

EVIDENCE-BASED PRACTICE SPECIAL INTEREST GROUP

SECTION ON RESEARCH

AMERICAN PHYSICAL THERAPY ASSOCIATION

**DOCTOR OF PHYSICAL THERAPY EDUCATION
EVIDENCE-BASED PRACTICE
CURRICULUM GUIDELINES**

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INTRODUCTION

This consensus document provides guidance on curricular objectives for teaching evidence-based practice (EBP) in entry-level physical therapist education programs. The intent of the document is to lay a common groundwork for educators to produce clinicians with a common foundation of the language, processes and applications of EBP. The expected outcomes of student learning are to create clinicians who are efficient and critical consumers of published evidence, who understand how to balance evidence with patients' preferences and their own clinical expertise, and who are lifelong learners that possess the knowledge, skill-set and tools required to keep current with the profession's ever expanding body of knowledge.

The science of evidence-based practice is continually evolving. Over the past decade, the shift has moved from prioritizing and searching for primary studies to seeking synthesized evidence as more sources become available. This guideline development group based the depth and breadth of this document on the following premises:

- The objectives are organized based on the five steps of evidence-based practice as described by Dawes et al. (2005).¹
- This document builds on the Normative Model of Physical Therapist Professional Education.² The basics of research design and statistics are considered foundational sciences that support EBP, and therefore this document does not contain detailed objectives related to those content areas. Programs will need to assess the depth and breadth taught in the areas of research design, statistics interpretation and application, and EBP processes, in part based on their program goals and the institutional mission in which the program resides.
- The process of applying EBP should not solely exist in a single course or course sequence. Although some aspects of EBP can be introduced within standalone EBP or research design courses, EBP should be reinforced throughout the didactic and clinical portions of the curriculum.
- The objectives in this guideline are focused on the basics of EBP that all programs should strive to incorporate, but does not preclude the teaching of more advanced skills.
- The objectives in this document are focused on developing DPT graduates who are able to obtain, analyze, synthesize and integrate trustworthy evidence into practice as educated consumers, based on the goals of the individual program and the institutional mission. Preparing students to engage in scholarly activity that produces evidence may also be a program goal, but objectives for that are not included in these recommendations.
- Students should be taught to preferentially seek synthesized evidence rather than primary sources, as appropriate for a given content area. This is consistent with the principles of efficiency, effectiveness and parsimony that enable clinicians to realistically and effectively integrate the highest level of evidence and patient values/circumstances into their clinical decision making, and apply it at the point of care. The 6S pyramid describes the hierarchy of preferred sources.³
- No one organization's definitions for levels of evidence and recommendation grades are endorsed in this document; graduates should understand that there are differences across

institutions and guideline writing groups and learn to identify the system that is referenced within an individual document.

- The curriculum objectives provided are focused toward teaching the principles associated with the application of EBP to individual patients. While EBP principles can and should be applied to healthcare systems and patient populations, in the interest of brevity, these issues are not addressed in these objectives.

Method of Document Development

The EBP Special Interest Group of the Section on Research initiated a call for participants as an open nomination process sent through the Section on Research. A total of 17 volunteers submitted resumes from which a task force of 9 members was formed with expertise in teaching EBP and curriculum design, and representing different size programs, geographic areas, and Carnegie classifications of the Universities.

One organizational conference call, asynchronous collaborative drafting, review and commentary on documents, and a full day working meeting (CSM2013) shaped the focus for the resulting learning objectives. To ensure a common and familiar language among faculty, the task force adopted the framework for learning objectives used in the Normative Model of Physical Therapist Professional Education. Additional documents that inform this guideline include the CAPTE Criteria for Physical Therapist Education, the Guide to Physical Therapist Practice, and the content guidelines from other sections.⁴⁻⁸

Sub-groups completed the document through continued distance collaboration. One group refined the introduction and overall premises for the document. A second group used the five steps of EBP as the organizing structure to allocate content areas from the Normative Model of Physical Therapist Professional Education and then provided a comprehensive list of terminal behavioral objectives and instructional objectives for the classroom and clinic. A third group composed the Additional Curricular Guidance that clarifies task force recommendations on a number of issues including: considerations related to CAPTE evaluative criteria, considerations related to the Normative Model of Physical Therapist Professional Education, application of the ICF model, variation in EBP teaching methods, and integration of practice based evidence concepts into EBP curricula. The final document was then compiled and circulated for Task Force review and comment.

In advance of CSM 2014, the draft guidelines were shared with leadership of the Section on Research and Evidence-based Practice Special Interest Group (EBP SIG), persons who had expressed interest in the EBP SIG (via email to the Section or attendance at CSM business meetings), other faculty and clinicians who requested to participate or who known to have interest and/or expertise in teaching EBP (count pending). The draft document was distributed via email with a link to a survey requesting feedback. Feedback was reviewed and responded to, through edits to the document, at a taskforce meeting during CSM 2014.

Future Updates to this Document

As this is a living document, systematic changes will occur on a regular basis to reflect changes in education and clinical practice. Areas likely to change frequently will be continually examined (e.g. economic analysis and EBP, synthesized sources of evidence, resources for EBP, etc.).

Whenever changes occur to the documents that significantly impact these guidelines i.e., CAPTE criteria, Normative Model of Physical Therapist Professional Education, Guide to Physical Therapy Practice), this document should undergo a revision to reflect these changes.

