UWS Document on Evidence-Based Practice Standards, Learning Objectives and Competencies

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This document has been derived by and used at the University of Western States, College of Chiropractic, to guide major curricular revisions relative to the discipline of evidence based practice (EBP). The material will be published in the Journal of Chiropractic Education.

**Methodology**

The process began in the fall of 2005 with the formation of an EBP committee tasked with searching for a published set of competencies for evidence based practice. A literature review failed to identify a set that was specific and detailed enough to serve as a blueprint for a curriculum. Consequently the committee decided to write an original document entitled *Training the EBP Practitioner: Standards, Learning Objectives, and Specific Competencies*. These standards and competencies were designed to serve as a foundation for guiding the creation and implementation of a new EBP program to be nested within the general curriculum.

**Committee members**

- Ron LeFebvre, DC (Curriculum Project Leader)*
- Mitchell Haas, DC (Principal Investigator, Associate Vice President of Research)*
- Dave Peterson, DC (Program Director)*
- Rich Gillette, PhD (Course instructor)*
- Charlie Novak, DC (Course instructor)*
- Janet Tapper, MLS (Director of Learning/Library Resources)
- John Muench, MD, MPH (Content expert from OHSU)

Funded by an R25 education grant from NIH/NCCAM, one of the committee members (RL) created a draft document. The content was derived primarily from the knowledge base contained in two classic evidence-based medicine text books: Straus et al’s *Evidence-Based Medicine: How to Practice and Teach EBM* and Guyatt and Rennie’s *Users’ Guides to the Medical Literature*. The content from these sources was edited and blended with input from additional text books and journal articles and underwent an arduous revision process. This material was organized into the five classic steps of EBP as emphasized by the Sicily consensus group on teaching evidenced based practice. Six standards were ultimately derived which include a general standard on the discipline of EBP, its characteristics, strengths and weaknesses. The standards are divided into 31 general learning objectives which, in turn, are broken down into specific competencies.

The six standards

1. The EBP competent practitioner can present an overview of EBP.
2. The EBP competent practitioner can translate an issue of clinical uncertainty into an answerable question.
3. The EBP competent practitioner can efficiently and effectively search for and retrieve useful and up-to-date healthcare information and evidence.
4. The EBP competent practitioner critically appraises the evidence for validity and clinical importance.
5. The EBP competent practitioner applies the relevant evidence to practice.
6. The EBP competent practitioner engages in self evaluation of his/her process for accessing, appraising and incorporating new evidence into practice.
From August 2005 through May 2006 the document was reviewed and substantially revised using a nominal group process. The final product was significantly shaped by the teaching experiences and personal opinions of the participants.

Grading the Learning Objectives and Competencies

Each item was given a relative value, based on importance and planned emphasis in the new curriculum. The following scoring system was developed:

1 = Basic/minimal competency for the graduate

Descriptors
- Minimal competency necessary for graduates to apply EBP to their practice.
- Very likely the focus of test questions and practice assignments.
- Student must demonstrate consistent mastery.
- More likely to permeate teaching in diagnosis and management courses.

2 = Advanced Competency

Descriptors
- Very useful but not absolutely necessary to master in order to apply EBP in practice.
- May appear in test questions and some assignments.
- Students may be asked to gain some experience with the knowledge or skill but will not be assessed for consistent mastery.
- Less likely to permeate teaching in diagnosis and management courses.

3 = Expert Level Competence

Descriptors
- More appropriate for one interested in becoming involved in research.
- Intended more as exposure or enrichment and may be sacrificed in the interest of time in a course.
- Seldom or never the object of test questions or focused assignments.
- Not likely to permeate the material in other courses; more likely found only in core EBP courses.

Each learning objective and specific competency was assigned a score by five members of the EBP Curricular Planning Committee (names above with asterisks). After lengthy discussions, each item was re-scored and an average computed, which appears in the final document. A score of 1.0 indicates that all of the graders felt that the objective/competency represents an important basic skill. A grade of 1.3 indicates that there was a majority supporting the learning objective/competency as a basic skill, but not unanimous agreement. A grade of or near 3 represents uniform agreement that the item is not appropriate for a chiropractic curriculum and is more suitable for advanced application and training. A grade of 2 indicates either relative consensus that the item fell into the second level of importance or a wide disagreement about where it should be placed. In either circumstance, an item scoring 2 was relegated to the second category for planning purposes as it is operationally defined above.

Strengths and limitations

The standards document is a very comprehensive, detailed catalogue of knowledge and skills in the realm of EBP. It formulates and organizes learning objectives into a 5 step structure that can be used to guide curricular or individual course planning. In addition, the document provides a suitable working basis for re-constructing the competencies into more educationally appropriate, measurable language.
A number of important limitations must be acknowledged. The depth and breath of the document are probably greater than can realistically be encompassed in a single program. Many of the individual items might well be “down scored” in terms of relative importance now that the committee has had extended experience in trying to implement that curriculum. In addition, the document reflects the biases, experiences, and limitations of the committee who constructed it. Finally, much additional work is required to craft each learning objective and competency into more suitable language that reflects knowledge and skills which are clearly attainable and measurable.

It has become clear that a “2.0” version of the document is needed and that process is ongoing.

First major revision

The first major revision targeted the domain of biostatistics as it applies to EBP. A committee charged with revising the learning objectives, competencies, and classroom content relative to biostatistics met throughout 2009 and the first part of 2010. Items were added, deleted, and re-evaluated. As part of this revision, we utilized language recommended at a McMaster seminar on teaching EBP (2009): the following action verbs were used denoting skills moving from lesser to greater proficiency: recognize, define, use, explain. The current version of the standards and learning objectives document incorporates these revisions.

Members of the Updating Committee (* indicate voting members)

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<tr>
<th>Name</th>
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<tr>
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References

Training the EBP Practitioner: Standards, Learning Objectives, and Specific Competencies.

Note: Items carry a consensus grade of 1-3 and many items are referenced to a text by page number.

1. **Standard 1: The EBP competent practitioner can present a general overview of the characteristics and principles of EBP.**

   1.1. Can describe EBP. (1.0)
   1.2. Can explain what is meant by best evidence. (1.0)
   1.3. Can explain what is meant by clinical expertise. (1.0)
   1.4. Can explain what is meant by patient values and circumstances. (1.0)
   1.5. Can outline the 5 classic steps in the application of EBP. (1.2)

1.2. Appreciates the difference between scientific evidence and other forms of knowledge and opinion. (1.0)

   1. Can differentiate data from assertions and opinions. (1.0)
   2. Can differentiate a balanced, systematic consideration of the evidence from a selective data presentation (“cherry picking” data). (1.0)
   3. Can differentiate among rational hypotheses, empirically-based hypotheses, and *a priori* beliefs. (1.0)

1.3. Appreciates the necessary balance between patient-oriented evidence and disease/pathomechanical-oriented evidence. (1.0)

   1. Can articulate the difference between patient-oriented evidence and disease or pathomechanical evidence. (1.0)
   a. Can define the characteristics of patient-oriented evidence (e.g., based on mortality, morbidity, pain status, functional capacity, and quality of life). (1.0)
   b. Can define the characteristics of disease-oriented and pathomechanical evidence (i.e., based on understanding etiology and mechanisms, or measuring pathophysiological, neurological, or biomechanical changes). (1.0)
   c. Can distinguish patient-oriented outcomes from changes in physical examination findings (e.g., palpatory tenderness, spinal motion, muscle tests, leg alignment). (1.0)

   2. Can articulate the strengths and weakness of evidence which is based on pathophysiology (i.e., disease) and pathomechanical research. (1.2)
   a. Can cite the benefits of clinically-oriented basic science research (e.g., best causal evidence) when compared to informal clinical experience or speculation based solely on extrapolation of basic science or biomechanical principles. (1.7)
   b. Can identify the limitations of pathophysiological and pathomechanical evidence compared to EBP/outcome-oriented evidence. (1.0)

   3. Can put into perspective the role of pathophysiological and pathomechanical evidence in making clinical decisions. (1.0)
   a. Can access meaningful evidence in these realms of knowledge. (1.0)
   b. Can appraise the quality and relevance/applicability of this type of evidence. (1.3)

1.4. Can explain the steps involved in performing both rapid and in-depth acquisition and assessment of clinical evidence. (1.0)

   1. Can perform a comprehensive literature search and an in-depth critical analysis of the quality of individual primary studies, applying the classic steps of EBP (“doing mode”). (1.0)
a. Understands that this process is most commonly applied to those conditions encountered routinely. (2.0) 1, p. 4

2. Can rapidly access dependable sources of pre-appraised evidence and judge its quality and applicability (skipping the critical appraisal of primary sources) (“using mode”). (1.0) 1, p. 4

a. Understands that this process is the most commonly applied to conditions encountered less frequently. (1.8) 1, p. 4

b. Understands that this process is most practical for addressing questions during clinical practice. (1.3) 1, p. 4

3. Can access and identify quality clinical guidelines and decision-making rules relevant to his/her patient (“replicating mode”). (1.0) 1, p. 5

a. Understands that this process is more commonly applied to conditions encountered very infrequently. (1.8) 1, p. 5

1.5. Can articulate the advantages of EBP.

1. Understands that evidence-based care and best practice recommendations may lead to better patient outcomes. (1.0) 6, p. 312

a. Understands that clinical experience alone is not enough to provide the best possible care. (1.0) 6, p. 312; 7, p. 61

b. Understands that knowledge of disease processes is not enough for effective patient management. (1.0) 6, p. 312

