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# EVIDENCE-BASED PRACTICE IN

# UNDERGRADUATE ATHLETIC TRAINING EDUCATION

By

Sarah A. Manspeaker, ATC
Bachelor of Science in Athletic Training, 2001, Duquesne University
Master of Science in Education, Athletic Training, 2003, Old Dominion University

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Approved by:

Bonnie L. Van Lunen (Director)

Paula S. Tufocv (Member)

Shana L. Pribesh (Member)

James A. Onate (Member)

# Evidence-Based Practice in Undergraduate Athletic Training Education

# ABSTRACT

EVIDENCE-BASED PRACTICE IN
UNDERGRADUATE ATHLETIC TRAINING EDUCATION

Sarah A. Manspeaker, ATC
Old Dominion University, 2010
Director: Dr. Bonnie Van Lunen

As Evidence-Based Practice (EBP) has progressed within medicine, nursing, and physical therapy, athletic training has been subsequently slow to infuse EBP and its associated concepts at the professional level. The aim of Project I was to determine athletic training instructors experience and use of evidence-based concepts (EBC) during instruction through emergent design qualitative interviews. Project II was designed to establish the Evidence-Based Teaching Model (EBTM) as a tool for athletic training educators' to use to introduce EBP concepts to professional students.

Project I featured 11 educators from Commission on Accreditation of Athletic Training Education (CAATE) programs. Instructors identified primary approaches to EBC implementation within their programs: curricular emphasis, teaching strategies, and student activities that followed Bloom's revised taxonomy. Categories of need for EBP instruction including respect for the athletic training profession, use of EBP as part of the decision-making toolbox, and for third-party reimbursement were found in Project 1B. Barriers included time, role strain, knowledge, and the gap between clinical and educational practices. Strategies for surmounting barriers included identifying a starting point for inclusion and approaching implementation from a faculty perspective.

Project II included nine educators and their respective students for program evaluation of the EBTM and analysis of the effects of the EBTM on student knowledge, attitudes, and use of EBCs. The EBTM was designed to instruct the five core steps of EBCs. Overall, instructors valued the EBTM to implement EBCs and perceived it as a user-friendly teaching tool. Assignments requiring direct interaction between students and approved clinical instructors were considered most favorable. Eighty-two students underwent a within subjects' pre/post-test evaluation through the Evidence-Based Concepts: Knowledge, Attitudes, and Use (EBCKAU) survey; 78 students (95%) completed the knowledge portion of the evaluations, while 68 (83%) fully completed the knowledge, attitudes, and use portions of the survey. Students significantly increased their knowledge, confidence in knowledge, familiarity, and confidence in use of EBP skills. Prior to the EBTM, students mean knowledge was 50% correct overall, with post-EBTM mean scores increasing to 66%. Students' interest and importance scores did not increase. Student barriers included time, available resources, ACI open-mindedness, and experience.

Word Count: 348

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In the words of my adviser, Dr. Bonnie Van Lunen, the PhD experience is, "about the process." As I have learned, this process does not arrive at one singular answer, but rather delivers a lot of information in a few areas, and ultimately leads to more questions. Questions that most of my mentors never thought I would be asking, let alone attempting to answer. And to those mentors, I say that had it not been for your influence, I would not have been able to enter into this process.

Initially, I would like to thank Bonnie further for her willingness to adapt the newly formed PhD in Human Movement Science program to "fit" my interests. I knew that embarking on a journey to complete a terminal degree would be difficult, but it was comforting to know that the teacher who threw a pen at me years ago to, "get me to think," would be a good example to follow. I am extremely thankful for the guidance you have given me both while at ODU and the time in between, and I look forward to our continued friendship.

Neither my sanity nor this document would be intact without the help of Dorice. Your actions, whether through quiet support or all-out cheerleading, were a major influence on my ability to stay focused and see the process through. I am grateful to call you my friend, honored to call you a colleague, and in disbelief that we ended up in the same place at the same time again. Both Whiskers and I thank you.

To my family, I would like to thank you for your sarcasm through all of my hard work. While you understood the magnitude of what I was doing, you never let it influence your expectations of me, nor did you let me take myself too seriously. Mom, I

am sorry that I had to one-up you degree-wise, but let's be honest, you expected it. And Dad, we need some Goldschlager.

For my Virginia Beach family, Josh, Shannon, Alex, Mindy, Jessica, Lori, and Teresa, your support over the past three years has been instrumental in providing pockets of fun during my brain overload. The experiences I have shared with each of you during long runs in First Landing State Park, hot yoga, cooking out, covering sports, or going to musicals, will be great additions to my school memories. To Josh especially, I am happy to have begun the program with you, and you kept me motivated to finish, I thank you for allowing me to be part of your journey, and I hope to keep you and Shannon as part of my next journey. And to Lori, I know you took a chance on me during that first year with my hectic class schedule, but I have really enjoyed working with you, and being part of the Tallwood family.

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I am sorry to have bored you all with this non-sense, I am certain all you read was, "blah, blah, blah margarita."

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# LIST OF PUBLICATIONS

The following manuscripts support compilation of this dissertation:

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Manspeaker SA, Van Lunen BL, Turocy PS, Pribesh SL, Onate JA, Hankemeier DA (2010). Effect of the Evidence-Based Teaching Model on Student Knowledge, Attitudes, and Use of Evidence-Based Concepts. To be submitted to *ATEJ*.

# Chapter I

## Introduction

Evidence-based practice (EBP) has become a foundational component of health-care professions over the past twenty years (Straus, 2005). The five-step EBP process consists of defining a clinical question, searching for the best available literature evidence, critically appraising this evidence, gathering clinician expertise, and evaluation of outcomes (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996). Many professions have aligned education and clinical practice to include foundational components of EBP toward improvement of patient care (Straus, 2005). Through the integration of evidence, patient values, and clinician expertise, EBP can have a profound impact on health care (Straus, 2005).

Driven by an expectation of improved patient outcomes, EBP has increased the need for high quality research (Straus, 2005). Requirements of third-party reimbursement, cost containment, availability of information, and expanded care options has demanded an evolution within health-care practice (Youngblut & Brooten, 2001). Through this evolution, the need for clinicians and researchers to use and produce EBP has broadened (Youngblut & Brooten, 2001). To this end, students of health-care professions must be educated in how to question current practice and attain improved outcomes (Casa, 2005).

Evidence-based practice has reached a critical point in the advancement of the athletic training profession. Compared to other health-care professions, athletic training is lacking in evidence-based information to support our clinical practices (Steves & Hootman, 2004). EBP must be infused in our profession so as to demonstrate that the

care we provide is effective, supported, and worthy of reimbursement (Hertel, 2005). If we do not educate our students in the area of EBP and its potential influence on the future of the profession, where will they learn it (Casa, 2005)? And how will our profession continue to thrive?

The current approaches to implementation of EBP within athletic training education programs needs to be evaluated. Current literature of athletic training does not feature teaching strategies, curricular approaches, or student outcomes as related to the concepts of EBP (Manspeaker & Van Lunen, 2010). Determination of current strategies used by educators, and development and dissemination of new strategies, will help to transition toward infusion of EBP into athletic training education curricula.

## Project IA

*Statement of the Problem*

The purpose of this study is to evaluate athletic training educators' experience with implementation of evidence-based practice concepts in CAATE-accredited undergraduate entry-level athletic training education programs in order to establish the current state of instructional approaches and incorporation of evidence-based practice concepts.

*Aims of Research*

We aim to describe teaching strategies and instructors' experience regarding teaching of EBP concepts qualitatively through coding and triangulation.

## Project IB

*Statement of the Problem*

The purpose of this study is to evaluate the barriers athletic training educators' experience with implementation of evidence-based practice concepts in CAATE-accredited undergraduate entry-level athletic training education.

*Aims of Research*

We aim to describe the perceived barriers and strategies for overcoming these barriers toward implementation of evidence-based concepts within curricula qualitatively through coding and triangulation.

## Project IIA

*Statement of the Problem*

The purpose of this project is to conduct a program evaluation of the Evidence-Based Teaching Model (EBTM) as a tool for athletic training (AT) educators' to use to introduce EBP concepts to professional AT students.

*Aims of Research*

We aim to illustrate instructors' experience regarding implementation of the EBTM in the areas of ease of use, implementation, perceived value, and intended future use through qualitative program evaluation interviews.

## Project IIB

*Statement of the Problem*

To evaluate the effectiveness of the Evidence-Based Teaching Model (EBTM) in increasing student knowledge, attitudes, and use of evidence-based concepts.

*Null Hypotheses*

There will be no statistically significant difference between pre-EBTM knowledge and post-EBTM knowledge. There will be no significant relationships between confidence in knowledge, familiarity, confidence in use, interest, or perceived importance of EBP and demographic characteristics.

*Research Hypotheses*

Overall knowledge will significantly increase following implementation of the EBTM. Significant relationships will be identified between confidence in knowledge, familiarity, confidence in use, interest, perceived importance of EBP and demographic characteristics.

*Independent Variables*

Demographic characteristics of students include GPA, number of semesters enrolled in the ATEP, and academic year. Instructor years of teaching experience will also be considered as an independent variable.

*Dependent Variable*

Scores produced by the responses of participants on the knowledge, attitudes, and use scales of the *Evidence-Based Concepts: Knowledge, Attitudes, and Use* survey.

*Operational Definitions*

- Athletic Training Didactic Curricula are foundational and professional courses athletic training students of CAATE accredited athletic training programs must complete prior to commencement. Foundational courses include human anatomy, human physiology, exercise physiology, kinesiology/biomechanics, nutrition, statistics and research design, strength training and reconditioning, and acute care of injury and illness. Professional courses include risk management and injury/illness prevention, pathology of injury/illness, assessment of injury/illness, general medical conditions and disabilities, therapeutic modalities, therapeutic exercise and rehabilitation, health care administration, weight management and body composition, psychosocial intervention and referral, medical ethics and legal

issues, pharmacology, and professional development and responsibilities ("Athletic Training Education Overview," 2008).

- Athletic Training Education Instructor is any qualified person listed by the institution as the instructor of record for athletic training didactic curriculum courses.
- The Commission on Accreditation of Athletic Training Education (CAATE) is the governing board responsible for developing, maintaining and promoting the minimum standards of quality for athletic training education programs. An institution must adhere to these standards in order to be recognized as a CAATE accredited athletic training education program. Furthermore, via comprehensive and annual review processes, CAATE is responsible for the evaluation of a program's compliance with the standards (CAATE Accreditation Standards, 2008).
- Clinical Instructor also known as a athletic training clinical supervisor, or preceptor, is a certified athletic trainer who teaches, evaluates and supervises athletic training students in their field experiences ("CAATE Clinical Education Terminology," 2009).
- Evidence-Based Practice is the integration of the best available research evidence, patient values, and clinician expertise to make clinical decisions (Forrest & Miller, 2002; Sackett, et al., 1996; Steves & Hootman, 2004)
- Evidence-Based Teaching Model (EBTM) is a teaching strategy designed to assist athletic training instructors in implementing EBP into curricula. Designed to be taught over the course of two or three class days, the EBTM consists of an online

tutorial, PowerPoint, student assignments that promote discussion between the student and clinical instructor, recommended articles for reading, rubrics for grading assignments, suggested syllabus objectives relating to EBP, and questions for potential exam use.

- Evidence-Based Concepts: Knowledge, Attitudes, and Use Survey is a survey of seven knowledge questions with associated calibration of confidence, 20 Likert-scale items assessing attitudes, two open-ended questions relating to intended use and barriers of EBP, and checklists of resources utilized for studying and patient care.
- Undergraduate Entry Level Athletic Training Education Programs (ATEP) are competency-based programs encompassing both didactic and clinical education. Curricular content is grounded in cognitive, psychomotor areas through affective competencies and clinical proficiencies (NATA, 2008).

*Assumptions*

- The athletic training educators took the tutorial seriously and answered the associated questions honestly.
- The student surveys were completed by appropriate individuals.
- Available answer options on the EBCKAU survey were applicable to every participant.
- The instrumentation used in the study was valid and reliable.
- Students' answers were due to their own knowledge and experience and not external sources.

- Provided EBTM materials were thorough enough to provide appropriate instruction in EBP.

*Limitations*

Project 1

- Participants were not randomized for inclusion.
- It is assumed that educators' answered all interview questions honestly.
- A small sample of educators was utilized.

Project 2

- The environment in which educator's took the tutorial was not controlled.
- The classroom environment was not controlled for during survey administration or lecture delivery.
- The delivery technique of each instructor was varied.
- The amount of time students spent completing each survey varied.
- Student's ability to understand survey questions and directions was not controlled.
- The participants were not randomly selected.
- Retention of EBP was not evaluated for students enrolled in the Evidence-Based Teaching Model project.

*Delimitations*

The project participants are instructors and students associated with CAATE-accredited Athletic Training Education Programs.

# Chapter II

# REVIEW OF THE LITERATURE

The following review of literature will detail evidence-based practice and related educational topics of instructional strategies and competencies. While publications have previously defined evidence-based practice and established its presence in the instruction in health-care professionals, there is a need for athletic training to follow suit by establishing and disseminating methods of educational implementation. This chapter serves to identify the steps of evidence-based practice, review teaching strategies, and methods of evaluation knowledge, attitudes, and use of evidence-based practice.

## *Evidence-Based Practice*

Evidence-based practice (EBP) promotes the use of best evidence in a judicious, conscientious, and explicit manner, to assist in the decision making process for the care of individual patients (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996). In essence, EBP allows clinicians to research information, critically appraise that information, and apply it appropriately to clinically based problems, particularly to benefit patient outcomes (Wanvarie et al., 2006). Evidence-based practice has been widely accepted, recommended and integrated in clinical practice by physicians and several health care professions including nursing, occupational therapy, and physical therapy. Current recommendations suggest that health professions integrate EBP due to its real-time, dynamic approach to individualized health care (Khan & Coomarasamy, 2006). However, a review of research literature in the field of athletic training reveals that there is a significant lack of EBP available and demonstrated utilization of EBP is limited when compared to other health care professions.

The process of EBP is typically described in the following five-step continuum: 1) develop a clinical question, 2) search for the best available evidence, 3) critically appraise the evidence, 4) examine clinical expertise, and 5) assess the outcomes (Sackett et al., 1996; Straus, 2005). The process allows practitioners to answer clinical questions through the application of research related skills and patient needs, rather than sole reliance on clinical experience (Haynes, 2002). Adoption of an evidence-based approach to patient care allows clinical questions to be answered through interdisciplinary cooperation and understanding. This collaboration can be achieved while improving initial patient management, knowledge of participants, and effectiveness of interventions (Shlonsky & Gibbs, 2004).

To fully describe the steps of an evidence-based inquiry, the following case-scenario will be utilized throughout discussion of the EBP process.

> *Emily, a 20 year-old out-of-season volleyball athlete, arrives in the athletic training clinic for evaluation 10 days status/post lateral ankle sprain. Signs and symptoms include moderate effusion over her anterior talofibular ligament and limited range of motion due to discomfort. In your experience with similar injuries, you have seen differing results for each patient, and wish to gain more insight into an effective therapeutic modality treatment for her case, with particular interest in therapeutic ultrasound. You decide to embark on an inquiry to help you assess this course of treatment.*
>
> *Clinical Note: Although you personally may not choose ultrasound as a course of treatment, this example is good at promoting discussion in comparison with other modalities, such as electrical stimulation and/or infrared options, as*

*well as serves as a good base question for a research inquiry. Even if this selection does not match your personal practice, the inquiry process will assist you in determining the presence or lack of support for your decision, which is in essence evidence-based practice.*

*Defining a Clinical Question*

An evidence-based inquiry begins by defining a well-developed, answerable clinical question (Straus, 2005). Ideas for clinical questions can arise from any aspect of patient care, at any time. Encounters with patients most often instill thoughts in the mind of the clinician, thus promoting a desire for further insight into the issue at hand (Straus et al, 2005). Patients themselves can serve as the foundation for an evidence-based inquiry as they ask questions relating to their conditions, course of treatment, or ultimate prognoses. Most often, clinical questions stem from at least one of the following areas: clinical findings, etiology, clinical manifestations, differential diagnosis, diagnostic tests, prognosis, therapy, prevention, experience, and/or improvement of care (Straus, 2005).

Clinical questions are useful in patient care as they can assist the clinician in several ways. Primarily, these questions can help to focus time toward identifying evidence that is relevant to patient needs and clinician knowledge. Producing focused topics also relates to establishing well-planned search strategies that will yield the most useful results. Additionally, as a team approach often is utilized in patient care, clinical questions assist in communication between health care professionals. Lastly, when answers to clinical questions are attained, the knowledge gains positively reinforce the curiosity that instigated the inquiry and translates to more efficient, individualized patient care (Straus, 2005).

Well-constructed clinical questions typically have four structural components, 1) a problem or patient population of interest, 2) a primary intervention, 3) a comparison intervention, and 4) associated outcomes (Straus, 2005). This structure of clinical question development is typically referred to through the acronym "PICO," representing the [P], patient [I], intervention [C], comparison and [O], outcome components (Fineout-Overholt & Johnston, 2005; Nicholson LJ, 2007; Wanvarie et al., 2006; Yousefi-Nooraie, Rashidian, Keating, & Schonstein, 2007).

Formulating a clinical question begins with [P], the problem or patient population of interest. Recognizing key characteristics related to the patient such as primary complaint, age, gender, medical history, and previous care, allows for individualization of the treatment inquiry (Sackett et al., 1996). Within the clinical case presented, Emily's primary complaint is limited range of motion due to discomfort, and effusion over the ATF. She is 20 years-old and an active volleyball player.

Determining an intervention for Emily should be based upon her signs, symptoms, her clinician's experience, and available treatment options (Forrest & Miller, 2002). In her case, the athletic trainer would like to investigate the effectiveness of ultrasound, thus determining the appropriate intervention [I], of her PICO formatted clinical question. It is important to note that not all PICO questions will have a specific intervention (Straus, 2005). A general inquiry into effective interventions may sometimes be more suitable when patient characteristics are not enough to provide a solid guide into an appropriate course of action. For Emily, the identified signs and symptoms correlate well to the indications for use of therapeutic ultrasound; therefore, this intervention choice is viable for her case.

After determining the primary intervention, the [C], comparison options, must be considered. Many possible comparisons may be considered, including, though not limited to similar technique, diagnostic test, additional modality, or new therapy presented in a peer-reviewed journal. A comparative option does not always need to be presented; in cases where newly developed interventions are investigated, when a control group is needed, or when no viable comparison can be identified, the [C], component of the PICO may be skipped (Forrest & Miller, 2002). Appropriate comparisons to ultrasound, as chosen for Emily, may include rest, ice, compression, and elevation, a therapeutic rehabilitation program, electrical stimulation, or no treatment at all.

The last component to defining the clinical question, [O], requires determination of desired outcomes. Clinician and patient goals influence the information included in this section. Both short and long-term goals may be identified, as well as specific benchmarks relating to pain, swelling, medications, time, prevention of recurring injury, and activities of daily life (Forrest & Miller, 2002; Johnston & Fineout-Overholt, 2006). As Emily is a volleyball athlete, her short-term goals might include alleviation of discomfort and increase in range of motion, with long-term goals of return-to-play and strength improvement to prevent further injury.

During development of a clinical question utilizing the PICO format, a table may be used to logically display the key terms and phrases summarizing each component (Table 1). This chart serves as a reference to ensure that each aspect of the PICO is addressed in a succinct and appropriate manner. Once the key segments have been completed, the phrases and key words can be combined to formulate the actual clinical question. An appropriate question for Emily might be: "Is ultrasound an effective

treatment for decreasing swelling and increasing range of motion associated with lateral ankle sprains in collegiate athletes?" The actual layout and structure of a clinical question does not need to follow the specific format provided in the sample question above, as there are many ways to write a clear, effective clinical question. From this point, the clinician can begin the next step of the evidence-based practice process, searching the literature (Bigby, 1998).

**Table II.1**

***Case Scenario: PICO Chart for Emily***

| | |
|---|---|
| *Patient* | Ankle sprain, collegiate volleyball player, 20 y/o, decreased range of motion, effusion over ATF |
| *Intervention* | Ultrasound |
| *Comparison* | RICE, electrical stimulation, therapeutic exercise, nothing |
| *Outcome* | Primary: Decrease swelling, increase range of motion/tissue extensibility<br>Secondary: Return to play |

*Searching the Literature*

Progressing the clinical question to formulation of a relevant answer requires a pointed search of the literature. The more targeted and accurate the clinical question, the less time needed to identify accurate, applicable information resources (Fineout-Overholt, Hofstetter, Shell, & Johnston, 2005; Steves & Hootman, 2004). Literature searching knowledge and skills are imperative to successful completion of this step of the EBP process.

