to interpret measures of effect for binary outcomes&quot;</td>
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<td>Practised with exercise</td>
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<td></td>
<td>The difference between clinical and statistical significance.</td>
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<td>Confidence Intervals: what they are and how to interpret.</td>
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<td></td>
<td>How to interpret measures of effect for continuous outcomes: e.g. difference of means, ratio of means.</td>
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<td>P-values: what they are and how to interpret.</td>
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<td>8. Unmapped</td>
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<td></td>
<td>Practised with exercise</td>
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<td></td>
<td>Critical appraisal of a prognostic study.</td>
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<td>Critical appraisal of a harm study.</td>
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<td></td>
<td>Critical appraisal of a qualitative study.</td>
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</tbody>
</table>

9. Are there any suggestions you would like to make on the wording or content or incorporation of any of these concepts?
### Part 3: POSSIBLY INCLUDE – EXPLAINED

**Part 3** These are concepts that were rated as should be ‘Explained’ by the majority, but did not reach the predefined level of consensus.

Please rate each concept as to whether it should be ‘Explained’ or ‘Mentioned’. Some of the concepts where possible, have been mapped to the concepts in part 1.

**Mentioned:** a concept that should be just mentioned in an EBP training program (i.e. provide common knowledge about this concept).

**Explained:** a concept that should be briefly explained in an EBP training program (i.e. provide understanding of the concept but without practical exercises).

*1. Additional concepts relevant to concept 1.1: "The five steps of EBP: ask, acquire, appraise, apply and assess."

The definition of evidence-based practice (EBP): “e.g. the integration of the best research evidence with our clinical expertise and our patient’s unique values and circumstances [1]."

- How to identify and prioritise personal uncertainties or knowledge gaps in practice
- Management of uncertainty in decision making in clinical practice.

*2. Additional concepts relevant to concept 1.2: "Using PICO to structure answerable clinical questions (includes: PICO elements, how to translate clinical problems into structured clinical questions, advantages of structured clinical questions)."

- The difference between background and foreground questions (e.g. “What is myocardial infarction?” versus “In adult patients with myocardial infarction, does aspirin improve patients’ survival?”).

*3. Additional concepts relevant to concept 1.3: "How to use different databases (e.g. PubMed, EMBASE, Cochrane)."

- Categories of sources of information (e.g. original primary databases vs. filtered resources vs. pre-appraised evidence).
- SS (or) 6S model of evidence resources (i.e. studies, syntheses, synopses, summaries, systems): what it is and the advantages and disadvantages of resources at each level [2].
<table>
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<th>4. Additional concepts relevant to concept 1.6: “Critical appraisal of a systematic review.&quot;</th>
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<tbody>
<tr>
<td></td>
<td>The difference between random error and systematic error (Bias).</td>
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<td>Classifications of the type of bias (sources, types and how to deal with): e.g.</td>
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<td>performance bias; reporting bias; detection bias; recall bias; selection bias; publication</td>
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<td></td>
<td>bias (funnel plot, egger's test).</td>
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<td>Types of validity (internal vs. external validity).</td>
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<td></td>
<td>Sensitivity analysis: what is it and how to interpret its results.</td>
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<td>Subgroup analysis: what is it and how to interpret its results.</td>
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<td>The Grading of Recommendations Assessment, Development and Evaluation (GRADE) - Level of</td>
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<td>evidence.</td>
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<td>Baseline risk of individual patient affects expected benefit (and calculation of individual</td>
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<td>**5. Additional relevant to concept 1.7: &quot;Critical appraisal of a clinical practice guideline.</td>
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<td>The Grading of Recommendations Assessment, Development and Evaluation (GRADE) - Strength of</td>
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<td>Recommendations</td>
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<td>**7. Concepts relevant to concept 1.10: &quot;How to interpret measures of effect for binary</td>
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<td></td>
<td>outcomes&quot;</td>
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<td>Classifications of types of data: categorical (dichotomous, nominal, ordinal) vs.</td>
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<td>continuous data.</td>
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<td>**8. Additional concepts relevant to concept 1.11: &quot;The history and origin of EBP&quot;</td>
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<td></td>
<td>The distinction between the mechanistic vs. empiricism approach of dealing with what is</td>
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<td>effective (e.g. Dr. Spock's advice to put infants on fronts to sleep to avoid choking on</td>
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<tr>
<td></td>
<td>vomit [mechanistic] while this led to avoidable cot death [empirical]</td>
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The distinction between using research (that is, search for pre-appraised evidence to apply in practice or follow the five steps of EBP) vs. conducting research (that is, conducting primary or secondary research).

The rationale for EBP (e.g. there is a huge amount of literature that clinicians cannot read all: an expanding amount of publications vs. clinicians’ workload and the need to keep up-to-date).

### 9. Unmapped

The importance of the reporting quality of studies: EQUATOR Network of reporting guidelines (e.g. STROBE, CONSORT, and PRISMA) and how to assess the quality of reporting of an article.

Clinical Decision Making (its components, application of the concepts of decision anatomy in the analysis of a clinical problem, and the barriers for objective decision making).

Barriers of knowledge translation: individual versus organizational level and strategies to overcome these barriers.

Clinical audit (its importance and how to conduct).

Reflective clinical practice (what is it and how to practice it).

The definition and calculation of incidence and prevalence.

The importance of considering conflict of interest/ funding sources in appraising articles.

The anatomy of a scientific paper (IMRD: Introduction, Methods, Results, and Discussion, identifying the “must read” sections).

Confounding (methods to detect and adjust for confounders).

10. Are there any suggestions you would like to make on the wording or content or incorporation of any of these concepts?
Part 4: POSSIBLY INCLUDE – Mentioned

Part 4 These are concepts that were rated as should be ‘Mentioned’ by the majority, but did not reach the predefined level of consensus.

Please rate each concept as to whether it should be ‘Mentioned’ or ‘Omitted’. Some of the concepts where possible, have been mapped to the concepts in part 1.

Omitted: a concept that is not a priority to be included in an EBP training program.
Mentioned: a concept that should be just mentioned in an EBP training program (i.e. provide common knowledge about this concept).

* 1. Additional concepts relevant to concept 1.3: "How to use different databases (e.g. PubMed, EMBASE, Cochrane)."

The difference in topics covered between databases (e.g. PubMed: medical, CINAHL: nursing and allied health, PsycINFO: psychiatry and mental health).

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<tr>
<th>Mentioned</th>
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* 2. Unmapped

Earlier detection of disease is not necessarily better.

The leaky evidence pipeline (aware, accept, decide, do, recall, adhere, agree with patient, done) [1].

New, brand-named, or more expensive treatments are not necessarily better than current alternatives.

<table>
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<tr>
<th>Mentioned</th>
<th>Omitted</th>
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3. Are there any suggestions you would like to make on the wording or content or incorporation of any of these concepts?
Part 5 These are concepts that were either on the additional list in Round 1 or from participants’ comments.

Please rate each concept as whether it should be 'Practised with exercise', 'Explained', 'Mentioned', or 'Omitted'.

**Omitted**: a concept that is not a priority to be included in an EBP training program.

**Mentioned**: a concept that should be just mentioned in an EBP training program (i.e. provide common knowledge about this concept).

**Explained**: a concept that should be briefly explained in an EBP training program (i.e. provide understanding of the concept but without practical exercises).

**Practised (with exercises)**: a concept that should be practised with exercises in an EBP training program (i.e. provide a detailed understanding of the concept, enhanced with practical exercises).

<table>
<thead>
<tr>
<th>* 1. Additional concepts relevant to concept 1.10: &quot;How to interpret measures of effect for binary outcomes&quot;</th>
<th>Practice with exercise</th>
<th>Explained</th>
<th>Mentioned</th>
<th>Omitted</th>
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<tbody>
<tr>
<td>Types of outcome measures (surrogate vs. composite end points measures).</td>
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<table>
<thead>
<tr>
<th>* 2. Unmapped</th>
<th>Practice with exercise</th>
<th>Explained</th>
<th>Mentioned</th>
<th>Omitted</th>
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</thead>
<tbody>
<tr>
<td>Graphical presentation of data (e.g. scatter plot, Kaplan-Meier curve, Bland-Altman plot).</td>
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<tr>
<td>Mixed-method research: how to appraise and interpret.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type I &amp; Type II Error.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultural competence (including the workplace context).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qualitative research: how to appraise.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary of Findings (SoF) tables: how to interpret.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient decision aids: what they are, role in EBP, and how to use.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinician decision support tools: role in EBP.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Are there any suggestions you would like to make on the wording or content or incorporation of any of these concepts?