2. Understands that EBP provides a method to maintain and update clinical skills. (1.0)

a. Understands that there is a need to remain up-to-date in an environment of continuous and rapidly expanding health care information. (1.0) 6, p. 312

b. Understands that finding up-to-date evidence on a particular clinical question may be more useful than depending solely on postgraduate education programs. (1.0) 8

3. Understands the role that EBP can play in furthering the goals of the profession. (1.2)

a. Understands the role that EBP can serve to improve professional credibility and recognition. (1.2)

b. Understands the role that EBP can serve to improve chiropractic’s positioning in societal, political, and the insurance environments. (1.2)

c. Understands the role that EBP can serve to help establish chiropractic care in integrative health care. (1.2)

Understands the potential role that EBP can play in expanding scope of practice. (1.8)

1.6. Can address controversial issues regarding EBP. (1.2)

1. Can articulate potential barriers to EBP. (1.2)

a. Understands the natural apprehension that one can have of the new subject material that EBP represents (especially concern about level of biostatistics expertise needed). (1.3) 9, p. 258

b. Understands the role of inherent human skepticism and resistance to change. (1.7)

c. Understands the challenge that there are large quantities of information to manage (“information overload”). (1.2)

d. Understands that there can be peer bias against EBP. (1.7) 9, p. 258

e. Understands there can be a lack of professional support and encouragement in developing EBP skills out in practice. (1.8)

f. Understands there are limited mentors for role modeling. (1.8)

2. Understands the criticisms and misperceptions surrounding EBP. (1.0)

a. Understands the perception that EBP might be used to define evidence too narrowly, focusing too much on controlled studies (e.g., double-blind random controlled studies), minimizing the contribution of other study designs (e.g., observational studies). (1.0)
b. Understands the perception that EBP might overemphasize evidence based on patient-centered outcomes while under valuing to an inappropriate degree evidence derived from pathophysiological and pathomechanical investigation. (1.3)

c. Understands the perception that EBP may devalue clinical experience. (1.0)^6, p. 13

d. Understands the fear that EBP might minimize the role of patient values. (1.2)^1, p. 8

e. Understands the perception that EBP can promote a “cookbook” health care approach. (1.0)^1, p. 8; 6, p. 13

f. Understands the perception that EBP might threaten the autonomy of the doctor-patient relationship. (1.7)

g. Understands the fear that that EBP can be used inappropriately to promote cost cutting, poorer quality of care, and 3rd party payment denial. (1.3)^1, p. 8; 6, p. 13

h. Understands the concern that EBP may be too time intensive to be practical in busy clinical practice. (1.5)^2, p. 215; 9, p. 258

3. Understands that EBP has limits in contributing to diagnostic or therapeutic certainty. (1.0)

a. Understands that not all issues can be formulated into questions that will yield evidence-based answers. (1.0)^9, p. 258

b. Understands that often there is insufficient quantity and quality of evidence to make an evidence-based clinical decision. (1.8)^2, p. 213; 9, p. 258

c. Understands that the generalizability of research evidence may be limited in practice settings. (1.0)

d. Understands that there may be conflicting studies or systematic reviews. (1.0)

e. Understands the pitfall of responding to the limitations of evidence-based care with a general nihilistic view. (1.2)^9, p. 258

f. Understands that there is limited research demonstrating whether EBP itself actually improves patient outcomes. (1.7)^2, p. 216

2. **Standard 2: The EBP competent practitioner can translate an issue of clinical uncertainty into an answerable question.** ^1, p. 13; 2, p. 16

2.1. The practitioner understands the issues relating to clinical ambiguity and uncertainty. (1.0)

1. Understands the role of probability (and, therefore, uncertainty) in establishing provisional or differential diagnoses, predicting prognoses, and assessing risks. (1.0)^3

2. Understands the challenges in linking cause and effect regarding therapy or harm in clinical settings or in research studies. (1.0)^10, p. 101

a. Can describe the rules of evidence regarding causality in clinical research (e.g., using Hill’s/Koch’s postulates). (1.2)^1, p. 178; 10, p. 101

2.2. The practitioner can translate uncertainty or a knowledge gap into a question the answer to which is best found in reliable sources. (1.0)^1, p. 13

1. Can differentiate a foreground from a background question. (1.0)^1, p. 15; 2, p. 14

a. Can identify the best types of resources to answer background questions, such as textbooks and narrative reviews. (1.2)^1, p. 15

2. Can determine the type of clinical question that is being posed. (1.0)^1, p. 20; 2, p. 20; 9, p. 19

a. Recognizes a therapy-related question. (1.0)^1, p. 20

b. Recognizes a harm-related question in terms of risk factors and prevention as well as side effects. (1.0)^1, p. 20

2. Recognizes a diagnosis-related question, both in terms of differential diagnosis and test accuracy. (1.0)^1, p. 20

3. Recognizes a prognosis-related question. (1.0)^1, p. 20

3. Can frame a foreground question into its critical “PICO” components (i.e., the relevant population of patients or the problem of interest (P); the type of
intervention/exposure/prognostic indicator (I), or comparison of one intervention to a standard intervention (C), and the specific outcome of interest (O)). (1.0) 

4. Can construct an effective search string based on the components of a PICO question (1.0).
   a. Can choose appropriate Boolean operators and search punctuation (e.g., parentheses, asterisk)
   b. Can choose appropriate synonyms as search terms

5. Can demonstrate a strategy to capture patient-related questions while working in a clinic setting. (1.0) 

3. **Standard 3: The EBP competent practitioner can effectively and efficiently access, retrieve and manage useful, up-to-date health care information and evidence.**

3.1. Can choose appropriate sources to access information/research evidence based on need, time restrictions, and the nature and depth of the information/evidence being sought. (1.0)
   1. Can define and discuss the suitability of research-based professional journals, open-source journals, peer-reviewed journals, trade journals and lay publications depending on the nature of the information required. (1.0)
   2. Can select an appropriate data base or other electronic resource. (1.0) (See 2.5.1)
      a. Recognizes that each database/resource has unique characteristics and selects appropriately. (1.0)
      b. Can demonstrate familiarity with and the ability to use the following identified best electronic tools and resources:
         i. DynaMed
         ii. EBSCOHost platform databases: MEDLINE COMPLETE, CINAHL, Cochrane Library, SportDiscus, Rehabilitation and Sports Medicine, DARE, AMED
         iii. Other proprietary databases: Natural Standard, Natural Medicines Comprehensive Database
         iv. Publically available web-based databases and websites: PubMed, PubMed Clinical Queries, TRIP, BestBets, Index to Chiropractic Literature, PEDro, Medline Plus
   3. Can select sources based on limited time considerations. (1.0)
      a. Understands the need to access quality information in a busy practice setting. (1.0)
      b. Can demonstrate a strategy of how to use pre-filtered/pre-appraised sources (e.g., guidelines, synopses, point of service resources) to aid in rapid acquisition and assessment. (1.0)
   4. Can select sources when greater depth and comprehensiveness is desired or a search of pre-filtered resources is unproductive.
      a. Understands where to search for primary studies and systematic reviews (e.g., MEDLINE, PUBMED, Cochrane Library, CINAHL) (1.0)
   5. Can select appropriate sources based on when the goal is browsing (e.g., “foraging” for useful information from journals or “push” services) rather than problem-solving (“hunting” for an answer to a specific clinical question). (1.0)
      a. Can define and identify push services. [to be revised and voted on]
      b. Knows criteria useful in selecting appropriate push services.
      c. Knows how to set up alerts to have targeted material pushed (e.g., alerts or RSS feeds).
   6. Can differentiate primary research literature from pre-appraised/pre-filtered and other secondary sources. (1.0)
a. Understands the why primary research literature is the best first choice in answering foreground questions. (1.0)
   i. Can recognize primary research literature. (1.0)
   ii. Can cite the advantages and disadvantages of using primary research literature. (1.0)

b. Understands the role of pre-appraised/pre-filtered sources in answering foreground questions. (1.0)
   i. Can recognize pre-appraised/pre-filtered sources and cite examples (e.g., guidelines, synopses, systematic reviews, point of service resources). (1.0)
   ii. Can cite the advantages and disadvantages of using pre-appraised/pre-filtered literature. (1.0)

c. Understands the role of textbooks, narrative reviews and similar resources in answering background questions. (1.0)
   i. Can define what a narrative review is and distinguish it from a systematic review. (1.0)
   ii. Can cite the advantages and disadvantages of using textbooks and narrative reviews. (1.0)