EVIDENCE-BASED PRACTICE ENTRY-LEVEL CURRICULUM CONTENT

How to use this table: The table is divided into five sections based on the 5 steps of evidence-based practice.¹ *The Primary Content* is content that should be included in the curriculum. It is intended to provide guidance for faculty in structuring learning objectives when teaching EBP. Much of the terminology for Primary Content comes from the Normative Model of Physical Therapist Professional Education. The *Terminal Behavioral Objectives* column provides the Task Force recommendations for EBP-specific learning objectives that should be achieved by graduates of DPT programs. The final two columns, *Instructional Objectives for the Classroom and the Clinic* provide examples (not an exhaustive list) of objectives to be achieved in the respective settings to facilitate development of the terminal behavior objectives.

Step 1 Ask a focused clinical question		
Primary Content		
<ul style="list-style-type: none"> • History of patients/clients • Patient care management model • Structure of clinical questions (e.g., PECO, PICO questions) • Foreground questions • Background questions 		
Terminal Behavioral Objectives	Example Instructional Objectives for the Classroom	Example Instructional Objectives for the Clinic
After the completion of the content, the student will be able to...	After the completion of the content, the student will be able to...	After the completion of the content, the student will be able to...
1) Distinguish between foreground and background questions and recognize that different strategies are needed to answer each type of question.	<ul style="list-style-type: none"> • Examine the differences between background and foreground questions. • Identify sources used to answer background and foreground questions. • Compare the characteristics (e.g. cost, coverage, search options, indexing features) of databases for background and foreground questions. 	<ul style="list-style-type: none"> • Construct a background question related to an episode of patient care. • Develop a strategy and search for answer(s) to the background question. • Compose a foreground question related to an episode of patient care. • Develop a strategy and search for evidence to help answer the foreground question.
2) Articulate gaps in their clinical knowledge.	<ul style="list-style-type: none"> • Formulate examples of background questions related to prevalence, 	

Terminal Behavioral Objectives	Example Instructional Objectives for the Classroom	Example Instructional Objectives for the Clinic
	<p>pathophysiology, etiology, diagnosis, medical management</p> <ul style="list-style-type: none"> • Compose sources of foreground questions related to therapy, diagnosis, prognosis, and economic questions. 	
<p>3) Formulate patient-centered answerable (focused, searchable) clinical questions, using a systematic process for each of the principle elements of clinical practice: screening, diagnosis (examination and evaluation), prognosis, intervention, and outcome measurement.</p>	<ul style="list-style-type: none"> • Use the PICO (Patient / Population; Intervention; Comparison; Outcome; process to develop search terms. • Modify the PICO process for diagnostic and prognostic foreground questions. • Apply the POEMS (Patient-Oriented Evidence that Matters) to differentiate between patient important outcomes and surrogate outcomes. • Discuss challenges when using surrogate outcomes for clinical care decision-making. 	<ul style="list-style-type: none"> • Use the PICO process (or a modification) for a patient the student has encountered in the clinic.

Step 2 Search for the best available evidence

Primary Content

- Search engines, databases, and gateways
- Search strategies, including use and combination of search terms
- Search resources (e.g. reference librarian, software/apps, tutorials, colleague)
- Pyramid of sources of peer-reviewed literature^{3,9}
- Individual studies
- Synthesized literature (e.g., systematic reviews and clinical practice guidelines)
- Sources of non-peer-reviewed literature
- Clinical decision-making models
- Use of technology to access information (e.g. Push technology)
- Laws regarding intellectual property (rights of authors, rights of publishers, rights of readers)

Terminal Behavioral Objectives After the completion of the content, the student will be able to...	Example Instructional Objectives for the Classroom After the completion of the content, the student will be able to...	Example Instructional Objectives for the Clinic After the completion of the content, the student will be able to...
1) Analyze the appropriate search engines/databases to find the best available published evidence relevant to their clinical question.	<ul style="list-style-type: none"> • Compare results from multiple search engines/databases using the same clinical question. 	<ul style="list-style-type: none"> • Select appropriate search engines/databases to perform a search for research evidence to answer a PICO question about a particular patient.
2) Efficiently use databases/search engines/reference librarian to create effective search strategies (e.g. select, alter, and combine appropriate search terms).	<ul style="list-style-type: none"> • Compare the results from a search completed with and without use of MeSH terms (after completing MeSH terms tutorial at http://www.nlm.nih.gov/bsd/disted/pubmed.html) 	<ul style="list-style-type: none"> • Assess the results of a search on a patient related PICO for topical relevance, types of evidence, and usefulness for answering the question.

Terminal Behavioral Objectives	Example Instructional Objectives for the Classroom	Example Instructional Objectives for the Clinic
3) Apply resources to improve efficiency of the search process.	<ul style="list-style-type: none"> • Compare and contrast the benefits and limitations of possible resources available through educational institutions, clinical facilities, professional organizations, and web-based sources, both free to end-user and paid. 	<ul style="list-style-type: none"> • Evaluate resources available in the clinical setting to find full-text evidence.
4) Use identified sources of synthesized evidence first within the search process. Note: Early in the curricula students may not be prepared to read/appraise summative literature.	<ul style="list-style-type: none"> • Obtain a systematic review article or guideline from a synthesized evidence source such as Cochrane Collaboration, PT Now, or National Guideline Clearing House. 	<ul style="list-style-type: none"> • Locate systematically synthesized material on patient related topic from the Cochrane Collaboration or National Guideline Clearing House.
5) Screen evidence for relevance to determine helpfulness for answering their clinical question. Note: Students are aware that few, if any, articles will contain exactly what they are looking for and that an article that is similar to the clinical question may be valuable for informing their clinical decision.	<ul style="list-style-type: none"> • Evaluate the abstracts of 15 articles identified in a search to determine if full text should be sought and reviewed. 	<ul style="list-style-type: none"> • Compare and contrast the articles identified through searches for the same clinical questions conducted by the student and the clinical instructor.
6) Appraise the credibility of the source of information from a variety of resources (peer reviewed, popular press, web pages, continuing education courses, authorities, tradition etc.).	<ul style="list-style-type: none"> • Determine three threats to credibility from each source of information. • Compare and contrast the advantages and disadvantages of standard peer review systems in assuring better credibility. 	<ul style="list-style-type: none"> • Assess the quality of a health-related website mentioned by a patient during the course of care.