Developing a core set of EBP concepts - Delphi survey round 2

Thank you

Thank you very much for your participation
# eTables

**eTable 1.** Characteristics of included studies in the systematic review

<table>
<thead>
<tr>
<th>Author, date</th>
<th>Country, language of intervention</th>
<th>Participants (number, profession, education level)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Randomized Controlled Trials</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buchanan 2014</td>
<td>South Africa, English</td>
<td>56 practising occupational therapists</td>
</tr>
<tr>
<td>Dizon 2014</td>
<td>Philippines</td>
<td>54 practising physical therapists</td>
</tr>
<tr>
<td>Welch 2014</td>
<td>US, English</td>
<td>175 professional athletic training students, graduate students, clinical preceptors, educators, and clinicians.</td>
</tr>
<tr>
<td>Al-Baghali 2013</td>
<td>Saudi Arabia, English</td>
<td>59 medical doctors in primary health care centres</td>
</tr>
<tr>
<td>Brettle 2013</td>
<td>UK, English</td>
<td>77 first-year undergraduate pre-registration diploma nursing students</td>
</tr>
<tr>
<td>Campbell 2013</td>
<td>Australia, English</td>
<td>135 allied health professionals from four regions in Australia.</td>
</tr>
<tr>
<td>Eldredge 2013</td>
<td>US, English</td>
<td>71 first-year medical students</td>
</tr>
<tr>
<td>Ilic 2013</td>
<td>Australia and Malaysia</td>
<td>147 medical students</td>
</tr>
<tr>
<td>Kok 2013</td>
<td>Netherland</td>
<td>132 insurance physicians</td>
</tr>
<tr>
<td>Cheng 2012</td>
<td>Taiwan, Mandarin</td>
<td>94 final-year medical students</td>
</tr>
<tr>
<td>Ilic 2012</td>
<td>Australia, English</td>
<td>121 third-year medical students</td>
</tr>
<tr>
<td>Kulier 2012</td>
<td>7 LMICs</td>
<td>204 postgraduate trainees (residents, registrars and postgraduate clinical trainees) in obstetrics and gynaecology</td>
</tr>
<tr>
<td>Sanchez-Mendiola 2012</td>
<td>Mexico, Spanish</td>
<td>289 fifth-year medical students</td>
</tr>
<tr>
<td>Gardois 2011</td>
<td>Italy, Italian</td>
<td>22 paediatric residents and interns</td>
</tr>
<tr>
<td>Jalali-Nia 2011</td>
<td>Iran</td>
<td>41 undergraduate nursing students</td>
</tr>
<tr>
<td>Feldstein 2010</td>
<td>US, English</td>
<td>48 internal medicine residents</td>
</tr>
<tr>
<td>Hadley 2010</td>
<td>UK, English</td>
<td>237 postgraduate medical trainee at foundation or internship level</td>
</tr>
<tr>
<td>McLeod 2010</td>
<td>US, English</td>
<td>443 residents in general surgery</td>
</tr>
<tr>
<td>Johnston 2009</td>
<td>China</td>
<td>129 second-year medical students</td>
</tr>
<tr>
<td>Kulier 2009</td>
<td>Netherland and UK</td>
<td>61 postgraduate trainees in obstetrics and gynaecology</td>
</tr>
<tr>
<td>Davis 2008</td>
<td>UK, English</td>
<td>55 newly qualified foundation year doctors</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Study</th>
<th>Country/Region</th>
<th>Sample Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hugenholtz 2008</td>
<td>Netherlands</td>
<td>98 occupational physicians</td>
</tr>
<tr>
<td>Kim 2008</td>
<td>US, English</td>
<td>50 residents in internal medicine</td>
</tr>
<tr>
<td>Davis 2007</td>
<td>UK, English</td>
<td>179 first medical students</td>
</tr>
<tr>
<td>Lee 2007</td>
<td>China</td>
<td>132 final-year medical students</td>
</tr>
<tr>
<td>Shuval 2007</td>
<td>Israel</td>
<td>75 primary care doctors</td>
</tr>
<tr>
<td>Stark 2007</td>
<td>US, English</td>
<td>77 second- and third-year residents in internal medicine</td>
</tr>
<tr>
<td>Krueger 2006</td>
<td>US, English</td>
<td>77 third-year osteopathic medical students</td>
</tr>
<tr>
<td>Schilling 2006</td>
<td>US, English</td>
<td>238 third-year medical students</td>
</tr>
<tr>
<td>Bradley 2005</td>
<td>Norway</td>
<td>175 tenth-semester medical students</td>
</tr>
<tr>
<td>Macrae 2004</td>
<td>Canada, English</td>
<td>81 general surgeons</td>
</tr>
<tr>
<td>Stevenson 2004</td>
<td>UK, English</td>
<td>30 musculoskeletal physiotherapists</td>
</tr>
<tr>
<td>Taylor 2004</td>
<td>UK, English</td>
<td>145 healthcare professionals (general practitioners, hospital physicians, professions allied to medicine, and healthcare managers/administrators)</td>
</tr>
<tr>
<td>Cheng 2003</td>
<td>China</td>
<td>800 healthcare clinicians (medical doctors, nurses, allied health professionals)</td>
</tr>
<tr>
<td>Forsetlund 2003</td>
<td>Norway</td>
<td>148 public health physicians</td>
</tr>
<tr>
<td>Bradley 2002</td>
<td>US, English</td>
<td>10 residents in neonatal care unit</td>
</tr>
<tr>
<td>Cabell 2001</td>
<td>US, English</td>
<td>48 internal medicine resident physicians</td>
</tr>
<tr>
<td>Verhoeven 2000</td>
<td>Nederland</td>
<td>103 healthcare professionals (general practitioners and others)</td>
</tr>
<tr>
<td>MacAuley 1999</td>
<td>UK, English</td>
<td>99 GP trainers</td>
</tr>
<tr>
<td>Stevermer 1999</td>
<td>US, English</td>
<td>59 residents in family practice</td>
</tr>
<tr>
<td>Erickson 1998</td>
<td>US, English</td>
<td>31 residents in obstetrics and gynaecology</td>
</tr>
<tr>
<td>Rosenberg 1998</td>
<td>UK, English</td>
<td>108 medical students</td>
</tr>
<tr>
<td>Haynes 1993</td>
<td>Canada, English</td>
<td>392 physicians and physicians-in-training</td>
</tr>
<tr>
<td>Romm 1989</td>
<td>US, English</td>
<td>108 medical students</td>
</tr>
<tr>
<td>Linzer 1987</td>
<td>US, English</td>
<td>44 medical interns</td>
</tr>
</tbody>
</table>

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## Non-Randomized Controlled Trials

<table>
<thead>
<tr>
<th>Study</th>
<th>Location/Country</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ilic 2015</td>
<td>Australia, English</td>
<td>61 second-year medical students</td>
</tr>
<tr>
<td>Olsen 2015</td>
<td>Norway</td>
<td>37 clinical instructors in Physiotherapy</td>
</tr>
<tr>
<td>Ramos-Morcillo 2015</td>
<td>Spain, Spanish</td>
<td>109 registered nurse</td>
</tr>
<tr>
<td>Vrdoljak 2015</td>
<td>Croatia, Croatian</td>
<td>98 mentors in general practice</td>
</tr>
<tr>
<td>Fernandez 2014</td>
<td>Australia and Hong Kong, English</td>
<td>186 postgraduate nursing students</td>
</tr>
<tr>
<td>Balajic 2012</td>
<td>Croatia, Croatian</td>
<td>1232 medical students in 3 medical schools.</td>
</tr>
<tr>
<td>Haas 2012</td>
<td>US, Croatian</td>
<td>339 chiropractic doctoral students</td>
</tr>
<tr>
<td>Schoonheim-Klein 2012</td>
<td>Netherland</td>
<td>62 working group of dental students</td>
</tr>
<tr>
<td>Wallen 2010</td>
<td>US, English</td>
<td>159 nurses participating in leading/mentoring activities</td>
</tr>
<tr>
<td>Kim 2009</td>
<td>US, English</td>
<td>208 senior fourth-year nursing students</td>
</tr>
<tr>
<td>Carlock 2007</td>
<td>US, English</td>
<td>90 junior first-semester nursing students</td>
</tr>
<tr>
<td>Schaafsma 2007</td>
<td>Netherland</td>
<td>125 occupational health physicians and insurance physicians</td>
</tr>
<tr>
<td>Gruppen 2005</td>
<td>US, English</td>
<td>92 fourth-year medical students</td>
</tr>
<tr>
<td>Thomas 2005</td>
<td>US, English</td>
<td>46 residents in internal medicine</td>
</tr>
<tr>
<td>Aki 2004</td>
<td>US, English</td>
<td>40 medical students and residents rotating with the general internal medicine team at a university hospital.</td>
</tr>
<tr>
<td>Sanchez-Mendiola 2004</td>
<td>Mexico, Spanish</td>
<td>131 medical students</td>
</tr>
<tr>
<td>Ross 2003</td>
<td>US, English</td>
<td>48 residents in family practice</td>
</tr>
<tr>
<td>Mills 2002</td>
<td>Canada, English</td>
<td>83 Naturopathic interns</td>
</tr>
<tr>
<td>Badgett 2001</td>
<td>US, English</td>
<td>157 third-year medical students</td>
</tr>
<tr>
<td>Edwards 2001</td>
<td>UK, English</td>
<td>482 third-year medical students</td>
</tr>
<tr>
<td>Major-Kincade 2001</td>
<td>US, English</td>
<td>64 paediatrics house staff</td>
</tr>
<tr>
<td>Shorten 2001</td>
<td>Australia, English</td>
<td>143 nursing students</td>
</tr>
<tr>
<td>Ghali 2000</td>
<td>Canada, English</td>
<td>60 third-year medical students</td>
</tr>
<tr>
<td>Smith 2000</td>
<td>US, English</td>
<td>55 first-year residents in internal medicine</td>
</tr>
<tr>
<td>Study</td>
<td>Country, Language</td>
<td>Participants</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>Bazarian 1999</td>
<td>US, English</td>
<td>32 emergency medicine residents</td>
</tr>
<tr>
<td>Fu 1999</td>
<td>Canada, English</td>
<td>12 residents in psychiatry</td>
</tr>
<tr>
<td>Green 1997</td>
<td>US, English</td>
<td>34 second- and third-year internal medicine residents</td>
</tr>
<tr>
<td>Landry 1994</td>
<td>US, English</td>
<td>146 third-year medical students</td>
</tr>
<tr>
<td>Seelig 1993</td>
<td>US, English</td>
<td>44 practising internists and residents</td>
</tr>
<tr>
<td>Frasca 1992</td>
<td>US, English</td>
<td>92 third-year medical students</td>
</tr>
<tr>
<td>Griffin 1992</td>
<td>US, English</td>
<td>57 occupational therapy students</td>
</tr>
<tr>
<td>Langkamp 1992</td>
<td>US, English</td>
<td>27 residents in Paediatrics</td>
</tr>
<tr>
<td>Kitchens 1989</td>
<td>Canada, English</td>
<td>83 residents in internal medicine</td>
</tr>
<tr>
<td>Bennett 1987</td>
<td>Canada, English</td>
<td>79 final-year medical students</td>
</tr>
<tr>
<td>Linzer 1988</td>
<td>US, English</td>
<td>85 residents in internal medicine</td>
</tr>
<tr>
<td>Radack 1986</td>
<td>US, English</td>
<td>33 medical students</td>
</tr>
<tr>
<td>Riegelman 1986</td>
<td>US, English</td>
<td>292 medical students</td>
</tr>
<tr>
<td>Viniegra 1986</td>
<td>Mexico, Spanish</td>
<td>20 residents in internal medicine</td>
</tr>
</tbody>
</table>