7. Is familiar with recommended “best” resources for finding evidence in a variety of circumstances. (1.0)
   a. Recognizes a hierarchy of information sources and services (e.g., Hanes pyramid / i.e. secondary vs. primary sources). (1.0)¹, p. 34; ², p. 10
      i. Can define and describe the utility of decision support systems (i.e., computerized decision-making programs). (1.0)¹, p. 34
      ii. Can define and describe the utility of recommended information synopses (e.g., summaries of individual studies or systematic reviews). (1.0)¹, p. 37
      iii. Can define and describe the utility of recommended information syntheses (e.g., clinical review articles, systematic reviews, meta-analysis). (1.0)¹, p. 38; ¹³, p. 31
      iv. Understands the hierarchy of primary studies with respect to cause and effect (e.g., RCT vs. cohort). (1.3)¹, p. 169

b. Can access appropriate sources and services based on the type of question posed (e.g., diagnosis, therapy, harm or prognosis). (1.0)

c. Can access appropriate sources and services based on the health care discipline being mined (i.e. primary care/general medicine, neuromusculoskeletal health care, complementary and alternative medicine (CAM) and manual therapy). (1.0)

d. Can describe the characteristics and content focus of a variety of evidence-based databases. (1.0)
   i. Free databases (e.g., PubMed, ICL, clinicaltrials.gov). (1.0)
   ii. Proprietary databases (e.g., Medline, CINAHL, ICL). (1.0)

e. Can access “best” pre-filtered resources which have the greatest likelihood of being clinically useful. (1.0)¹³, p. 36

f. Is familiar with and can access important evidence-based electronic sources of information. (1.0)
   i. For questions in the domain of primary care/general medicine (e.g., American Family Physician, (AFP) http://www.aafp.org/afp/, Cochrane Collaboration www.cochrane.com). (1.3)
   ii. For questions in the domain of NMS health care. (1.4)
   iii. For questions in the domain of CAM (e.g., National Center for Complementary and Alternative Medicine). (1.2)
   iv. For questions in the domain of manual therapy. (1.6)

 g. Is familiar with and can access important sources for evidence-based clinical guidelines. (1.0)
i. For questions in the domain of primary care/general medicine (e.g., Canadian Task Force on the Periodic Health Care www.ctfphc.org, US Preventive Services Task Force www.uspstf.org, ). (1.6)

ii. For questions in the domain of NMS health care (e.g., CCGPP). (1.2)

iii. For questions in the domain of CAM. (1.5)

iv. For questions in the domain of manual therapy (e.g., CCGPP, Canadian Practice Guidelines). (1.0)

h. Is familiar with and can access the important general sources for systematic reviews. (1.1)

i. For questions in the domain of primary care/general medicine (e.g., Canadian Task Force on the Periodic Health Care, US Preventive Services Task Force, Cochrane Library). (1.0)

ii. For questions in the domain of NMS health care (e.g., Cochrane Library, ACP Journal club). (1.0)

iii. For questions in the domain of CAM (e.g., Cochrane Library). (1.0)

iv. For questions in the domain of manual therapy (e.g., Cochrane Library, Spine, JMPT). (1.3)

i. Is familiar with important journal sources for primary research articles and evidence-based review articles. (1.2)

i. For questions in the domain of primary care/general medicine (e.g., Annals of Family Practice, Annals of Internal Medicine). (1.0)

ii. For questions in the domain of NMS health care (e.g., Spine, JMPT). (1.0)

iii. For questions in the domain of CAM (e.g., Alternative and Complementary Medicine). (1.0)

iv. For questions in the domain of manual therapy (e.g., Manual Therapy, JMPT). (1.0)

j. Can determine and access best evidence-based textbooks. (1.0)

i. Can utilize the criteria listed below to identify which type of textbook would be most relevant for the question being asked. (1.0)

3.1.7.j.i.1. Based on foreground (e.g., CMDT, Mosby’s 5 Minute Consult series) or background questions (e.g., Harrison’s Principles of Internal Medicine). (1.0)

3.1.7.j.i.2. Based on type of knowledge: signs and symptoms (e.g., Souza’s Differential Diagnosis for the Chiropractor), specific conditions diagnosis in primary care (e.g., Harrison’s Principles of Internal Medicine), orthopedic tests (e.g., Magee’s Orthopedic Physical Assessment), physical examination (e.g., McGee’s Evidence-Based Physical Diagnosis), and specialty issues (e.g., Liebenson’s Rehabilitation of the Spine). (1.0)

3.1.7.j.i.3. Based on domain of knowledge: CAM (e.g?), manual therapy (e.g., Peterson’s Chiropractic Technique Principles and Procedures, 2nd edition), NMS/orthopedics, or general medicine/health care. (1.0)

ii. Can utilize specific criteria to assess a textbook relative to its quality and usefulness for evidenced-based information. (1.0)

3.1.7.j.ii.1. How recent and how often the text is updated. (1.0)

3.1.7.j.ii.2. Discussion of diagnostic strategies and processes. (1.6)

3.1.7.j.ii.3. Information on accuracy and reliability. (1.4)

3.1.7.j.ii.4. Accuracy of specific signs and symptoms provided. (1.4)

3.1.7.j.ii.5. References provided. (1.0)

3.1.7.j.ii.6. Frequency of disease or clinical finding. (1.0)
3.1.7.j.ii.7. Above categories are rated based on whether the concept is consistently explained and applied through the text along with specific examples.

3.2. Can design an effective search.
   1. Can effectively use limiters in a variety of data bases (e.g., Clinical Queries)

3.3. Can conduct an effective and efficient search
   1. Can modify searches to respond to search “feasts” and “famines”
   2. Can quickly scan search results for currency, relevancy, and quality
   3. Can scan abstracts for clues of relevancy and quality
   4. Can navigate to full text using a variety of methods (e.g., using the A-Z list, linking directly from a data base, using inter-library loan)

3.4. Has the knowledge and skills necessary to coalesce, organize, store and retrieve previously searched health care information. (1.0)
   1. Can generate and manage data bases of health care references (can demonstrate familiarity with a commercial product such as Reference Manager, EndNote, ProCite). (2.2)
   2. Can generate a critically appraised topic (CAT) or other type of summary for later retrieval. (1.2) \textsuperscript{1}, p. 91
   3. Can synthesize evidence from a variety of resources into a coherent and balanced summary.

4. **Standard 4: The EBP competent practitioner can critically appraise the validity and clinical significance of relevant evidence.**

4.1. Understands the inherent strengths and weaknesses of different levels of evidence and can rate their quality. (1.0)
   1. Can outline and define levels of evidence. (1.0) \textsuperscript{1}, p. 169
   2. Can identify and contrast the differences between narrative reviews and systematic reviews. (1.0)\textsuperscript{13}, p. 32; 13, p. 183
      a. Can differentiate types of systematic reviews. (1.0)\textsuperscript{16}, p. 187
         i. Knows the key characteristics of a meta-analysis (e.g., pooling data from similar studies, use of a formal quantitative analysis). (1.0)
         ii. Knows the key characteristics of a qualitative systematic review/best-evidence synthesis (e.g., qualitative nature, often composed of studies too heterogeneous to pool for statistical meta-analysis). (1.0)
   3. Can evaluate the quality of narrative clinical review articles. (1.0)\textsuperscript{13}, p. 32
      a. Can identify if an article has the characteristics of a higher quality clinical review. (1.0)\textsuperscript{13}, p. 33
         i. Can determine if the review cites original research, not just other reviews. (1.0)
         ii. Can determine if it is primarily (but not necessarily exclusively) composed of the highest levels of evidence. (1.0)
         iii. Can determine if it cites latest studies and also landmark studies. (1.2)
         iv. Can determine if it cites peer-reviewed journals. (1.0)
      b. Can identify and discuss potential weaknesses of a narrative clinical review. (1.0)\textsuperscript{13}, p. 33
         i. Understands the potential for selection bias inherent in narrative reviews. (1.0)
         ii. Understands the limitations of an unsystematic search strategy. (1.2)
         iii. Understands the potential for a review to be influenced by funding, author or journal bias. (1.2)
4. Can evaluate the quality of systematic reviews. (1.0)  
   a. Can identify if an article has the characteristics of a higher quality systematic review. (1.2)  
      i. Can determine if the methodology has adequate transparency (e.g., citation of search techniques, data synthesis, conflicts of interest). (1.0)  
      ii. Can determine if the types of studies selected were appropriately matched to the type of question asked in the realms of diagnosis, harm, therapy or prognosis (e.g., RCTs are preferred for questions of therapy). (1.0)  
      iii. Can determine if there was a comprehensive and detailed search for relevant studies (e.g., appropriate key words and data bases, a wide range of sources including personal communications with researchers, discussions at scientific meetings, or other less formal resources). (1.0)  
      iv. Can determine if all of the individual studies included were assessed for methodological quality. (1.0)  
      v. Can determine if the author addresses whether the individual studies were sufficiently similar for meaningful synthesis. (1.0)  
      vi. Can determine if there is any significant funding, author and journal bias. (1.8)  
   b. Can evaluate the usefulness of a systematic review. (1.0)  
      i. Can determine whether the evidence is of sufficient quality. (1.0)  
      ii. Can determine if there is consistency of results across studies. (1.0)  
      iii. Can determine if the evidence was of sufficient magnitude and precision to impact practice. (1.0)  
   c. Can summarize the inherent weaknesses and controversy pertaining to systematic reviews. (1.0)  
      i. Understands that systematic reviews of the very same pool of evidence can reach different conclusions (based on quantitative vs. qualitative methods, the degree of consensus among the reviewers, different quality scales, rules for inclusion, or rules of evidence). (1.8)  
      ii. Understands the importance of using appropriate quality scales based on the type of research (e.g., ratings of physical medicine studies may be affected by using quality scales more appropriate for medicine). (2.0)  
      iii. Understands that patients, comparison groups, outcomes, and follow-up time points from various studies may not be similar enough to be pooled for the quantitative methodology used in meta-analysis. (1.2)  
5. Can evaluate the quality of clinical practice guidelines. (1.0)  
   a. Can determine whether a guideline includes a comprehensive, reproducible literature review current within a reasonable timeframe (recommendations range from 1-3 years). (1.0)  
   b. Can determine whether individual recommendations are both tagged by the level of evidence (based on type, quality, and quantity) and linked to specific citations. (1.0)  
   c. Can assess the relative quality based on the transparency of the methodology, the make up and qualifications of the authors or consensus group, the consensus process, and the opinions offered in any appended minority report. (1.4)  
6. Can identify and evaluate the quality of clinical decision making tools. (1.0)  
   a. Can identify decision-making instruments and formats such as clinical decision-making rules (e.g., Ottawa rules for acute ankle radiographs), algorithms/decision-making trees, and quantitative clinical decision analyses. (1.0)  
   b. Can explain in general the strengths and weaknesses of diagnostic and treatment decision-making trees/algorithms. (1.8)
c. Can explain in general the strengths and weaknesses of clinical decision-making rules. (1.6)
d. Can define and discuss in general quantitative clinical decision analysis. (3.0)
e. Can assess the quality of decision-making tools in general. (1.6)\(^1\), p. 158
   i. Considers the level of content expertise of the authors. (2.2)
   ii. Considers the rigor of the methodology. (1.8)
   iii. Considers the levels of evidence utilized. (1.0)
   iv. Considers if it has verified clinical efficacy/validity in actual clinical trials. (1.0)
   v. Considers the ease of use. (1.0)
   vi. Considers the intended end user (e.g., chiropractor specifically, manual therapist, medical specialist). (1.4)
   vii. Considers whether it includes significant diagnostic and therapeutic alternatives. (2.0)
   viii. Considers whether each branch of a quantitative-based decision-making tree contains valid and credible outcome probabilities (leading to a particular result). (2.8)
   ix. Considers whether each branch of a quantitative-based decision-making tree contains valid and credibly assigned weightings of clinical utility (based on an estimation of the risk-benefit impact on the patient). (2.8)
   x. Considers whether the gains associated with one course of action opposed to another are clinically important enough to justify its application. (1.2)