Terminal Behavioral Objectives	Example Instructional Objectives for the Classroom	Example Instructional Objectives for the Clinic
7) Organize and store information collected from research evidence.	<ul style="list-style-type: none"> • Assess at least three systems for information organization, determining which has the best cost-benefit ratio. 	<ul style="list-style-type: none"> • Present options of information retrieval and storage to clinicians as part of an in-service.
8) Develop a strategy to use available technology (e.g. push) to maintain currency across their professional career.	<ul style="list-style-type: none"> • Keep a journal of new ideas generated from two sources of push technology for EBP over the course of 3 months. 	<ul style="list-style-type: none"> • As part of an in-service, present 3 opportunities to have relevant evidence pushed to clinicians, using both web and smart phone applications.

Step 3 Critical Appraisal of the Evidence

Primary Content

- Research designs
 - Quantitative
 - Experimental (e.g. RCT)
 - Nonexperimental (e.g. cohort, case-control, single subject)
 - Qualitative
 - Basic science research design
- Study design/quality classifications
- Measurement science
 - Definitions
 - Requirements
 - Data types
 - Reliability and validity of quantitative data
 - Trustworthiness of qualitative data
- Sampling
 - Sampling population
 - Sampling techniques
 - Probability sampling
 - Nonprobability sampling
- Other factors affecting quality of the research (e.g. bias, sampling, confounding, intention to treat, number needed to treat, power, sample size, inferential, descriptive, and clinically relevant statistics)
- Reference populations
- False positive
- False negative
- Dependent variables
- Independent variables
- Common statistical tests
 - Inferential statistics
 - Descriptive statistics
 - Epidemiologic indices that measure magnitude of clinical meaningfulness

<ul style="list-style-type: none"> ○ Parametric statistics ○ Nonparametric statistics ● Standards and process of dissemination of research findings (e.g. peer-review process, publication bias, open source, open access, and licensed access). 		
Terminal Behavioral Objectives	Example Instructional Objectives for the Classroom	Example Instructional Objectives for the Clinic
After the completion of the content, the student will be able to...	After the completion of the content, the student will be able to...	After the completion of the content, the student will be able to...
1) Critically appraise the most common published evidence (e.g. individual studies, systematic reviews, and clinical practice guidelines).	<ul style="list-style-type: none"> ● Using provided appraisal tools, complete the appraisal process for therapy, diagnostic, prognostic, guideline, and economic studies. 	<ul style="list-style-type: none"> ● Appraise a study related to a foreground question based on an episode of care.
2) Describe how the characteristics of different research designs determine their applicability to answering a clinical question.	<ul style="list-style-type: none"> ● Identify the study design(s) best suited to answer a given clinical question 	<ul style="list-style-type: none"> ● While appraising studies related to foreground questions based on episodes of care from different areas of practice (i.e. screening, diagnosis examination and evaluation, prognosis, intervention, and outcome measurement) analyze how different designs are used to answer the different questions.
3) Demonstrate awareness of the relevance of animal and basic science research to clinical practice.	<ul style="list-style-type: none"> ● Discuss how animal work in central pattern generators and plasticity contribute to the practice of rehabilitation in spinal cord injury and stroke. ● Discuss how knowledge of histology influences treatment decisions of strains and sprains. 	

Terminal Behavioral Objectives	Example Instructional Objectives for the Classroom	Example Instructional Objectives for the Clinic
<p>4) Systematically examine the quality of research evidence pertaining to the principle elements of clinical practice: screening, diagnosis examination and evaluation, prognosis, intervention, and outcome measurement.</p>	<ul style="list-style-type: none"> • When given an intervention, diagnosis, prognosis, or outcome measurement question, find 3-5 relevant studies and rank them by quality. 	<ul style="list-style-type: none"> • Based on an episode of care, find 3-5 relevant studies, and rank them by quality.
<p>5) Recognize the existence of different evidence quality classification systems (e.g. levels, grades) used to rate evidence and recommendations.</p>	<ul style="list-style-type: none"> • Compare and contrast evidence quality classification systems (e.g. levels, grades) used to rate evidence and recommendations used by various guideline groups (e.g. <i>J Orthop Sports Phys Ther</i>, <i>SIGN</i>, <i>Pediatric Phy Ther</i> and the Oxford Centre for Evidence-Based Medicine.). 	<ul style="list-style-type: none"> • Illustrate the uses and limitations of study design classification systems (e.g. levels, grades) used to rate evidence during a clinical in-service..
<p>6) Describe how factors other than design (such as relevance) contribute to the usefulness of any particular piece of evidence.</p>	<ul style="list-style-type: none"> • Discuss how applicability, clinical meaningfulness, and patient values and circumstances influence the usefulness of the evidence in a given clinical scenario. 	<ul style="list-style-type: none"> • Discuss how applicability, clinical meaningfulness, and patient values and circumstances influence the usefulness of the evidence based on an episode of care.
<p>7) Describe foundational concepts associated with study design and statistical methods required to judge the quality and implications of published evidence.</p>	<ul style="list-style-type: none"> • Discuss the strengths and weakness of study designs typically used to address clinical questions related to intervention, diagnosis, prognosis, and outcome measurement. • Given a published study or excerpt, identify the study design. • Identify the common statistical methods 	<ul style="list-style-type: none"> • Give an in-service illustrating the interpretation of common descriptive and inferential statistics. • Explain the most relevant results from a research article and how they inform patient care.