Abbreviations: RCT: randomised controlled trial; CT: controlled trial; P: postgraduate; U: undergraduate
eTable 2. EBP competencies identified from included studies in the systematic review

<table>
<thead>
<tr>
<th>Introductory</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The definition of evidence-based practice (EBP): “the integration of the best research evidence with our clinical expertise and our patient’s unique values and circumstances”.</td>
<td></td>
</tr>
<tr>
<td>The distinction between the mechanistic vs. empiricism approach of dealing with what is effective (a common example is Dr. Spock's advice to put infants on fronts to sleep to avoid choking on vomit [mechanistic] while this led to avoidable cot death [empiric evidence])</td>
<td></td>
</tr>
<tr>
<td>Hierarchy of levels of evidence (i.e. hierarchy for each clinical question type, primary research vs. secondary research).</td>
<td></td>
</tr>
<tr>
<td>The history and origin of EBP.</td>
<td></td>
</tr>
<tr>
<td>The rationale for EBP (e.g. there is a huge amount of literature that clinicians cannot read all: an expanding amount of publications vs. clinicians’ workload and the need to keep up-to-date).</td>
<td></td>
</tr>
<tr>
<td>The five steps of EBP: ask, acquire, appraise, apply and assess.</td>
<td></td>
</tr>
<tr>
<td>The distinction between using research (that is, search for pre-appraised evidence to apply in practice or follow the five steps of EBP) vs. conducting research (that is, conducting primary or secondary research).</td>
<td></td>
</tr>
<tr>
<td>New, brand-named, or more expensive treatments are not necessarily better than current alternatives.</td>
<td></td>
</tr>
<tr>
<td>Earlier detection of disease is not necessarily better.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ask</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>How to identify and prioritise personal uncertainties or knowledge gaps in practice</td>
<td></td>
</tr>
<tr>
<td>The difference between background and foreground questions (e.g. “What is myocardial infarction?” versus “In adult patients with myocardial infarction, does aspirin intake improve patients’ survival?”).</td>
<td></td>
</tr>
<tr>
<td>Type of foreground clinical question (Frequency vs. Aetiology vs. Therapeutic vs. Prognosis vs. Diagnosis).</td>
<td></td>
</tr>
<tr>
<td>Using PICO to structure answerable clinical questions (includes: PICO elements, how to translate clinical problems into structured clinical questions, advantages of structured clinical questions).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acquire</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5S(or)6S model/pyramid of evidence resources.</td>
<td></td>
</tr>
<tr>
<td>Categories of sources of information (original primary databases vs. filtered resources vs. pre-appraised clinical evidence).</td>
<td></td>
</tr>
<tr>
<td>The difference in topic covered between databases (e.g. PubMed: medical, CINAHL: nursing and allied health, PsycINFO: psychiatry and mental health).</td>
<td></td>
</tr>
<tr>
<td>How to use different databases (e.g. PubMed, EMBASE, and Cochrane).</td>
<td></td>
</tr>
<tr>
<td>General search strategy: How to develop one (e.g. search terms: free text vs. Key words or MeSH terms) and Boolean operations: e.g. AND, OR, NOT.</td>
<td></td>
</tr>
</tbody>
</table>

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Role of search filters (e.g. limit to language, human, year or study design).
The importance of designing a search strategy that reflects the purpose of the search (e.g. a narrow “the best” search for answering a quick clinical question vs. a broad search “everything” for conducting a systematic review.
How to find full text articles.

<table>
<thead>
<tr>
<th>Appraise – Epidemiological</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomisation (the importance and methods of randomisation).</td>
</tr>
<tr>
<td>Allocation concealment.</td>
</tr>
<tr>
<td>Blinding.</td>
</tr>
<tr>
<td>Loss to follow up/Attrition.</td>
</tr>
<tr>
<td>Intention-To-Treat analysis (vs. Per Protocol analysis).</td>
</tr>
<tr>
<td>The difference between Causation and Association.</td>
</tr>
<tr>
<td>Confounding (methods to detect and adjust for confounders).</td>
</tr>
<tr>
<td>The definition and calculation of incidence and prevalence.</td>
</tr>
<tr>
<td>The importance of considering conflict of interest/ funding sources in appraising articles.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appraise – Appraisal</th>
</tr>
</thead>
<tbody>
<tr>
<td>The anatomy of a scientific paper (IMRD: Introduction, Methods, Results, and Discussion, identifying the “must read” sections).</td>
</tr>
<tr>
<td>Classifications of study designs: e.g. Interventional vs. observational; systematic reviews, RCTs, Non-RCTs, cohort, case-control, cross-sectional, etc.</td>
</tr>
<tr>
<td>The Pros &amp; Cons of each study design for different types of research questions.</td>
</tr>
<tr>
<td>Systematic reviews &amp; Meta-analysis (definitions and their importance).</td>
</tr>
<tr>
<td>Level of evidence and grade of recommendations (GRADE).</td>
</tr>
<tr>
<td>How to critical appraise a systematic review.</td>
</tr>
<tr>
<td>How to critical appraise a treatment study.</td>
</tr>
<tr>
<td>How to critical appraise a diagnostic study.</td>
</tr>
<tr>
<td>How to critical appraise a prognostic study.</td>
</tr>
<tr>
<td>How to critical appraise a harm study.</td>
</tr>
<tr>
<td>How to critical appraise a qualitative study.</td>
</tr>
<tr>
<td>How to critical appraise a clinical practice guideline.</td>
</tr>
</tbody>
</table>

| Appraise – Statistical |

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The importance of the reporting quality of studies: EQUATOR Network reporting guidelines (e.g. STROBE, CONSORT, and PRISMA) and how to assess the quality of reporting of an article.

Classifications of the types of data: categorical (dichotomous, nominal, ordinal) vs. continuous data

P-values: what they are and how to interpret.

Confidence Intervals: what they are and how to interpret.

The difference between clinical and statistical significance.

The difference between random error and systematic error (Bias).

Classifications of the types bias (sources, types and how to deal with): e.g. performance bias; reporting bias; detection bias; recall bias; selection bias; publication bias (funnel plot, egger’s test).

Meaning and types of validity (internal vs. external validity).

Sensitivity analysis: what is it and how to interpret its results.

Subgroup analysis: what is it and how to interpret its results.

Meta-analysis: what is it and how to interpret its results.

Heterogeneity: what is it, methods to detect it and how to interpret it.

**Appraise – Results Interpretation**

Types of measures of association and effect for binary outcomes (how to interpret): e.g. effect size in general, odds ratio, relative risk reduction/increase, absolute risk difference, relative risk /risk ratio, hazard ratio, NNT/NNH.

Measures for continuous outcomes (how to interpret): e.g. difference of means, ratio of means.

A 2x2 or contingency table (how to interpret and construct).

Measures to evaluate diagnostic accuracy (how to interpret): e.g. sensitivity, specificity, positive and negative predictive value, positive and negative likelihood ratio.

**Apply**

Clinical Decision Making (its components, application of the concepts of decision anatomy in the analysis of a clinical problem, and the barriers for objective decision making).

Management of uncertainty in decision making in clinical practice.

The purpose and use of clinical prediction rules.

Shared decision making (importance of and strategies including communicating benefit and harms to patients, and sharing decision with patients) and the role of decision support tools.

Baseline risk of individual patient affects expected benefit (and calculation of individual expected benefit).

Barriers of knowledge translation: individual versus organizational level and strategies to overcome these barriers.

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### Assess/Evaluate

- The leaky evidence pipeline (aware, accept, decide, do, recall, adhere, agree with patient, done).
- Clinical Audit (its importance and how to conduct).
- Reflective clinical practice (what is it and how to practice it).