7. Can evaluate the clinical applicability of expert opinion. (1.0)\(^8\), 14, p. 47
   a. Can assess the expert's content expertise (based on credentials, publications, frequency of being cited, etc.) and EBP competence (e.g., there is reason to believe the personal clinical opinion is offered within the context of best current evidence). (1.4)\(^8\), 17, p. 48
   b. Considers whether the expert opinion might be generalizable to other patient populations and clinical environments outside of the expert's own clinical populations. (1.4)\(^8\), 17, p. 48
   c. Appreciates that opinions may be highly variable even among equally qualified experts. (1.0)

8. Can evaluate the clinical applicability of consensus statements based on practitioner surveys. (2.0)
   a. Can describe a Delphi process. (2.0)\(^{16}\), p. 315
   b. Can articulate the limitations of such methodologies in terms of validity and usefulness. (1.8)\(^{15}\)
   c. Can articulate the role of surveys in documenting common practice behaviors. (1.8)

4.2 Demonstrate a basic conceptual understanding of biostatistics as they apply to EBP. (1.0)
   1. Demonstrate a basic understanding of the role and importance of statistical analysis in the generation, interpreting, and reporting of research results. (1.0)
   2. Recognize the terms biostatistics and epidemiology. (1.2)\(^{16}\), p. 427
   3. Distinguish population parameters from descriptive statistics (1.4) and descriptive statistics from inferential statistics (i.e., population estimates). (1.0)\(^{16}\), p. 91; 16, p. 109
   4. Demonstrate a basic knowledge of how data can be distributed or shaped (when graphically displayed). 16, p. 103; 16, p. 102; 16, p. 104
      a. Define variability (1.0) and related terms (i.e., dispersion (1.0) standard deviation (1.0) interquartile range (2.2) and variance (3.0).
      b. Recognize normal distribution (1.0) (AKA Gaussian distribution/ bell shaped curve).
      c. Recognize skewed distribution. (1.0)
5. Define descriptors of central tendency: mean, (1.0) median (1.0) and mode. (2.0)\textsuperscript{16}, p. 94

6. Recognize the difference between categorical (e.g., nominal, ordinal) and continuous (e.g., interval, ratio) data. (1.0)\textsuperscript{16}, p. 95

7. Explain the difference between sampling and randomization as it applies to a study design. (1.0)\textsuperscript{1}, p. 263; 2, p. 332
   a. Define sampling (1.0)
   b. Define sample mean (central tendency) (1.0)*
   c. Define random error (1.0)
   d. Define variability (e.g., standard error). (1.2)

8. Use the concepts of precision and point estimate in interpreting research results. (1.0)\textsuperscript{1}, p. 26; 1, p. 130; 2, p. 67
   a. Recognize a point estimate. (1.0)
   b. Define the precision of a point estimate using a standard error or confidence interval. (1.0)
   c. Use confidence intervals or standard error in interpreting the precision of research results. (1.0)

9. Recognize common ways used to display data in charts and graphs (1.0)
   a. Read a scatter plot bar graph (1.0) a line graph (1.0), a forest plot (1.0), a box plot (1.0), a histogram (1.5), an ROC curve (2.0) and a survival plot (2.0).
   b. Recognize the difference between a standard error bar (precision) versus a standard deviation bar (estimate of variability in the population) when presented in a plot (2.0)

10. Use the concept of statistical significance to better understand the results of a study. (1.0)
   a. Define the concept of $P$ values (i.e., the tolerable amount of chance intrusion) (1.0)\textsuperscript{1}, p. 263; 2, p. 331
   b. Recognize that an “acceptable” level of probability/chance error is set before the study begins and that it is usually set $\leq .05$ in clinical trials. (1.0) \textsuperscript{1}, p. 263; 2, p. 331
   c. Demonstrate simple ways to estimate whether or not sample size was adequate in a particular study (based on the concepts of $P$ values, confidence intervals, and power).
   d. Recognize some of the basic concepts associated with the power of a study (1.0)\textsuperscript{16}, p. 118; 4
      i. Define power as the probability of a study to detect a statistically significant difference between groups when there really is a difference in the study population. (1.2)
      ii. Recognize that a study is too small if the power to detect a clinically meaningful benefit is less than 80% (in studies with negative results). (1.0)

11. Demonstrate familiarity with a variety of descriptive and inferential statistics.\textsuperscript{16}, p. 120
    a. Define common descriptive statistics including mean (1.0), median (1.2), mode (1.6), standard deviation (1.0), standard error* (1.0), odds ratio* (1.0), relative risk* (1.0), and hazard ratio (1.4).
b. Recognize a variety of methods to compare groups statistically (inferential statistics). (1.0)
c. Recognize Chi-square.* (1.4)
d. Recognize T-test.* (1.5)
e. Recognize non-parametric tests: Wilcoxon, Mann-Whitney, Kruskal-Wallis, Friedman’s, median, and sign tests. (2.4)
f. Recognize post hoc tests. (1.8)
g. Recognize analysis of variance (ANOVA)*. (1.4)
h. Recognize analysis of covariance (ANCOVA)*. (1.4)
i. Recognize other tests, that like ANCOVA, correct for baseline differences between groups: regression, logistic regression, general linear models, generalized linear models, mixed effects models, and generalized estimating equations; proportional hazards models and Cox regression (time to event analysis). (2.4)
j. Recognize common measures of correlation. (1.6)
   i. Recognize Pearson’s correlation coefficient (Pearson’s r)*. (1.6)
   ii. Recognize Spearman’s rho. (2.0)
k. Define and demonstrate a basic understanding of regression analysis used for the purpose of prediction. (1.4)
   i. Recognize linear regression*. (1.6)
   ii. Recognize multiple regression. (1.8)
   iii. Recognize logistic regression. (2.0)
l. Recognize if treatment and control groups are similar at baseline in terms of important prognostic predictor variables or, if not, the predictor variables are adjusted for in the analysis. (1.0)
m. Recognize if analysis of covariance (ANCOVA) or equivalent (including general linear models or regression) was conducted. (2.0)

4.3 Understands the design and hierarchy of different types of primary studies along with their inherent strengths and weaknesses. (1.0)
1. Can demonstrate a basic understanding of hypothesis testing. (2.2)  
   a. Can explain the terms research hypothesis (alternative hypothesis, H1) and the Null hypothesis (Ho). (2.2)
   b. Understands the basic difference between a Type I/alpha error (the probability of incorrectly rejecting the null hypothesis) and a Type II/beta error (the probability of incorrectly accepting the null hypothesis). (2.4)
2. Can explain the differences in design and methodology of various types of primary studies. (1.0)
   a. Can define and differentiate prospective vs. retrospective, observational vs. experimental, randomized vs. non-randomized comparisons (quasi-experimental), between subjects (nomothetic) vs. within subject (idiographic), and qualitative vs. quantitative studies. (1.0)
   b. Can define and explain basic terminology used in research studies. (1.0)
      i. Can define basic terms and concepts used in RCTs including intervention/treatment group vs. control group, sham treatment, nonspecific treatment effect and placebo effect. (1.0)
      ii. Can define basic terms and concepts regarding participants in a research study to include population, target population, sample (including random and nonrandom), and cohort. (1.0)