Terminal Behavioral Objectives	Example Instructional Objectives for the Classroom	Example Instructional Objectives for the Clinic
	used in studies addressing clinical questions related to intervention, diagnosis, prognosis, and outcome measurement.	
8) Interpret results in the text, tables, and figures of research articles in relation to the clinical question.	<ul style="list-style-type: none"> • Interpret the results in the text, tables, and figures of a published study or excerpt, that addresses a clinical question related to intervention, diagnosis, prognosis, or outcome measurement 	<ul style="list-style-type: none"> • Based on an episode of care, lead a journal club with particular emphasis on application of the article results.
9) Differentiate among the information provided by descriptive, inferential, and clinical meaningfulness statistics.	<ul style="list-style-type: none"> • Compare and contrast the information contained in the typical descriptive and inferential statistics used to analyze data from studies addressing a clinical question related to intervention, diagnosis, prognosis, or outcome measurement. • Use confidence intervals and minimal clinically important difference to discuss the clinical meaningfulness of the results in a published study or excerpt that addresses a clinical question related to intervention, diagnosis, prognosis, or outcome measurement. 	<ul style="list-style-type: none"> • Based on an episode of care, lead a journal club with particular emphasis on application of the article results. • Use clinical meaningfulness statistics to develop goals for patient outcomes.
10) Compare and contrast qualitative and quantitative research including what types of clinical questions each can address and the typical goals for each type of design.	<ul style="list-style-type: none"> • Differentiate the types of clinical questions typically addressed by qualitative and quantitative studies. • Compare and contrast the philosophical underpinnings of qualitative and quantitative research. • Compare and contrast methods to enhance the validity of the results in qualitative and quantitative research. 	<ul style="list-style-type: none"> • Based on an episode of care, formulate clinical questions best answered using a qualitative study design.

Terminal Behavioral Objectives	Example Instructional Objectives for the Classroom	Example Instructional Objectives for the Clinic
	<ul style="list-style-type: none"> • Compare and contrast qualitative research using ethnography, phenomenology, and grounded theory approach. 	
11) Rapidly appraise whether a research study has sufficient applicability, validity, and clinical meaningfulness to be used in his/her clinical decision-making.	<ul style="list-style-type: none"> • Use the title and abstract to identify elements (present or absent) related to the validity, applicability, and clinical meaningfulness of the results in relation to a clinical question 	<ul style="list-style-type: none"> • Based on an episode of care, analyze 3 to 5 title and abstract citations for elements (present or absent) related to the validity, applicability, and clinical meaningfulness of the results.
12) Discuss general concepts about how research results are disseminated and how this affects access to research evidence.	<ul style="list-style-type: none"> • Discuss how statistical significance and language of publication may lead to publication bias. • Discuss two strengths and weaknesses of relying exclusively open access journals to answer clinical questions. 	

Step 4 Apply the Evidence

Primary Content

- Clinical reasoning
- Accountability
- Cultural Competence
- Communication
- Professional Duty

Terminal Behavioral Objectives After the completion of the content, the student will be able to...	Example Instructional Objectives for the Classroom After the completion of the content, the student will be able to...	Example Instructional Objectives for the Clinic After the completion of the content, the student will be able to...
1) Integrate best available evidence with patient values and circumstances and clinical expertise in patient care and across the curriculum.	<ul style="list-style-type: none"> • Given a clinical scenario, demonstrate how patient values and circumstances and evidence inform clinical decision making. • Identify research methods for examining patient values and circumstances. • Develop search strategies to identify evidence related to patient values and circumstances. 	<ul style="list-style-type: none"> • Integrate patient values and circumstances with evidence during clinical decision-making for a patient's episode of care.
2) Understand that clinical circumstances may merit variation in the application of information from published evidence potentially resulting in different outcomes than those found in the literature.	<ul style="list-style-type: none"> • Given a clinical scenario, analyze how patient values and circumstances may alter expected outcomes relative to published evidence. 	<ul style="list-style-type: none"> • Explain to a patient how their values or circumstances may alter expected outcomes relative to published evidence.

Terminal Behavioral Objectives	Example Instructional Objectives for the Classroom	Example Instructional Objectives for the Clinic
<p>3) Demonstrate an appreciation of the constraints that must be considered in the application of evidence to a particular patient (insurance, social policy, resources, equipment, therapist competence, patient choice).</p>	<ul style="list-style-type: none"> • Debate how research evidence from studies that provided subjects more visits than actual patients will receive might inform clinical decision-making. 	<ul style="list-style-type: none"> • Describe how a particular intervention, diagnosis, or prognosis is informed by research evidence and how it has been modified based on the patient's circumstances.