### Additional

- Citations tracking (forward/backward).
- Types of outcome measures (surrogate vs. composite end points measures).
- Types of summary measures (proportion, mean, mode, median, SD, range, IQ ranges).
- Graphical presentation of data (e.g. scatter plot, distribution curve, Kaplan-Meier curve, Bland-Altman plot, forest plot).
- Tabular presentation of data (e.g. summary of finding tables in Cochrane reviews).
- Clinical Practice Guidelines (development, sources, advantages and limitations).
- Critical appraisal of cost-effectiveness paper + economic analysis.
- Type I & Type II Error.
- Sampling: techniques (probability vs. non-probability sampling) and sample size calculation.
- Descriptive vs. Inferential statistical tests.
- Parametric vs. Non-parametric tests.
- Regression analysis: types (logistic, linear), independent vs. dependent variables.
- Survival analysis (life table).
- Random vs. Fixed effect models.
- Equivalence vs. Non-inferiority vs. Superiority trials.
- Reliability: reliability coefficients (e.g. intra-class correlation coefficient, kappa statistics).
- Cultural competence.
- Academic detailing.
- Supervision and training EBP to students.
eTable 3. Summary of round 1 Delphi questionnaire results.

<table>
<thead>
<tr>
<th>EBP Competencies</th>
<th>Omitted</th>
<th>mentioned</th>
<th>explained</th>
<th>practised</th>
</tr>
</thead>
<tbody>
<tr>
<td>The definition of evidence-based practice (EBP): “the integration of the best research evidence with our clinical expertise and our patient’s unique values and circumstances”.</td>
<td>0 (0)</td>
<td>59 (32.1)</td>
<td>100 (54.3)</td>
<td>25 (13.6)</td>
</tr>
<tr>
<td>The distinction between the mechanistic vs. empiricism approach of dealing with what is effective (a common example is Dr. Spock’s advice to put infants on fronts to sleep to avoid choking on vomit [mechanistic] while this led to avoidable cot death [empiric evidence])</td>
<td>5 (2.7)</td>
<td>62 (33.7)</td>
<td>100 (54.3)</td>
<td>17 (9.2)</td>
</tr>
<tr>
<td>Hierarchy of levels of evidence (i.e. hierarchy for each clinical question type, primary research vs. secondary research)</td>
<td>2 (1.1)</td>
<td>7 (3.8)</td>
<td>81 (44)</td>
<td>94 (51.1)</td>
</tr>
<tr>
<td>The history and origin of EBP.</td>
<td>10 (5.5)</td>
<td>130 (71)</td>
<td>41 (22.4)</td>
<td>2 (1.1)</td>
</tr>
<tr>
<td>The rationale for EBP (e.g. there is a huge amount of literature that clinicians cannot read all: an expanding amount of publications vs. clinicians’ workload and the need to keep up-to-date).</td>
<td>0 (0)</td>
<td>61 (33.2)</td>
<td>101 (54.9)</td>
<td>22 (12)</td>
</tr>
<tr>
<td>The five steps of EBP: ask, acquire, appraise, apply and assess.</td>
<td>0 (0)</td>
<td>10 (5.4)</td>
<td>44 (23.9)</td>
<td>130 (70.7)</td>
</tr>
<tr>
<td>The distinction between using research (that is, search for pre-appraised evidence to apply in practice or follow the five steps of EBP) vs. conducting research (that is, conducting primary or secondary research).</td>
<td>8 (4.4)</td>
<td>49 (26.8)</td>
<td>108 (59)</td>
<td>18 (9.8)</td>
</tr>
<tr>
<td>New, brand-named, or more expensive treatments are not necessarily better than current alternatives.</td>
<td>55 (30.1)</td>
<td>101 (55.2)</td>
<td>18 (9.8)</td>
<td>9 (4.9)</td>
</tr>
<tr>
<td>Earlier detection of disease is not necessarily better.</td>
<td>48 (26.1)</td>
<td>109 (59.2)</td>
<td>15 (8.2)</td>
<td>12 (6.5)</td>
</tr>
<tr>
<td>How to identify and prioritise personal uncertainties or knowledge gaps in practice</td>
<td>3 (1.6)</td>
<td>45 (24.5)</td>
<td>113 (61.4)</td>
<td>23 (12.5)</td>
</tr>
<tr>
<td>The difference between background and foreground questions (e.g. “What is myocardial infarction?” versus “In adult patients with myocardial infarction, does aspirin intake improve patients’ survival?”).</td>
<td>3 (1.6)</td>
<td>51 (27.7)</td>
<td>106 (57.6)</td>
<td>24 (13)</td>
</tr>
<tr>
<td>Type of foreground clinical question (Frequency vs. Aetiology vs. Therapeutic vs. Prognosis vs. Diagnosis).</td>
<td>5 (2.7)</td>
<td>14 (7.6)</td>
<td>72 (39.1)</td>
<td>93 (50.5)</td>
</tr>
<tr>
<td>Using PICO to structure answerable clinical questions (includes: PICO elements, how to translate clinical problems into structured clinical questions, advantages of structured clinical questions).</td>
<td>1 (0.5)</td>
<td>6 (3.3)</td>
<td>15 (8.2)</td>
<td>162 (88)</td>
</tr>
<tr>
<td>5S/(or)6S model/pyramid of evidence resources[1].</td>
<td>2 (1.1)</td>
<td>45 (25.1)</td>
<td>109 (60.9)</td>
<td>23 (12.8)</td>
</tr>
<tr>
<td>Categories of sources of information (original primary databases vs. filtered resources vs. pre-appraised clinical evidence).</td>
<td>2 (1.1)</td>
<td>55 (30.7)</td>
<td>99 (55.3)</td>
<td>23 (12.8)</td>
</tr>
<tr>
<td>The difference in topic covered between databases (e.g. PubMed: medical, CINAHL: nursing and allied health, PsycINFO: psychiatry and mental health).</td>
<td>32 (17.9)</td>
<td>122 (68.2)</td>
<td>18 (10.1)</td>
<td>7 (3.9)</td>
</tr>
<tr>
<td>How to use different databases (e.g. PubMed, EMBASE, Cochrane).</td>
<td>2 (1.1)</td>
<td>17 (9.6)</td>
<td>26 (14.6)</td>
<td>133 (74.7)</td>
</tr>
<tr>
<td>General search strategy: How to develop one (e.g. search terms: free text vs. Key words or MeSH terms) and Boolean operations: e.g. AND, OR, NOT.</td>
<td>2 (1.1)</td>
<td>8 (4.5)</td>
<td>22 (12.3)</td>
<td>147 (82.1)</td>
</tr>
<tr>
<td>Role of search filters (e.g. limit to language, human, year or study design).</td>
<td>3 (1.7)</td>
<td>23 (12.8)</td>
<td>48 (26.8)</td>
<td>105 (58.7)</td>
</tr>
</tbody>
</table>

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The importance of designing a search strategy that reflects the purpose of the search (e.g. a narrow “the best” search for answering a quick clinical question vs. a broad search “everything” for conducting a systematic review.

<table>
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<th>Section</th>
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<th>Count</th>
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<td>How to find full text articles.</td>
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<td>Randomisation (the importance and methods of randomisation).</td>
<td>3 (1.7)</td>
<td>21 (11.7)</td>
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<td>Allocation concealment.</td>
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<td>77 (43.3)</td>
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<td>Blinding.</td>
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<td>109 (60.9)</td>
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<td>Loss to follow up/Attrition.</td>
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<td>Intention-To-Treat analysis (vs. Per Protocol analysis).</td>
<td>12 (6.7)</td>
<td>76 (42.5)</td>
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<td>The difference between Causation and Association.</td>
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<td>Confounding (methods to detect and adjust for confounders).</td>
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<td>The definition and calculation of incidence and prevalence.</td>
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<td>79 (44.1)</td>
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<tr>
<td>The importance of considering conflict of interest/ funding sources in appraising articles.</td>
<td>38 (21.3)</td>
<td>115 (64.6)</td>
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<tr>
<td>Classifications of study designs: e.g. Intervenational vs. observational; systematic reviews, RCTs, Non-RCTs, cohort, case-control, cross-sectional, etc.</td>
<td>8 (4.5)</td>
<td>81 (45.5)</td>
<td>89 (50)</td>
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<td>The Pros &amp; Cons of each study design for different types of research questions.</td>
<td>15 (8.5)</td>
<td>56 (31.6)</td>
<td>105 (59.3)</td>
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<td>Systematic reviews &amp; Meta-analysis (definitions and their importance).</td>
<td>12 (6.7)</td>
<td>129 (72.5)</td>
<td>37 (20.8)</td>
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<td>Level of evidence and grade of recommendations (GRADE).</td>
<td>63 (35.6)</td>
<td>89 (50.3)</td>
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<td>How to critical appraise a systematic review.</td>
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<td>28 (15.7)</td>
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<td>How to critical appraise a treatment study.</td>
<td>3 (1.7)</td>
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<td>How to critical appraise a diagnostic study.</td>
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<td>125 (70.6)</td>
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<td>How to critical appraise a prognostic study.</td>
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<td>49 (27.7)</td>
<td>106 (59.9)</td>
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<td>How to critical appraise a harm study.</td>
<td>16 (9)</td>
<td>59 (33.3)</td>
<td>95 (53.7)</td>
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<td>How to critical appraise a qualitative study.</td>
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<td>45 (25.3)</td>
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<td>How to critical appraise a clinical practice guideline.</td>
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<td>40 (22.6)</td>
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<td>The importance of the reporting quality of studies: EQUATOR Network reporting guidelines (e.g. STROBE, CONSORT, and PRISMA) and how to assess the quality of reporting of an article.</td>
<td>60 (33.9)</td>
<td>91 (51.4)</td>
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<td>Classifications of the types of data: categorical (dichotomous, nominal, ordinal) vs. continuous data</td>
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<tr>
<td>P-values: what they are and how to interpret.</td>
<td>10 (5.6)</td>
<td>74 (41.8)</td>
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<td>Confidence intervals: what they are and how to interpret.</td>
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<td>59 (33.3)</td>
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<td>The difference between clinical and statistical significance.</td>
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<td>71 (40.1)</td>
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<td>The difference between random error and systematic error (Bias).</td>
<td>58 (32.8)</td>
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</table>

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Classifications of the types bias (sources, types and how to deal with): e.g. performance bias; reporting bias; detection bias; recall bias; selection bias; publication bias (funnel plot, egger’s test).