* Indicate most common tests to see in the literature.
iii. Can recognize if appropriate randomization occurred in a study, based on method (e.g., sealed envelopes, computer generated, and coin flip) and type (e.g., simple, block, stratified, and design adaptive). (2.0)

iv. Can explain the need for concealing the study group prior to allocation (i.e., to prevent selection bias). (1.0)

c. Can define and describe a randomized controlled trial (RCT). (1.0) ¹, p. 117; 16, p. 151

i. Can differentiate pragmatic from explanatory (fastidious) trials. (1.4)

ii. Can differentiate placebo-controlled vs. comparison trials. (1.0)

iii. Can define and compare crossover, single-blind, double-blind, triple-blind, and assessor-blind randomized controlled trials. (1.4)

d. Can cite and discuss the strengths and weaknesses inherent in the design of RCTs. (1.0) ², p. 85

i. Can discuss the following advantages of RCTs relative to other study designs: able to establish causality, able to diminish the effects of random chance, and potentially offers more trustworthy data. (1.0)

ii. Can discuss the following limitations of RCTs: too difficult or unethical to design for some questions, possible problems with generalizability to practice (particularly for explanatory trials). (1.0)

e. Can cite and discuss the strengths and weaknesses inherent in nonrandomized comparison studies. (1.0) ¹⁶, p. 156

i. Can explain a variety of design strengths including usefulness for large practice-based studies, useful for generating hypotheses, better at accumulating large amounts of data than an RCT, results are more generalizable than those of RCTs. (1.0)

ii. Appreciates the limitations of this design including the data are less reliable (trustworthy) than that of an RCT and are limited by lack of blinding, lack of randomization, and inherent susceptibility to selection bias. (1.0)

f. Can describe a variety of observational studies and discuss their inherent strengths and weaknesses. (1.0) ², p. 255; 16, p. 250

i. Can cite the differences between a cohort design, a case-control design, and a cross-sectional design. (1.0)

ii. Understands that they are considered to be the strongest design after RCTs and can cite examples when they would be more appropriate than an RCT (e.g., when an RCT is not possible or advisable due to ethical considerations). (1.0)

iii. Understands that observational studies have a tendency to overestimate intervention effects compared to an RCT. (1.0)

g. Can cite and discuss the inherent strengths and weaknesses of a cohort design (e.g., confounding variables may not be controlled). (1.0) ¹, p. 180; 2, p. 86; 9, p. 86

i. Can discuss the following advantages of a cohort design relative to other study designs: ability to identify large group trends, better reflects actual practice environment, may be a more ethical design than an RCT for some questions of harm, has the potential to identify cause and effect relationships suitable for further research. (1.0)

ii. Can discuss the following limitations of the cohort design: cannot establish causality, lack of randomization increases the possibility of results being influenced by a variety of confounders. (1.0)

h. Can cite and discuss the inherent strengths and weaknesses of a case-control design. (1.0) ¹, p. 181; 2, p. 88; 9, p. 88

i. Can explain their usefulness in identifying potential causes of rare diseases. (1.0)
ii. Can cite design difficulties such as finding appropriately matched controls, establishing temporal linkages from the past (e.g., recall bias) and the inability to control for other confounding biases and causal factors. (1.0)

i. Can cite and discuss the inherent strengths and weaknesses of cross-sectional studies. (1.0)

1. Can explain the problems of exposure. (1.8)
2. Can explain the potential effect of “recall bias.” (1.2)
3. Can explain the difference between the association/correlation identified in cross-sectional studies compared to questions of direct causation. (1.0)
4. Understands that uncontrolled confounders may be present. (1.2)

j. Can define the role and inherent weaknesses of a case series design. (1.0)

1. Can define the role and inherent weaknesses of a case series design. (1.0)

i. Can explain the problems of exposure. (1.0)
ii. Understands their lack of control groups introduces many potential confounders. (1.0)

k. Can define the role and inherent weaknesses of case studies/case reports. (1.0)

i. Can describe their usefulness for hypothesis generation and to share unique observations with the profession. (1.0)
ii. Understands their lack of control groups introduces many potential confounders. (1.0)
iii. Understands findings are isolated to a single patient and are not generalizable. (1.0)

l. Can define the design and the strengths and weaknesses of an N-of-1 randomized trial. (1.4)

1. Can explain how an N-of-1 study is conducted. (1.8)
2. Can explain the potential usefulness for an individual patient in a real patient setting. (1.4)
3. Can explain why the results provide no evidence of generalizability beyond the case under study. (1.4)
4. Understands the controversy surrounding the value of the research design (e.g., criticized by some epidemiologists as being quasi-experimental). (2.0)

3. Can identify a hierarchy of research designs based on the type of clinical question posed. (1.4)

a. Can identify the best research designs for questions of differential diagnosis. (1.6)

b. Can identify the best research design for questions involving diagnosis. (1.2)

i. Can identify the best research designs regarding reliability and validity (i.e., cross-sectional with randomization and blinding). (1.0)
ii. Can identify the best research designs regarding utility and efficacy of specific diagnostic tests (i.e., RCT, non-randomized comparison study). (1.7)
iii. Can identify the best research designs regarding test responsiveness (i.e., prospective observational study). (1.8)

b. Can identify the best research designs for questions involving diagnosis. (1.2)

i. Can identify the best research designs regarding reliability and validity (i.e., cross-sectional with randomization and blinding). (1.0)
ii. Can identify the best research designs regarding utility and efficacy of specific diagnostic tests (i.e., RCT, non-randomized comparison study). (1.7)
iii. Can identify the best research designs regarding test responsiveness (i.e., prospective observational study). (1.8)
d. Can identify the best research designs for questions of treatment side effects (i.e., RCTs and observational studies such as cohort or case control). (1.0) 1, p. 181

e. Can identify the best research designs for harm questions regarding health risk factors (i.e., observational studies such as cohort or case control). (1.2) 1, p. 181

f. Can identify the best research designs for questions regarding prognosis (i.e., observational studies such as cohort and case control). (1.0) 1, p. 102; 2, p. 86

4.4 Can describe the basic characteristics that determine the quality of research studies. (1.0)

1. Can define the broad concepts of external validity (i.e., generalizability of evidence from a research study population to an actual practice population) and internal validity (i.e., the degree to which a study is measuring what it set out to) and experimental bias. (1.2)

2. Can define and discuss the key determinants of external validity. (1.4) 16, p. 162

a. Can discuss the importance of the patient population in the study. (1.0)

i. Can describe the following methods of sampling: random sampling, stratified random sampling, cluster sampling, and convenience sampling. (1.0)

ii. Can describe the selection process and the impact of inclusion/exclusion criteria. (1.0)

iii. Can discuss the potential effects of subpopulations. (1.4)

b. Can discuss the role of provider and assessor characteristics (including the degree to which they are blinded and the potential for a variety of biases). (1.0)

c. Can discuss the impact of the research setting (including the differences between hospital vs. private practice settings, primary care vs. specialist practice settings, and chiropractic vs. allopathic practice settings). (1.0) 16, p. 162

3. Can define and discuss the key determinants of internal validity. (1.0) 16, p. 160

a. Can discuss the potential impact of unplanned events that affect the history of the study as it unfolds (e.g., care sought outside the study, additional treatment that is not part of the study design, data from resentful respondents receiving less desirable treatment). (1.4) 16, p. 160

b. Understands the importance of factoring in the role of natural history (“maturation”) of the subject’s condition. (1.0) 16, p. 160

c. Understands the effect of the attrition rate (i.e., number of dropouts and noncompliant subjects). (1.0)

d. Understands that the very act of measuring a phenomenon may change it, influencing the outcomes and conclusions. (1.6)

e. Understands that the quality of the data is influenced by the quality and characteristics of the outcome measures used in the study (i.e., issues of test reliability, validity and responsiveness). (1.0) 16, p. 160

f. Understands the phenomenon of regression to the mean. (1.0) 16, p. 161

i. Understands the natural tendency of signs, symptoms and physiological systems to return to a natural mean value even without intervention. (1.0)

ii. Understands the concepts of central tendency in measurements with random error. (1.6)

g. Understands the importance of appropriate allocation (i.e., assuring that the characteristics of participants are the same across comparison groups) that is well concealed. (1.0)

h. Understands the inherent ambiguity of differentiating cause from effect and the potential for drawing erroneous conclusions. (1.0) 1, p. 120; 16, p. 425

i. Understands the confounding role of patient expectations and actions (e.g., the Hawthorne effect, placebo effect, non-specific treatment effect recall bias) (1.0)
j. Understands the potential effects of experimenter’s/provider’s expectations and actions, i.e., trying harder or greater enthusiasm because of participation in the study (attention and expectation bias). (1.0)

k. Can explain the problem of diffusion of information or imitation of treatments (e.g., one group gets information that only the other group should have). (3.0)

l. Can explain the importance of accounting for ceiling and floor effects. (2.2)

4.5. Demonstrate an understanding of the basic characteristics of DIAGNOSTIC tests. (1.0)

1 Can explain the differences between normal and abnormal vs clinically significant or clinically insignificant in the context of diagnostic testing. (1.0)
   a. Explain a clinical, evidence-based definition. (1.4)
   b. Explain a statistical norm-based definition. (1.4)
   c. Explain an opinion-based definition. (2.0)
   d. Discuss various methods that help determine cut points and test thresholds used to divide normal from abnormal. (1.8)
      i. Recognize that ROC curves can be used to establish optimal statistical performance of a diagnostic test. (2.6)
      ii. Explain what a cut point is relative to designating clinically important test results. (2.2)
      iii. Explain the choice of cut points based on whether the test is used for screening, case finding, or confirming a diagnosis. (2.2)
      iv. Explain the choice of cut points based on population normative values (e.g., within 2 standard deviations). (2.6)
      v. Understands the choice of cut points based on definitions of normal and abnormal as they apply to the state of optimum health. (2.2)

2 Demonstrate a basic understanding of common measures of reliability. (1.0)
   a. Explain the concept of reliability measures.
   b. Define the following types of reliability: inter-examiner (1.0) intra-examiner (1.0) and test-retest. (2.0)
   c. Recognize and interpret the results of Kappa (1.0) and intraclass correlation coefficient (ICC) (1.8) in terms of excellent, good, fair and poor.