Evidence-based practitioners are recommended to minimize the use of out-dated text books and increase their comfort with research studies, systematic reviews, synopses,

and evidence-based information systems (Straus, 2005). Contemporary search methods require the ability to navigate online databases and resources to gather such sources. Points of focus to be used in these inquiries could include the population, condition, treatment, or outcome desired. Identifying key words related to the PICO identified areas, such as Boolean search terms, allows for the initiation of a targeted search of available literature using these areas (Arnold, Gansneder, & Perrin, 2005; Bigby, 1998).

Initiation of a literature search typically begins with the use of a text search related to the areas of clinical interest. The various approaches to text searching will determine the amount and relevance of literature options returned in the search (Bigby, 1998). The term, "ankle sprain," will be used to describe the possible results from text search. If one were to type, *ankle sprain*, into a database, literature containing at least one of these two words in any row would be returned. In essence, the fact that no additional symbols are used in the search indicates that each word is optional. The results of a search such as this are typically numerous and very general. If the same search were conducted with the addition of the + symbol, ankle + sprain, rows containing both words would be retrieved. This symbol indicates that the both words must be present in every item returned. Use of a – symbol, ankle – sprain would find rows containing the word, 'ankle,' but not 'sprain.' Oftentimes a * symbol will be utilized, sprain*, to identify rows that contain the root of 'sprain.' Thus, rows featuring words such as sprain, sprains, and sprained might be identified. The most specific way to identify terms is to place them in parentheses, "ankle sprain," to locate rows that contain the exact phrase between each symbol. Results of these searches are typically very specific to the priority area of the search. Once the search results have been returned from the database, narrowing of the

results should occur and can be accomplished several ways including, though not limited to, year of publication, abstract availability, level of evidence (to be discussed further in the literature appraisal section) and overall relevance of literature to topic of interest (Bigby, 1998).

In addition to the knowledge of *how* to search, knowledge of *where* to search and which resources are best suited to employ with text search terms is helpful (Straus, 2005). Evidence-based practitioners should be familiar with the literature databases available to them and the general contents of each. Library databases, for example, are beneficial when conducting general searches that are targeted at specific areas of inquiry. The Cochrane Database, for example, is an outlet for health care research that is already summarized and interpreted to promote dissemination of high quality research for use in EBP (Fineout-Overholt, Hofstetter et al., 2005). It is important to note that in athletic training, not all clinical questions will have specific publications related to our clinical questions due to the overall dearth of available research in our profession. In these instances where targeted answers to our clinical questions are not easily found, applying evidence from other medical professionals' experience could serve as the needed gathering of evidence.

*Appraising the Literature*

After gathering evidence relating to the clinical question from a literature search, the next step in the EBP process is to appraise the information for validity, reliability, and applicability (Fineout-Overholt, Hofstetter et al., 2005; Straus, 2005). In regard to validity, the evidence-based user should evaluate whether the study results align with the initial hypotheses and the measures utilized to obtain the results. Furthermore, the

reliability of those results should be assessed through evaluation of whether they can be replicated if the same study were conducted again (Fineout-Overholt, Melnyk, & Schultz, 2005) . Lastly, the ability of the study findings to be applied to the patient of consideration should be weighed (Straus, 2005).

Determining the validity of study findings requires the clinician to objectively view the study in several areas. The most important components of validity relate to the randomization of patients and study design (Straus, 2005). Randomization determines if all subjects in the sample stood equal chance of receiving a treatment. Other items to evaluate related to participant validity include blinding, similarity of participants at the start of the study, equal treatment of groups outside of the treatment option, attrition rates, and sufficient follow-up with patients (Straus, 2005).

Measures utilized to gather data during a study significantly influence the validity of a study. Reference measures compared to existing "gold" standards should be used whenever possible to obtain the highest possible validity (Straus, 2005). Gold standards are the definitive benchmarks of an evaluative test with high sensitivity (ability to identify all patients with a condition) and specificity (ability to rule out a condition in all patients). However, use of sensitivity and specificity in relation to athletic training is limited due to insufficient available resources regarding soft tissue evaluation tests and many treatments. Therefore, it is important to note that no research study is perfect. Clinicians should be able to determine whether structural design issues will impact the validity of the results of the study as they may assist in determining a clinical decision (Fineout-Overholt, Melnyk et al., 2005).

Assessing the applicability of study results to the clinical question of interest comprises the final phase of critical appraisal of the literature. Clinicians should answer the following questions regarding the literature they found: 1) is the difference between the patient of interest and those included in the study so great that the results cannot be applied? 2) Is the treatment featured in the study feasible in the setting of interest? 3) What are the potential outcomes, both harmful and beneficial, from the treatment? 4) Do the values and goals of patients appear to align with the anticipated outcomes of the treatment in the study (Straus, 2005)?

In addition to the concepts of validity, reliability, and applicability of a study, it is important for the evidence-based practitioner to understand study designs. A few of the most common designs found in health care literature include systematic reviews, randomized control trials, independent laboratory trials, single-subject, and case reports. Each of these designs can be classified on a level of evidence scale, ranging from 1-5, or high to low, respectively (Straus, 2005).

Systematic reviews are considered to be the most useful forms of evidence available in medical literature (CEBM, 2009; Straus, 2005). As a structured search aimed to critically appraise and synthesize medical literature related to a specific topic, these reviews attempt to minimize bias and error (Straus, 2005). The highest level of systematic review would be one that combines all relevant randomized trials, detailed description of the search, evaluation of validity of the included studies, and type of data (individual patient versus aggregate) utilized (Straus, 2005).

An additional form of research that is highly regarded for strength of design is that of randomized control trials (RCT) due to the goal of determining effectiveness of a

treatment or intervention (Arnold et al., 2005). The RCT is typically referenced as the "gold standard" for determining causal relationships (Arnold et al., 2005). Key elements of this design include randomization of participants, tracking of data over time, and the ability to account for other variables that may influence an outcome (Straus, 2005).

Single-subject designs are utilized on one subject, or a very small group of subjects, who serve as their own control group (Creswell, 2009) Most often multiple treatments will be administered on the participant over time, with return to baseline between interventions. This design can be of value, though it has limited generalizability; an evidence-based practitioner would need to match the subject characteristics carefully to gain significant applicability to a patient. It should also be noted that a cross-over effect may be seen as one treatment may influence another (Arnold et al., 2005).

Similar to single-subject design in its emphasis on one patient (or a small series of patients), are case reports, which typically describe how one unique incident was handled by a clinician (Arnold et al., 2005). Generally, an overview of the condition, treatments utilized, perceived effectiveness by the patient and clinician are included, though they lack a comparison group (Straus, 2005). While these reports are not as strong in design as are randomized control trials, they are in fact levels of evidence and should be weighed in value similar to that of clinician expertise (CEBM, 2009). Case reports should be used to help generate hypotheses and illustrate areas warranting future investigation (Straus, 2005).

When conducting an evidence-based inquiry, it is important to note that all evidence does not hold equal value (Medina, McKeon, & Hertel, 2006). The Oxford

Centre for Evidence Based Medicine (CEBM) created a rating system to establish the value of evidence. Understanding the levels of evidence allows the clinician to interpret the value of reported results (Medina et al., 2006). Evidence levels range from 1 to 5, with 1 indicating the highest level of evidence, and 5 the lowest (CEBM, 2009). Table 2 illustrates the relationship between the study designs presented and levels of evidence.

**Table II.2**

***Levels of Evidence and Associated Study Design***

| *Level of Evidence* | *Study Design* |
|---|---|
| 1 | Systematic reviews and randomized control trials |
| 2 | Cohort studies and outcomes research |
| 3 | Case-control studies |
| 4 | Case reports or series |
| 5 | Anecdotal evidence and clinical expertise |

*Adapted from the Oxford Center for Evidence Based Medicine

An additional grading system is provided within the CEBM to allow for interpretation of a body of evidence relating to a topic. Grading scores range from A through D, with A indicating consistency in the literature translating to a strong recommendation for clinical use, to a D or I which indicate that there is insufficient evidence to make a clinical change recommendation (CEBM, 2009). Table 3 illustrates the CEBM grading scale.

**Table II.3**

***CEBM Grading System for Clinical Practice Recommendation***

| *Grade* | *Criteria* |
|---|---|
| A | Level 1 evidence with consistent results; high confidence in clinical recommendation |
| B | Consistent Level 2 or 3 evidence, or inconsistent Level 1 evidence; fair confidence in clinical recommendation |
| C | Conflicting evidence from Level 4 |
| D/I | Insufficient evidence to make a recommendation |

*Adapted from the Oxford Center for Evidence Based Medicine

*Examining Clinical Expertise*

Integration of critical appraisal with clinical expertise and patient characteristics comprises the fourth step of the EBP process (Straus, 2005). Although clinical expertise is considered a low level of evidence, the experiential knowledge gained from practice is an important factor to consider when interacting with patients, particularly when little or no research evidence is available (Youngblut & Brooten, 2001). Certain factors may influence clinician experience and decision making capabilities. These factors include the ability to recall a treatment or outcome, lack of exposure to a specific condition, geographic location, practice setting (rural versus urban), patient population, and educational background (Estabrooks, 1998; Youngblut & Brooten, 2001). Combining the areas of experience, both personal and experience obtained from discussion with other health care professionals, with the best available literature should establish a strong foundation for answering the clinical question.

*Assessing Outcomes*

After the clinical question has been formulated, literature has been gathered and appraised, and clinical experience has been considered, an assessment of the outcome in the clinical setting should occur (Fineout-Overholt, Melnyk et al., 2005). Collection of data relating specifically to the patient and treatment outcomes should be obtained in a combination of qualitative and quantitative formats to create a cumulative picture of the results (Fineout-Overholt, Melnyk et al., 2005). Such data should include the satisfaction of the patient with the treatment procedure, its outcome, and ability to meet the selected goals. All aspects of the treatment should be assessed from a clinician perspective. These items will be important to subjectively reflect on, while simultaneously considering the success of the entire EBP process (Fineout-Overholt, Melnyk et al., 2005; Straus, 2005). In effect, the experience gained by the clinician then can be used during future EBP inquiries to further implement evidence-based care and improved practice (Fineout-Overholt, Melnyk et al., 2005). For the clinical case presented, the clinician would determine if ultrasound was in fact an effective method for decreasing Emily's swelling and increasing her range of motion, with particular consideration of the literature and expertise.

***Instruction of Evidence-Based Practice in Health Professions***

Utilization of EBP by health care professionals is contingent upon the possession of efficient skills in searching for information, appraising information, and ultimately applying valid information to influence clinical practice (Wanvarie et al., 2006). Through incorporation of EBP skills, students will benefit in their ability to think critically, improve understanding of research methods and ultimately lead to a greater

pursuit of EBP throughout their professional careers (Fonteyn, 2005). In the professional setting, a practitioner with a strong foundation in EBP will possess enhanced reasoning and decision making abilities thus improving outcomes in a more cost-effective approach to patient care (Burns & Foley, 2005; Fonteyn, 2005). In this manner, educational programming must be available for clinicians and students to supplement the learning process.

Many health care professions have approached topics for the incorporation of EBP processes into curricula and continuing education opportunities. Relevant subject areas have included, though are not limited to, utilization of up-to-date high quality research to form course content, instruction of critical appraisal of literature, determination of validity and reliability of research publications, mastery of the PICO format of creating clinical questions, and group projects geared toward solving clinically based problems often stemming from clinical supervisor discussions (Brancato, 2006; Burns & Foley, 2005; D Ciliska, 2006; Johnston & Fineout-Overholt, 2006; Schmidt & Brown, 2007; Shlonsky & Gibbs, 2004; Wanvarie et al., 2006; Yousefi-Nooraie et al., 2007). Specific courses for EBP should be established, as well as merging skills training into existing courses, creating a longitudinal integration of EBP within the full curriculum (Wanvarie et al., 2006).

Review of published teaching techniques show great variance in methods of delivery including technology based programs (Davis et al., 2007; Grad et al., 2005; LaRue, Draus, & Klem, 2009), journal clubs (Alguire, 1998), oral examinations (Burman, Hart, Brown, & Sherard, 2007), critical appraisal activities (Del Mar, Glasziou, & Mayer, 2004), abbreviated courses (Fritsche, Greenhalgh, Falck-Ytter, Neumayer, & Kunz,

2002), curricular infusion (Wanvarie et al., 2006), and clinical scenarios or problem-based learning (Heinrichs, 2002). Both positive and negative aspects, as well as barriers that could prevent their full incorporation in certain settings, can be identified within each model.

Technology based programs have employed the use of web-based tutorials and personal digital assistants (PDA) and have become increasingly popular in recent years. Particular benefits of a technology-based program reside in increased learner interaction, flexibility, ability to revisit particular sections of material, standardization of presentation, availability of additional information via hyperlinks, and cost effectiveness (Davis et al., 2007; Greenhalgh, 2001). Davis (2007) found that this form of instruction demonstrated a positive increase in knowledge and skills in allied health students studying EBP (Davis et al., 2007). When compared to typical lecture delivery in a postgraduate education session on EBP, he found that students who received a computer based EBP session scored no differently than the lecture group, and both groups significantly increased their knowledge scores, thus demonstrating that the web-based information was just as effective as the classic lecture setting in postgraduates.

Other investigators found similar results when evaluating medical students' use of PDAs in EBP instruction with additional access to InfoRetriever (Grad et al., 2005). When compared to a control group receiving lecture only, no significant difference in knowledge gains were found (Grad et al., 2005). These findings indicate that PDA-training for EBP is at least as effective as typical lecture preparation in typical medical students. For educational programs that have already invested in PDA devices, such a teaching mechanism could be beneficial to allocating time for other EBP strategies in the

traditional classroom setting. Curricula that have not already implemented PDA-based components may find this approach difficult due to the increased cost necessary to initiate the program, with no true evidence that it is more beneficial than current lecture strategies.

A web-based tool for mastery of the PICO process also has been evaluated and deemed valuable for independent learning of EBP concepts for undergraduate nursing students (LaRue et al., 2009). This online model required students to review clinical scenarios and formulate PICO clinical questions. Faculty reported that the questions created by students were satisfactory for their year of enrollment (LaRue et al., 2009). A web-based teaching mechanism in this fashion could possibly serve as an adjunctive lecture piece, allowing students to approach EBP from a more self-learning perspective. An additional benefit to this strategy is the overall ease of longitudinal integration throughout a curriculum.

Journal clubs also have been utilized to instruct concepts relating to EBP. This mode of delivery has been useful due its group oriented nature, ease of use, minimal preparation requirements, and faculty confidence in implementation (Alguire, 1998; Hatala, Keitz, Wilson, & Guyatt, 2006). Increased participation and outcomes of journal clubs often occurs through encouragement of reading guides, checklists, inclusion of original research articles, and food (Alguire, 1998). Specific to the process of EBP, goals for journal clubs emphasize critical appraisal of literature, establishing impact on clinical practice, and maintaining knowledge of current research and practice. Alguire (1998) suggested that journal clubs take an additional step to attempt to answer clinical questions with assistance of evidence-based users' guides and or review formats. The overall

flexibility of this form of instruction enables utilization at all levels of education with the ability to adapt content to area of study.

The variance in content of EBP also has led to unorthodox methods of instruction. For example, oral examinations have presented a unique opportunity for students to demonstrate mastery of self-guided EBP (Burman et al., 2007). Implementation of this technique involves a period of initial instruction regarding the process of EBP followed by assigned articles for critical review and a clinical case. Students are guided to read the article from the perspective of how they may or may not apply the information in the article to the clinical case. Use of additional resources and collection of other literature is encouraged to maximize the EBP process. To demonstrate understanding, students must then present their decisions to instructors and answer questions relating to both the process they went through and their clinical decisions. Qualitative assessment of this method found that while students found the oral defense of their processes to be unpleasant, they appreciated the outcomes and understanding of EBP (Burman et al., 2007). This method of instruction requires a high level of critical thinking and synthesis on the part of the student.

Expanding upon clinical scenarios as an instructional method, the use of critical appraisal has provided alternatives to more traditional methods of instruction (Del Mar et al., 2004). Critically appraised topics, for example, offer a structured mechanism for medical students to develop a clinically based question, research the evidence, and provide a solution (Del Mar et al., 2004; CE Welch & Yakuboff, 2008). A cumulative answer from this approach then can be presented as a critical appraisal to peers and faculty. Grading of such assignments is individualized to best fit the institution and

student population; criteria include class discussions, professional presentations, clinical setting presentation/application, and format (Del Mar et al., 2004). An additional critical appraisal design was suggested by Hatala (2006) in the form of an "inpatient rotation" as a way to engage medical students in EBP. This method required students to work as a team during clinical experiences to create an answerable clinical question and conduct a related literature search. Critical appraisal of their findings were presented and discussed during rounds. Such rotations have been found to significantly increase both student confidence in using EBP, and feelings of improvement in patient care (Thom, Haugen, Sommers, & Lovett, 2004).

Practicing professionals typically do not have consistent learning opportunities as do students to learn about EBP. For these clinicians and educators, abbreviated courses allow for the introduction of EBP skills and knowledge in a timeframe that permit intense presentation of information (Fritsche et al., 2002). The content of the abbreviated courses typically encases the five steps of EBP. Courses instructed in this manner have been found to significantly increase practicing professionals knowledge and skills of EBP (Fritsche et al., 2002; McCluskey & Lovarini, 2005). McCluskey and Lovarini (2005) found that a two-day workshop significantly increased occupational therapists' knowledge of EBP. They recommended post-workshop emphasis on critical appraisal skill development and establishment of new routines of practice relating to EBP. These results and recommendations demonstrated that while knowledge increases as a result of a short-course workshop, behavior typically does not.

Faculty development programs also have utilized the short course approach to engage members in the EBP process and promote usage within the classroom.

Participants in such courses demonstrated an increase in desire to incorporate EBP at their institution and self-reported knowledge (Hatala et al., 2006). Participation in short tutorials also may result in quick "turnaround time" for implementation of EBP, though no studies have evaluated the long-term use or instruction of EBP following these courses.

Although short courses appear to be effective at increasing clinician knowledge and skills, students enrolled in health care profession education programs benefit more from longitudinal curriculum implementation of EBP concepts (Wanvarie et al., 2006). In the Ramathibodi medical program, students undergo a series of EBP instructional courses over three of their six years of enrollment (Wanvarie et al., 2006). Principle components of EBP including the process, epidemiology, and statistics, were gradually introduced to students along with an information technology emphasis to encourage critical appraisal skills. The students enrolled in this curriculum enhanced their critical thinking skills and valued the instruction (Wanvarie et al., 2006).

Nursing curricula also have introduced EBP concepts into student learning. For example, the University of Pittsburgh has implemented two courses within freshman nursing curricula that emphasized the EBP process, barriers to use of EBP, search strategies, and critical thinking (Burns & Foley, 2005). The introductory course, offered in the students' first semester, features segments relating to database searching and retrieval of relevant articles. An introduction to nursing course then follows with the objective of synthesizing nursing issues and trends with EBP critical thinking strategies. These two courses were infused into the first year education program to better prepare students for clinical experiences during their second year. While this curricular approach

appears to be a good preparatory step in preparing nursing students, the evaluation of its effectiveness is minimal. Only brief qualitative findings stating that the nursing courses are "successful" are evident (Burns & Foley, 2005).

During clinical experience, mentors and role models play a key role in the development of student skills and knowledge (Hatala et al., 2006). Clinical preceptors are vital to the preparation of students and integral to the successful implementation of EBP (D. Ciliska, 2005). In the teaching of EBP, it is therefore important that faculty and preceptors utilize the concepts that they are instructing in a manner visible to students. However, some faculty may themselves lack the knowledge and confidence in EBP. Faculty development programs should incorporate the necessary skills for EBP in a supportive manner, while providing proposed teaching techniques and assessment tools to demonstrate that faculty have mastered the content (D. Ciliska, 2005; Hatala et al., 2006). Appropriate time to learn the process of EBP and how to model it to more accurately support students also should be provided. Skill development opportunities, whether on campus or as destination learning modules, should be provided to create a staff with the skills, positive attitude, and authority to move evidence-based curriculum forward (D. Ciliska, 2005).