<table>
<thead>
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<th>Classification</th>
<th>Yes</th>
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<td>Meaning and types of validity (internal vs. external validity).</td>
<td>6 (3.4)</td>
<td>60 (33.7)</td>
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<td>Sensitivity analysis: what is it and how to interpret its results</td>
<td>3 (1.7)</td>
<td>48 (27.3)</td>
<td>102 (58)</td>
<td>23 (13.1)</td>
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<tr>
<td>Subgroup analysis: what is it and how to interpret its results</td>
<td>5 (2.8)</td>
<td>56 (31.6)</td>
<td>95 (53.7)</td>
<td>21 (11.9)</td>
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</tr>
<tr>
<td>Meta-analysis: what is it and how to interpret its results</td>
<td>3 (1.7)</td>
<td>55 (31.3)</td>
<td>95 (54)</td>
<td>23 (13.1)</td>
<td></td>
</tr>
<tr>
<td>Heterogeneity: what is it, methods to detect it and how to interpret it.</td>
<td>0 (0)</td>
<td>10 (5.6)</td>
<td>82 (46.3)</td>
<td>85 (48)</td>
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</tr>
<tr>
<td>Types of measures of association and effect for binary outcomes (how to interpret): e.g. effect size in general, odds ratio, relative risk reduction/increase, absolute risk difference, relative risk/risk ratio, hazard ratio, NNT/NNH.</td>
<td>1 (0.6)</td>
<td>14 (8)</td>
<td>36 (20.5)</td>
<td>125 (71)</td>
<td></td>
</tr>
<tr>
<td>Measures for continuous outcomes (how to interpret): e.g. difference of means, ratio of means.</td>
<td>7 (4)</td>
<td>15 (8.5)</td>
<td>61 (34.7)</td>
<td>93 (52.8)</td>
<td></td>
</tr>
<tr>
<td>A 2x2 or contingency table (how to interpret and construct).</td>
<td>2 (1.1)</td>
<td>18 (10.2)</td>
<td>51 (29)</td>
<td>105 (59.7)</td>
<td></td>
</tr>
<tr>
<td>Measures to evaluate diagnostic accuracy (how to interpret): e.g. sensitivity, specificity, positive and negative predictive value, positive and negative likelihood ratio.</td>
<td>2 (1.1)</td>
<td>20 (11.4)</td>
<td>45 (25.6)</td>
<td>109 (61.9)</td>
<td></td>
</tr>
<tr>
<td>Clinical Decision Making (its components, application of the concepts of decision anatomy in the analysis of a clinical problem, and the barriers for objective decision making).</td>
<td>1 (0.6)</td>
<td>76 (43.2)</td>
<td>82 (46.6)</td>
<td>17 (9.7)</td>
<td></td>
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<tr>
<td>Management of uncertainty in decision making in clinical practice.</td>
<td>2 (1.1)</td>
<td>68 (38.6)</td>
<td>90 (51.1)</td>
<td>16 (9.1)</td>
<td></td>
</tr>
<tr>
<td>The purpose and use of clinical prediction rules.</td>
<td>9 (5.1)</td>
<td>63 (36)</td>
<td>87 (49.7)</td>
<td>16 (9.1)</td>
<td></td>
</tr>
<tr>
<td>Shared decision making (importance of and strategies including communicating benefit and harms to patients, and sharing decision with patients) and the role of decision support tools.</td>
<td>0 (0)</td>
<td>15 (8.5)</td>
<td>66 (37.5)</td>
<td>95 (54)</td>
<td></td>
</tr>
<tr>
<td>Baseline risk of individual patient affects expected benefit (and calculation of individual expected benefit).</td>
<td>5 (2.8)</td>
<td>72 (40.9)</td>
<td>78 (44.3)</td>
<td>21 (11.9)</td>
<td></td>
</tr>
<tr>
<td>Barriers of knowledge translation: individual versus organizational level and strategies to overcome these barriers.</td>
<td>4 (2.3)</td>
<td>54 (30.5)</td>
<td>97 (54.8)</td>
<td>22 (12.4)</td>
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</tr>
<tr>
<td>The leaky evidence pipeline (aware, accept, decide, do, recall, adhere, agree with patient, done)[1].</td>
<td>51 (29)</td>
<td>100 (56.8)</td>
<td>10 (5.7)</td>
<td>15 (8.5)</td>
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<tr>
<td>Clinical Audit (its importance and how to conduct).</td>
<td>13 (7.4)</td>
<td>72 (40.9)</td>
<td>79 (44.9)</td>
<td>12 (6.8)</td>
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<tr>
<td>Reflective clinical practice (what is it and how to practice it).</td>
<td>9 (5.1)</td>
<td>81 (46)</td>
<td>70 (39.8)</td>
<td>16 (9.1)</td>
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</table>

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### eTable 4. Summary of round 2 Delphi questionnaire results.

#### EBP Competencies (Group 1)

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<thead>
<tr>
<th>Competency</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>The five steps of EBP: ask, acquire, appraise, apply and assess.</td>
<td>Practised</td>
<td></td>
</tr>
<tr>
<td>Using PICO to structure answerable clinical questions (includes: PICO elements, how to translate clinical problems into structured clinical questions, advantages of structured clinical questions).</td>
<td>Practised</td>
<td></td>
</tr>
<tr>
<td>How to use different databases (e.g. PubMed, EMBASE, Cochrane).</td>
<td>Practised</td>
<td></td>
</tr>
<tr>
<td>General search strategy: How to develop one (e.g. search terms: free text vs. Key words or MeSH terms) and Boolean operators: e.g. AND, OR, NOT.</td>
<td>Practised</td>
<td></td>
</tr>
<tr>
<td>Systematic reviews &amp; Meta-analysis (definitions and their importance).</td>
<td>Explained</td>
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</tr>
<tr>
<td>Critical appraisal of a systematic review.</td>
<td>Practised</td>
<td></td>
</tr>
<tr>
<td>Critical appraisal of a treatment study.</td>
<td>Practised</td>
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<tr>
<td>Critical appraisal of a clinical practice guideline.</td>
<td>Practised</td>
<td></td>
</tr>
<tr>
<td>Critical appraisal of a diagnostic study.</td>
<td>Practised</td>
<td></td>
</tr>
<tr>
<td>How to interpret measures of effect for binary outcomes: e.g. effect size in general, odds ratio, relative risk reduction/increase, absolute risk difference, relative risk ratio, hazard ratio, NNT/NNH.</td>
<td>Practised</td>
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<tr>
<td>The history and origin of EBP.</td>
<td>Mentioned</td>
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#### EBP Competencies (Group 2)