3 Demonstrate a basic understanding of common measures of validity. (1.0)
   a. Demonstrate an understanding of test sensitivity. (1.0)
      i. Explain how test sensitivity is determined. (1.2)
      ii. Define sensitivity in terms of percent of true positives. (1.6)
      iii. Use test sensitivity to rule out conditions based on its rate of false negatives. (1.2)
      iv. Calculate sensitivity using a 2X2 table. (1.4)
   b. Demonstrate an understanding of test specificity. (1.0)
      i. Explain how test specificity is determined. (1.2)
      ii. Define test specificity in terms of true negatives. (1.6)
      iii. Use test specificity to rule in a condition based on its rate of true positives. (1.0)
      iv. Calculate specificity using a 2X2 table. (1.2)
   c. Demonstrate an understanding of the relationship between sensitivity and specificity. (1.4)
      i. Explain the inverse relationship between sensitivity and specificity when establishing cut points. (1.0)
      ii. Recognize that if the specificity and specificity of a test adds up to 100% the diagnostic test is of no clinical value.
   d. Explain the meaning of test results when expressed as test accuracy as well as the limitations of this mode of expression. (2.0)
e. Demonstrate an understanding of pre-test probability and its application to diagnostic testing. (1.0)\textsuperscript{16, p. 90}
   i. Define incidence and prevalence. (1.0)
   ii. Explain how prevalence affects the results of screening an asymptomatic population. (1.0)
   iii. Explain how pre-test probability affects testing a symptomatic patient. (1.0)

f. Demonstrate an understanding of positive and negative predictive values. (1.2)\textsuperscript{9, p. 157}
   i. Define positive and negative predictive values in relationship to false positives and false negatives. (2.2)

g. Demonstrate an understanding of likelihood ratios. (1.0)\textsuperscript{2, p. 128; 9, p. 165}
   i. Define positive and negative likelihood ratios. (1.0)
   ii. Explain their relationship to sensitivity and specificity. (1.2)
   iii. Explain their relationship to establishing predictive values for a particular condition being tested (post-test vs. pretest odds ratios). (1.4)
   iv. Calculate positive and negative likelihood ratios from sensitivity and specificity numbers. (1.2)
   v. Use a nomogram to calculate post test probabilities. (1.0)

h. Define and discuss the clinical significance of test responsiveness. (1.0)
   i. Explain the concept of test responsiveness (i.e., evaluation of clinical change). (1.0)
   ii. Explain the significance of determining the minimally clinically important change for an instrument. (1.0)

i. Can distinguish definitive diagnostic tests from initial screening tests for a patient population. (1.0)\textsuperscript{1, p. 82; 16, p. 296}
   i. Can explain whether sensitivity or specificity is more important depending on the seriousness of the condition being screened and the risks of treatment. (1.0)

j. Understands that test clusters or test regimens may perform differently than individual tests. (1.0)

k. Can define and discuss the clinical significance of test utility/efficacy. (1.0)
   i. Can explain how utility is related to how test results affect treatment choices. (1.0)
   ii. Can explain how utility is related to how test results affect outcomes. (1.0)

l. Can explain the various types of validity that are cited as evidence to support the use of a diagnostic test. (1.0)\textsuperscript{16, p. 290}
   i. Can define a gold standard (criterion validity). (1.0)
   ii. Can define concurrent validity. (2.0)
   iii. Can define face validity (AKA sensibility). (2.0)
   iv. Can define predictive validity (e.g., sensitivity, specificity, etc.). (2.0)

4.6 Can appraise the validity and usefulness of a primary study of DIAGNOSTIC tests. (1.0)\textsuperscript{1, p. 71; 2, p. 121; 9, p. 70}
   1. Can assess the common characteristics of a valid study of a diagnostic test. (1.0)\textsuperscript{1, p. 71; 2, p. 121; 9, p. 70}
      a. Can ascertain if an appropriate case mix is used (i.e., a representative patient spectrum or a subgroup). (1.0)\textsuperscript{1, p. 72}
      b. Can ascertain if subjects are blinded to all test findings. (1.0)\textsuperscript{2, p. 125}
c. Can determine if assessors are blinded to confounding information (e.g., other exam findings that might influence the interpretation). (1.0) 1, p. 72; 9, p. 71

d. Can ascertain if a complete test or complete test battery (cluster) was evaluated (i.e., partial test characteristics alone do not evaluate the reliability or validity of a complete test). (1.0)

2. Can identify the key elements of a valid study on test reliability (clinical agreement). (1.0)
   a. Can assess if proper methodology was used (i.e., a randomized order of assessors and blinding of assessors to each others’ findings). (1.0)
   b. Can assess if proper statistical tools were used. (1.0)
      i. Can define the following statistical tools and scales of measurement: NOI/R (nominal, ordinal, interval/ratio), KAPPA, weighted KAPPA, and ICC. (1.0)
      ii. Can match the appropriate statistic with type of data: nominal, ordinal, interval, or ratio. (1.0)
      iii. Can interpret the magnitude of a kappa or intraclass correlation coefficient. (1.0)

3. Can identify the key elements of a valid study on test validity. (1.0) 16, p. 385
   a. Can define the following terms: gold standard (AKA reference/criterion standard), face validity, content validity, construct validity, and discriminative validity. (1.8) 16, p. 290
   b. Can determine if an appropriate gold standard was used. (1.0) 1, p. 71; 9, p. 70
   c. Can determine if all the patients were compared to the reference (gold) standard. (1.0) 9, p. 73

4. Can identify the key elements of a valid study on test utility and efficacy (i.e., the same criteria used for studies on treatment). (1.2)

5. Knows the criteria for a useful study of a diagnostic test. (1.0) 9, p. 26; 9, p. 76; 16, p. 302
   a. Can determine exactly how the test was performed (operationally defined). (1.0)
   b. Can determine if the test was evaluated in a clinically meaningful manner. (1.0)
   c. Can determine if a relevant patient population was used. (1.0) 9, p. 75
   d. Can determine if a relevant assessor population was used. (1.0)
   e. Can determine if the reliability and validity of a test or procedure are relevant to the condition or clinical question being posed. (1.0)
   f. Can distinguish test scale accuracy from test diagnostic validity. (1.2)
   g. Can determine if the evidence supports whether the test can accurately distinguish patients who do and do not have a specific disorder. (1.0)

4.7 Can appraise the validity and usefulness of research on the process of DIFFERENTIAL DIAGNOSIS. (1.0) 2, p. 111; 17

1. Can demonstrate an understanding of the diagnostic process. (1.0)
   a. Understands the role of pattern recognition. (1.0)
   b. Understands the role of individual tests and test clusters in narrowing down the diagnostic possibilities. (1.0)
   c. Understands the process of identifying a working/provisional diagnosis out of a set of differential diagnoses. (1.0)
   d. Understands how criteria are derived for some diagnostic entities (e.g., IHS criteria for cervicogenic headache, American College of Rheumatism’s criteria for SLE). (1.8)

2. Can differentiate an article on diagnostic procedures from an article on differential diagnosis. (1.6)

3. Can determine if the patients enrolled in a differential diagnosis study are representative of typical patients with the clinical problem. (1.8)
   a. Can ascertain if the clinical problem assessed was clearly defined. (1.6)
b. Can ascertain if the study’s patient population is representative of those with the clinical problem. (1.4)
   i. Can determine if subjects were from a consecutive series design or from a specific geographical location. (2.0)
   ii. Can identify the inclusion and exclusion criteria for the study. (2.0)
   iii. Can determine if all subjects were assessed in a similar setting (e.g., a specialty clinic vs. a primary care clinic) or represent a broader cross section of settings. (2.0)
   iv. Can determine if the authors identified and addressed any subjects who dropped out of the study or who had incomplete follow-up. (2.0)

4. Can ascertain if the definitive diagnostic standard used in the study was appropriate and whether the differential diagnostic process was credible. (2.0)
   a. Can determine if explicit diagnostic criteria were used, described, and referenced. (2.0)
   b. Can determine if findings were described and used to both confirm and exclude a diagnosis. (2.0)
   c. Can determine if the diagnostic criteria were based on a comprehensive search to identify all causes of the clinical problem. (1.8)
   d. Can determine if the interexaminer reliability of the assessment procedures used in the study was cited and adequate. (2.0)
   e. Can determine if the process was clear, sufficiently described, and standardized to replicate their design. (2.0)
   f. Can determine if the diagnostic criteria were applied consistently among examiners. (2.0)

5. Can determine if the follow-up period was of sufficient time and completeness for initially undiagnosed patients. (2.0)
   a. Understands that a higher number of undiagnosed patients increases the chance of error in estimating disease probability. (2.0)
   b. Understands that longer follow-up periods have a better chance of determining if a patient has a diagnosable disorder which was initially missed. (2.0)

6. Can determine if the study reported all diagnoses identified and their probabilities. (2.0)
   a. Can determine the percentages of the established diagnoses. (2.0)
   b. Can determine how precise the estimates of the probability of each disease were by evaluating the reported confidence intervals. (2.0)