The organization of EBP instruction should incorporate various techniques and strategies with the goal of enriching the learning experience for students (Murad, 2009). Mastering the concepts relating to EBP could be enhanced through student interactions, role-playing, infusion with clinical experience, and simulation of real world experiences (Khan & Coomarasamy, 2006; Murad, 2009; Wanvarie et al., 2006). Group learning atmospheres can be especially helpful early in the EBP process to promote discussion,

with individual projects rounding out the educational experience to demonstrate full mastery of skills and concepts (Wanvarie et al., 2006).

Athletic training students need to develop critical thinking and decision making skills through learning strategies that best match the millennial student (Heinrichs, 2002). The passive lecture model has been replaced by student-centered activities that engage students in the learning process (Heinrichs, 2002). Active learning opportunities promote discussion and reflection among students as they undergo problem solving exercises, particularly in relation to case studies (Murad, 2009; Wanvarie et al., 2006). A larger scope of information can be covered in a shorter period of time when targeting EBP through learning strategies appropriate to the current student population (Heinrichs, 2002).

A specific strategy for increasing student critical thinking is through the use of problem-based learning (PBL). As one of the most commonly used teaching techniques, critical thinking and problem solving is emphasized through use of specific scenarios (Heinrichs, 2002; Lusardi, Levangie, & Fein, 2002). This active learning technique requires students to utilize educational tools, conduct searches for data relevant to the problem, communicate with others, and develop a resolution to the issue (Heinrichs, 2002), which aligns well with the EBP process (Lusardi et al., 2002). Benefits to use of PBL include increased student engagement, enthusiasm toward course information, promotion of creativity, discussion, and encouragement of open-mindedness in solving problems (Saarinen-Rahiika & Binkley, 1998). This method also has demonstrated improved retention and transference to clinical practice when implemented in didactic curriculum (Saarinen-Rahiika & Binkley, 1998).

### *Evidence-Based Practice Competencies in Health Care Professions*

The Committee on Health Profession Education has an established commitment to patient-centered care from an interdisciplinary team approach, emphasizing EBP (Greiner & Knebel, 2003). In this manner, the Committee has adopted five core competencies that all clinicians should possess: 1) provide patient-centered care, 2) work in interdisciplinary teams, 3) employ evidence-based practice, 4) apply quality improvement and, 5) utilize informatics (Greiner & Knebel, 2003).

Preparing students to become evidence-based practitioners who are proficient in the use of best evidence (Denegar & Hertel, 2002), patient values, and clinician expertise (D. K. Ciliska, Pinelli, DiCenso, & Cullum, 2001) has become a focus of health education programs. Clinical practice and educational guidelines must adapt to reflect these foci in curriculum design (Denegar & Hertel, 2002). Accreditation standards for professional level physical therapy, occupational therapy, and nursing education programs have formalized expectations that their graduates demonstrate competence in the areas of literature searching, critical appraisal, and knowledge management skills that are essential to effective EBP (Lusardi et al., 2002). Master's-level nursing competencies have also been proposed by a national consensus board (Kring, 2008). These proposed competencies are grounded in The Academic Center for Evidence-Based Practice (ACE) Star Model of Knowledge Transformation, which was developed as a tool for understanding the characteristics of EBP (Stevens, 2004). The conceptual framework of the ACE Star Model depicts the five transformation processes that occur during EBP including, discovery, summary, translation, integration, and evaluation (Stevens, 2004). Graduate programs have combined these five processes with the domains of nursing

practice to form a matrix of the relationship between clinical practice and EBP (Kring, 2008). Each of the proposed competencies aligns within a nursing practice domain, demonstrating clinical nurse specialists as multi-faceted professionals capable of functioning as expert practitioners, researchers, consultants, leaders, and educators in relation to EBP (Kring, 2008).

In concert with updating standards to include EBP concepts, the challenge of changing practice through education has begun (Gwyer, 2004). Creative methods are needed to provide effective instruction, with subsequent assessment of instruction, into both didactic and clinical curricula (Gwyer, 2004). The concepts related to EBP should be embedded throughout curricula including assessment, modalities, rehabilitation, and administration courses (Casa, 2005). While curricular changes are most effective when conducted in a deliberate, slow manner over time (Levin R, 2006), integration of EBP curricula must be demonstrated by faculty that are knowledgeable and dedicated to leading by example (Petrisor & Bhandari, 2006).

Current National Athletic Trainers' Association (NATA) Educational Competencies, require clinical skill development, critical thinking, and research, as components of entry-level athletic training education curricula (NATA, 2006). While these competencies help to develop the athletic training student, they do not specifically address EBP. The NATA Educational Competencies will be updated and published in the fall of 2010 and will include an EBP focus (NATA, 2009); therefore, there is an immediate need for education and models for implementation of these concepts. As the NATA, Commission on Accreditation of Athletic Training Education (CAATE), and Board of Certification have formed an alliance to collaborate on issues facing athletic

training (Hunt, 2009), their cohesive support of EBP infusion as spearheaded by the Executive Committee on Education's NATA Educational Competencies (NATA, 2010), is anticipated.

***Assessment of Evidence-Based Practice Concepts in Health Care Professions***

As EBP has progressed through implementation within health care professions, the need to evaluate the influence of EBP in relation to factors such as knowledge, attitudes, beliefs and use of EBP concepts has developed. Numerous assessment tools have been created to determine the knowledge and perceptions of various professional sectors through surveys, questionnaires, and interview formats. However, many of these instruments have not been evaluated for validity (Smith et al., 2000). Furthermore, many EBP survey tools were designed with the sole purpose of evaluating a specific evidence-based course or curriculum within an institution or conference, with limited generalizability in their original form to other research agendas (Shaneyfelt et al., 2006).

Currently, three validated assessment tools, the Berlin Questionnaire, Fresno Test of Evidence-Based Medicine (EBM), and Evidence-Based Concepts for Clinical Practice Assessment, are evident and feature different survey designs and question formats to determine knowledge of EBP concepts (Fritsche et al., 2002; Ramos, Schafer, & Tracz, 2003; C. Welch et al., 2009). These surveys are primarily comprised of multiple choice or short answer questions, analysis of a clinical scenario, and interpretation of research evidence format. The Berlin Questionnaire was designed primarily to evaluate physician knowledge regarding research evidence interpretation and the ability to incorporate quantitative data into patient care (Fritsche et al., 2002). Alternately, the Fresno Test of EBM was developed to determine the effectiveness of an instructional program in

residency on knowledge and skills of EBP (Ramos et al., 2003). Each of these tests have been adapted and used in other health care professions to determine similar clinical competence outcomes. Such an adaptation occurred to formulate portions of the Evidence-Based Concepts for Clinical Practice Assessment which assessed athletic training educators' knowledge, comfort, and importance levels relating to EBP following a workshop (C. Welch et al., 2009).

More subjective aspects of EBP including attitudes, behaviors, and individual use, also have been analyzed in recent literature (Cameron et al., 2005; Jette et al., 2003; Yousefi-Nooraie et al., 2007). In general, the associated survey instruments utilized to evaluate these factors were self-report questionnaires assessing perceptions of EBP, with particular emphasis on barriers to use and importance of EBP. Jette et al (2003) assessed physical therapists perceptions of EBP including motivations and barriers to infusion of EBP concepts within clinical practice. Similarly, Yousefi-Nooraie et al (2007) analyzed medical educators' perceived importance of the EBP process. Data summarizing barriers, behaviors, and use is beneficial to the development of athletic training literature as we expand toward EBP infusion. Establishing a baseline of these concepts relative to athletic training will help to develop strategies for inclusion of EBP. However, the direct application of any of the aforementioned assessment tools to the athletic training student population is inappropriate due to the assumed baseline level of knowledge and terminology contained within each. Generally, there is a lack of EBP knowledge within athletic training (Steves & Hootman, 2004; C. Welch et al., 2009). This dearth of knowledge directly affects the student population in that if the professionals as they learn from the professionals they interact with. If an educator or clinician is unfamiliar with

the concepts of EBP, students will not receive the necessary information to guide them toward becoming an evidence-based practitioner. Therefore, in order to accurately gauge student knowledge, attitudes, and use of EBP concepts, creation of a valid instrument must occur and be disseminated to the educational realm.

***Barriers to Implementation of EBP***

Over the course of EBP evolution, many barriers have been identified in all facets of health care. Clinicians, educational faculty, and students all have recognized issues relating to implementation of EBP concepts (D Ciliska, 2006). In the field of psychiatry, for example, Bilsker and Goldner (2004) identified that students' perceived discrepancies between conclusions drawn from EBP programs and clinical supervisors, as well as a sense of intimidation when appraising research. Nursing professionals have reported lack of time, resources, skills, perceived authority to change practice, and difficulty in generalizing and applying results as obstacles preventing full utilization of EBP (D Ciliska, 2006). On a more generalized scale, nurses also have identified leadership, motivation, vision, strategy, and direction as barriers to EBP at the institutional level (Gerrish & Clayton, 2004). Table 4 highlights the barriers reported from several health professions.

Prior to implementation within a curriculum, it is imperative that faculty fully embrace and overcome barriers related to EBP (D Ciliska, 2006). The shared didactic and clinical instructional requirements of athletic training education create an environment conducive to these barriers. There is a need for athletic training to move toward implementation of evidence-based concepts in undergraduate education despite the presence of barriers. By recognizing the need for student EBP concept mastery, and

the potential issues an educator may face when trying to implement these components, strategies can be developed to overcome these obstacles.

**Table II.4**
***Examples of Studies Including Barriers to Implementation of Evidence-Based Practice***

| *Study* | *Health Profession* | *Identified Barriers* |
|---|---|---|
| Bhandari et al. (2003) | Surgical Medicine | Institutional barriers, powerless to enact change, acceptability of EBM, time, confusing terminology, lack of understanding of critical appraisal, motivation, lack of interest |
| Bilsker and Goldner (2004) | Psychiatry | Overemphasis of EBP on research, lack of consistency between didactic and clinical information, intimidation from breadth of material |
| Brancato (2006) | Nursing Education | Magnitude of available information, proliferation of databases, unfamiliarity with computers and software |
| Brown et al. (2008) | Nursing | Communication, organizational barriers of time and autonomy |
| Ciliska (2005) | Nursing Education | Awareness of EBP, student resistance, lack of current evidence on certification exams, time available in curriculum |
| Gerrish and Clayton (2004) | Nursing Education | Time, resources, lack of authority to enact practice changes |
| Guyatt et al. (2004) | Medicine | Time, local practice patterns, product marketing, finances |
| Haynes and Haines (1998) | Medicine | Poor access to best evidence, organizational barriers, ineffective continuing education programs |
| Jette et al. (2003) | Physical Therapy | Time, generalizability of research findings, inability to apply findings to patients, and lack of interest |
| McCluskey and Lovarini (2005) | Occupational Therapy | Time, search and appraisal skills, access to journals |

| | | |
|---|---|---|
| Melnyk et al. (2008) | Nurse Practitioner | Resources including time and money, traditional mindset, access to data, and lack of mentorship |
| Nolan et al. (1998) | Nursing | Values, skills, and awareness of EBP, organizational barriers, quality of research, methods of research presentation |

***Guiding Athletic Training Practice toward Infusion of EBP***

The implementation of evidence-based practice is important to the field of athletic training to assist in the recognition of our position within the ranks of health care professionals and our alignment with the current educational practices of those professions (Steves & Hootman, 2004). As previously mentioned, EBP has established a consistent pattern of practice and decision making. In 1997 The National Athletic Trainers' Association Education Task Force recognized AT's potential "fit" within schools of health care professions (NATA, 1997). Several reasons support this alignment including the multi-disciplinary nature of athletic training education, which is comparable to that of nursing, physical therapy, and occupational therapy and the equal emphasis of EBP in the clinical decision making and practice of AT's.

Additional support for the need to move toward EBP inclusion in athletic training can be seen in current issues facing the profession (Kronenfeld et al., 2007; Steves & Hootman, 2004). Specific areas of emphasis of EBP reside in improving patient care (Steves & Hootman, 2004), support for licensure, third-party reimbursement (Hertel, 2005), access to current evidence-based information, dissemination of knowledge (Denegar & Hertel, 2002), and the ability to demonstrate cost-effective care (Kronenfeld et al., 2007). While each of the aforementioned areas is important to the progression of athletic training, it is imperative that entry-level programs begin to educate students in these areas to better prepare them to overcome these professional obstacles in the future.

While the infusion of EBP into athletic training is a step toward moving the profession forward with a more longitudinal vision toward monitoring patient outcomes through evidence-based processes should be addressed in the future. Patient outcomes

are a large component of evidence that is currently lacking in athletic training (Steves & Hootman, 2004). Without the ascertainment and dissemination of this form of evidence (Denegar & Hertel, 2002), support for treatment decisions, reimbursement for clinical practice interventions , and establishment of cost-effectiveness of care (Kronenfeld et al., 2007) could be limited. As athletic trainers become more confident in their skills and use of evidence-based practice, we will augment our clinical decision making, enhance the quality of patient care, and increase the probability of attaining positive patient outcomes (Fonteyn, 2005).

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# Chapter III

## Project IA

## Implementation of Evidence-Based Practice Concepts in Undergraduate Athletic Training Education: Experiences of Select Educators

Title: Implementation of Evidence-Based Practice Concepts in Undergraduate Athletic Training Education: Experiences of Select Educators.

Authors: Sarah Manspeaker, Bonnie Van Lunen

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**Introduction**

Evidence-based practice (EBP) has become a foundational component of health professions in the United States, particularly in the fields of medicine (Dinkevich, Markinson, Ahsan, & Lawrence, 2006; Khan & Coomarasamy, 2006; Wanvarie et al., 2006), nursing (Burman, Hart, Brown, & Sherard, 2007), physical therapy and occupational therapy(Cameron et al., 2005). Health care professionals, and therefore students preparing for these professions, must be able to develop and answer clinical questions through the integration of patient needs, research skills, and clinical experience (Haynes, 2002; Sandrey & Bulger, 2008; Winterstein & McGuine, 2006; Youngblut & Brooten, 2001). The aforementioned professions have embedded EBP concepts within their entry-level educational standards and programs to encourage the development of evidence-based practitioners. As Steves and Hootman (2004) emphasized, "athletic trainers need to embrace the critical-thinking skills to assess the medical literature and incorporate it into their clinical practice." Current NATA Educational Competencies(NATA, 2006), include curricular emphasis on critical thinking, clinical skill development, and research, making undergraduate education the ideal place to enhance the movement toward EBP. It is important for athletic training educators to shift toward, "how to teach EBP" rather than, "is EBP an important concept to teach?"(Yousefi-Nooraie, Rashidian, Keating, & Schonstein, 2007)

In 1992, the Journal of the American Medical Association,("Evidence-based medicine. A new approach to teaching the practice of medicine," 1992) published *Evidence-based medicine: A new approach to teaching the practice of medicine* as a catalyst to establishing EBP within health care professions. Medical professions, such as

medicine (Dinkevich et al., 2006; Wanvarie et al., 2006) and nursing,(Burman et al., 2007; Brancato, 2006; Burns & Foley, 2005; Johnston & Fineout-Overholt, 2006; Schmidt & Brown, 2007) have accentuated EBP teaching strategies in recent years. In comparison to these professions, athletic training has not thoroughly documented the implementation of EBP within the educational realm,(Sandrey & Bulger, 2008) most notably in the area of how to implement EBP into entry-level education. This lack of emphasis illustrates the slow progression of our comparatively young profession to promote, utilize, and embrace EBP as part of the educational curriculum. The Athletic Training Education Journal began publication in 2006, with presentation of articles relating to evidence-based practice debuting in 2008,(Sandrey & Bulger, 2008) leaving room for expansion of EBP instructional inclusion within our professional education journal. Without emphasis of EBP concepts by educators, it could be difficult to progress student critical thinking skills into evidence-based clinical practice.

Implementation of EBP should occur within athletic training education to supply new practitioners with the skills to locate, appraise, and apply well-founded information to answer clinical problems (Wanvarie et al., 2006). Evidence-based practice must evolve more fully in the athletic training profession as only anecdotal data regarding known number practitioners and educators utilizing and incorporating EBP is available. Furthermore, the Commission on the Accreditation of Athletic Training Education (CAATE) graduate tracking data (Graman, 2007) indicate that of the 46 percent of undergraduate students pursuing advanced education upon graduation, only eight percent continue on to study for an advanced master's degree in athletic training. Therefore, it is hypothesized that a small proportion of our profession to date has formal undergraduate

or graduate classroom instruction in the components of EBP as directly related to athletic training. No mechanism currently exists to insure that EBP is a component of clinical growth or advancement at either educational level. Therefore, an initial inquiry as to the current implementation strategies of EBP concepts within entry-level athletic training education programs must be performed.

The purpose of this study was to examine select entry-level undergraduate athletic training educators' experiences and use of EBP concepts during instruction of athletic training students. Specifically, the focus of the inquiry was to determine the strategies used by select educators to incorporate EBP concepts into curriculum and coursework. Additionally, a query of their feelings and suggestions for broadening the topic to other educators and practitioners was conducted. Qualitative inquiry best suited this investigation due to its ability to contribute to professional knowledge and provide insight as to how EBP is being implemented at the undergraduate level (Patton, 2002).

## Methods

### Participants

A total of eleven educators (3 males, 8 females) currently instructing in CAATE-accredited undergraduate entry-level athletic training education programs (ATEP) were interviewed regarding their teaching experience, program use, and recommendations for implementing evidence-based practice concepts. Table III.1 identifies demographic characteristics of all participants. Educators were interviewed by one researcher (SM) via telephone during the spring and fall 2008 academic semesters. The sampling method utilized included snowball/chain sampling in combination with critical case sampling. Snowball sampling involves identification of individuals believed to know the most about

the phenomenon to be studied, in this case teaching and using EBP in athletic training courses, gaining their insight and opinions on the topic, and asking that he or she provide names of others they believe to have knowledge in the area (Patton, 2002). Participants were contacted after their names were provided by other professionals involved with the study. Educators known to provide instruction solely at the master's level were not included in the sample. Sampling was ceased after saturation of data occurred. Beyond colleague recommendation, criterion and intensity sampling were used to further ensure that the individuals met two criteria 1) had current involvement (within the past 12 months) within an undergraduate ATEP and, 2) were believed to utilize evidence-based concepts within their instructional methods. Utilization of evidence-based concepts was confirmed with each participant via email invitation and constituted a "yes" answer to the following question: "Do you currently include evidence-based practice in athletic training courses?" The small purposeful sample was targeted to attain the richest information possible regarding the topic of teaching EBP (Patton, 2002; Pitney & Parker, 2001).

**Design**

The qualitative design best suited for this study was that of emergent design flexibility, with elements of modified-grounded theory. The emergent design allowed for freedom and flexibility to develop the inquiry as the interview process transpired(Patton, 2002). Openness to fully evaluate all avenues in which the data and questions led during the interviews was permitted with this design; no conversation was stopped if deviations from the initial questioning protocol occurred. Meaning, structure and experience relating to the topic of EBP implementation were identified during theory evaluation and explanation (Patton, 2002; Mensch & Ennis, 2002).

A semi-structured interview containing a series of open-ended interview questions was created with the goal of attaining insight into the experience, use, and implementation of evidence-based practice concepts in the athletic training curriculum (see Table III.2). These questions initially were developed within a doctoral level qualitative research design course and developed with the oversight and final approval of the course instructor. Question design stemmed from investigator inquiry into the phenomenon of evidence-based practice instructional presence in undergraduate education. In accordance with emergent design (Patton, 2002), the researcher encouraged participants to elaborate, define, and/or clarify answers during the interview, as well as maintained the flexibility to deviate from set questions when appropriate. All interviews were tape-recorded and transcribed by a professional transcriptionist for analysis. The study was approved by the human participants committee as an exempt project by the University. To maintain confidentiality, all participant names in the discussion are pseudonyms. Instructors having earned a terminal degree are indicated with the prefix, "Dr.," those without a terminal degree are given a last name only.

All interviews were coded for identification of themes, patterns, and categories that underwent comparison within and between participants (Patton, 2002). Patterns initially were identified during interview conduction and provided the basis for theme development during coding. Confirmation, expansion, and sub-categorization of the data were performed by the primary researcher (SM) until data categories were saturated and/or exhausted (Patton, 2002; Pitney & Parker, 2009). Examination of the transcribed interview data through constant comparison lent to the confirmation of the emerging

theories and analysis of patterns, thus determining the meaning and structure of the experiences the participants had in regards to EBP (Patton, 2002; Pitney & Parker, 2001).