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<tr>
<th>Competency</th>
<th>Group 1</th>
<th>Group 2</th>
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</thead>
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<tr>
<td>Shared decision making (importance of and strategies including communicating benefit and harms to patients, and sharing decision with patients) and the role of decision support tools.</td>
<td>103 (71.5)</td>
<td>41 (28.5)</td>
</tr>
<tr>
<td>Types of clinical questions (e.g. frequency, aetiology, therapeutic)</td>
<td>101 (70.1)</td>
<td>43 (29.9)</td>
</tr>
<tr>
<td>Major types of study designs: e.g. Interventional vs. observational; systematic reviews, RCTs, cohort, case-control, cross-sectional</td>
<td>85 (59)</td>
<td>59 (41)</td>
</tr>
<tr>
<td>Hierarchy of levels of evidence (i.e. hierarchy for each clinical question type, primary research vs. secondary research).</td>
<td>42 (29.2)</td>
<td>102 (70.8)</td>
</tr>
<tr>
<td>The pros &amp; cons of major study designs for different types of research questions.</td>
<td>38 (26.4)</td>
<td>106 (73.6)</td>
</tr>
<tr>
<td>How to find full text articles.</td>
<td>106 (73.6)</td>
<td>38 (26.4)</td>
</tr>
<tr>
<td>Role of search filters (e.g. limit to language, human, year or study design).</td>
<td>105 (72.9)</td>
<td>39 (27.1)</td>
</tr>
<tr>
<td>The importance of designing a search strategy that reflects the purpose of the search (e.g. a narrow “the best” search for answering a quick clinical question vs. a broad search “everything” for conducting a systematic review.)</td>
<td>101 (70.1)</td>
<td>43 (29.9)</td>
</tr>
<tr>
<td>Heterogeneity: what it is, methods to detect it and how to interpret it.</td>
<td>36 (25)</td>
<td>108 (75)</td>
</tr>
<tr>
<td>A 2x2 or contingency table (how to interpret and construct).</td>
<td>84 (58.3)</td>
<td>60 (41.7)</td>
</tr>
<tr>
<td>Meta-analysis: what is it and how to interpret its results.</td>
<td>110 (76.4)</td>
<td>34 (23.6)</td>
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<tr>
<td>Allocation concealment.</td>
<td>69 (47.9)</td>
<td>75 (52.1)</td>
</tr>
<tr>
<td>Blinding.</td>
<td>73 (50.7)</td>
<td>71 (49.3)</td>
</tr>
<tr>
<td>Intention-To-Treat analysis (vs. Per Protocol analysis).</td>
<td>86 (59.7)</td>
<td>58 (40.3)</td>
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<table>
<thead>
<tr>
<th>Topic</th>
<th>E (%)</th>
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<tr>
<td>Randomisation (the importance and methods of randomisation).</td>
<td>81 (56.3)</td>
<td>63 (43.8)</td>
</tr>
<tr>
<td>Loss to follow up/Attrition.</td>
<td>75 (52.1)</td>
<td>69 (47.9)</td>
</tr>
<tr>
<td>The difference between causation and association.</td>
<td>43 (29.9)</td>
<td>101 (70.1)</td>
</tr>
<tr>
<td>How to interpret measures to evaluate diagnostic accuracy: e.g. sensitivity, specificity, positive and negative predictive value, positive and negative likelihood ratio.</td>
<td>116 (80.6)</td>
<td>28 (19.4)</td>
</tr>
<tr>
<td>The difference between clinical and statistical significance.</td>
<td>105 (72.9)</td>
<td>39 (27.1)</td>
</tr>
<tr>
<td>Confidence Intervals: what they are and how to interpret.</td>
<td>110 (76.4)</td>
<td>34 (23.6)</td>
</tr>
<tr>
<td>How to interpret measures of effect for continuous outcomes: e.g. difference of means, ratio of means.</td>
<td>106 (73.6)</td>
<td>38 (26.4)</td>
</tr>
<tr>
<td>P-values: what they are and how to interpret.</td>
<td>101 (70.1)</td>
<td>43 (29.9)</td>
</tr>
<tr>
<td>Critical appraisal of a prognostic study.</td>
<td>57 (39.6)</td>
<td>87 (60.4)</td>
</tr>
<tr>
<td>Critical appraisal of a harm study.</td>
<td>38 (26.4)</td>
<td>106 (73.6)</td>
</tr>
<tr>
<td>Critical appraisal of a qualitative study.</td>
<td>54 (37.5)</td>
<td>90 (62.5)</td>
</tr>
<tr>
<td><strong>EBP Competencies (Group 3)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>The definition of evidence-based practice (EBP): “e.g. the integration of the best research evidence with our clinical expertise and our patient’s unique values and circumstances [1]”</strong></td>
<td>101 (72.7)</td>
<td>38 (27.3)</td>
</tr>
<tr>
<td><strong>How to identify and prioritise personal uncertainties or knowledge gaps in practice</strong></td>
<td>78 (56.5)</td>
<td>59 (42.8)</td>
</tr>
<tr>
<td><strong>Management of uncertainty in decision making in clinical practice.</strong></td>
<td>102 (73.9)</td>
<td>36 (26.1)</td>
</tr>
<tr>
<td><strong>The difference between background and foreground questions (e.g. “What is myocardial infarction?” versus “In adult patients with myocardial infarction, does aspirin improve patients’ survival?”).</strong></td>
<td>106 (76.3)</td>
<td>33 (23.7)</td>
</tr>
<tr>
<td><strong>Categories of sources of information (e.g. original primary databases vs. filtered resources vs. pre-appraised evidence).</strong></td>
<td>101 (73.2)</td>
<td>37 (26.8)</td>
</tr>
<tr>
<td><strong>5S (or 6S) model of evidence resources (i.e. studies, syntheses, synopses, summaries, systems): what it is and the advantages and disadvantages of resources at each level [2].</strong></td>
<td>61 (44.2)</td>
<td>77 (55.8)</td>
</tr>
<tr>
<td><strong>The difference between random error and systematic error (Bias).</strong></td>
<td>107 (77.5)</td>
<td>31 (22.5)</td>
</tr>
<tr>
<td><strong>Classifications of the type of bias (sources, types and how to deal with): e.g. performance bias; reporting bias; detection bias; recall bias; selection bias; publication bias (funnel plot, egger’s test).</strong></td>
<td>103 (74.6)</td>
<td>35 (25.4)</td>
</tr>
<tr>
<td><strong>Types of validity (internal vs. external validity).</strong></td>
<td>102 (74.5)</td>
<td>35 (25.5)</td>
</tr>
<tr>
<td><strong>Sensitivity analysis: what is it and how to interpret its results.</strong></td>
<td>98 (71)</td>
<td>40 (29)</td>
</tr>
<tr>
<td><strong>Subgroup analysis: what is it and how to interpret its results.</strong></td>
<td>96 (70.1)</td>
<td>41 (29.9)</td>
</tr>
<tr>
<td><strong>The Grading of Recommendations Assessment, Development and Evaluation (GRADE) - Level of evidence.</strong></td>
<td>103 (74.6)</td>
<td>35 (25.4)</td>
</tr>
<tr>
<td><strong>Baseline risk of individual patient affects expected benefit (and calculation of individual expected benefit).</strong></td>
<td>102 (75)</td>
<td>34 (25)</td>
</tr>
<tr>
<td><strong>The Grading of Recommendations Assessment, Development and Evaluation (GRADE) - Strength of Recommendations</strong></td>
<td>102 (73.9)</td>
<td>36 (26.1)</td>
</tr>
<tr>
<td><strong>The purpose and use of clinical prediction rules.</strong></td>
<td>66 (48.2)</td>
<td>71 (51.8)</td>
</tr>
<tr>
<td><strong>Classifications of types of data: categorical (dichotomous, nominal, ordinal) vs. continuous data</strong></td>
<td>99 (72.3)</td>
<td>38 (27.7)</td>
</tr>
</tbody>
</table>

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The distinction between the mechanistic vs. empiricism approach of dealing with what is effective (e.g., Dr. Spock's advice to put infants on fronts to sleep to avoid choking on vomit [mechanistic] while this led to avoidable cot death [empirical])

The distinction between using research (that is, search for pre-appraised evidence to apply in practice or follow the five steps of EBP) vs. conducting research (that is, conducting primary or secondary research).

The rationale for EBP (e.g., there is a huge amount of literature that clinicians cannot read all: an expanding amount of publications vs. clinicians’ workload and the need to keep up-to-date).

The importance of the reporting quality of studies: EQUATOR Network of reporting guidelines (e.g., STROBE, CONSORT, and PRISMA) and how to assess the quality of reporting of an article.

Clinical Decision Making (its components, application of the concepts of decision anatomy in the analysis of a clinical problem, and the barriers for objective decision making).

Barriers of knowledge translation: individual versus organizational level and strategies to overcome these barriers.

Clinical audit (its importance and how to conduct).

Reflective clinical practice (what is it and how to practice it).

The definition and calculation of incidence and prevalence.

The importance of considering conflict of interest/ funding sources in appraising articles.

The anatomy of a scientific paper (IMRD: Introduction, Methods, Results, and Discussion, identifying the “must read” sections).

Confounding (methods to detect and adjust for confounders).

<table>
<thead>
<tr>
<th>EBP Competencies (Group 4)</th>
<th>M</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>The difference in topics covered between databases (e.g., PubMed: medical, CINAHL: nursing and allied health, PsycINFO: psychiatry and mental health).</td>
<td>116 (84.7)</td>
<td>21 (15.3)</td>
</tr>
<tr>
<td>Earlier detection of disease is not necessarily better.</td>
<td>101 (73.7)</td>
<td>36 (26.3)</td>
</tr>
<tr>
<td>The leaky evidence pipeline (aware, accept, decide, do, recall, adhere, agree with patient, done) [1].</td>
<td>64 (46.7)</td>
<td>73 (53.3)</td>
</tr>
<tr>
<td>New, brand-named, or more expensive treatments are not necessarily better than current alternatives.</td>
<td>99 (72.3)</td>
<td>38 (27.2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EBP Competencies (Group 5)</th>
<th>P</th>
<th>E</th>
<th>M</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of outcome measures (surrogate vs. composite end points measures).</td>
<td>16 (11.6)</td>
<td>68 (49.3)</td>
<td>43 (31.2)</td>
<td>11 (8)</td>
</tr>
<tr>
<td>Graphical presentation of data (e.g., scatter plot, Kaplan-Meier curve, Bland-Altman plot).</td>
<td>12 (8.8)</td>
<td>71 (51.8)</td>
<td>39 (28.5)</td>
<td>15 (10.9)</td>
</tr>
<tr>
<td>Mixed-method research: how to appraise and interpret.</td>
<td>15 (10.9)</td>
<td>43 (31.2)</td>
<td>67 (48.6)</td>
<td>13 (9.4)</td>
</tr>
<tr>
<td>Type I &amp; Type II Error.</td>
<td>21 (15.2)</td>
<td>70 (50.7)</td>
<td>35 (25.4)</td>
<td>12 (8.7)</td>
</tr>
<tr>
<td>Cultural competence (including the workplace context).</td>
<td>7 (5.1)</td>
<td>21 (15.2)</td>
<td>56 (40.6)</td>
<td>54 (39.1)</td>
</tr>
<tr>
<td>Qualitative research: how to appraise.</td>
<td>69 (50)</td>
<td>44 (31.9)</td>
<td>18 (13)</td>
<td>7 (5.1)</td>
</tr>
<tr>
<td>Summary of Findings (SoF) tables: how to interpret.</td>
<td>40 (29)</td>
<td>75 (54.3)</td>
<td>17 (12.3)</td>
<td>6 (4.3)</td>
</tr>
<tr>
<td>Patient decision aids: what they are, role in EBP, and how to use.</td>
<td>20 (14.5)</td>
<td>69 (50)</td>
<td>43 (31.2)</td>
<td>6 (4.3)</td>
</tr>
<tr>
<td>Clinician decision support tools: role in EBP.</td>
<td>16 (11.6)</td>
<td>76 (55.1)</td>
<td>37 (26.8)</td>
<td>9 (6.5)</td>
</tr>
</tbody>
</table>

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**eTable 5.** The final set of EBP core competencies grouped into the main EBP domains and an elaboration of each competency.
(M=mentioned, E=explained, P=practised with exercises).