Step 5 Evaluate Outcomes

Primary Content

- Decision analysis theory
- Patterns of clinical reasoning
- Clinical Sciences

Terminal Behavioral Objectives After the completion of the content, the student will be able to...	Example Instructional Objectives for the Classroom After the completion of the content, the student will be able to...	Example Instructional Objectives for the Clinic After the completion of the content, the student will be able to...
1) Identify personal strengths and weaknesses related to implementing the first four steps of the EBP process and develop a plan to address their weaknesses.	<ul style="list-style-type: none"> • Identify four specific personal EBP skills that need to be strengthened. • Identify at least one individual activity that can be done to strengthen the skill of electronic searching. 	<ul style="list-style-type: none"> • Discuss the results of an exercise described in steps 1-4 and reflect on ways to improve that activity in the future.
2) Identify resources and obstacles related to implementing EBP and develop a plan to address obstacles.	<ul style="list-style-type: none"> • Participate in class discussion regarding ways to overcome obstacles to EBP. 	<ul style="list-style-type: none"> • Identify at least 3 barriers and 3 opportunities that exist in implementing EBP. • Identify at least one activity that can be done to reduce the barrier of lack of time.
3) Discuss the value of the EBP process as a preferred model for clinical decision-making.	<ul style="list-style-type: none"> • Participate in a class discussion regarding the benefits of using EBP as a model for clinical decision-making. • Be able to counter common arguments against the value of EBP. • Show awareness of limitations of EBP as a model for clinical decision-making 	<ul style="list-style-type: none"> • Determine the potential negative ramifications if evidence has not been used in decision-making to create an appropriate plan of care for a patient.

Terminal Behavioral Objectives	Example Instructional Objectives for the Classroom	Example Instructional Objectives for the Clinic
4) Use individual and collective patient outcomes to inform clinical decision-making, shared-informed decision-making, and future clinical questions.	<ul style="list-style-type: none"> • Describe how the systematic collection and analysis of the patient's outcomes is essential to completing the process of EBP. • Describe the roles of electronic health records in evidence-based clinical decision-making for managing patients with the same diagnosis. 	<ul style="list-style-type: none"> • Identify an outcome measure to use with the next 5-10 patients seen with a particular diagnosis. Discuss changes in the measurement over time with the patients.
5) Evaluate outcome measures based on their clinical usefulness.	<ul style="list-style-type: none"> • Identify the minimal detectable change and minimal clinically important difference for 3 physical therapy tests and measures • Given a clinical scenario, use the minimal detectable change and minimal clinically important difference to interpret the measurement results 	<ul style="list-style-type: none"> • Identify 3 outcome measures used in the clinical practice. Describe the resources needed to use them and the information that they provide. Do the benefits outweigh the costs?
6) Share outcomes associated with the EBP process as part of peer review activities (formal and informal) to promote professional growth and collaboration.	<ul style="list-style-type: none"> • Identify 3 ways to promote professional growth and collaboration through EBP. 	<ul style="list-style-type: none"> • Identify 3 recommendations for changes in behavior based on the results of reviewing patient outcomes (via chart review) for a particular outcome measure.
7) Use the EBP process and patient outcomes to influence referral sources, marketing strategies, and consumer choices.	<ul style="list-style-type: none"> • Given a clinical scenario, write a letter to a potential referral source that uses evidence to illustrate the role of physical therapy for a disease or disorder. 	<ul style="list-style-type: none"> • Develop 2-3 templates to use in corresponding with referral sources that demonstrate the application of evidence in choices made in a patient's care. • Write a letter to an insurance company using evidence to support a denied service.

ADDITIONAL CURRICULAR GUIDANCE

The Curriculum Content provides a foundation for course content in evidence-based practice (EBP) for doctor of physical therapy (DPT) programs. Deployment of that content will vary depending on: 1) the mission of the academic institution and department, 2) the curriculum design, 3) the style, interests and knowledge base of the teacher, and 4) the needs and interests of the learners. The following guidance addresses issues identified by the taskforce as important for EBP curricular development and provides suggestions for additional resources to support faculty and students.

Considerations Related to CAPTE Evaluative Criteria and Integration of EBP into Didactic and Clinical Courses

EBP content and learning experiences are often introduced with standalone courses. However, the limited amount of research^{10,11} regarding effectiveness of EBP instruction suggests that this content should also be imbedded in courses on patient management and clinical reasoning. Based on these findings, the task force recommends that EBP knowledge and behavioral objectives be reinforced throughout the curriculum, especially in didactic courses focused on patient management and clinical experiences. Doing so continually reinforces the ability to ask answerable clinical questions and to find evidence to influence patient care decisions.

EBP is mentioned specifically in the CAPTE evaluative criteria related to learning experiences in the behavioral sciences necessary for initial practice. EBP is also referenced in some of the curricular content related to practice expectations, such as those regarding:

- use of technology to access sources of information to support clinical decisions,
- critical evaluation of sources of information related to physical therapist practice, research, and education,
- application of knowledge from these sources in a scientific manner and to appropriate populations, and
- integration of the best evidence for practice with clinical judgment and patient/client values to determine the best care for a patient/client.

EBP can also be incorporated into course objectives and learning experiences aimed at the following areas of competency for clinical practice:

- 5.9 Promote active involvement of the patient/client in his or her care.
- 5.18 Identify, respect, and act with consideration for patients'/clients' differences, values, preferences, and expressed needs in all professional activities.
- 5.25 Participate in the design and implementation of patterns of best clinical practice for various populations.
- 5.27 Determine when patients/clients need further examination or consultation by a physical therapist or referral to another health care professional.
- 5.32 Determine a diagnosis that guides future patient/client management
- 5.38 Monitor and adjust the plan of care in response to patient/client status.