Triangulation, peer review, and participant checking were performed to assess the trustworthiness of the findings and further define the context of information (Mensch & Ennis, 2002; Patton, 2002; Pitney & Parker, 2009). Triangulation (Patton, 2002) occurred via multiple-analyst evaluation as two members of the research team analyzed transcriptions and thoroughly discussed the emergent themes. Peer review (Patton, 2002) was accomplished by having an athletic training educator with knowledge of qualitative research review identified themes for consistency and significance. Participant checking (Pitney & Parker, 2009) occurred through review of transcript coding results by select participants for their agreement with the themes and patterns identified.

**Results**

The coding and triangulation processes revealed three primary approaches to EBP concept implementation within CAATE-accredited undergraduate programs. These strategies included curricular emphasis, teaching strategies, and student activities. See Figure 1 for the conceptual framework of themes and associated categories. The data revealed that of the eleven programs examined, only one institution has incorporated an independent evidence-based practice course into the curriculum. It is important to note that this institution actually has two EBP courses, while the remaining ten programs have implemented EBP concepts into existing courses. These courses include therapeutic modalities, upper and lower extremity evaluation, organization and administration, various practicum courses, therapeutic rehabilitation, research methods, general medical conditions, and professional development (see Table III.3).

### *Curricular Emphasis*

Early in the analysis, the importance of establishing EBP as a core component of the athletic training curriculum emerged as a theme. Educators emphasized the need to have EBP identifiable as a foundation of the ATEP as evidenced by the three categories of faculty support, program goals, and concept implementation throughout the curriculum.

#### *Faculty Support*

While most educators echoed this view, a difference was identified between programs that specifically incorporate EBP as a full curriculum approach, where all instructors have a specific role in the evolution of EBP knowledge, versus those programs having one individual focus on EBP while the rest of the faculty do not actively participate. In the instances where not all instructors were utilizing EBP, the importance of having support from the faculty to use EBP was discussed.

> *It (EBP) needs to be done through the mission of the program. I want to say everyone needs to be on board, not that everyone needs it in their class, but everybody needs to be on board... If one of the missions of your program is to promote a successful clinical practice, you'd better be practicing evidence-based medicine. So the first part is the mission, the second part is to make sure that everyone is on board, and maybe that incorporates together. (Conners)*

> *I think from an individual standpoint, I guess for me, I think everybody just thinks, "Well, I don't have to do as much...the students are going to get that stuff (EBP) from (me) when they take modalities," kind of thing. So I guess from that perspective I feel a little bit of pressure in that it kind of falls on my head a little bit, which is fine, I don't mind doing that. But I think from a program standpoint we all need to be current...on the same page. (Miser)*

> *We try to think of ways to thread it (EBP) through the curriculum and disguise it almost and really identifying it as a concept that you use every single day. (Dr. House)*

*Program Meetings*

Educators discussed their initial approaches to EBP concept adoption within the programs' curricula. These approaches included the use of meetings and in-services to discuss the meaning of EBP, goal setting for implementation, and determining desired outcomes.

> *We took each course in our core, and said, "Ok, if our goal at the end of the program is for the student to be able to read research, and to understand a little bit of evidence-based practice...what do we want to teach them over the course of the next five or six semesters?" So then we worked backwards. If we want them to know this, what do they need to know first? What do they need to know second? (Dr. Ellis)*

> *We actually devoted a year of meetings to this (EBP), where we met, I don't know, once every other week, and we went through what was in the Sackett book. I can't remember who the first author is, but it was the first edition, I think it was called EBM, some evidence-based medicine, and we went through it chapter by chapter to learn it, and we did this kind of guided, you know someone would sort of lead the discussion and we would review articles and you know really try to make sure that we got it first. And then we started to talk about how to put it into the curriculums. (Dr. House)*

Dr. Ellis indicated that faculty discussion assisted in allowing her program to develop its curriculum emphasis on EBP. In multiple meetings, the faculty discussed the anticipated goals and outcomes of integrating EBP concepts. She explained that,

> *When this whole push first started coming, that was one of the things that (program director) said is that, "we'll just try to kind of highlight and sprinkle it throughout our classes." And I said, "We are not going to have any consistency if we do that, because I could talk about some things and you could expect that they know certain things that I might not have talked about. So why don't we get all on the same page," which is why we developed this whole (curricular) plan.*

*Concept Implementation*

Most instructors commented that the elements of EBP must be multi-faceted; evident in course teaching, administration, clinical instructor interaction; and adaptable to best match the individual teaching methods of faculty and staff. Through EBP concept

implementation within the entire curriculum, students reach the goals of developing appreciation and understanding of the importance of EBP. Dr. Stevens discussed this concept most specifically by saying,

> *I think that it sort of permeates the curriculum in ways where I hope that students, when they see things in their clinical settings or when they go out (as a professional), that they have their own rationale for the decisions that they make and that they critically observe what others have found.*

***Teaching Strategies***

A second theme to emerge from the data was that of the teaching strategies utilized by the educators. Sub-categories included instructor descriptions of EBP implementation through class preparation, presentation methods, concept inclusion objective, and pedagogical philosophies for implementation.

*Class Preparation*

Athletic training educators expressed individual processes of classroom preparation. These processes included remaining current with content knowledge in their specialty teaching areas. For example, Dr. Front, who utilizes an evidence-based teaching approach, stated,

> *I will take what I already have, review it and then I will go and search online to see if there is anything new, med info gives me updates in my particular topic areas, and it highlights any new publications that have come out in peer-reviewed journals. That's kind of an ongoing (process), but when I am teaching a specific course, for example nutrition, I'll search out to see if there is anything new, for example, in dosage requirements for carbohydrates, which just changed in the last year and a half.*

Mendelsen discussed his preparation process in terms of combining his clinical experience with what the literature is saying,

> *A lot of it for me comes out of preparation for class, use modalities for example. I would look in, what is the literature, number one, saying about it? Text books are a little more outdated and recent research literature is even outdated a little bit.*

*But I think you need to take a combination of those...and staying current in the clinical setting you are applying actual treatments that you're teaching about, and you know what's working and what's not working. I think you need to have a balance between the two.*

*Evidence-Based Concept Presentation Methods*

Instructors discussed specific methods of presenting evidence-based concepts to their students. Individual teaching styles, student learning styles, class size, student level within programs, and institutional culture all influenced how EBP concepts were incorporated within a course.

*At first what I had was a PowerPoint on evidence-based practice. And then what I found is I never made time for it. So I literally took the slides and embedded them so there are slides in the ankle PowerPoint and in the knee, in the shoulder. So what I do over the course of the semester is, there are three goals: the first is to again, go over what evidence-based practice is, the three parts of the definition, the research, the clinician, and the patient values. And then we also talk about what a gold standard is and what clinical prediction rules are. Then the second part, we talk about specificity and sensitivity, because by that time we've gotten into some special tests and stuff like that. I also introduce the concepts of what a peer-reviewed article is...also what is a research article? Then the third part of the semester I talk about the anatomy of an article...and we also talk about what are the clinical outcomes and patient based outcomes. (Dr. Ellis)*

*We've developed a basic lecture, and I hate to use a lecture all of the time...but to introduce information and then I'll tie in some activities within the lecture, where they might be applying something or thinking about some questions. So I talk about what it (EBP) is, what is evidence-based practice? What is it not? It's not the end all, and I talk to them about that, and I talk about the importance of clinician experience, and about the basic steps and then where can they do searches to find information. I kind of lead them that way. (Dr. Lowder)*

*...put it into modalities class...I took out the inflammatory process because when we teach modalities we are also teaching therapeutic rehab or therapeutic exercise and they are discussing it in there. That's why I took the two classes I usually use for inflammation and the acute inflammatory responses and turned it into evidence-based practice, which fit much better in my class because of the projects. (Miser)*

*Objectives for Concept Inclusion*

A primary subtheme emerged within the teaching discussion as instructors identified the different levels of EBP concept knowledge and mastery objectives within their curricula. Instructors utilized the terms know, find, question, evaluate, and problem-solve when describing the goals of instruction. These words align within the typical progression of the revised Bloom's Taxonomy, including remembering, understanding, applying, analyzing, evaluating, to creating (Anderson LW, 2001; Boone, Boone, & Gartin, 2005; Larkin & Burton, 2008; Su, Osisek, & Starnes, 2005).

*Knowledge/Remember*

*I can expect the students to know what evidence-based medicine is and I can bring examples and the projects that they do based on that. (Conners)*

*Understanding*

*I have incorporated test questions into my exams about everything, so I ask them to describe evidence-based medicine. I explain to them too that the test questions are more of an evaluation of, "do you know it?" Finding an article to me is more about the process. (Dr. Ellis)*
*So they search that, and learn how to actually critique the literature a little bit and learn data bases and search the search engines, figure out how to find information and then ...write up their case report and present it in poster format using the foundation (NATA Research and Education Foundation) guidelines for poster. (Dr. Frissel)*

*Applying*

*...just finding some information that they can read, tie it into lecture and I think they have to hear it a number of times. They can't just hear it once and then be expected to use it. So you have to create some types of learning assignments or activities for them to be able to apply it, and then use it. (Dr. Lowder)*

*Evaluating*

*I think that they see when they get into problem-solving situations, like well, what information do I need? How do I decide what I am going to do next and then where is the support for the evidence to help me make some of those decisions, and applying them in the outcome thing. (Dr. Stevens)*

*And then they start to write CATs which are critically appraised topics, and they're very quick, very tithe (small) summaries, and then in the senior level now they're, they're asking a clinical question and answering it. So now we're gonna get to the end, which is what we really think they should be able to do is if they have a patient question how do I go to the literature, distill it all, and arrive at an answer. (Dr. House)*

*Pedagogy*

Another important theme to emerge during coding was that of the need to emphasize pedagogical strategies in fostering an evidence-based teaching practice rather than only teaching evidence-based practice. While it is important for the concepts of EBP to be instructed at the undergraduate level, participants revealed that it also is important for teachers to utilize methods and teaching techniques that are themselves evidence-based. Inclusion of pedagogically strong instructional methods that foster learning outcomes and create valuable educational experiences should be a key component of a teacher's repertoire (Mensch & Ennis, 2002).

*What evidence is out there to support our teaching methods? Whether it's clinical change, classroom activities, what is the best way to learn something? There are some real holes in that particular area. (Dr. Stevens)*

*You have to know your content, but equally important, you have to understand your students, and where they are coming from and meet them at their level. But also how do you take that content and instruct it in a way that becomes meaningful and for student to be motivated to learn. (Dr. Frissel)*

*You don't just look at the athletic training evidence, you look at educational research as well...you look at ed psych and how kids learn and how to motivate kids and their goals, and you have to look at assessment literature. So, I think we are selling ourselves short as educators. I learn the most from my education literature that I read and I combine that with my clinical skills and...that is what makes me a good teacher. (Dr. Mensou)*

*It is enough (of a challenge) to get them (instructors) to understand the theory of teaching, it is very difficult when you don't have a lot of time and this (EBP) is the route I want to take. If they (clinicians) are not using it in their own clinical practice it is going to be very difficult for me to convert them to teach students to think this way in the classroom. (Dr. Frissel)*

### *Student Activities*

Athletic training educators consistently ask, "How do I incorporate evidence-based practice into my courses?" When posed this question, participants discussed multiple avenues of concept inclusion through activities such as self-discovery, finding and evaluating literature, and clinical application. Within these courses, several types of student activities were discussed as leading to accomplishment of evidence-based learning objectives.

#### *Self-Discovery Activities*

*For the modalities, what I do there is I have them become an "expert in their field," it's sort of the name I give it, but they won't write a paper. They have to come up with six papers (journal articles) addressing the same topic. They can be a meta-analysis, systematic reviews, or it could just be another assessment or intervention paper. What they do is take that information and they create a small presentation that addresses the question. They will use their six papers that they have, that's their current evidence and we try to keep it within the last five years. And then we use the text book and they create a lab, I give them a generic template in which they have to come up with ten definitions and four general questions that need to be asked on this lab, something generic, not too application oriented. And then they have four questions that have to be clinically applicable and four situations that they present. After they create the lab, we do the lab in class, and I direct most of them, so I can make changes to the lab too. (Conners)*

*They did the tutorial on the Ohio State web site, and another web site that took them through a tutorial on how to formulate a good clinical question. (Miser)*

*We have guided journals where we say, what did you see (in your clinical experience) that we talked about in class that was consistent and what did you see that was inconsistent? How did you reconcile what you saw and what was your take on that? Try to clarify the confusion that they might have from classroom to clinical practice...even in things as simple as communication, talk about what does the literature say? What is most effective? We know the common sense-ical things, but what has been proven? (Dr. Mensou)*

*...come up with a concept map that traces the assessment of something from a history through the diagnosis and at different points give examples of supporting evidence. Whether they find a correlation from some little history and an outcome or whether it is sensitivity and specificity on a clinical exam. (Dr. Stevens)*

***Finding and Evaluating the Literature***

*...have them find certain types of articles. They have to find a meta-analysis, they have to find a randomized control trial, they have to search databases, and give a little paragraph as to how they did that and what was successful about it and what wasn't...why was the search not successful and here's how I could make it better. (Dr. Ellis)*

*The PEDro Scale there is 11, well really 10 points that you look at, you "yes" or "no" these and you given them a point and then ok, those papers have scored an 8 or 9 out of 10. Those are solid papers according to the PEDro scale and papers that get a 2, 3, or 4 they're not as strong. So we have students do that stuff, but they don't fully understand it. They don't fully understand blinding, matching, randomization, but they don't really see the big picture when it comes down to the statistics. They are grading the papers, but I'm really harping on the level of evidence, I feel like this is a building block. (Conners)*

***Clinical Practice***

*They're using it (EBP) with an example patient...how are they using it (on said patient) and actually force them to use evidence-based practice while they are working on a treatment for their patient. They're going to be responsible for finding the evidence that suggests that they should use this treatment or shouldn't. You know, something that helps support what they are doing in the clinical setting. (Dr. Lowder)*

*What I suggest is to do some kind of assignment...where students have to interact with their ACIs. So maybe they have to together form a clinical question or maybe the student has to create a clinical question and then they have to go over it with their ACI and their ACI is to sign off before they can turn it in for class. (Dr. Ellis)*

Each of the implementation strategies discussed by the instructors demonstrated their commitments to providing students with opportunities to use evidence-based practice concepts. It is important for educators to share how they include these EBP concepts, and the above information should serve as a basic foundation for instructors to modify to best fit their own program goals.

## Discussion

Introducing evidence-based concepts to students and utilizing evidence-based teaching strategies appear to be valued by educators who have already adopted EBP as part of their athletic training curricula. Three themes emerged to establish educational strategies used by these educators: curricular emphasis, teaching techniques, and student activities. The identified themes provide a framework for athletic training educators to develop their own approaches to implementation.

### *Curricular Emphasis*

The curricular approach presented by the participants lent support to the research engagement model of Martin et al (Martin, Myer, Kreiswirth, & Kahanov, 2009). This model suggested sequential implementation of research-based knowledge and skills into education programs. As evidence-based concepts align well with research skills, curricular inclusion of these concepts would enhance the educational experience and preparation of our future professionals. As practicing athletic trainers must be able to create sound clinical questions and evaluate research pertaining to those questions (Sandrey & Bulger, 2008), educators must begin to embed these concepts within entry-level preparation. Establishing the goals of implementation, using teaching methods to foster student learning, and providing specific activities for students to complete will help to solidify EBP as a component of entry-level curricula.

### *Objectives for Content Inclusion*

The educational objectives associated with the revised Bloom's taxonomy require understanding of lower levels of learning prior to developing higher level learning processes (Larkin & Burton, 2008). As EBP entails multiple layers of knowledge adding

to the steps of an evidence-based inquiry, (including statistical familiarity and incorporation in the clinical setting), these concepts are well-suited to progressing evidence-based concepts via the taxonomy within educational curriculum. The learning objectives discussed by the educators are structured within the taxonomy and support current nursing assessment methods and clinical teaching that align cognitive processes and knowledge to achieve diagnostic reasoning (Larkin & Burton, 2008; Su et al., 2005).

*Pedagogy*

The pedagogical emphasis presented by the participants illustrates the need discussed by Schellhase for athletic training educators to reference research on effective teaching methods, which often originates in the broader educational realm (Schellhase, 2008). Proven teaching techniques, such as problem-based learning (Barrell, 1998), enhance student learning and prepare students for the decision-making requirements needed as a professional. Beyond specific teaching strategies, educational approaches must be grounded in student knowledge level and understanding. Instruction must begin at a point students can grasp and then progress to more complex ideas that require higher levels of student application and synthesis. (Bain, 2004)

*Incorporating Evidence-Based Instruction*

Mastery of content knowledge must begin with simple principles and develop to more advanced skills of evaluation, in accordance with Bloom's taxonomy (Boone et al., 2005; Larkin & Burton, 2008). Early in instruction, information relating to EBP should be specific to the processes of evidence-based skills, such as the five steps to conducting an inquiry. Classroom activities should encourage student involvement and be relevant to clinical practice (Cameron et al., 2005). Burns and Foley, for example, discuss a two-

day freshman nursing seminar that instructs students on how to conduct a database search, access journal citations using different search strategies, limit search results, and download full text articles (Burns & Foley, 2005). Following instruction, nursing students are required to complete these skills on their own. During the subsequent semester, a full freshman course addresses the following objectives: 1) identifying EBP characteristics, 2) discussing steps of an evidence-based approach to clinical practice, 3) defining EBP, 4) comparing traditional EBP approaches to answering clinical questions, 5) identifying barriers to EBP, and 5) identifying effective strategies to using best evidence in clinical practice. This early implementation of lecture content, supplemented by assignments, allows nursing students to begin to use and perform evidence-based inquiries related to clinical practice (Burns & Foley, 2005). Other research (Yousefi-Nooraie et al., 2007) demonstrates that the statistical concepts of reliability, validity, sensitivity, specificity, likelihood ratios, and numbers needed to treat are not appropriate content items for beginning stages of evidence-based instruction and that question formulation, literature searching, and introduction to systematic reviews were concepts appropriate to early course instruction.

With the layers of EBP knowledge in mind, athletic training educators can incorporate concepts of the evidence-based process, such as the steps of EBP, searching for relevant literature, and developing a clinical question, in early courses of their curriculum (Yousefi-Nooraie et al., 2007). Topics for courses later in educational curricula might include critical appraisal, diagnostic probabilities, clinical versus statistical significance, and communicating evidence to others (Yousefi-Nooraie et al., 2007). At the undergraduate level, implementation of these concepts should help to meet

the goals of enhancing critical thinking skills and developing an understanding of clinical research as provided in the NATA education competencies (Burns & Foley, 2005; Winterstein & McGuine, 2006).

Teaching strategies focusing on EBP concept implementation should be developed for all levels of education, from undergraduate to continuing education (Ciliska, 2006). Our research revealed that select undergraduate athletic training educators are in fact incorporating EBP concepts into undergraduate courses, though the methods of instruction have not been evaluated for effectiveness of skill acquisition or behavior change in students. Educational research on effective methods of teaching EBP is limited in all health professions and should be further investigated (Ciliska, 2006). Athletic training educators should be open to adopting evidence-based teaching methods and evaluating the results with the intent of dissemination to other professionals.

*Shifts within Educational Design*

Current NATA Educational Competencies (NATA, 2006) require that athletic training students develop and master related to critical thinking, clinical skill development, and research. As EBP embodies each of these concepts, structure of curricula should transition to include EBP with the understanding that it can be achieved in steps. While most educators interviewed in this study valued full curricular approaches across all faculty members and years of student enrollment, smaller strides can be taken to achieve implementation. Our findings support previous medical teaching models (Wanvarie et al., 2006) which indicate that evidence-based skills should be merged within existing courses and integrated throughout the curriculum. For athletic training, these courses could include therapeutic modalities/rehabilitation, evaluation

courses, and research design, and would be complimented by introduction of basic steps, terminology, and skills related to EBP. Adjustments to course topics and layout could open valuable time for presentation of EBP concepts.