<table>
<thead>
<tr>
<th>0. Introductory</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0.0 Understand evidence-based practice (EBP) defined as the integration of the best research evidence with clinical expertise and patient’s unique values and circumstances.</strong></td>
</tr>
<tr>
<td>In this competency, the learner needs to understand the definition of evidence-based practice and the interplay between its three main domains: (i) best research evidence (i.e. clinically relevant research, sometimes from the basic sciences of medicine, but especially from patient-centred clinical research into the accuracy and precision of diagnostic tests, the power of prognostic markers, and the efficacy and safety of therapeutic, rehabilitative, and preventive strategies); (ii) clinical expertise (i.e. the ability to use clinical skills and past experience to rapidly identify each patient’s unique health state and diagnosis, their individual risks and benefits of potential interventions/exposures/diagnostic tests, and their personal values and expectations). Clinical expertise is required to integrate evidence with patient values and circumstances; (iii) patient values and circumstances (i.e. the unique preferences, concerns, expectations, hopes, strengths, limitations, and stresses each patient brings to a clinical encounter and which must be integrated into shared clinical decisions if they are to serve the patient; and their individual clinical state and the clinical setting. The clinical practice of EBP must balance and integrate these factors, deal with not only the traditional skills of diagnosis but also the applicability of relevant research evidence and the patient’s preferences and circumstances before guiding choices of action.</td>
</tr>
</tbody>
</table>

| **0.1 Recognise the rationale for EBP.** |
| This competency includes the need to recognise: |
| - The daily clinical need for valid information to inform decision making, and the inadequacy of traditional sources for this information. [M] |
| - The disparity between diagnostic skills and clinical judgment, which increase with experience, and up-to-date knowledge and clinical performance, which decline with age and experience. [M] |
| - Lack of time to find and assimilate evidence as a clinician. [M] |
| - The gaps between evidence and practice can lead to suboptimal practice and quality of care. [M] |
| - The potential discordance between a pathophysiological and empirical approach to thinking about whether something is effective. [M] |
| In this competency, the learner needs to recognise the rationale for EBP, including the daily clinical need for valid and quantitative information about diagnosis (e.g. knowing that earlier diagnosis does not necessarily mean better), prognosis, therapy (e.g., new interventions are not necessarily better than current alternatives), and prevention. Learner needs to recognise the inadequacy of traditional information sources because they are out of date (e.g., traditional textbooks), frequently biased (e.g., experts), ineffective or too overwhelming in their volume and too variable in their validity for practical clinical use (e.g., health journals). Learner also needs to recognise the disparity between diagnostic skills and clinical judgment, which increase with experience, and up-to-date knowledge and clinical performance which decline. Learner needs to recognise clinicians’ inability to afford more than a few minutes per patient to find and assimilate evidence. Learner needs to recognise the gaps between evidence and practice (including overuse and underuse of evidence) leading to suboptimal practice and quality of care. Learner needs to recognise the distinction between the pathophysiological (or mechanical) approach and empirical approach to dealing with what is effective. |

| **0.2 For each type of clinical question, identify the preferred order of study designs, including the pros and cons of the major study designs.** |
| This competency includes: |
| - Classify the major study designs for each type of clinical question. [E] |
| In this competency, the learner needs to identify the preferred order (from least to most biased) of study designs for each type of clinical question (e.g., treatment question best to be answered by a systematic review of randomised controlled trials; while question about people’s beliefs and experiences best to be answered by qualitative studies). Learner needs to recognise the pros and cons of the major study designs |

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– importantly those of highest level of evidence (e.g., systematic reviews, RCTs). In addition, learner needs to recognise when randomised controlled trials are unnecessary—such as in case of large, dramatic effects of intervention “all or none”.

0.3 Practice the 5 steps of EBP: Ask, Acquire, Appraise and Interpret, Apply, and Evaluate.

In this competency, the learner needs to practice the 5 steps of EBP: (i) Step 1 – identifying uncertainty and converting the need for information (about prevention, diagnosis, prognosis, therapy, causation, etc.) into an answerable question and to know that there are various strategies to keep track of knowledge gaps in practice; (ii) Step 2 – tracking down the best evidence with which to answer that question; (iii) Step 3 – critically appraising that evidence for its validity, impact, and applicability or accessing trustworthy pre-appraised sources; (iv) Step 4 – integrating the critical appraisal, and in particular the net benefit associated with alternative courses of action, with clinical expertise and with patient’s unique biology, values and circumstances; (v) Step 5 – evaluating on effectiveness and efficiency in executing steps 1–4 and seeking ways to improve them both for next time and to optimize clinical practice.

0.4 Understand the distinction between using research to inform clinical decision making versus conducting research.

In this competency, the learner needs to describe the distinction between ‘conducting research’ that is, completing primary or secondary research, which requires knowing the principles of scholarly inquiry, and ‘using research’ that is, search for pre-appraised evidence to apply in practice or follow the five steps of EBP. The latter “using research” is what is needed for clinical practice.

1. Ask

1.1 Explain the difference between the types of questions that cannot typically be answered by research (background questions) and those that can (foreground questions).

In this competency, the learner needs to identify the difference between background questions (e.g., “What is myocardial infarction?”) and foreground questions (e.g., “In adult patients with myocardial infarction, does aspirin improve patients’ survival?”).

1.2 Identify different types of clinical questions, such as questions about treatment, diagnosis, prognosis, and aetiology.

In this competency, the learner needs to identify different types of clinical questions, such as questions about treatment, diagnosis, prognosis, and aetiology.

1.3 Convert clinical questions into structured, answerable clinical questions using PICO.

This competency includes:
- Recognise the importance of and strategies for identifying and prioritising uncertainties or knowledge gaps in practice. [M]
- Understand the rationale for using structured clinical questions. [E]
- Identify the elements of PICO questions and use variations of it when appropriate (e.g., PICOT, PO, PECO - Exposure) to structure answerable clinical questions. [P]

In this competency, the learner needs to convert clinical questions into structured, answerable clinical questions using PICO format (stands for P: population, I: intervention, C: comparator, O: outcome), and its variations (e.g., PO only for a prevalence question, PICOT to include the timing; exposure replaces intervention for observational studies, Index test replaces intervention for diagnostic studies. In addition, learner needs to recognise the strategies for identifying and prioritising uncertainties and knowledge gaps in practice, and identifying the known unknown clinical questions.

2. Acquire

2.1 Outline the different major categories of sources of research information, including biomedical research databases or databases of filtered or pre-appraised evidence or resources.

This competency includes:
- Outline the advantages of using filtered or pre-appraised evidence sources and recognise relevant resources. [E]
- Indicate the differences between the hierarchy of evidence, level of processing of evidence, and types of EBM resources. [E]
In this competency, the learner needs to outline the different major categories of sources of research information, and the advantages of using filtered or pre-appraised evidence sources (e.g., ACCESSSS, UpToDate, ACP Journal Club, TRIP database, PEDro). In addition, learner needs to indicate the differences between the hierarchy of evidence (different hierarchy of designs for each type of question), the level of processing of this information, and types of EBM resources (e.g. summaries and guidelines, preappraised research, and non-preappraised research.)

### 2.2 Construct and carry out an appropriate search strategy for clinical questions.

**This competency includes:**

- Know where to look first to address a clinical question. [P]
- When necessary, construct a search strategy that reflects the purpose of the search. [P]
- Apply a general search strategy including the use of search terms, and the role of Boolean operators; truncation; and search filters for more efficient searches. [E]

In this competency, the learner needs to design and conduct an appropriate search which reflect the purpose of the search, and to indicate the role of Boolean operators (such as AND, OR, NOT); truncation (such as the asterisk or a question mark); and search filters (such as limits on language, human, year, or study design for more efficient searches).

### 2.3 State the differences in broad topics covered by the major research databases.

In this competency, the learner needs to recognise the differences in topics covered by the major traditional databases and those relevant to their profession (e.g., PubMed largely covers medical topics, CINAHL covers nursing and allied health, and PsycINFO covers psychological topics) and to know which source is the most appropriate for answering a particular clinical question.

### 2.4 Outline strategies to obtain the full text of articles and other evidence resources.

In this competency, the learner needs to define strategies to obtain the full text of the articles (this may include open access, institutional access, or special access such as HINARI programme) and other evidence resources (this may include pre-appraised resources such as evidence-based guidelines and decision-support tools such as patient decision aids).

### Appraise and Interpret

#### 3.1 Identify key competencies relevant to the critical evaluation of the integrity, reliability, and applicability of health-related research.