- 5.47 Analyze results arising from outcome measures selected to assess individual outcomes of patients/clients.
- 5.63 Challenge the status quo of practice to raise it to the most effective level of care.

The taskforce also recommends that the application of evidence-based principles for diagnosis and referral be taught and modeled to students particularly related to direct access provider roles. Emphasizing how diagnostic and referral decisions are strengthened by EBP shows the process at work.

Similarly, showing students that the use of valid and reliable outcome measures allows them to gather information about their patients to inform and guide current and future treatment plans is a concept much more likely learned in applied situations.

Considerations Related to the Normative Model

The Normative Model of Physical Therapist Professional Education contains a considerable range of content elements in the Educational Outcomes, Primary Content, and Objectives for EBP. It is likely this range was provided to allow for different professional DPT programs to tailor their approach to EBP based on their environment and resources. In addition, some of these objectives are tailored toward programs that emphasize application of evidence in clinical practice (e.g., 9.1 – consistently use information technology to access sources of information to support clinical decisions) whereas others are oriented toward programs that emphasize development of research skills in their students (e.g., 9.4 – contribute to the evidence for practice by written systematic reviews of evidence or written descriptions of practice). This tension between *application* and *creation* of evidence produces some challenges in the delivery of EBP content.

The curricular objectives outlined in the preceding table describe the content that the task force feels represents the needs of the evidence-based clinician. In the paragraphs that follow, key issues are outlined that the task force believes distinguish between teaching EBP in programs that emphasize *application* of evidence and programs that emphasize *creation* of evidence. In order to structure this consideration, the key differences in philosophical approaches and selected content areas are provided.

Strategies for Curricular Integration

The process of applying EBP should not solely exist in a single course or course sequence. Although some aspects of EBP can be introduced within standalone EBP or research design courses, EBP should be reinforced throughout the didactic and clinical portions of the curriculum.

In the didactic curriculum, EBP should be integrated into courses that teach patient management, so that the ability to ask answerable clinical questions and find trustworthy evidence to inform clinical decision-making are continually reinforced. Integration of these guidelines for EBP content and outcomes may take more than one form. The following process is a sample of how a collective faculty might incorporate these recommendations.

- These guidelines should be shared with all faculty members in a program who have primary responsibility for a course or content area within the curriculum.
- Self-assessment by each faculty member of their own knowledge regarding EBP skills in the recommendations
 - Faculty or program directors should develop strategies to seek training.
 - Following training, faculty may need further assistance with curricular implementation.
- Collective faculty should identify which aspects of EBP are already covered in the curriculum. In many cases, a program will see that they are already covering quite a lot of the primary content and terminal objectives, and individual faculty will learn who is teaching or reinforcing which parts.
- The collective faculty or a curricular committee/task group should review the items that are not covered in the curriculum to:
 - Identify low hanging fruit or easy additions/substitutions.
 - Prioritize the missing items that faculty thought were in the curriculum or feel should be in the curriculum.
 - Strategize where changes might be instituted to address the most valued missing items, recognizing that the individual institutional and programmatic missions might influence the priority order.
 - Consider the overall curricular plan to avoid redundant student experiences or assignments, but that also allows for progressive skill building across semesters.
- Teaching approaches
 - The activities or objectives in the table are examples; individual programs may have other methods of achieving the terminal objectives.
 - Group assignments for papers or presentations may allow integration of EBP with the benefits of peer learning and reduced faculty burden for grading.
 - Individual assignments that use rubrics can incorporate items that reflect EBP processes.
 - EBP skills can be distributed among a variety of courses so that individual faculty members do not feel they need to teach all of the recommendations in any one course.

In the clinical environment, EBP is used as evidence for patient care management, as the structure for evidence based in-service presentations or patient education products, to support communication with other professionals, to support policy change, to support performance improvement and to link clinical problems to research endeavors.

- Program faculty may want to conduct focus groups with the clinical sites with the goals of helping
 - To identify the training needs of clinical instructors.
 - To identify resources and time management strategies to enable EBP in the clinical settings.
 - To identify how implementation of EBP can progressively reinforce EBP during successive clinical rotations.

- Core and clinical faculty see how EBP skills mastered in the didactic program are further reinforced and expanded on in the clinical education sequence.

Measuring outcomes of EBP content integration might be through

- Student program outcomes related to EBP.
- Quality of final projects from clinical rotations with regard to application of EBP principles and processes.
- Use of standardized tools that measure EBP attitudes, confidence, skill or behavior levels.
- Graduate follow-up on their use of EBP processes or use of products.

Teaching EBP in Programs that Emphasize Application of Evidence in Practice

Current CAPTE curricular standards require all programs to address content related to the integration of evidence in clinical practice. Some programs focus on these standards with a philosophy that students are learning EBP so that they can better *apply* evidence. The underlying assumption is that their graduates are unlikely to be leading efforts to create new evidence, although they may be participants in the process.

This perspective creates some challenges with respect to the extent to which content pertaining to research design, measurement, statistics, and research ethics is included. The task force suggests faculty dealing with these challenges consider the following competencies:

- Research designs – students require an ability to identify and appraise a variety of research designs in order to determine which are at higher or lower risk for creating bias in study results.
- Measurement/statistics – students require an ability to identify and interpret methods of measurement and statistical analysis that are commonly used in clinical research. They also must be able to determine if these techniques have been used appropriately.
- Research ethics – students require an ability to apply ethical concepts to clinical practice activities (i.e., data collection) that are a part of formal research projects.