Research has documented barriers to implementation of evidence-based practice in clinical practice and education in professions such as physical therapy (Jette et al., 2003) and nursing (Brancato, 2006; Cameron et al., 2005; Yousefi-Nooraie et al., 2007; Ciliska, 2006). These barriers include, though are not limited to, lack of time, knowledge, access to research materials, confidence in EBP skills, and institutional or employer support. Potential for these barriers to impede EBP concept implementation exists within athletic training education due to the nature of the combined didactic and clinical instructional requirements. Future research reports will include more detailed and specific presentation of the educational barriers identified by the athletic training educators featured in this study. In the meantime, instructors wanting to incorporate EBP within their courses should be proactive in overcoming personal and institutional barriers related to EBP through continuing education opportunities within the profession.

**Limitations**

The athletic training educators who participated in this study constitute a specific, purposive, non-randomized sample that may not represent the full population of evidence-based instructors, including entry-level master's program educators. The self-report nature of data also could be a limitation, as it is assumed that all participants were truthful in their responses. It is recommended that application of the evidence-based strategies presented be considered by individual athletic training educators for their compatibility with personal and programmatic teaching philosophies, methods, and

objectives. Each ATEP should adapt and utilize the results of this study to compliment their own current pedagogical methods.

**Conclusions**

Concepts relating to EBP should be instructed to undergraduate students enrolled in entry-level ATEPs. While a full curricular approach is preferred, small steps can be made toward incorporation of these topics within already existing courses. Though evidence-based concepts have yet to be included in NATA Educational Competencies (NATA, 2006), instructors should be proactive in placing this information within their didactic curricula, as well as encourage its use during clinical experience. Developing clinical experience that integrates research components (Winterstein & McGuine, 2006) will assist in promoting critical thinking, potential research interest, and further development of the available body of knowledge of our growing clinical practice. As this concept expands in athletic training, educators should be creative in how they implement EBP within their programs and share their experiences with the profession. Entry-level education is an ideal venue for inclusion of EBP concepts such as defining clinical questions, searching for evidence to enhance decision making, evaluating literature, and applying findings clinically.

Future research should continue the shift away from, "is EBP an important concept to teach?" and move toward, "how do we teach EBP?" (Yousefi-Nooraie et al., 2007). Educators and researchers should evaluate best practices for teaching evidence-based concepts and establish evidence to support these models. Additional research should investigate the influence of evidence-based concept instruction on use of EBP as a practicing clinician and subsequent improvement in patient outcomes.

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**Table III.1**

***Participants' Demographic Information***

| Participant Pseudonym | Sex | Terminal Degree | Years Teaching Experience | Accreditation Time |
|---|---|---|---|---|
| Conners | M | No | 18 | 12 |
| Dr. Ellis | F | Yes | 9 | 4 |
| Dr. Frissel | F | Yes | 18 | 14 |
| Dr. Front | F | Yes | 26 | 13 |
| Dr. House | F | Yes | 15 | 20 |
| Dr. Lowder | F | Yes | 11 | 40 |
| Mendelsen | M | No | 10 | 14 |
| Dr. Mensou | F | Yes | 20 | 10 |
| Miser | F | No | 10 | 8 |
| Dr. Stevens | M | Yes | 23 | 20 |
| Westin | F | No | 2 | 4 |

**Table III.2**

***Protocol of Interview Questions***

| |
|---|
| What sparked your initial interest in EBP? |
| What makes EBP important to you? |
| What is your personal process of EBP? |
| What is your personal approach to intertwining EBP in the classroom setting? |
| Please discuss the process you utilized to implement EBP concepts into your program. |
| What barriers did you encounter when implementing EBP concepts into your program? |
| Please discuss the courses that you have implemented EBP concepts within and any associated assignments. |
| How do you evaluate the impact EBP has had/is having on your ATEP? |
| How do you determine and/or instruct how to apply the evidence with patient outcomes? |
| What advice do you have for programs that have interest in introducing EBP to their curriculums but have yet to do so? |
| What steps do you feel could be taken to broaden the use of EBP in the AT profession? |
| What does your future vision of EBP and athletic training education include, both within your own program and nationally? |
| When beginning an EBP inquiry, what sources do you turn to first, and how do you instill that process in your students? |
| What other athletic training education programs and/or specific educators do you know of that are utilizing EBP in undergraduate education? |
| What is your response to clinicians that believe EBP is placing too much emphasis on research and not enough on clinical experience? |
| Are there any aspects of EBP that I have not specifically asked about that you would like to discuss? |

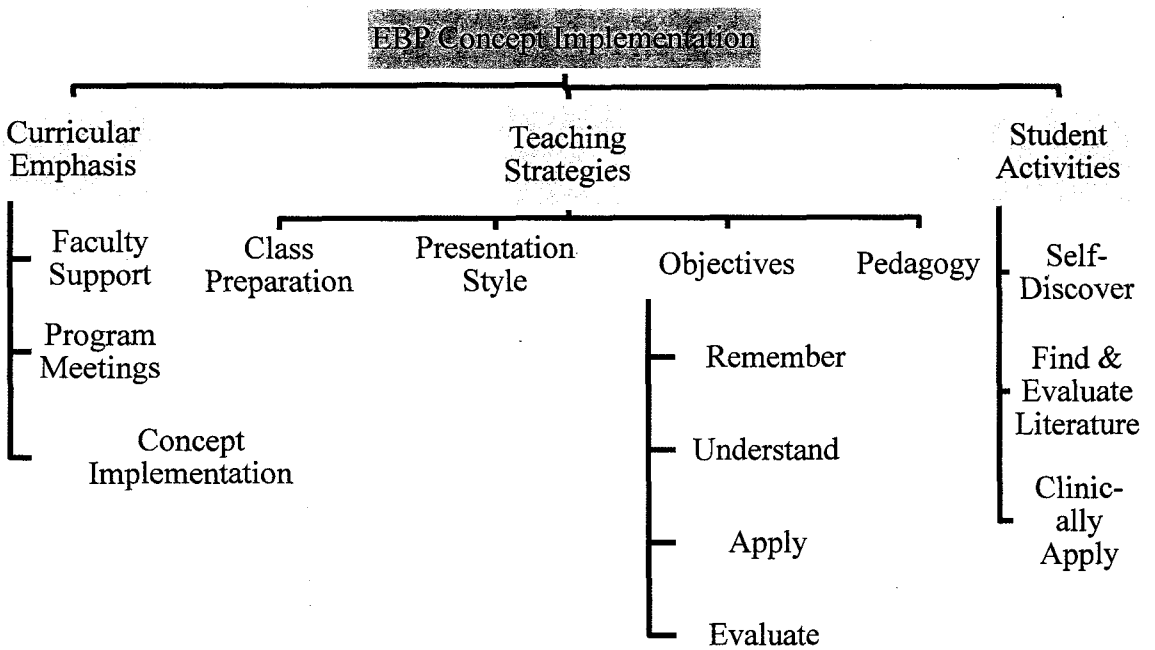
**Table III.3**

***Undergraduate Athletic Training Courses that Incorporate Evidence-Based Practice Concepts***

| | Frequencies |
|---|---|
| Therapeutic Modalities | 6 |
| Evaluation (upper or lower extremity) | 5 |
| Therapeutic Rehabilitation | 2 |
| Practicum | 2 |
| General Medicine | 2 |
| Research Design | 1 |
| Professional Development | 1 |
| Organization & Administration | 1 |
| Independent EBP Course | 1 |

**Figure III.1**

***Conceptual Framework of Overarching Theme and Associated Categories***



# Chapter IV

## Project IB

## Overcoming Barriers to Implementation of Evidence-Based Practice Concepts in Athletic Training Education: Perceptions of Select Educators

Title: Overcoming Barriers to Implementation of Evidence-Based Practice Concepts in Athletic Training Education: Perceptions of Select Educators.

Authors: Sarah Manspeaker, Bonnie Van Lunen

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**Introduction**

Health professions have demonstrated a strong commitment to evidence-based practice (EBP), as it supports the combination of patient values and clinical expertise with strong research evidence (Kring, 2008; Kronenfeld et al., 2007; Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996). In athletic training, this commitment has been noted in recent years through the National Athletic Trainers' Association (NATA) in its efforts toward continuing education opportunities involving EBP (Hertel, 2005), grant funding for EBP related research, and formatting of position statements to match the Cochrane evidence-based grading scale (Kronenfeld et al., 2007). These emphases are important and essential; however, we also should emulate the EBP frontrunners of medicine (Petrisor & Bhandari, 2006; Straus et al., 2004; Wanvarie et al., 2006) and nursing (Burman, Hart, Brown, & Sherard, 2007; Ciliska, 2005; Jack, Roberts, & Wilson, 2003; Kring, 2008), in designing educational curricula to include evidence-based concepts to prepare students to act as evidence-based practitioners.

The need for EBP inclusion in athletic training is multi-faceted (Kronenfeld et al., 2007; Steves & Hootman, 2004). Specific areas of emphasis of EBP reside in improving patient care (Steves & Hootman, 2004), support for licensure, third-party reimbursement (Hertel, 2005), access to current evidence-based information, dissemination of knowledge (Denegar & Hertel, 2002), and the ability to demonstrate cost-effective care (Kronenfeld et al., 2007). While each of the aforementioned areas is very important to the progression of athletic training, it is imperative that entry-level programs begin to educate students in these areas to better prepare them to overcome these professional obstacles in the future.

Preparation of the entry-level clinician to use EBP should include integration of the associated concepts into educational programs. Curricula of nursing (Kring, 2008; Stevens, 2004) and physical therapy (Gwyer, 2004; Portney, 2004; Slavin, 2004) have begun the transition toward this inclusion via educational competencies. Primarily, these competencies focus on developing skills in the five areas of EBP: defining a clinical question, conducting a targeted literature search, critically analyzing the literature, applying clinical expertise, and evaluating the overall process (Slavin, 2004). Current NATA Educational Competencies (NATA, 2006) require clinical skill development, critical thinking, and research, as components of entry-level education curricula. While these competencies help to develop the athletic training student, they do not specifically address EBP. The NATA Educational Competencies will be updated and published in the fall of 2010 and will include an EBP focus (NATA, 2009). Therefore, there is an immediate need for education within these concepts and the methods by which to incorporate them into practice. As the NATA, CAATE, and Board of Certification have formed an alliance to collaborate on issues facing athletic training (Hunt, 2009), their cohesive support of EBP infusion, as spearheaded by the Executive Committee on Education (NATA, 2010), is anticipated.

While other health professions have implemented EBP, there have been many documented barriers to this inclusion in both clinical practice (Brown, Wickline, Ecoff, & Glaser, 2009; Jette et al., 2003) and didactic realms (Bhandari et al., 2003; Ciliska, 2006; Melnyk, Fineout-Overholt, Feinstein, Sadler, & Green-Hernandez, 2008; Petrisor & Bhandari, 2006; Yousefi-Nooraie, Rashidian, Keating, & Schonstein, 2007). These barriers include, though are not limited to, lack of time (Bhandari et al., 2003; Brown et

al., 2009; Jette et al., 2003; Melnyk et al., 2008), knowledge (Brown et al., 2009; Petrisor & Bhandari, 2006; Yousefi-Nooraie et al., 2007), access to research materials (Ciliska, 2006; Melnyk et al., 2008), confidence in EBP skills (Jette et al., 2003), and institutional or employer support (Bhandari et al., 2003; Brown et al., 2009; Melnyk et al., 2008). The shared didactic and clinical instructional requirements of athletic training education create an environment conducive to these barriers. There is a need for athletic training to move toward implementation of evidence-based concepts in undergraduate education despite the presence of barriers. By recognizing the need for student EBP concept mastery, and the potential issues an educator may face when trying to implement these components, strategies can be developed to overcome these obstacles.

The purpose of this study was to evaluate select entry-level undergraduate athletic training educators' experiences and use of EBP concepts. The focus of the investigation was to establish the need for evidence-based practice implementation and the barriers associated with its inclusion in the educational realm. Due to the subjective and insight oriented nature of this inquiry, qualitative design best suited the goals of the study (Patton, 2002).

## Methods

### Participants

Eleven educators (3 males, 8 females) (Table IV.1) currently instructing in CAATE-accredited undergraduate entry-level athletic training education programs (ATEP) were interviewed regarding their views on the EBP process, barriers to implementation of associated concepts, and strategies to overcoming these barriers. Educators were interviewed by one researcher (SM) via telephone during the spring and

fall 2008 academic semesters. The purposeful sampling method utilized included snowball/chain sampling in combination with critical case sampling. Snowball sampling involves recognition of individuals believed to have the most knowledge about the phenomenon to be studied, in this case use of evidence-based practice, gaining their views and beliefs regarding the topic, and asking that he or she provide names of others who they believe to have knowledge in the area (Patton, 2002). Participants were contacted after their names were provided by other athletic training educators involved with the study. Educators known to provide instruction solely at the master's level were excluded from participation. When saturation of data, or redundancy in answers, occurred, the sampling process ceased. In addition to colleague recommendation, criterion sampling was used to ensure that participating individuals met two criteria, 1) current involvement (within the past 12 months) within an undergraduate ATEP and, 2) utilization of evidence-based concepts within their instructional methods. Utilization of evidence-based concepts was confirmed with each participant via email invitation and constituted a "yes" answer to the following question: "Do you currently include evidence-based practice in athletic training courses?" The small purposeful sample was targeted to attain the richest information possible regarding the topic of teaching EBP (Patton, 2002).

**Design**

The qualitative design best suited for this study was that of emergent design combined with modified-grounded theory. Flexibility to develop the qualitative inquiry as the interview process transpired was accomplished through the emergent design structure (Patton, 2002). Openness to fully examine all paths in which the data and

questions led during the interviews was permitted with this design; all conversation was encouraged regardless of deviance from the initial questioning protocol. Meaning, structure and experiences relating to the topic of EBP implementation were identified during theory evaluation and explanation (Patton, 2002; Pitney & Parker, 2009).

A semi-structured interview containing open-ended interview questions was created with the goal of attaining the experiences of athletic training educators regarding evidence-based practice concepts (Table IV.2). As described in emergent design (Patton, 2002), the researcher encouraged participants to elaborate, define, and/or clarify answers during the interview, while the flexibility to deviate from set questions was maintained. Interviews were tape-recorded and transcribed for analysis. The study was approved by the human subjects committee as an exempt project by the University. To maintain confidentiality, all participant names in the discussion are pseudonyms.

During interview analysis, the research team identified themes, patterns, and categories of data with subsequent comparison within and between participants (Patton, 2002). Patterns initially were identified during interview conduction and provided the basis for theme development during coding. Confirmation, expansion, and sub-categorization of the data were performed by the primary researcher (SM) until data categories were saturated and/or exhausted (Patton, 2002; Pitney & Parker, 2009). Constant comparison allowed for the confirmation of emerging theories and patterns, thus establishing the meaning and structure of participants' experiences regarding EBP (Patton, 2002; Pitney & Parker, 2009).

Trustworthiness of the data was established via triangulation, peer review, and participant checking (Patton, 2002; Pitney & Parker, 2009). Multi-analyst triangulation

(Patton, 2002) occurred via evaluation of data by two members of the research team who analyzed transcriptions and discussed emergent themes. An athletic training educator with knowledge of qualitative research conducted the peer review (Patton, 2002) by examining identified themes for consistency and significance. Lastly, participant checking (Pitney & Parker, 2009) occurred through review of transcript coding results by select participants for their agreements with identified themes and patterns.

**Results**

Evaluation of transcribed data revealed themes relating to the need for EBP in athletic training, perceived barriers to implementation within CAATE-accredited undergraduate programs, as well as strategies to overcoming barriers. The conceptual framework of themes and associated categories is located in Figure IV.1.

***Need for EBP in Athletic Training***

During interview conduction, it became evident that educators' expressed a need for EBP inclusion in athletic training. Initial discussion of this theme stemmed from educators detailing why they felt undergraduate education should introduce these concepts.

> *You are doing your students a tremendous disservice if they don't hear these terms and understand that this (EBP) is out there...because I think this is not a fad. I think that this is an actual appropriate transit of trying to look at where the best way to go for this is. So for other programs, I think you just get it in, you've got to start somewhere. –Dr. Stevens*

Further needs discussion focused on the categories of desire for respect of the athletic training profession, use of EBP as a decision making tool, and justification for third-party reimbursement.

*Respect*

Educator's indicated that increasing respect for the profession hinders on the ability to justify our practice decisions, particularly in comparison to other health professions.

> *Well, I think it (EBP) drives health care. If athletic trainers want to be considered part of the health care team, then we need to adopt those principles in our everyday work. It's the thing that gets you recognition now in terms of credibility in healthcare. –House*

> *I really want to see athletic training go far, I want it to be respected as an allied health profession, to the extent that physical therapist or occupational therapist is respected and especially with the debates going on about our profession. I think evidence-based medicine is going to really help to identify who we are and signify our importance--why we're needed, why we should be kept around. --Westin*

*Tools*

Educators articulated their perceptions of how EBP can be used as a tool in clinical decision making and allowing students to ask, "why?" in a structured and purposeful manner.

> *It's (EBP) another tool, another piece to our knowledge, so that we can make a better decision about what to do or what not to do. It is a tool to help you be more effective. That's kind of how I use it. –Dr. Lowder*

> *So we try to get students to understand that it's not just this esoteric concept coming down from above, it's really something that you use every day, so why wouldn't you do it in management of your patients? –House*

> *Personally, I'd like to see it (EBP) just as another tool in the toolbox that clinicians use, or educators use, in the classroom, you know, a great way to get it across is to question why. If a student asks a question, instead of answering them with what you know, tell them to go look. –Westin*

*Reimbursement*

Support toward gaining third-party reimbursement was one of the greatest needs expressed by educators. They discussed the link between evidence and use of effective treatment practices, such as these examples from Miser and House, respectively.

*I think probably showing of treatment efficacies of patient care. I guess bottom line, why would you do something that doesn't work? Why would you buy something that didn't work? It's going to keep people safe first; it's going to keep our bottom line down if we are doing more efficient treatment. I just think in general it's going to look better for us (athletic trainers) and I think we will be the better for it. –Miser*

*Because one of the big drivers in health care of evidence-based practice is insurance companies. Because they're tired of paying for stuff that doesn't work...maybe in the fee for service world, maybe we're probably seeing more there. You're not going to see it in athletic training because why wouldn't I do a contrast bath when I'm going to follow it up with three other things? --House*

Other educators spoke of concern reflecting both respect and reimbursement, and how they must progress together.

*Even with third party reimbursement, evidence is really going to play a role, the only way to prove who we (athletic trainers) are and what we do is by evidence, and without the evidence, we're not going to go anywhere. –Westin*

Lastly, Frissel discussed how other health professions are accountable to outside sources to justify their clinical practices.

*I think physical therapists do it all the time...They have to answer to somebody. They have to answer to the public. They have to answer to insurance companies. They have to answer to physicians. Because that patient is supposed to get better in eight periods that you see them by whatever means, range of motion, pain, inflammation, gait patterns, whatever it may be, and if they don't, you have someone to answer to. But we (athletic trainers) don't. We are not held accountable to outside stakeholders. –Frissel*

***Barriers to Implementation***

A second theme conveyed by educators was that of the perceived barriers to curricular implementation. Sub-categories within this theme included time available, knowledge, role strain, and gaps between the clinical and educational realms. Educators also discussed the courses in which they chose to implement EBP concepts (Table IV.3).

*Time*

**Time available in courses**

*(an article gave)...some examples of some things to do in classes which was a little overwhelming, in my opinion. I can't implement all that in my class, it's just too much. Again, you've got to keep a balance between making sure that the students know how to do the evals and know the basics. –Dr. Ellis*

*The only barrier I see is if there is any need for greater emphasis than we are currently doing (in our courses). For example, in the research class, to do what I know could be done better, and really discuss evidence-based practice to the depth I need, I would have to change the course entirely and this is the only research class they really get. So, I am forced to put a lot of things in, in a very short period of time. –Dr. Front*

*I think the other barrier for me was just figuring out where to put it in class. I had my own little evidence-based medicine PowerPoint and I never found time, so I just inserted right into the other PowerPoint, because otherwise I would have blown it off. –Dr. Ellis*

**Time available to instructors**

*...to find the time to understand not only the concepts, like specificity and sensitivity, likelihood ratios, what the evidence-based medicine and the five steps of it are, and understand what it is and what it isn't. So a lot of it was just time to have to read all of the information and digest it.--Dr. Ellis*

*I think time becomes a barrier. Even though we are division three, we're quite stressful with sports (and teaching). I think that time is, because it does take time to develop the student, to teach them these five steps, to make sure they are doing them adequately. –Frissel*

*Knowledge*

A second significant barrier to implementation of EBP is evident in educators' discussions of knowledge relating to EBP. Instructors detailed concern for whether educators truly know what EBP is, how to attain knowledge, barriers to mastering knowledge, and ultimately how to convey EBP knowledge upon students. An initial category within the knowledge theme addressed the misconceptions of what EBP is and what it is not. As Dr. Ellis articulated,

*I think there is a lot of misconception out there on what it is. You have to ask a clinical question and you have to figure out how answer it. I think the biggest misconception I had about evidence-based practice in the beginning, before I read very much, was that if you research the topic and read up on it, that was evidence-based practice. And really that's not truly evidence-based practice. This is just reading up on the literature. –Dr. Ellis*

Additional emphasis was placed on identifying beneficial sources for obtaining evidence-based knowledge.