**This competency includes**

- Understand the difference between random error and systematic error (Bias). [E]
- Identify the major categories of bias and the impact of these biases on the results. [E]
- Interpret commonly used measures of uncertainty, in particular, confidence intervals. [P]
- Recognise that association does not imply causation and explain why. [E]
- Recognise the importance of considering conflict of interest/funding sources. [M]
- Recognise the use and limitations of subgroup analysis and how to interpret the results of subgroup analysis. [M]

In this competency, the learner needs to identify key competencies relevant to the critical evaluation of the integrity, reliability, and applicability of health-related research which requires an understanding of the different categories of bias (such as confounding, measurement and detection bias, and reporting and publication bias), and the impact of these biases and uncertainty (random error) on estimates from studies. Conflicts of interest may also influence research reports, particularly the conclusions drawn from results. Learner needs to recognise if it is necessary to read the discussion of the article, or rely on the authors’ interpretation of their findings; the necessity, if this is the case and conflict of interest exists, to look to un-conflicted sources of the interpretation. Knowledge of statistical calculations is not required, but the ability to interpret statistical results, such as confidence intervals, is essential. Understanding that association does not imply causation and why (e.g., confounding) is also important. Since subgroup analyses are commonly reported, their meaning and limitations should be known.

#### 3.2 Interpret different types of measures of association and effect, including key graphical presentations.

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This competency includes
- Identify the basic types of data such as: categorical and continuous. [E]
- Recognise the meaning of some basic frequency measures. [M]
- Identify the difference between "statistical significance" and "importance", and between a lack of evidence of an effect and 'evidence of no effect'. [E]

In this competency, the learner needs to interpret quantitative results of research, which implies some understanding of: (i) the basic types of data such as categorical (dichotomous, nominal, ordinal) and continuous data; (ii) the meaning of some basic frequency measures such as means, medians, and rates; and (iii) measure of association derived from these such as difference and ratio measures for both dichotomous and continuous outcomes. Note that these may best be taught within the context of studies appraisals.

### 3.3 Critically appraise and interpret a systematic review.

This competency includes
- Recognise the difference between systematic reviews, meta-analyses, and non-systematic reviews. [M]
- Identify and critically appraise key elements of a systematic review. [P]
- Interpret presentations of the pooling of studies such as a forest plot and summary of findings table. [P]

In this competency, the learner needs to critically appraise a systematic review which requires being able to identify and assess the key elements of a systematic review such as the search strategy, the appraisal and selection of studies, and the synthesis and summary of findings (including a Summary of Findings table) and how these elements differ from a traditional review. Interpreting the results requires an understanding of the presentations of pooled studies such as a forest plot, and a basic idea of measures of statistical heterogeneity. Such appraisal skills should include understanding the concept of quality of evidence, and how one might rate the quality of evidence, particularly using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach. Also, learner needs to be able to differentiate between assessing the methods used in a systematic review (trustworthy or flawed) and assessing the certainty of the evidence for estimates that a review summarises (garbage in, garbage out).

### 3.4 Critically appraise and interpret a treatment study.

This competency includes
- Identify and appraise key features of a controlled trial. [P]
- Interpret the results including measures of effect. [P]
- Identify the limitations of observational studies as treatment studies, and recognise the basics of adjustment methods and its limitations. [E]

In this competency, the learner needs to critically appraise a treatment study (such as a randomized controlled trial) which requires being able to identify and appraise key features of a controlled trial such as Randomisation and Allocation concealment, Blinding, Loss to follow up/Attrition, Intention-To-Treat analysis (vs. Per Protocol analysis), and Performance bias. Interpreting the results requires being able to interpret the common measures of effect (such as odds ratio, relative risk reduction/increase, absolute risk difference, relative risk /risk ratio, hazard ratio, NNT/NNH) and measures of uncertainty (confidence intervals and p-values). Learner needs to identify the limitations of observational studies to inform a treatment decision and recognise the principles of adjustment methods and why they are inadequate.

### 3.5 Critically appraise and interpret a diagnostic accuracy study.

This competency includes
- Identify and appraise key features of a diagnostic accuracy study. [P]
- Interpret the results including interpret measures to evaluate diagnostic accuracy. [P]
- Recognise the purpose and use of clinical prediction rules. [M]

In this competency, the learner needs to critically appraise a diagnostic study, which requires being able to identify and appraise key features such as subject selection, loss to follow up/verification bias, and
independent and blind comparison assessment of index and reference standard. Interpreting the results requires being able to interpret the common measures of discrimination such as sensitivity, specificity, positive and negative predictive value, positive and negative likelihood ratio. Also, learner needs to be able to interpret a 2X2 table or contingency table.

**3.6 Distinguish evidence-based from opinion-based clinical practice guideline.**

In this competency, the learner needs to understand that many guidelines are not evidence-based, and be able to recognise key features of an evidence-based guideline, such as a search, selection and appraisal strategy, grading of evidence, and management of conflicts of interest. Should be able to do some appraisal of these key features, but this does not imply a full critical appraisal (e.g., Appraisal of Guidelines, Research and Evaluation – AGREE) is appropriate.

**3.7 Identify the key features of, and be able to interpret, a prognostic study.**

This competency includes
- Identify and appraise key features of a prognostic study. [E]
- Interpret the results including measures of effect (e.g., Kaplan Meier “survival” curves) and uncertainty. [E]
- Recognise the purpose and use of clinical prediction rules. [M]

In this competency, the learner needs to be able to critically appraise a prognostic study, which requires being able to identify and appraise key features such as subject selection, loss to follow up, and blinding of (subjective) outcome measures, and methods to detect and adjust for confounders. Interpreting the results requires being able to interpret the common measures of prognosis such as cumulative incidence, hazard ratio or “survival” curves.

**3.8 Explain the use of harm/aetiologies study for (rare) adverse effects of interventions.**

This competency includes
- Indicate that common treatment harms can usually be observed in controlled trials, but some rare or late harms will only be seen in observational studies. [E]

While critical appraisal of such studies is not a core skill, the learner needs to indicate when and why they are needed. Also, learner needs to recognise that treatment may be harmful and increasing the amount of an effective treatment does not necessarily increase its benefits and may cause harm.

**3.9 Explain the purpose and processes of a qualitative study.**

This competency includes
- Recognise how qualitative research can inform the decision making process. [M]

In this competency, the learner needs to understand some of the basic methods of gathering qualitative data, and it's purpose. While critical appraisal of qualitative studies is not a core skill, awareness of when and why they are needed is. Also, learner needs to recognise the importance of qualitative research in informing decision making processes.

**4. Apply**

**4.1 Engage patients in the decision making process, using shared decision making, including explaining the evidence and integrating their preferences.**

This competency includes:
- Recognise the nature of the patient’s dilemma, hopes, expectations, fears, and values and preferences. [M]
- Understand and practice shared decision making. [P]
- Recognise how decision support tools such as patient decision aids can assist in shared decision making. [M]

In this competency, the learner needs to engage patients in the decision making process, to communicate evidence about benefit and harms to patients, to recognise the nature of the patients’ dilemma, hopes, expectations, fears, and values and preferences, and to recognise the role of decision support tools such as patient decision aids in shared decision making.

**4.2 Outline different strategies to manage uncertainty in clinical decision making in practice.**

This competency includes:
- Recognise professional, ethical, and legal components/dimensions of clinical decision making, and
the role of clinical reasoning. [M]

In this competency, the learner needs to outline different strategies to manage uncertainty in clinical decision making in practice (which may depend on profession and level of experience, such as e.g., test of time, diagnostic pause, gut feeling for medicals). In addition, learner needs to recognise various dimensions of clinical decision (e.g., professional, legal, and ethical), and the implication of these dimensions in the analysis of a clinical problem.

### 4.3 Explain the importance of baseline risk of individual patients when estimating individual expected benefit.

This competency includes:

- Recognise different types of outcome measures (surrogate vs composite endpoints measures). [M]

In this competency, the learner needs to explain the importance of baseline risk of individual patients when estimating individual expected benefit (average measures of effects can be misleading), and its role in engaging the patients in the decision making process (e.g., balance benefits and harms of a treatment). In addition, learner needs to recognise different types of outcome measures and to identify the most important to the patients (e.g., patients related outcomes are more relevant to the patients than surrogate outcomes).

### 4.4 Interpret the grading of the certainty in evidence and the strength of recommendations in health care.

In this competency, the learner needs to interpret the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach to evaluate the strength of recommendations and identify and consider key factors drive the direction and strength of the recommendations, and its role in shared decision making (e.g., weak recommendations are usually sensitive to the patients’ values and preferences).

## 5. Evaluate

### 5.1 Recognise potential individual-level barriers to knowledge translation and strategies to overcome these.

This competency includes:

- Recognise the process of reflective clinical practice. [M]

In this competency, the learner needs to recognise potential individual-level barriers to knowledge translation and strategies to overcome these. More detailed information regarding the organisational level barriers and knowledge translation/ implementation science can be taught elsewhere (e.g., knowledge translation workshops).

### 5.2 Recognise the role of personal clinical audit in facilitating evidence-based practice.

In this competency, the learner needs to recognise the role of personal clinical audit in facilitating evidence-based practice (e.g., various areas need to be improved can be identified by comparing clinician’s clinical practice to well-defined evidence-based standards).
**eFigure 1.** PRISMA flow chart of the systematic review

1682 Records identified through citation analysis

714 Records remained after the Cochrane RCT filter

714 Titles and abstracts screened

286 Full-texts articles assessed for eligibility

203 Full-texts excluded:
- 62 Intervention not related to EBP
- 50 Not primary or original studies
- 46 Study design (no comparator)
- 32 No educational intervention
- 13 Participants not in a health discipline

83 Included in the analysis
References of included studies


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Dizon JMR, Grimmer-Somers K, Kumar S. Effectiveness of the tailored Evidence Based Practice training program for Filipino physical therapists: a randomized controlled trial. BMC Med Educ. 2014;14.