4.8 Can appraise the validity and usefulness of a primary study on THERAPY (e.g., an RCT).

1. Knows the criteria for a valid study on a therapeutic intervention. (1.0)
   a. Can determine if patients were properly identified and appropriate sampling was done to help ensure external validity. (1.0)
   b. Can determine if proper subject randomization was conducted to ensure control of internal validity (control for allocation bias). (1.0)
   c. Can determine if proper blinding of experimenters, patients and therapists was conducted to ensure internal validity. (1.0)
      i. Can determine if there was potential for selection bias. (1.0)
      ii. Can define and describe study designs that are single-blind, double-blind, triple-blind assessor-blind, blinding to the degree possible, and the use of naiveté in lieu of blinding. (1.0)
      iii. Can determine if there was a concealment of group assignment prior to acceptance into study. (1.4)
d. Can determine if treatment and control groups are similar at baseline in terms of important prognostic predictor variables or, if not, the predictor variables are adjusted for in the analysis. (1.0) \(^1\), p. 120; **2**, p. 61; 9, p. 61
   i. Can determine if analysis of covariance (ANCOVA) or equivalent (including general linear models or regression) was conducted. (2.0)
   ii. Can determine if the baseline values of outcome measures were treated as a covariate in the analysis. (1.8)

e. Can determine if appropriate outcome measures were used. (1.0) \(^9\), p. 61
   i. Can determine if patient-centered outcomes were included as primary outcomes. (1.0)
   ii. Can determine if there were biased outcomes and/or treatment effects. (1.0)
   iii. Can determine if outcomes were measured at appropriate follow-up time points. (1.0)

f. Understands the importance of experimental and control groups being treated equally aside from the main intervention (expectation bias). (1.0) \(^1\), p. 123
   i. Can determine if outside care is evaluated and balanced across groups. (1.0)

g. Can determine if there are missing data or dropouts and whether these concerns are addressed (attrition bias). (1.2) \(^1\), p. 121; 9, p. 62
   i. Can determine if percentages of missing data were small and balanced in each group. (1.0)
   ii. Can determine if the reasons for missing data are reported for each group. (1.6)
   iii. Can determine if missing data are addressed in the statistical analysis. (2.0)
   iv. Knows how to use the “5 and 20” rule (i.e., fewer than 5% loss is a low threat to validity, more than 20% significant is a threat) along with the limitations to this rule. (1.0)

h. Can assess if appropriate analysis was performed. (1.0) \(^1\), p. 121; **2**, p. 269; 9, p. 62
   i. Understands the need for intention-to-treat analysis. (1.0)
   ii. Understands the need for adjusting p-values for multiple comparisons, multiple outcome measures, and multiple looks at the data. (1.8)
   iii. Understands the difference between primary and secondary outcomes as well as the role of each (i.e., the potential for drawing major conclusions vs. simply generating hypotheses). (2.0)
   iv. Can determine if authors’ conclusions are justified based on the study design, how it was conducted, method of analysis, and how robust are the actual results (author filter bias). (1.0)

2. Apply criteria to determine if a study on THERAPY may be clinically useful. (1.0)
   a. Explain the concept of *treatment effect* magnitude. (1.0) \(^1\), p. 124; **2**, p. 66
      i. Define and interpret appropriate expressions of treatment efficacy to include treatment effect (difference between groups) (1.0), relative risk (1.0), relative risk reduction (1.25), absolute risk (1.0), absolute risk reduction (1.2), ORs (1.0), NNT (1.0), and effect size (standardized difference between groups) (2.2) \(^1\), p. 124; 2, p. 355; 9, p. 125
      ii. Calculate NNT if the absolute risk is provided. (1.2)
      iii. Distinguish within person, within-group and between-group effect magnitudes in identifying a clinically important effect. (1.6)
   b. Explain the concept of clinical importance/significance (1.0)
      i. Explain the distinction between a statistically significant and a minimal clinically important difference (MCID).
      ii. Recognize that interpreting the magnitude of the treatment effect depends, in part, on what the intervention is being compared to (e.g., placebo, no-treatment, a validated treatment, a non-validated treatment). (1.4)
iii. Recognize the factors involved in deciding if an NNT is judged to be clinically important (such as patient profile, phase of the condition, definition of treatment success, what it is compared to). (1.8)

iv. Recognize the challenges around establishing what degree of improvement is necessary to be meaningful to researchers vs. clinicians vs. patients. (2.0)

c. Recognize whether the outcome has a patient-centered, clinically meaningful effect (e.g., decreased pain, improved activities of daily living or quality of life) or is based on a surrogate measure (e.g., improved muscle test, range of motion, cholesterol level). (1.0)

4.9 Can appraise the validity and usefulness of a study on PROGNOSIS. (1.0) ¹, p. 102; ², p. 144

1. Knows the criteria for a valid study on prognosis. (1.0) ¹, p. 102; ², p. 145

a. Can determine if defined, representative patient samples were recruited (to avoid referral filter bias). (1.0) ¹, p. 103; ², p. 146

b. Can determine if subjects were assembled at a common point in the disease process. (1.0) ¹, p. 103; ², p. 146

c. Can assess if there was appropriate length and completeness of follow-up. (1.0) ¹, p. 103; ², p. 147

i. Can determine if the percentages of missing data are small and balanced in each group. (1.0)

ii. Can determine if the number and reasons for missing data are reported and whether these omissions are likely to have a significant impact on the conclusions. (1.0)

iii. Can determine if missing data are included in the statistical analysis. (1.4)

iv. Can determine if the follow-up was too brief to provide useful information. (1.0)

v. Can determine if appropriate periodic sampling was conducted and whether there might be a significant problem due to recall bias. (1.0)

d. Can determine if the study contains objective outcome criteria applied in a blind fashion. (1.0) ¹, p. 103; ², p. 148

e. Can determine if subgroups were adjusted for important prognostic indicators. (1.0) ¹, ², p. 239

f. Can determine if subgroups were validated by an independent group of “test-set” patients. (1.0) ¹, p. 107

2. Knows the criteria for a useful study on PROGNOSIS. (2.0)

a. Can determine the likelihood of predicted outcomes and the likelihood that these outcomes can be sustained over time. (2.0) ¹, p. 109

b. Can explain the use of regression coefficients for predictors of outcomes and the standard error of estimate (precision of predicted outcomes). (2.0)

4.10 Can appraise the validity and usefulness of a study on HARM. (1.0) ¹, p. 179

1. Can describe two types of harm studies: risk factors related to prevention and side effects from treatments. (1.0)

2. Knows the criteria for a valid study on harm. (1.0) ¹, p. 178; ², p. 84

a. Can determine if comparison groups were adequately described and equally shared key characteristics except for the exposure to the treatment or risk factor. (1.0) ¹, p. 179; ², p. 84

i. Can rule out selection and information bias. (1.0)

ii. Can determine if any remaining differences between the groups were adequately accounted for. (1.2)

b. Can determine if the method of measuring outcomes was identical for both groups. (1.0) ¹, p. 183; ², p. 90

C. Can determine if assessors were blinded or, if not, whether the measurements were likely susceptible to assessor bias. (1.0) ¹, p. 183
d. Can determine if patient follow-up was sufficiently long enough for the side effect or harm to likely occur. (1.0)\(^1\), p. 178; 2, p. 91

e. Understands that the results of a harm study are influenced by the choice of research design (e.g., larger changes in risk are needed to be significant in observational studies than in RCTs). (1.0)\(^1\), p. 180; 2, p. 88

f. Can determine if the study demonstrates a cause and effect relationship. (1.0)\(^1\), p. 185
   i. Can determine if exposure precedes the onset of the outcome. (1.0)
   ii. Can determine if regression analysis establishes a link between a particular factor and harm. (1.4)
   iii. Can determine if there is a dose-response gradient (e.g., increased exposure links to increase magnitude of effect). (1.0)
   iv. Can determine if there is positive evidence from a “dechallenge-rechallenge” study (in the case of risk factors). (1.0)
   v. Can determine if there is consistent association from study to study (i.e., a repeatable effect). (1.0)
   vi. Can determine whether there is a biologically plausible association. (1.0)
   vii. Can determine if alternate explanations have been adequately addressed. (1.0)

3. Knows the criteria for a useful study on HARM. (1.0)\(^1\), p. 187
   a. Can determine the magnitude of the association between the exposure and outcome. (1.0)\(^1\), p. 187; 2, p. 93
   b. Can demonstrate an understanding of the various terms used to communicate the degree of risk in Harm studies. (1.0)\(^1\), p. 188
      i. Can define absolute risk (AR) (1.0) relative risk (RR) (1.0), relative risk reduction (RRR) (1.6) odds ratios OR (1.0) and numbers needed to harm NNH (1.0).
      ii. Can interpret the clinical significance of reported RRR (DV 2), RR (DV 1), OR (DV 1), AR (DV 1), and NNH values. (DV 1) (1.0)
      iii. Recognizes the relationship between case control studies and odds ratio (OR) and cohort studies and relative risk (RR). (2.2)

4.11 Can appraise the validity and usefulness of a study on COST EFFECTIVENESS. (1.4)\(^1\), p. 160

1. Knows the criteria for a valid study on cost effectiveness. (1.2)\(^1\), p. 161
   a. Understands the need for comparable patients and/or correcting for differences between study groups. (1.2)
   b. Understands the need for a fair comparison between interventions or tests (e.g., inclusion of comparable costs across comparison groups). (1.4)\(^1\), p. 161
   c. Understands the difference between cost-effectiveness, cost-benefit, and cost-utility. (2.0)
   d. Understands the concept of quality-adjusted life years. (2.0)
   e. Can define direct and indirect health care cost and understands the need to assess their relevance. (2.6)\(^1\), p. 161

2. Knows the criteria for a useful study on cost-effectiveness. (1.2)
   a. Can determine if the procedures under study are relevant to practice. (1.2)\(^1\), p. 164
   b. Can determine if the study setting (e.g., HMO, PPO, out-of-pocket) is relevant to practice. (1.2)\(^1\), p. 164
   c. Can understand the significance of marginal cost-effectiveness ratios. (2.2)

5. **Standard 5: The EBP competent practitioner applies the relevant evidence to practice.**