*The other thing that we found is that there are some online modules which teach evidence-based a little bit, but you know it all depends on what the module teaches. You know some of them just teach the concept of it. There is one out at BU (Boston University) that teaches actual, you write a clinical question and it evaluates your clinical question for you which is really good. But you know that is only one of the five steps. And it's hard to teach all that in a forty-five minute session at the convention, in a lecture format.—Dr. Ellis*

Elaborating further on how to become comfortable with this knowledge during student interaction also elicited the importance of continued inclusion of EBP concepts in course work.

*For me, the biggest barrier was learning all the information and being comfortable talking about it to the students. This was not taught in my undergrad. This was not taught in my grad program, so I am kind of learning as I go. Some of the barriers were just being afraid to talk about it to the students, because I would get confused and then I would not look like I know what I'm talking about. But what I found was the more I talk about it, the better obviously I get at it. –Dr. Ellis*

Lastly within this theme, educators' emphasized the need for faculty to understand their knowledge shortcomings, while identifying the difficulty that can be associated with student mastery of evidence-based concepts.

*I think if you don't know the literature that could also be it (a barrier). I mean, if you don't keep up with what's out there, I think that could be very threatening. Because a student is going to be inquisitive and I think that self-efficacy is very important in that as well. If the faculty member doesn't want to be challenged, in a positive way challenged, or can have the confidence to say, "you know, I don't know that. I've got to take it to the next step too and I will get back to you on*

*that." I think young faculty members struggle with that, those of use that have been here for a while probably have a little easier time doing that.—Dr. Mensou*

*I think it is hard to get kids into the literature. I think it is critical that we do. You know in younger, when they are just trying to learn the parts, they are more worried about the "how-to," instead of the science behind it. Sometimes cramming the science down their throat makes them not like it. –Dr. Mensou*

*The other barrier is student understanding, and it's really not their fault. It's the concept, it's hard to grasp for some of them. Even after I've explained it and they have seen it and we've talked about it, they still don't quite get it. Maybe they understand it, but they don't get it. –Dr. Ellis*

*Role Strain*

Additional barriers to evidence-based concept implementation were manifested in the role strain illustrated by educators. Many educators wear multiple hats in their academic positions, thus leading to difficulty in devoting appropriate time to such concepts.

*I have to keep my assignments to a minimum because if I give too many assignments I'll get bogged down and can't focus on my research. So if you are at a teaching institution, where that is valued...and you don't have any research responsibilities, then you could do a lot of things with the students and spend more time doing assignments. –Dr. Ellis*

*I think that the typical things, time constraints, volume of patient loads...are holding true that athletic training as profession is just as it is with the other allied health professions. I think that folks in our profession that know how to do it (EBP), search it. –Dr. Front*

*...a lot of faculty don't incorporate it because it's easier to just use the prefabricated Power Points that come with the book, because that is more time efficient. And when you are being pulled clinically, and pulled academically, and pulled administratively, sometimes you have just go to get it done and you know, I think those issues might also impact the depth that it(EBP) is used. –Dr. Mensou*

*Clinical to Educational Gap*

The final category within the barriers theme emerged as the perceived gap between what is taught in the classroom and what is being performed in athletic training

facilities. Educators portrayed this gap as a barrier that must have compromise from the academic and clinical supervisor standpoints.

> *I think sometimes we get results, especially in academics and we get a little overzealous and say, "well of course this is best. Why aren't we doing it in the athletic training room?" I think as educators we have to do a better job of not only educating our students, but educating the clinical instructors. –Mendelsen*

> *It's pretty hard to go in and just all of a sudden decide, "hey, guess what. The thing you have been doing, there is no evidence for that." It's a callus hit...you don't want to put practitioners on the spot. –Dr. Stevens*

> *As an educator in a program, I can start at the ground level and get those people, the clinical instructors that I am working with, and encourage them to use it (EBP) more. And if I do that by giving the students assignments, where they are utilizing it in the clinical with their ACIs and CIs, then maybe they'll start to use it more, you know the clinical instructors themselves. –Dr. Lowder*

> *...if I'm doing a literature review for a modalities class, I should be sharing that with our CIs as well as our students, in trying to make our clinical educators better in understanding...why they do what they do. --Mendelsen*

Educators also explained that clinicians should be open to new information, particularly when acting with students.

> *...the clinical part and the research have to come together (in educating students). And sometimes the clinical part has to take down some of their old thoughts and come to a new way of thinking and saying, "this really is better." And we really need to do this regardless of how comfortable we feel with it. – Mendelsen*

> *I think we all need to be current too, along with our assessment skills and rehab skills etc, I think we all need to be responsible as clinicians for being current. I think that individual responsibility is probably the biggest inhibitor (to use of EBP).--Miser*

**Strategies for EBP Implementation**

Educators echoed a common theme of recommended strategies for use toward programmatic implementation of EBP concepts. These strategies included identifying a

starting point for the individual educator and program, while establishing a foundational approach from the full ATEP faculty.

*Beginning Recommendations*

While educators agreed that a starting point must be established for EBP inclusion, the initiation point was vastly different. For example, Mendelsen recommended that the process begin with the individual educator through conversations relating to concept implementation,

> *...discussion with other educators as well as clinicians...As instructors, we have to keep learning through discussion with, and part of that has to be discussion with other educators as well as clinicians (on how to start). I would encourage them to begin the research process on their own. And looking at what is the best practice and how do they go about implementing that...If they are not looking at any literature or attending workshops on evidence-based practice on a certain topic that they are instructing or something, I would encourage them to start it as soon as possible. –Mendelsen*

In contrast, Dr. Front discussed that programs may not choose to implement EBP concepts until it is a requirement from CAATE or for the Board of Certification (BOC).

> *So to get them (ATEPs) to put it (EBP) in, I think it would have to be presented in such a way, 1) that it was required, and 2) that if they don't their (students) can't sit for the BOC exam. –Dr. Front*

Additionally, providing programming with the methods and skills needed to provide transition toward inclusion of these concepts was emphasized.

> *...what folks pay for when they come to (continuing) education is basically, "what can I walk out of here and dump in my program ASAP?" We've got to give people things that they can use. It's a gratification just like our students.—Dr. Front*

> *Probably about two years ago –maybe even three, when we sat down for our approved clinical instructor training, we sat down as a group, as this was really emerging in the discussions in athletic training, and said, "ok, what can we do in our program to make this more visible to our students and more evident versus us just talking about it or saying, 'oh yeah I'm going to do that' from a clinician standpoint?" And we just kind of all decided to take our own direction based on our course content with that, and so I think there has been much more delving*

*into the research, addressing it from a clinical standpoint when we are with the athletic training students in like a teachable moment setting in the athletic training room. I think it has been both formal and informal in many ways, but I think formalized through an ACI meeting and through our specific courses that we are teaching.—Miser*

*They (instructors) should read the orange Sackett book before they even start. They should read that little orange book before they even begin, because that was one of the mistakes that I made was that I didn't read that book and I had a real misconception about what it was...advise them to read the book first and then sit down, develop a sequence and work backwards.—Dr. Ellis*

*We, they, are not (implementing EBP) because they don't know it. I think we need to hold more workshops for people to first understand what it is, because I don't think I can do it unless I understand it. I think you first need progressive workshops. 1. What is evidence based practice? What is evidence based medicine? Understanding it and maybe giving us assignments to do it just like you do a student and let us walk through the process as a student would. 2. And then let's talk about now integrating into your teaching. I am a believer that unless you have done it, and can understand it, and not everybody has to do it, I am just a kinesthetic learner, that then; it's hard to teach it if you haven't done it or understand it. And a lot of people think they are already doing it. –Dr. Mensou*

*Faculty Approaches*

Educators also provided examples of how faculty within their own programs approached implementation of evidence-based concepts within curricula.

*We did a week long course and hammered a lot of implications of where evidence is and what does it mean, really defining it. But then (the course instructor) harped on how are we pumping into our education system and why? And are we making it a practice that is useful for our students so that it is benefiting the profession. --Conners*

*What are your goals? What do you want your students to know? If we want them (students) to know this (EBP concept), what do they need to know first? What do they need to know second and don't give them too much information because, you know every program is different I am sure. You can't overwhelm them. –Dr. Ellis*

*The program director (said) that this (EBP) was something we should be doing and that there is evidence to help support what we are doing in a clinical setting; we really started using that more in class. Then we tried to get people to use it more in the clinic. And I was both, I was in the athletic training room and I was also in the teaching. So, I really learned from some of those colleagues, that this is very important and why. So, we would have discussion, we would have like*

*little House bag lunches where we were talking about is this really effective for this type of an injury? It was kind of our EBP moment when we talked. It was like a little half hour discussion we would have with clinical and faculty staff together. –Dr. Lowder*

*We've recently been talking, the program and myself (clinical coordinator), about how we can implement it more in the clinical setting. What we'd like to do is implement an assignment where they're using it with an example patient...how are they using it (EBP) and actually force them to use evidence-based practice while they are working on a treatment for their patient. –Dr. Lowder*

**Discussion**

Preparing athletic training students for use of EBP as professionals appears to be valued by entry-level educators. Broadening the recognized need for implementation of evidence-based concepts is essential to initial development of EBP concepts in ATEPs, but barriers and associated manners to overcome these barriers must be cultivated as well.

*Need for EBP in Athletic Training*

The profession of athletic training is facing true issues in the form establishing third-party reimbursement (Hertel, 2005) and increasing respect as clinicians. Each of these issues has a strong link to enhanced training in evidence-based practice (Hertel, 2005). Establishing evidence that demonstrates the effectiveness of clinical interventions delivered by athletic trainers will provide strong support toward attainment of reimbursement. Accountability for this evidence has been limited in athletic training, while other professions, such as physical therapy (Gwyer, 2004), have moved toward significant implementation via educational reform, clinical application, and continuing education. As educators, we must introduce athletic training students to evidence-based concepts (Steves & Hootman, 2004) in order to prepare them to play an active role in future reimbursement discussions. If our students do not learn EBP while in entry-level preparation, where will they learn it? If we rely on NATA Post-Professional Programs to

implement, then we will only be communicating with a small percentage of the future professionals. All educators should provide students with the tools to use EBP in order to make sound clinical decisions, interpret clinical significance of research, and foster an inquisitive nature for new research (Hertel, 2005; Steves & Hootman, 2004). However, it is imperative that we begin this process early within the educational training of our athletic training students.

*Strategies to Overcome Barriers to EBP Implementation*

Health professions are acutely aware of the barriers to fostering an evidence-based approach to education and clinical practice (Brown et al., 2009; Gerrish & Clayton, 2004; Granger, 2008; Jette et al., 2003; Maher, Sherrington, Elkins, Herbert, & Moseley, 2004). Entities responsible for guiding educational preparation and professional development of athletic trainers, such as the NATA, should work toward establishing EBP as a necessary component of athletic training preparation.

*Time and Role Strain*

Athletic training educators identified time as a major barrier to implementation of EBP concepts. Most specifically, educators felt that there was not enough time in already competency filled courses to fit EBP material, nor did they have enough personal time to investigate and master EBP content. As a new field of competencies is introduced to athletic training education programs, former competencies should be evaluated for their relevance and support of evidence-based concepts. If a competency references a set of skills or knowledge that is not supported in literature, the nature of inclusion of such a competency should be evaluated. As educational items are evaluated and potentially

removed, small portions of courses should become available for implementation of EBP items.

Athletic training educational faculty face many challenges as they try to fulfill their roles in teaching, administration, service, research (Perrin, 2007), and clinical responsibilities. These roles in and of themselves require time; requiring educators to take emphasis away from one of these areas to obtain new knowledge and teaching strategies could be perceived as unrealistic by some educators. In order to combat these barriers, administrative support (both within collegiate institutions and national organizations), facilitation of concept mastery through workshops and tutorials, and establishment of a culture that is receptive (Gerrish & Clayton, 2004) to the changing paradigm of athletic training education will help to decrease the time and role restraints on educators.

*Knowledge*

Ensuring that current educators have the skills to incorporate EBP concepts into classroom teaching is a barrier to ATEPs. An ideal mechanism to EBP knowledge attainment could be through a full faculty approach. Faculty should display a commitment to the evidence-based process as more than just utilization of research, but rather as combining research with consideration for patient values (Ciliska, 2005). Enhancement of this mindset can be achieved through faculty development opportunities (Ciliska, 2006). Institutions may select to send faculty off-campus for skill development sessions, or they may choose to have outside experts travel to campus for training sessions (Ciliska, 2005). Regardless of the route chosen, it is important to create a core

of faculty who possess the interest, skills, and authority to maintain an evidence-based curriculum (Ciliska, 2005).

Additionally, faculty development opportunities need to be made available in an appropriate format (Ciliska, 2006) to encourage educators to develop areas of knowledge that they may be lacking. The influential bodies of athletic training, including the NATA and the Executive Council on Education, are actively working toward providing resources to infuse EBP in the near future. Possible formats for such materials include internet based tutorials and expanded publication of evidence related topics. Initially, these modes of instruction should focus on foundational concepts of EBP including formation of a clinical question and searching for relevant literature (Manspeaker, 2010). As knowledge increases, more application-based concepts of diagnostic probabilities and clinical significance should be addressed (Manspeaker, 2010). Combined with the release of the next set of NATA Competencies (Fall 2010), these educational modules should contain quality content that can be easily understood in a timely manner. Once educators have mastered content, an examination of effective ways to teach these concepts to students then can be evaluated.

Athletic training educators and researchers (Casa, 2005; Steves & Hootman, 2004) recommend that evidence-based concepts become a component of entry-level student knowledge. Casa, for example, recommends that educators approach, "every course…with honest assessments of the actual evidence to support the topics being covering… (these concepts can be) embedded within assessment, rehabilitation, modalities, administration, counseling, etc." (Casa, 2005). Implementation of student activities and assignments that engage learners to search, retrieve, appraise, present, and

critically analyze (Burns & Foley, 2005; Manspeaker, 2010) will allow students to develop an understanding of EBP. Furthermore, in keeping with educational progress, students should be encouraged to develop an inquiry based mindset, so that in the future they may contribute to the scientific nature of athletic training practice through research conduction and publication (Turocy, 2002).

*Clinical to Educational Gap*

Educators spoke of the gap between the didactic and clinical realms of a student's educational experience as a barrier to implementation of EBP. These thoughts are reflective of recent publications (Hertel, 2005; Sauers, 2008) discussing the establishment of balance between scholarly and clinical activity. Scholarly activity, while of particular importance toward the advancement of evidence in athletic training, must be conducted and presented in manners that are usable and logical to clinicians. For example, scholars could supply more focus to outcomes based research involving randomized control trials that are linked to the questions that clinicians have. Additionally, educators could present information to clinicians in an appropriate manner that demonstrates value for clinician knowledge, while providing education outside the typical student classroom setting in effort to further incorporate approved clinical instructors into the educational process of EBP. In exchange, clinicians should be open to furthering their knowledge through evidence supporting their practice decisions (Denegar & Hertel, 2002). Clinicians may also benefit from more outcome-based research and randomized-control trials linked to the questions clinicians have. To further solidify this connection within the athletic training profession, journals should begin to transition toward inclusion of levels of

evidence for articles and clinical bottom lines, while textbooks can expand on recent trends to include sensitivity, specificity, and likelihood ratios.

**Limitations**

The participants of this study represent a purposeful, non-randomized sample of athletic training educators who may not be representative of the full population of instructors utilizing evidence-based concepts. The perception-oriented nature of the data also could be a limitation, as it is assumed that all participants were truthful in their responses. While the responses to this inquiry were variable in content, the value of such responses toward understanding EBP through select educators' eyes is important to progressing toward concept implementation. Other educators should review their own program content, assess relevant barriers, and design a plan for overcoming these barriers for the betterment of their students and the profession.

**Conclusion**

Athletic training education needs to include evidence-based practice concepts in order to prepare our clinicians for the current and future health care environment. Creating curricular modifications that effectively integrate EBP concepts should begin by assessment of current educational designs. Educators should review program content and competency distribution, assess relevant barriers, and design a plan for overcoming these barriers for the betterment of themselves as educators, their students, and the future practice of athletic training. As today's students are tomorrow's clinicians, we need to include EBP concepts in entry-level education to promote critical thinking, inspire potential research interest, and further develop the available body of knowledge in our growing clinical practice.

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**Table IV.1**

***Participants' Demographic Information***

| Participant Pseudonym | Sex | Terminal Degree | Years Teaching Experience | Role in ATEP |
|---|---|---|---|---|
| Conners | M | No | 18 | Clinical Coordinator |
| Dr. Ellis | F | Yes | 9 | Clinical Coordinator |
| Dr. Frissel | F | Yes | 18 | Program Director |
| Dr. Front | F | Yes | 26 | Program Director |
| House | F | No | 15 | Program Director |
| Dr. Lowder | F | Yes | 11 | Clinical Coordinator |
| Mendelsen | M | No | 10 | Program Director |
| Dr. Mensou | F | Yes | 20 | Program Director |
| Miser | F | No | 10 | Instructor/Asst ATC |
| Dr. Stevens | M | Yes | 23 | Program Director |
| Westin | F | No | 2 | Instructor |

*Prefix "Dr." in results indicates earning of a terminal degree.