Teaching EBP in Programs that Emphasize Creation of Evidence

Current CAPTE standards do not emphasize knowledge and skill development in evidence creation. However, programs may have institutional missions, requirements or philosophical perspectives for doctoral students that result in an orientation toward basic competence in the execution of original research. Students in these programs are learning how to *create* evidence.

Exposure to EBP only, by definition, does not prepare students to conduct original research. Therefore, programs must supplement CAPTE required content with additional objectives and experiences to develop the following skills:

- Research designs – students require an ability to plan and execute a variety of research designs to answer different research questions.

- Measurement/statistics – students require an ability to select and analyze the results of different measures and statistical tests implemented as part of original research.
- Research ethics – students require an ability to identify and implement strategies for human subjects’ protection during participation in original research.

Creating evidence also requires students to develop their writing skills to a greater extent than needed in routine clinical documentation.

Faculty in DPT programs are reminded that instruction in critical inquiry is not a substitute for content and learning experiences specific to the application of evidence in clinical practice. Students must be competent asking relevant questions and locating and appraising evidence to integrate into clinical decision making for individual patients independent of their ability to plan and execute an original research project.

Learning Assessment

The table in this document provides many examples of activities that can facilitate assessment of student learning. A combination for formative and summative learning assessments will provide students with feedback during the learning process and reinforcement for mastery of content. Assessment early in the learning process can be made more efficient by having all students engage in the same search, appraisal, application, and/or evaluation process. Once basic competence has been established, students may be ready for more challenging exercises where they select their own topic to explore. Tilson and colleagues¹² provide a comprehensive overview of EBP learning assessment including examples of standardized tools available for student assessment across seven learning outcome categories.

Other Considerations

Variation in EBP Teaching Methods

Individual faculty may use different methods for conducting EBP. For example, one faculty member might use PICO questions and search through PubMed for research evidence while another might not use PICO (but still develop effective searchable questions) and first access PTNow.org to find research evidence. Likewise, two faculty might use different methods for appraising research with both producing effective results. Different approaches to EBP may support student needs to develop their own individual preferences and styles. However, modeling (and teaching) different methods may create confusion regarding the ‘right’ EBP methodology for new learners. The taskforce recommends that faculty members within a program consider modeling consistent methods and reinforcing them throughout clinical courses so that students are provided with a consistent baseline of how to practice EBP.

The task force does not endorse one specific method of conducting EBP. Rather, we recommend that faculty deliberately choose a method of EBP that is implemented in an explicit fashion, so

that students understand the nature of any differences they encounter as they progress through their coursework and clinical experiences.

Application of the ICF Model

The Normative Model and the Guide to Physical Therapy Practice use a health/disability framework for presenting the role of physical therapy in examination, evaluation, and intervention. Therefore, faculty should consider presenting examples of EBP within the context of the International Classification of Function (ICF). Evidence-based questions can be used to address all aspects of care related to body structures and functions (e.g., accuracy of a special test to detect ligament disruption), activity (e.g., usefulness of a balance test to predict future fall risk), participation levels (e.g., effectiveness of an intervention with respect to return to sport), and environment and personal factors. By integrating EBP with the ICF model, faculty will integrate the clinical application of these skills and with the use of disablement models in evidence-based decision-making.

“6S Approach to Finding Useful Evidence”

Straus and Haynes described a hierarchy of pre-appraised evidence resources (systems, summaries, synopses, syntheses, studies).¹³ DiCenso *et al* subsequently proposed a six-level adaptation of the original hierarchy (systems, summaries, synopses of syntheses, syntheses, synopses of studies, studies). Faculty are encouraged to cite strategies described in these original article(s) and list them in the recommended reading lists in their syllabi, as pre-appraised sources of evidence may increase the efficiency of EBP implementation. However, faculty also should remind students that the ability to locate and appraise individual studies remains a vital skill set in light of gaps in the development and updating of evidence collections described in these hierarchies.

Search Strategy Guidance

Evidence searching skills are an important part of EBP education. The task force identified two issues for additional guidance. First, with regard to searching for primary articles and systematic reviews the task force recommends that students be given guidance regarding a reasonable amount of time to search for evidence for a single question before changing their approach. The task force consensus was a maximum of 20-30 minutes. Second, as synthesized evidence resources become more and more available, the task force recommends that students begin by looking for synthesized evidence prior to looking for primary articles. Websites that provide this type of information include but are not limited to:

- www.PTNow.org
- www.tripdatabase.com
- www.guidelines.gov
- www.pedro.org.au
- www.rehabmeasures.org

Fair Use

Faculty and students alike are held to fair use standards with respect to reproduction and dissemination of published works. Institutional policies regarding plagiarism, copyright infringement and other violations of intellectual property rights law also apply. Faculty should make these rules explicit to students in all courses in the curriculum. Applications to EBP curricular content include guidance regarding sharing of full text articles and other copyrighted products identified during the evidence search process.