5.1. Assesses the relevance of the appraised evidence to the clinical problem at hand (clinical applicability). (1.0)
1. Can distinguish research papers and reviews intended to change clinical decision-making from those papers proposing theoretical models or studies intended only as a basis for further research (e.g., pilot studies, animal studies, studies with insufficient power, studies with trends identified only in secondary outcomes). (1.0)
2. Can determine if the study subjects were sufficiently similar to the practitioner’s patient. (1.0) 16, p. 161
   a. Can determine if the study setting is similar to their practice setting. (1.0)
   b. Can determine if the disease frequency (pre-test probability) for the conditions evaluated in the study is similar to their practice. (1.0)
3. Understands the importance of weighing the strength of the evidence. (1.0)
4. Can determine whether the action taken based on a study will have a significant impact on the patient based on degree of efficacy (1.0), cost (1.2), cost-effectiveness (1.6), safety (1.0) or patient preference. (1.0)
5.2. Can select and interpret diagnostic tests appropriate to a particular patient’s problem. (1.0)
   1. Understands prevalence and pre-test probability as it applies to diagnostic testing of a particular patient. (1.0) 1, p. 79; 9, p. 160; 19, p. 90
      a. Understands the multiple factors involved in estimating a patient’s pre-test probability for a given problem. (1.0) 1, p. 80; 9, p. 163
         i. Knows how to access prevalence based on authoritative sources (national, state, primary studies, etc.). (1.2)
         ii. Understands that the pre-test probability may be different in his/her specific practice setting (primary care vs. secondary/tertiary care vs. chiropractic settings). (1.0)
         iii. Understands that the pre-test probability may be different from published prevalence estimates based on the patient’s constellation of signs and symptoms. (1.0)
         iv. Understands that the pre-test probability continues to change based on the results of prior testing. (1.0)
   2. Takes into consideration test reliability when choosing a diagnostic procedure and interpreting the results for a particular patient. (1.0)
      a. Can distinguish experimental reliability from clinically acceptable reliability. (1.8)
   3. Demonstrates how to apply likelihood ratios to diagnosis. (1.0)
      a. Recognize likelihood ratios which are potentially useful vs. those of little to no value. (1.0) 1, p. 87; 9, p. 161
      b. Explain how to use likelihood ratios to compare examination procedures to each other when selecting the best test. (1.0)
      c. Recognize that there are circumstances when likelihood ratios cannot be multiplied in sequence to predict post test probability.
   4. Understands how to choose tests to rule in a condition. (1.0) 1, p. 77
      a. Knows how to select a test based on its specificity (e.g., the mnemonic + SPin, “if positive, high specificity help to rule in”). (1.0) 1, p. 77
      b. Knows how to select a test based on its positive likelihood ratio. (1.0)
   5. Understands how to choose tests to rule out a condition. (1.0)
      a. Knows how to select a test based on its sensitivity (e.g., the mnemonic -- SNout, “if negative, high sensitivity helps to rule out). (1.0) 1, p. 77
      b. Knows how to select a test based on its negative likelihood ratio. (1.0)
   6. Understands the role of serial testing vs. parallel testing strategies. (1.6)
   7. Identifies and understands the concepts of utility and test efficacy and their application to diagnostic testing. (1.2)
      a. Can define clinical utility and test efficacy. (1.4)
b. Understands that when applying a test to a patient a determination must be made whether the test makes an important contribution to treatment selection or clinical outcome. (1.0)

c. Understands the importance of balancing risks and benefits within the context of the individual patient when selecting a test to diagnose a condition. (1.0)

d. Can balance the potential harm of being labeled with a disorder or risk compared to the likelihood of compliance with a management plan. (1.8)

8. Understands how to use evidence to make clinical decisions regarding screening and case finding. (1.8) 1, p. 92
   a. Can explain the difference between screening and case finding. (1.4) 1, p. 92
   b. Understands the importance of balancing risks and benefits when choosing a screening strategy for asymptomatic populations with various levels of risk. (1.2) 1, p. 92; 2, p. 136
   c. Can make an informed judgment if the frequency and severity of the target disorder warrants the time and resources necessary to screen in a particular practice setting. (1.8) 1, p. 97
   d. Can establish a system to incorporate screening and case finding into his/her own practice. (1.0)

5.3. Understands how to decide if a potential therapy is likely to be appropriate and effective for a particular patient. (1.0) 1, p. 134; 2, p. 95
   1. Understands treatment effect and effect size of a particular therapy. (1.4) 1, p. 124
   2. Understands the use of surrogate endpoints and class effect when comparing therapies. (1.6) 2, p. 72
   3. Understands how to implement an N-of-1 trial study. (1.8) 1, p. 172; 2, p. 275
      a. Understands the possible indications for conducting an N-of-1 trial (e.g., the likely lack of effectiveness of conventional treatment, the likelihood that the alternative treatment, if effective, will be continued long-term, and the willingness of the patient to collaborate in designing and carrying out the trial). (1.8) 1, p. 174; 2, p. 278
      b. Can determine the feasibility of conducting a formal N-of-1 trial on a patient in his/her own practice (e.g., based on if the treatment has a rapid enough effect, the treatment ceases to act soon after it is discontinued, the optimal treatment duration is feasible, the relevant outcomes can be measured, sensible criteria for stopping the trial are established, an unblended run-in period can be conducted, the patient is willing and capable of participating, and strategies for interpreting the trial data are in place). (1.8) 1, p. 174; 2, p. 278
      c. Can determine if there are ethical obstacles to conducting an N-of-1 trial. (1.8) 2, p. 286
      d. Can determine if the mode of therapy is so experimental that it is necessary to seek approval by a medical research ethics committee or local Chiropractic Board is necessary. (1.6)

4. Understands how to choose and apply clinical decision rules, (1.2) clinical guidelines, 1, p. 169 (1.2) and quantitative clinical decision analysis (CDA) 1, p. 159 tool to management decisions. (3.0)

5.4. Can apply pertinent evidence to a particular patient situation when estimating potential harm from health care decisions (diagnostic test, treatments, lifestyle choices, etc.). (1.0) 1, p. 194
   1. Can use appropriate evidence to estimate the patient’s risk vs. benefit for a particular procedure. (1.2) 1, p. 194
      a. Understands numbers needed to harm as it applies to the individual patient. (1.2) 1, p. 195
      b. Understands the importance of weighing the magnitude of harm. (1.2) 1, p. 195
c. Understands the importance of weighing the option of alternative treatment. (1.2)  

195

d. Understands the importance of weighing any corresponding loss of benefit. (1.2)  

195

2. Considers the patient’s values, desires, and preferences, concerns regarding potential harm when choosing a diagnostic or treatment procedure. (1.0)  

195

5.5. Understands and applies prognostic indicators to help predict a patient’s outcome. (1.0)  

1. Understands the role of natural history on prognosis. (1.0)  

9, p. 182

2. Can identify risk factors for poorer outcome (e.g., “yellow flags,” “red flags” for disease, pain severity). (1.0)  

9, p. 182

5.6. Understands how to select appropriate outcome measures. (1.0)  

1. Knows how to choose an outcome measure based on validly, reliability, and responsiveness. (1.0)  

2. Knows how to match an outcome measure to the health parameter to be monitored. (1.0)  

3. Knows how to select an outcome measure based on patient compliance. (1.2)  

4. Knows how to select an outcome measure based on ease of administration. (1.2)  

5. Knows how to administer and score a variety of commonly used outcome questionnaires (e.g., PSFS, NDI, Oswestry, Roland Morris). (1.0)  

5.7. Can develop and employ a plan to apply new evidence to the patient’s situation. (1.0)  

1. Understands the necessity of blending research evidence with clinical experience and patient’s values and goals (cultural/personal). (1.0)  

2. Can appropriately educate, motivate and negotiate patient participation in an evidenced-based management plan. (1.0)  

a. Understands the basic elements of motivational psychology (e.g., understanding that explaining the facts may not be the most important aspect in changing behavior, coercion typically fails, being sympathetic and supportive of the patient’s ideas and attitudes is important, and realizing that the patient, not the doctor, has ultimate control). (1.0)  

b. Can employ a step by step systematic process to engage the patient in the management plan. (1.0)  

i. Knows how to introduce the idea of change openly, educating the patient about the evidence in language readily understandable by the patient. (1.0)  

ii. Can assess the patient’s readiness to change. (1.0)  

iii. Demonstrates the ability to notice and take seriously any resistance and obstacles to change. (1.0)  

iv. Demonstrates the ability to negotiate with the patient. (1.0)  

v. Can create a plan to circumvent the obstacles to the assessment and management recommendations. (1.0)  

3. Understands the role of the PARQ conference (i.e., a discussion of the procedures, alternatives, risks and an opportunity for questions) and applies it in practice. (1.0)  


6.1. Demonstrates the behavior necessary to maintain and improve EBP skills. (1.0)  

1. Understands the necessity of devoting sufficient time to keep current with expanding health care information and EBP skills. (1.0)  

2. Understands that to stay current with EBP skills an ongoing financial investment for training and technology is required. (1.8)  

3. Understands the need for EBP skills to be efficient and pragmatic. (1.2)
4. Can establish a plan to address the time constraints imposed by a busy clinical practice. (1.2)
5. Understands the need for adequate physical space and hardware to support information searching. (1.7)
6. Understands how to acquire and maintain adequate access to health care information resources and data bases. (1.2)

6.2. Reflects on how well these activities are performed and continues to improve them. (1.0)
1. Generates a plan for maintaining and improving EBP competency through regular attendance at EBP workshops. (1.0)
2. Improves information resources as necessary. (1.0)
   a. Considers acquiring “push” services. (1.0)
   b. Understands how to create a system of support utilizing free and propriety data bases and local resources (local chiropractic colleges, medical libraries, etc.). (1.0)
3. Keeps reflective journals to record impression of application of EBP methods. (2.3)

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5 Rosser WW. Looking right down to the pores: why it is important to learn how to read journals. In: Rosser WW, Slawson DC, Shaughnessy AF. Information mastery: evidence-based family medicine. 2nd ed. Hamilton, Ontario: BC Decker Inc; 2004, p. 76-82.