**Table IV.2**
***Protocol of Interview Questions***

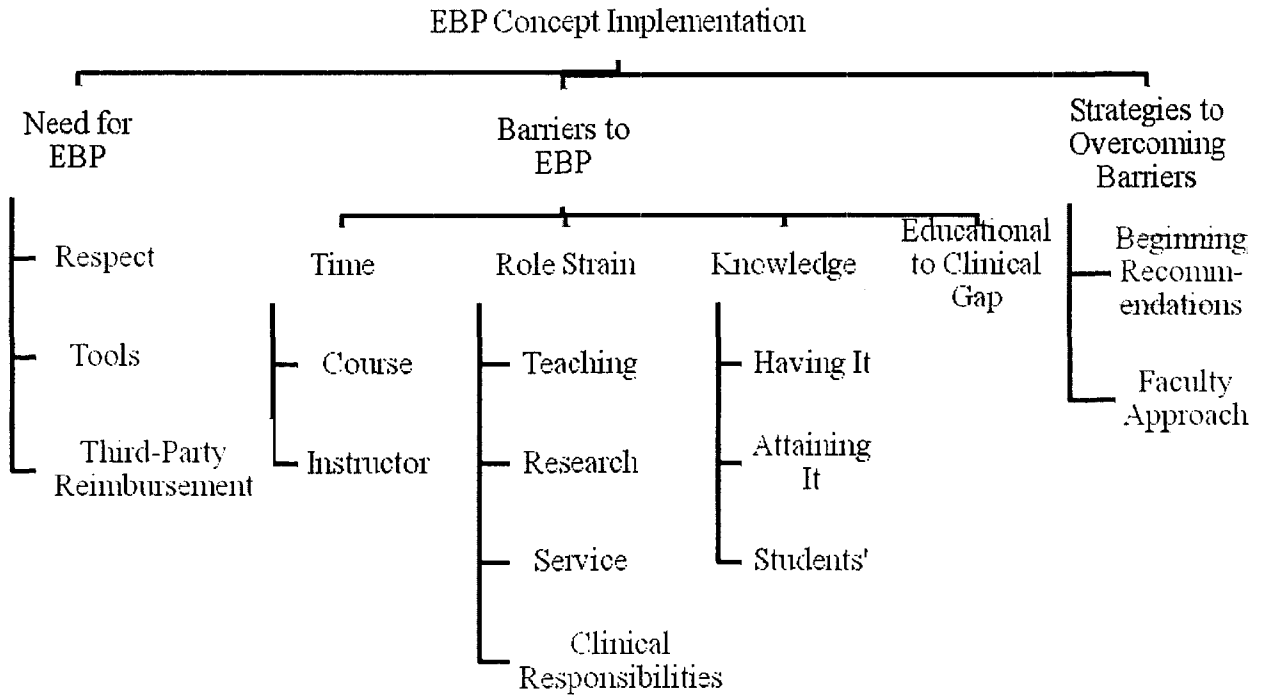
| |
|---|
| What sparked your initial interest in EBP? |
| What makes EBP important to you? |
| What is your personal process of EBP? |
| What is your personal approach to intertwining EBP in the classroom setting? |
| Please discuss the process you utilized to implement EBP concepts into your program. |
| What barriers did you encounter when implementing EBP concepts into your program? |
| Please discuss the courses that you have implemented EBP concepts within and any associated assignments. |
| How do you evaluate the impact EBP has had/is having on your ATEP? |
| How do you determine and/or instruct how to apply the evidence with patient outcomes? |
| What advice do you have for programs that have interest in introducing EBP to their curriculums but have yet to do so? |
| What steps do you feel could be taken to broaden the use of EBP in the AT profession? |
| What does your future vision of EBP and athletic training education include, both within your own program and nationally? |
| When beginning an EBP inquiry, what sources do you turn to first, and how do you instill that process in your students? |
| What other athletic training education programs and/or specific educators do you know of that are utilizing EBP in undergraduate education? |
| What is your response to clinicians that believe EBP is placing too much emphasis on research and not enough on clinical experience? |
| Are there any aspects of EBP that I have not specifically asked about that you would like to discuss? |

**Table IV.3**
***Undergraduate Athletic Training Courses that Incorporate Evidence-Based Practice Concepts***

| | Frequencies |
|---|---|
| Therapeutic Modalities | 6 |
| Evaluation (upper or lower extremity) | 5 |
| Therapeutic Rehabilitation | 2 |
| Practicum | 2 |
| General Medicine | 2 |
| Research Design | 1 |
| Professional Development | 1 |
| Organization & Administration | 1 |
| Independent EBP Course | 1 |

**Figure IV.1**

***Conceptual Framework of Overarching Theme and Associated Categories***



# Chapter V

## Project IIA

## Implementation of the Evidence-Based Teaching Model in Undergraduate Athletic Training Education

Title: Implementation of the Evidence-Based Teaching Model in Undergraduate Athletic Training Education

Authors: Sarah Manspeaker, Bonnie Van Lunen, Paula Turocy, Shana Pribesh, Dorice Hankemeier, James Onate

Intend to Submit to: Athletic Training Education Journal

**Introduction**

While other health professions have published teaching methods and course content relating to evidence-based practice (EBP) concepts,(Brancato, 2006; D Ciliska, 2006; Dinkevich, Markinson, Ahsan, & Lawrence, 2006; Guyatt, Cook, & Haynes, 2004; Johnston & Fineout-Overholt, 2006; Petrisor & Bhandari, 2006) such methods are not evident within athletic training education. Evidence-based practice encourages critical decision making through consideration of patient values, best available evidence, and clinician expertise(Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996). The use of EBP is important in Athletic Training, just as it is in other health professions. To ensure best clinical practice, athletic trainers should learn the process of conducting EBP inquiry (Sandrey & Bulger, 2008) and make it part of their practice. Learning the techniques and understanding the process early in professional preparation will be essential in the preparation of today's students to integrate evidence into their future clinical practice.

Establishing an expectation that entry-level health practitioners be "evidence users," in that they can locate, evaluate, and incorporate research from an evidence-based process into their clinical practices,(Fineout-Overholt & Johnston, 2005) must stem into athletic training. There has been a recent push toward infusion of EBP within health education, (Kronenfeld et al., 2007) due to its individualized approach to patient healthcare (D. Ciliska, 2005; Khan & Coomarasamy, 2006) with the primary goal of expanding the instruction and use of EBP. Teaching strategies, such as those found in nursing (Brancato, 2006; Fineout-Overholt & Johnston, 2005; Heye & Stevens, 2009; Johnston & Fineout-Overholt, 2006) and medicine literature, (Alguire, 1998; Hatala, Keitz, Wilson, & Guyatt, 2006) are needed to guide athletic training educators in their

formation of the course content that aligns with the next edition of NATA Competencies (Fall 2010); this edition will feature EBP-focused items for student mastery (NATA, 2009). These teaching strategies feature instruction of core EBP skills such as clinical questioning, literature search and appraisal, as well as levels of evidence, (Brancato, 2006; D Ciliska, 2006; Dinkevich et al., 2006; Johnston & Fineout-Overholt, 2006; Petrisor & Bhandari, 2006) that can be modeled later in athletic training practice.

Health professional curricula have begun integrating EBP concepts through learning opportunities that enhance evidence-based thinking through models containing clinical cases, relevant articles, activities requiring critical appraisal, and use of medical literature (Alguire, 1998; D. Ciliska, 2005; Hatala et al., 2006). While faculty in many Commission on Accreditation of Athletic Training Education (CAATE) accredited programs have implemented EBP into their curricula, no models have been published that are similar to those of other health professional curricula or demonstrate how to include these EBP concepts in models for future clinical practice.

The purpose of this project was to introduce a teaching strategy, the Evidence-Based Teaching Model (EBTM), to athletic training educators and evaluate outcomes of instructor and student factors relating to evidence-based concepts prior to and following its implementation. Specifically, we sought to establish the EBTM as a tool for athletic training educators' use to increase student knowledge, attitudes, and use of evidence-based practice concepts. This article focuses on instructors' goals for implementation, perceived ease of use, and outcomes related to the EBTM. Student outcomes will be presented in a separate publication.

## Methods

### Participants

Nine educators (2 males, 7 females) (Table V.1) from different CAATE-accredited undergraduate entry-level ATEPs were trained in the EBTM and interviewed regarding their experiences implementing the model during the Fall 2009 semester. A stratified purposeful, critical case sampling method was employed to identify educators who, 1) expressed interest in implementing a new teaching method involving EBP concepts, 2) matched for course instruction in the areas of therapeutic modalities or therapeutic rehabilitation, and 3) the research team believed to be responsible to follow the project through to completion. Of the initial contact list of 25, nine educators, and their respective students, began the project and completed all associated components. Participation was not limited by whether instructors were already teaching evidence-based concepts in their curricula. This population of athletic training educators served best for data collection sources due to the following criteria: the people and activity focused nature of the inquiry and procedures, (Patton, 2002) their ability to voice opinions, suggestions, and reflections as educators of a program, and consistent exposure to athletic training students.

### Design

We employed a qualitative program evaluation of the EBTM within the nine selected Athletic Training Education Programs (ATEPs). Our target population was comprised of the intended users of the EBTM, ATEP educators, and allowed for specific focus on the experience related to implementation outcomes of the model by gaining feedback from those directly involved. This approach permitted collection of aggregate

data related to the processes and outcomes of the EBTM (Patton, 2002). Additional purposes of our program evaluation included determining the goals and objectives for model implementation, and most specifically, the effectiveness of the EBTM (Patton, 2002).

After recruitment via email and telephone, all participants underwent an online training session for the EBTM during August 2009. See Table V.2 for the contents of the EBTM. The EBTM was designed to teach core EBP concepts including, 1) defining a clinical question, 2) searching for evidence, 3) critical appraisal skills, 4) using clinical expertise, 5) and determining appropriate treatment approaches (Straus, 2005). During the tutorial, instructors answered review questions to verify understanding of model content and evidence-based concepts; instructors must have answered 90% of the review questions correctly in order to continue participation, all educators met these criteria on the first attempt.

To further ensure instructor understanding of all material, semi-structured qualitative interviews of modified grounded theory were conducted via telephone by the primary researcher (SM). Interviews using this qualitative theory allowed for the meaning and structure of educators' experiences regarding the EBTM to be established through program evaluation (Patton, 2002; Pitney & Parker, 2009). The pre-interviews were used to establish educators' goals for use of the EBTM, anticipated outcomes and barriers to use of the model, as well as to gather demographic information relating to his/her institution, student population, and course for implementation. See Figure V.1 for the interview protocol.

During the semester, instructors implemented the EBTM according to the timeline determined during the pre-interview session, either a two or three-day instructional approach. The primary researcher was available to the instructor for advice, clarification, and encouragement via telephone and email throughout the period of implementation. On two occasions, once prior to EBTM implementation and once within two weeks of its completion, instructors administered the Evidence-Based Concepts: Knowledge, Attitudes, and Use (EBCKAU) survey to students. This instrument was created by the research team to assess students' knowledge, attitudes, and use of evidence-based concepts presented in the educational intervention. This survey and the students' results will be presented further in a subsequent publication. Upon completion of EBTM implementation, the educators participated in a 30-minute post-interview via telephone to identify the perceived outcomes, barriers, and ease of implementation of the EBTM.

All interviews were coded for recurrent themes and categories that underwent constant comparison within and between participants (Patton, 2002). Notes taken by the researcher during interview conduction served as the basis for theme identification. Once themes were established, data was condensed and sub-categorized to the point of saturation (Patton, 2002; Pitney & Parker, 2009). Several forms of data review were used to determine trustworthiness of the data. These methods included peer review, triangulation, and member-checking (Patton, 2002; Pitney & Parker, 2009). Peer review (Patton, 2002) was conducted by two athletic training educators with knowledge of evidence-based practice and qualitative research examined the data for accuracy of themes. Multi-analyst triangulation (Patton, 2002) was obtained as three members of the research team analyzed transcriptions and discussed the emerging themes. Lastly, select

participants were asked to review coded transcriptions for their agreement with themes and categories (Pitney & Parker, 2009).

**Results**

Analysis of coded and collapsed data revealed three primary themes relating to inclusion of the EBTM within undergraduate education. Themes included the overall need for an EBP presence in education, specific goals for implementation of the EBTM, and perceptions of the model itself. A framework of identified themes and categories is provided in Figure V.2.

***Need for EBP Inclusion***

An initial theme to emerge was that of the need to implement EBP concepts within educational aspects of athletic training. Instructors revealed their beliefs that EBP is a necessary component for the future and longevity of the profession of athletic training. Additionally, they expressed their views on the presence of EBP concepts within NATA Competencies and continuing education opportunities.

> *It's got to be something that we push at the national level, and also education programs have got to take some responsibility here. And that's why we kind of push it (within our ATEP) as much as we do. We are educating tomorrow's leaders, we need to work hard to make sure they understand the importance and the fact that we can't just go on doing what we've done forever without some type of evidence to back it up.—Dr. Cloud*

> *This is what the medical field is doing. We need to be on top of it so that we can enter the conversation. And if this (EBP process) is working for other professions, then we need to incorporate it more, because that's how we better ourselves as a profession. –Dr. Mott*

> *Incorporating it (EBP) into undergraduate athletic training programs, which I think is one way to look at this, maybe it should be one of the competencies that are required to teach and students to understand. –Perrott*

*The first thing is getting it (EBP) more into the educational system...(educators have) been trying so hard to figure out what the competencies are, that it almost takes competencies to get us to do something. –Dr. Mott*

### *Goals for Implementation*

A second major theme identified by our EBTM program evaluation emerged through the instructors' goals for implementation of the model. While answers varied between instructors, several categories emerged within this topic including, 1) what instructors' hoped students would gain from the model, 2) desire for interaction between students and clinical instructors (CIs), 3) benefits to the ATEP, and 4) personal benefits to the instructor. Subcategories were defined within the student gains category to specifically illustrate areas in which instructors hoped model implementation might influence their students. Table V.3 displays the thematic codes and supporting quotes for this section.

### *Perceptions of the Evidence-Based Teaching Model*

In addition to identifying what instructors hoped to gain from the EBTM, participants discussed the perceived usefulness and applicability of the model within their course after its implementation. These topics were presented through concerns, positive aspects, recommendations for improvement, and intended future use. Figure 3 features quotes regarding educators' perceptions of the EBTM.

## Discussion

Athletic training educators appear to value the EBTM as a tool to implement evidence-based concepts into curricula. Three primary themes emerged as educators described the need for EBP inclusion, their goals for implementation of the EBTM, and their perceived outcomes of the model.

### *Need for Implementation*

As athletic training heads into the future, it is facing issues related to educational reform requiring infusion of EBP concepts (NATA, 2009) and third-party reimbursement (Hertel, 2005). These topics are intricately related (Hertel, 2005), as fee-for-service is a major influence in health care; the underlying factor of fee-for-service is the ability to document positive outcomes for care provided. To maximize this opportunity, athletic trainers must be able to demonstrate that our clinical practice is grounded in evidence and that we are providing the validated best care for patients. As with any other reform, infusion of evidence-based practice will not occur quickly. The process must be cultivated within both the AT education and clinical environments. Educators should provide students with the skills inherent to EBP in order to foster clinical decision making, determine clinical relevance of research, (Sandrey & Bulger, 2008) and to promote new research through inquisition (Hertel, 2005).

Current athletic training practice, as with other health professions, is sometimes limited by the inaccuracy and irrelevance of out-of-date patient-care resources regarding patient care (Steves & Hootman, 2004; Straus, 2005). As athletic trainers become more familiar with the need for EBP, we can foresee a shift in the utilization of valid preventative, diagnostic, and treatment options for patient care (Straus, 2005). Nationally, progress toward inclusion of these concepts is evident in the cohesive agenda of the NATA, CAATE, and Board of Certification, (Hunt, 2009) to infuse EBP in all aspects of athletic training. In this manner, the EBTM was designed to assist educators implement these concepts within courses that already exist in curricula.

### *Goals for Implementation*

An initial sub-category to transpire from the data was instructors' goals for implementation of the EBTM. They specifically identified goals relating to students, Student: CI interactions, their athletic training program, as well as items for their own personal benefit.

#### Student Goals

The primary goals identified by educators relate to improving students' knowledge of research and ability to think critically. These goals align with other researchers' (D. Ciliska, 2005; Schellhase, 2008) who emphasized the importance of establishing objectives for teaching strategies early in the design process, prior to implementation, as objectives direct the instructional process. Ciliska (2005), suggested that successful curricular implementation of EBP begins with defining what the instructor expects of the student. Recommended evidence-based content objectives for student mastery typically include 1) establishing a clinical question, (Bilsker D. Goldner, 2004) 2) assessing medical literature, (Bilsker D. Goldner, 2004; Sandrey & Bulger, 2008; Steves & Hootman, 2004) 3) applying and using the best available information, (Sandrey & Bulger, 2008) 4) creating an environment for inquisition, (Hertel, 2005; Winterstein & McGuine, 2006; Yousefi-Nooraie, Rashidian, Keating, & Schonstein, 2007) 5) and implementing EBP in the clinical realm to establish best practices (Winterstein & McGuine, 2006). Current NATA Competencies (NATA, 2006) emphasize the need for student mastery of critical thinking skills and research thus making ATEPs an ideal venue for introduction of EBP concepts. The 5$^{th}$ edition of NATA Competencies will expand

on these critical thinking components by including specific requirements dedicated to EBP (NATA, 2009).

**Student: CI Interaction**

Clinical education offers a link for students between EBP theories and hands-on application of patient care (Brancato, 2006). A major stakeholder in the success of this link is the clinical instructor. Coomarasamy and Khan (Coomarasamy & Khan, 2004) found that integrating classroom teaching with clinical practice components improved EBP skills, attitudes, and behaviors of medical students. Educators in our study expressed interest in having the EBTM assist in cultivating a path for inclusion of EBP concepts by their clinical instructors. As the EBTM included assignments targeted at promoting evidence-based discussions between CIs and students regarding patient care, it seemed appropriate that the educators addressed this point during their interviews. One of the most interesting aspects of this discussion presented itself during the post-interviews, as most participant answers regarding the outcomes of EBTM implementation, both positive and negative, directly related to some aspect of the student and CI discussion assignments. They identified CIs' knowledge of EBP, time, and student contact as areas in which they noticed differences from the beginning to the end of EBTM implementation.

As clinical education is part of the requirements of entry-level athletic training curricula, implementation of EBP concepts should transcend into students' clinical experiences. The NATA Competencies (NATA, 2006) provide core behaviors that should be incorporated into education and professional practice. These behaviors include dissemination of new knowledge and promotion of research, (NATA, 2006) which are

both foundational components of the transition toward EBP inclusion. To assist in the placement of these concepts, athletic trainers who choose to serve as CIs should obtain knowledge of, and the ability to discuss EBP concepts, in order to maximize their professional responsibility and properly mentor students. Additionally, CAATE standards include provisions that ACI training must provide instruction in the areas of communication, mentoring, and appropriate clinical knowledge (CAATE, 2008). Thus, ACI training could be an ideal avenue for implementation of EBP concepts to help strengthen the link between didactic and clinical education (Brancato, 2006). Once CIs obtain the knowledge of EBP, it is important that they model the use of these concepts with students when making clinical decisions (D. Ciliska, 2005).

**Programmatic and Personal Goals**

Progression of EBP in athletic training depends on the cultivation of evidence-based practitioners who have knowledge in research, clinical experiences, (Raina P, 2004) and the ability to integrate both topics together. Athletic training educators must infuse these concepts within their courses. Use of the EBTM and establishing objectives for its implementation aligns with recent recommendations (D. Ciliska, 2005; Manspeaker & Van Lunen, 2010) that instructors approach EBP infusion in an organized manner involving establishment of goals, use of specific teaching methods reflecting those goals, and presence of activities for students to complete beyond the didactic environment.

***Perceptions of the EBTM***

To the best of our knowledge, no other evidence-based teaching model exists within athletic training education. It should be noted that most publicized educational

models of EBP instruction are focused on individual institutions' findings (Dinkevich et al., 2006; Thom, Haugen, Sommers, & Lovett, 2004; Wanvarie et al., 2006). The EBTM, however, was implemented at nine separate CAATE-accredited institutions representing five NATA districts and multiple courses. Therefore, the experiences of educators in this study represent a larger perception of potential model impact than most others found in educational research.

Overall, the educators valued the contents of the EBTM and intend to use all or part of the model in future courses. One institution in particular used the EBTM as a catalyst to create a full course in EBP for the upcoming academic year. This institution determined, as a faculty, that EBP should become a key foundation of their ATEP, and realigned content within several of their courses to create an available credit for a self-standing EBP course. With permission of the primary researcher, this institution is expanding on components of the EBTM to fulfill the content of this course including objectives, lecture materials, and student assignments.

The experiences of these educators should be embraced and reflected upon by other educators as they transition toward inclusion of EBP concepts in their curricula. Each program should evaluate its own faculty strengths and student learning styles as they develop plans for curricular implementation of EBP.

**Limitations**

Our participants comprise a small, non-randomized sample of educators with varying backgrounds in EBP. While educators were supplied with a tutorial, the contents of the EBTM, instructions for implementation, and researcher support, the researcher was not present for the EBTM instructional sessions. Therefore, it can only be assumed that

the implementation protocol was followed. Educators were permitted to add to instructional content, though they could not remove any pieces from the model or skip assignments. Disclosure of such changes was detailed to the researcher during post-interviews. Additional assumptions include that instructors gave maximal effort during tutorial completion and EBTM instruction, provided appropriate instruction to students during EBCKAU Survey administration, and answered truthfully during interviews.

**Conclusion**

The EBTM was viewed as successful by AT educators, because it fostered an inquisitive learning environment, critical thinking, and communication with CIs. As the 5th edition of NATA Competencies is proposed, this model can serve as a foundation for programs to consider as an implementation strategy, though other approaches do exist. Further elaboration of the EBP concepts instructed in the model should be included longitudinally throughout curricula. Utilizing teaching approaches that are valid and effective will help to enhance student retention of evidence-based practice concepts.

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**Table V.1**

***Participants' Demographic Information***

| Participant Pseudonym | Sex | Terminal Degree | Years Teaching | District | Research Role | Clinical Role | Prior EBP Instruction Experience |
|---|---|---|---|---|---|---|---|
| Grassly | F | No | 3 | 3 | No | Yes | No |
| Dr. Cloud | M | Yes | 10 | 2 | No | Yes | Yes |
| Dawes | F | No | 3 | 9 | No | No | No |
| Helenga | F | No | 5 | 4 | No | No | No |
| Dr. Humphrey | M | Yes | 16 | 3 | Yes | No | Yes |
| Harryson | F | No | 10 | 6 | No | No | No |
| Dr. Mott | F | Yes | 10 | 4 | No | No | No |
| Dr. Ressler | F | Yes | 14 | 4 | No | Yes | No |
| Perrott | F | No | 5 | 6 | No | No | No |

*Participant names are pseudonyms.