Practice Based Evidence

The term ‘Practice Based Evidence’ (PBE) refers to the analysis of outcomes collected in day-to-day practice to inform care.^{14,15} PBE most often refers to the use of large data sets used for comparative effectiveness studies or to identify associations between particular clinical actions and outcomes. In our profession, PBE could also refer to the systematic use of outcomes on a smaller (small clinic, individual) level. It is beyond the scope of this task force to make specific recommendations about the particular terminal behaviors that should be expected of all DPT graduates related to PBE. However, the task force felt strongly that PBE is emerging as an important issue in the profession that will impact future therapists. To that end, we recommend that DPT students be exposed to key concepts of PBE and be informed about the efforts of the profession to develop clinicians and scientists who can contribute to PBE data sets and registries (Foundation for Physical Therapy, Alexandria, VA. Available at: <http://foundation4pt.org/home/scientific-program-homepage/coe/>. February 3, 2014).

Synthesized Evidence and Synthesized Sources of Evidence

Synthesis of evidence involves the development of techniques to combine multiple sources of evidence. This synthesis of individual sources is critical in coming to conclusions on the topic.

Synthesized sources are collections of the best available evidence to support practice. The information is often distilled into very accessible formats for the clinician (e.g. The Cochrane Collaboration and the National Guideline Clearing House <http://www.guideline.gov>). Curricula should include strategies for critical appraisal of synthesized evidence in addition to appraisal strategies for individual studies.

Economic analyses

Economic analyses are becoming more prevalent and are increasingly used in policy discussions related to access to and payment for health care services. These studies often are highly technical and may be beyond the scope of an EBP curricula focused on evidence for clinical decision-making. Faculty are encouraged to: a) evaluate the extent to which it is reasonable to incorporate appraisal of economic analyses in their course content; and, b) provide students with additional resources that they can access to assist with using these studies after graduation.

APPENDICES

A. Helpful Definitions

The following terms were identified as potential sources of confusion for students.

Database – A collection of data arranged for ease and speed of search and retrieval. [<http://www.thefreedictionary.com/database>]. A database “works through the Internet, but is not an Internet site; is published by reliable companies, like book publishers; provides access to information, articles, and more; uses really flexible search methods.” [Boulder Public Library, Boulder, CO. Available at: <http://research.boulderlibrary.org/content.php?pid=37502&sid=348214>. Accessed February 3, 2014]

Fair Use – “Fair use is a part of copyright law that allows certain uses of copyrighted works, such as making and distributing copies of protected material, without permission.” [Association of Research Libraries, Washington, D.C.. Available at: <http://www.arl.org/storage/documents/publications/fair-use-code-faq-profs.pdf>. Accessed February 3, 2014]

Licensed access literature – Licensed access literature is in digital or print format and requires payment of a fee to the owner (usually a publisher) to obtain a copy.

Open access literature – “Open-access (OA) literature is digital, online, free of charge, and free of most copyright and licensing restrictions...[based on] the consent of the copyright holder (for newer literature) or the expiration of copyright (for older literature).” [Peter Suber, Earlham College, Richmond, IN. Available at: <http://legacy.earlham.edu/~peters/fos/overview.htm>. Accessed February 3, 2014]

Peer reviewed – Peer review is the evaluation of creative work or performance by other people in the same field in order to maintain or enhance the quality of the work or performance in that field. [http://www.linco.org/peer_review.html] With regard to published evidence, the process is used to determine whether a manuscript meets the quality criteria of a particular journal.

Portal – A website considered as an entry point to other websites, often by being or providing access to a search engine. [<http://www.thefreedictionary.com/portal>]

Epidemiological indices – These are statistical and proportional indices or calculations, expressed quantitatively and/or qualitatively, that convey magnitude of effect or change. Some examples include: sensitivity/specificity (Sn/Sp), Likelihood Ratios (LR's), Number Needed to Treat/Harm (NNT/NNH).

B. Preparing Students to Engage in EBP after Graduation

To the extent possible, faculties are encouraged to help students identify practical methods for incorporating EBP into busy clinical practices. The following resources are commonly identified as possible supports to EBP after graduation from professional and post-professional PT programs.

Database and Search Engine Alternatives – College and university library web sites are becoming more user-friendly in format and function. However, Google remains the industry standard for easy, efficient Web surfing and it is freely accessible. As a result, students are drawn toward the Google Scholar feature as a preferred method for conducting literature searches both before and after graduation. Faculty teaching EBP are advised to highlight alternative efficiencies in health care literature databases such as a focus on guidelines (guidelines.gov), systematic reviews (i.e., Cochrane Library), or on physical therapy interventions (i.e., PEDro, PTNow). Acknowledgement of access to subscription databases via APTA membership and/or through alumni society benefits after graduation also should be referenced.

Librarians – Faculty are advised to encourage students to access librarians in all venues (public libraries, colleges/universities, health systems) as knowledgeable resources whose guidance can improve the efficiency of literature searches. Collaboration with librarians as part of EBP courses also may enhance students' understanding of the librarians' role and responsibilities.

Mobile Access – Students may have questions about the availability of mobile access options for EBP. Major health care literature databases such as PubMed and EBSCO (host for CINAHL) are accessible via web applications (“apps”). Individual journals have other features such as podcast summaries (i.e. *Physical Therapy*). Guidelines, article summaries and other resources also are available through a variety of medically oriented applications. Faculty are encouraged to make students aware of these options and to identify potential evaluative criteria, such as the relevance of the service to physical therapist practice, currency of the resources, access to the resources, and evidence of peer review or quality control prior to adoption of these resources.

Published evidence appraisal tools – A variety of evidence appraisal checklists or worksheets are available via the Web (i.e., Centre for Evidence-based Medicine [www.cebm.net]) and published textbooks. Faculty are encouraged to include the resources that they do not adopt for their curricula in the recommended resource lists in their syllabi so that students are aware of the options available to them after graduation.

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