**Table V.2**

***Contents of the Online Training Tutorial and Instructor Manual***

| |
|---|
| Purpose of the EBTM |
| Informed consent for the research project as approved by the University |
| Steps to earning internal review approval from instructors' own institution if required |
| Steps of conducting an evidence-based inquiry |
| Evidence-based objectives for potential inclusion on syllabi |
| PowerPoint for lecture use |
| Test questions |
| Recommended articles for class discussions |
| Class activities for student completion |
| Rubrics for grading of student activities |
| Suggested timelines for implementation |
| Additional lecture content |

**Figure V.1**

***Interview Questions Regarding Implementation of the EBTM***

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**Interview 1: Pre-EBTM Implementation**

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How many years teaching experience do you have?

Which course do you intend to incorporate the EBTM in?
For how many years have you taught this specific course?
How many students are enrolled in this course, and are they all AT majors?
Please discuss your clinical responsibilities, if any.
Please discuss your research responsibilities, if any.
Was EBP part of your undergraduate or graduation education?

Pease briefly describe the admission process and where these students fall within your ATEP curriculum.
Please discuss the emphasis your program currently places on evidence-based practice.
Please discuss your background in evidence-based practice prior to going through the online tutorial for the EBTM.
Please discuss your goals for implementation of the EBTM within your course?
What timeline do you intend to use for EBTM implementation?
What specific questions can I answer for you regarding the EBTM?
Why did you select to implement the EBTM?
What concerns do you have regarding implementation of the model?
What impact do you feel the EBTM will have on your student's?
What steps do you feel could be taken to broaden the use of EBP in the AT profession?
Is there anything you would like to discuss that I have not specifically asked about?

**Interview 2: Post-EBTM Implementation**

---

Review information from previous interview:

Did you follow the timeline you identified in the pre-interview?
Please discuss how the concerns you presented in the pre-interview played out during implementation of the model. (Read instructor their answer from pre-interview)
Did you utilize any of the objectives provided within the Instructor Manual? If yes, which specific objectives?
In what ways was the EBTM helpful in meeting the objectives you selected?

Please discuss the aspect(s) of the model you found easiest to implement?
Please discuss the aspect(s) of the model you found most difficult to implement?
What aspects of the model could be improved and what specific suggestions do you have to accomplish these improvements?
Please discuss your perception of how the student's accepted the model, including content, activities and discussion.

Please tell me about the clinical supervisor discussion assignment.
    In what ways did this assignment influence student: clinical instructor interaction?
    What were your perceptions of this assignment overall?
Please tell me about the larger clinical decision making assignment.
    In what ways did this assignment influence student: clinical instructor interaction?
    What were your perceptions of this assignment overall?
Please discuss your use of the rubrics provided within the EBTM Instructor Manual.
Please discuss how well the content of the model fit the content of your course?
    Was it appropriate to your students' educational level and in what way?
    Please discuss how well content of the EBTM matched with the intended objectives of your syllabus?
In what ways do you feel the model may have influenced your student's perceptions of the athletic training profession?
Would you continue to use the model after this semester? (all or part)
Would you recommend the model to other educators within your ATEP?
    Outside of your ATEP?
    Are there other courses you think may fit well with the model and why?
Has your ATEP made any move toward further inclusion of EBP since the beginning of the semester? If yes, please discuss the process.
Is there anything I have not asked about that you would like to discuss?

---

**Figure V.2**

***Conceptual Framework of Themes Relating to the Evidence-Based Teaching Model***

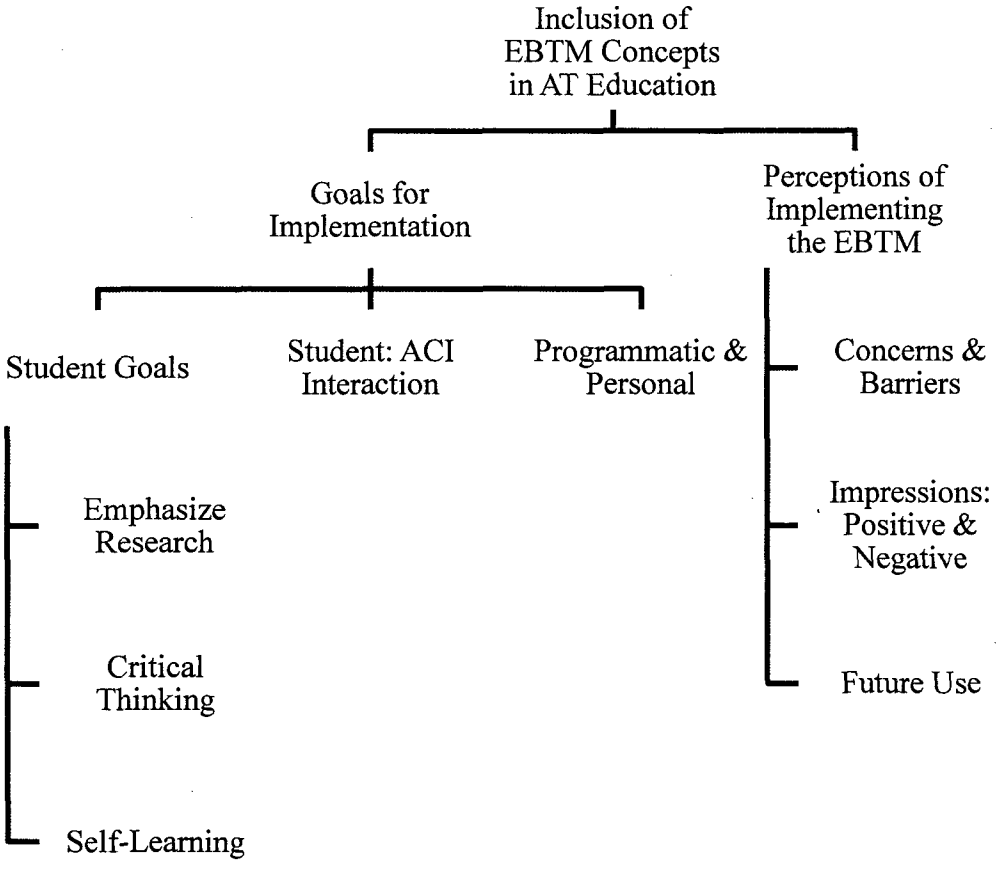

**Table V.3**

***Results: Goals for Implementation of EBTM***

| Pre-Interview Goals for Implementation | Post-Interview Perceived Outcome of Implementation |
|---|---|
| ***Research Related Goals*** | |
| *We want our students to be aware of the research that is out there and how to read it and how to interpret it. -Grassly*<br><br>*I'm hoping that this will help them...to formulate a research question and how to look critically at research.—Dr. Ressler*<br><br>*Hopefully, they'll be able to recognize that research is always changing and that you can't base all your opinions strictly off the book.--Dawes* | *I think that was, to me, the biggest success on the entire thing was, they really now know how to critique an article and for it to make sense on what they are looking for.--Harryson*<br><br>*They accomplished the ability to read research a little bit more critically and not just read it and take it as face value. Without a doubt I think that they have learned to construct a research question using the PICO format.—Dr. Ressler*<br><br>*I think that it helped them realize that research doesn't have to be a big, scary, formal process.—Dr. Mott* |

**Table V.3 Continued**

***Results: Goals for Implementation of EBTM***

| ***Critical Thinking/Decision Making Goals*** | |
|---|---|
| *I would like them to be able to tie it into critical thinking; I think that's the big connection. I want our students to be able to say, "here's a question that I don't know the answer to, how can I find the answer with good quality research?"—Dr. Cloud*<br><br>*Maybe they can start questioning some of the methods and techniques that we do (in the ATR). You know, why are we doing that, and is there evidence to support us using that type of modality or that type of rehab?—Dr. Ressler*<br><br>*I want them to think critically about what treatments they're giving. I want them to really think about that and hopefully will make them better clinicians for the future.—Perrott* | *I think it made them think through their process of why they are using what modalities. They learned a lot and they understand how to use this type of model and how they can apply it in the future.--Helenga*<br><br>*They're a little bit more willing to question things a bit better than maybe what they would have before, definitely.—Dr. Ressler*<br><br>*Well, for the first time, promoting it, I think just the whole idea that they knew that there was something out there that could help them explain why they were doing what they are doing.--Harryson* |
| ***Self-Learning*** | |
| *That they can become self-sufficient learners, that they don't have to always rely on other people's opinions.—Grassly*<br><br>*My goal is to have the student's think for themselves, to be able to disseminate the information and hopefully compare that to anecdotal experience.—Dr. Humphrey* | *This was a way for the students to give their own input into the situation (for patient care), because they did have something else that they could look at.--Harryson* |

**Table V.3 Continued**

***Results: Goals for Implementation of EBTM***

| ***Student: CI Interaction*** | |
|---|---|
| *I want them (students) to start educating their CIs a little bit too, questioning why they do this, why they do that, and choices they make.—Grassly*<br><br>*Incorporating more of these evidence things in and to get our CIs more involved with evidence-based practice and getting our students to discuss it with them.—Dawes* | *They really like getting feedback from our clinical instructors, I think that most of them responded that they felt like that was valuable to hear what another professional has to say and their input from that.—Dr. Ressler*<br><br>*The CIs responses weren't always the best, but in the overall scheme of things, there were still some good things that came out of it.—Dr. Ressler*<br><br>*I think anytime you create a conversation between a clinical instructor and a student, that both people benefit. I think that kind of assisted in that relationship.--Helenga*<br><br>*I think it was good for them to see the range of people and what they know, and also how maybe they can, in a nice way, kind of help their CI learn a little bit more.—Grassly* |

**Table V.3 Continued**

***Results: Goals for Implementation of EBTM***

| ***Programmatic Goals*** | |
|---|---|
| *I know that this (EBP) is a hot topic, and honestly I know that it will probably show up on the next set of educational competencies. So I think this is a great way to get us started in that direction.—Dr. Ressler*<br><br>*For the last several years, we've really tried to increase the amount of evidence-based medicine content...but we haven't specifically identified a way to do it.—Dr. Cloud*<br><br>*Undergraduate students need to be exposed to this (EBP). I wanted to teach it in some way, and I think it's (the EBTM) going to really help me figure out a way to teach it.—Perrott* | *Now that they (students) know these terminologies, I'm like, "this is competency stuff, this is stuff they need to be exposed to." –Dr. Mott*<br><br>*It greatly improved our evidence-based medicine component in the program. It actually has led to...a new syllabus being developed (for a new course), an evidence-based medicine syllabus. So it definitely helped streamline things for us.—Dr. Cloud* |
| ***Personal Goals*** | |
| *I could see how it's (the EBTM) done, see if it works better than some of the other units (of instruction), see if they get it better than some of the other concepts.—Perrott*<br><br>*It (EBP) was something that I didn't know anything about. So for me it was more personal. I was more interested in learning as much as I could about this because it is a buzz word, but I think it is an important buzz word.—Harryson* | *Giving me some good ideas for the future as far as just my teaching methods. I don't think I learned anything new from it other than the PICO stuff.—Dr. Ressler*<br><br>*I got to learn more about it (EBP), this was a nice way of kind of reiterating some of the stuff I have read, and it was a nice clear format.—Dr. Mott* |

**Figure V.3**

***Results: Instructor Perceptions of EBTM***

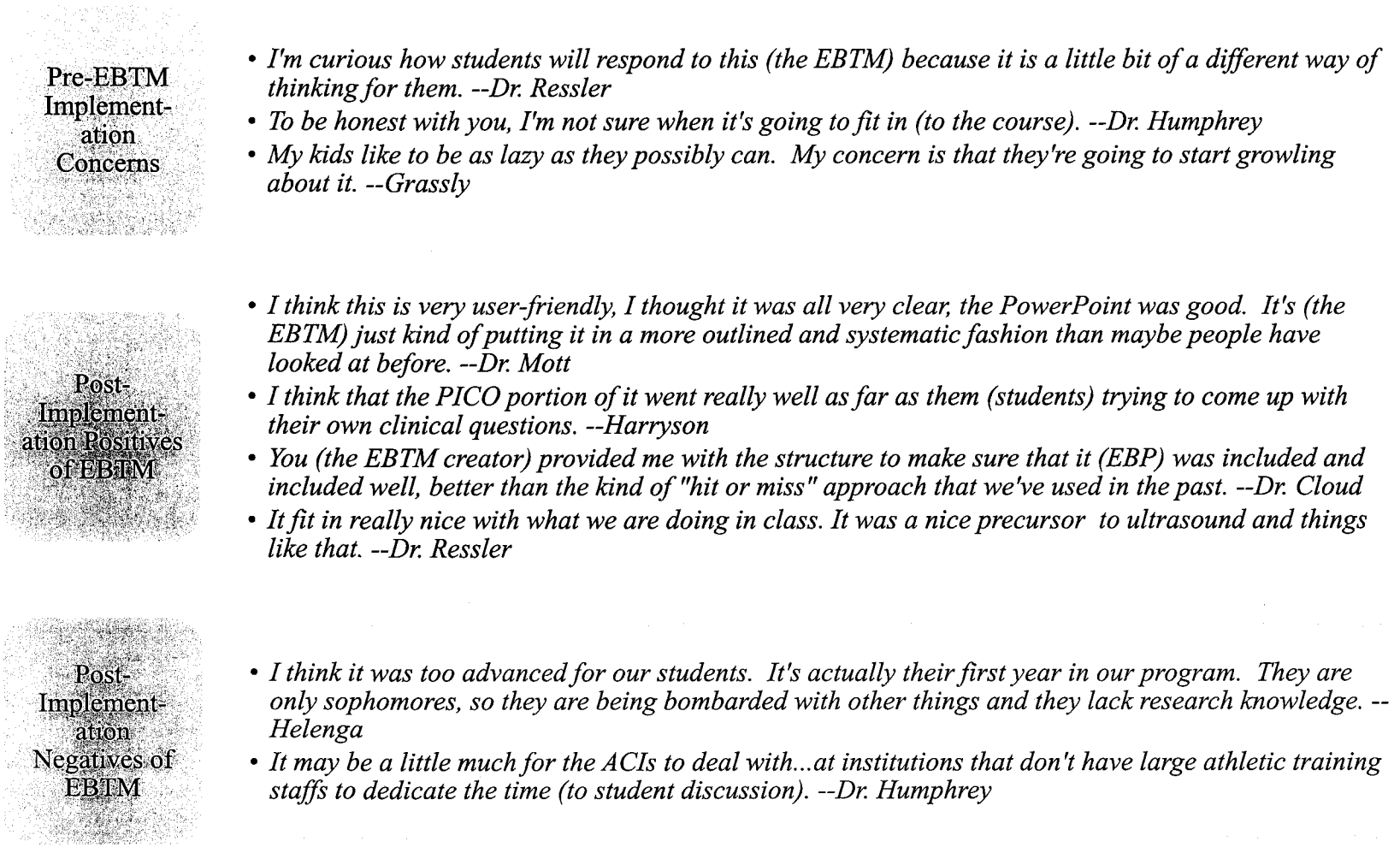

**Figure V.3 Continued**

***Results: Instructor Perceptions of EBTM***

| | |
|---|---|
| Suggested Improvements for EBTM | • *It may be better off later on in the curriculum where they have had some of those other classes (research design, modalities). --Dr. Humphrey*<br>• *I think a lot of the examples related to treatment, and I think evidence-based medicine needs to include diagnostic skills as well. --Dr. Cloud*<br>• *Unfortunately I hadn't covered ultrasound at that point (of implementation), which would have been really helpful because the article (the EBTM suggested) was an ultrasound article. --Dr. Ressler* |
| Burdens of EBTM Implement-ation | • *It's two class periods that you are taking away from other material that you thought you were going to have to cover this academic semester. --Dr. Humphrey*<br>• *It wasn't a burden whatsoever. It did cram me schedule wise a little bit (but) I thought this was a priority item so it was important to get it in there. --Dr. Cloud* |
| Future Thoughts on Incorporation of EBTM | • *I was going to ask you if that were alright if I did that (used it again). And I am not reinventing something like this. So if you don't mind. --Dr. Mott*<br>• *I would like to implement it with other things, especially within modalities so that things become clearer. --Helenga*<br>• *I plan to use the lecture that teaches them the steps of evidence-based practice and how to form the clinical question, and definitely the discussion with the clinical instructor. I may use the whole thing. --Perrott* |
| Courses Appropriate to EBTM Inclusion | • *I think it would be best (in) a clinical outcomes course or an advanced capstone course. --Dr. Humphrey*<br>• *I could apply it to the evaluation class and rehab would be good. --Perrott*<br>• *I believe it would fit in the eval and ther ex classes. --Grassly* |

# Chapter VI

## Project IIB

## Effects of the Evidence-Based Teaching Model on Student Knowledge, Attitudes, and Use of Evidence-Based Concepts

Title: Effects of the Evidence-Based Teaching Model on Student Knowledge, Attitudes, and Use of Evidence-Based Concepts

Authors: Sarah Manspeaker, Bonnie Van Lunen, Paula Turocy, Shana Pribesh, Dorice Hankemeier, James Onate

Intend to Submit to: Athletic Training Education Journal

## Introduction

Infusion of the knowledge and skills related to evidence-based practice (EBP) within health-care professional education programs is needed to promote current clinical practice and quality patient care (Fineout-Overholt, Melnyk, & Schultz, 2005). As a core component of educational curricula, (Coomarasamy & Khan, 2004; Greiner & Knebel, 2003; Hatala & Guyatt, 2002; Wanvarie et al., 2006) EBP promotes critical thinking among students through integration of patient values, best available evidence, and clinician expertise (Straus, 2005). Specific to Athletic Training (AT), these components of EBP should be taught within educational curricula to provide a more scientific base for clinical practice (Steves & Hootman, 2004).

A recent movement from the National Athletic Trainers' Association (NATA) aims to provide necessary resources for clinicians and educators to begin incorporating EBP into the profession. Implementation of these concepts is necessary as we continue to seek third-party reimbursement, demonstrate effective athletic training methods, increase the presence of evidence in our literature, (Denegar & Hertel, 2002) promote critical thinking, and enhance our reputation within health care (Steves & Hootman, 2004). Students enrolled in Commission on Accreditation of Athletic Training Education (CAATE) accredited programs should have significant exposure to EBP in these areas, as they will be future leaders of the AT profession (Casa, 2005; Steves & Hootman, 2004).

Curricula and continuing education opportunities of other health-care professions have focused on increasing students' abilities to find, analyze, and utilize research evidence to improve individualized patient care (D. Ciliska, 2005; Fineout-Overholt, Hofstetter, Shell, & Johnston, 2005; Khan & Coomarasamy, 2006; Kronenfeld et al.,

2007). To assist in instructing these concepts, specific teaching strategies have been developed in medicine, (Coomarasamy & Khan, 2004; Hatala & Guyatt, 2002; Wanvarie et al., 2006) nursing, (Brancato, 2006; Melnyk, Fineout-Overholt, Feinstein, Sadler, & Green-Hernandez, 2008) occupational therapy, (McCluskey & Lovarini, 2005; Welch & Dawson, 2006) and physical therapy (Stevenson, Grad, Lewis, & Hay, 2004). These strategies are typically profession-specific, focus on the process of EBP, and have varied manners of delivery. To further promote inclusion of EBP, the Committee on the Health Professions Education Summit (2003) established competencies that health care practitioners should incorporate into clinical practice including 1) patient-focused care, 2) interdisciplinary collaboration, 3) use of EBP, 4) improving quality of care, and 5) use of technology to obtain information (Greiner & Knebel, 2003).

Athletic training has transitioned to align with the above competencies by including many of these concepts, particularly related to the EBP process, in the next edition of NATA Competencies which are scheduled for release in the fall of 2010 (NATA, 2009). No teaching strategies specific to athletic training have been published to assist in accomplishing full implementation of these competencies (Manspeaker & Van Lunen, 2010a). Therefore, the purpose of this study was to implement an innovative teaching strategy, the Evidence-Based Teaching Model (EBTM), in select ATEPs to determine its effectiveness at improving student knowledge, attitudes, and use of EBP concepts.

## Methods

### *Study Design*

We employed a within subjects study design with pre- and post-intervention evaluations of students' EBP knowledge, attitudes and intended use. Athletic training students enrolled in therapeutic modalities or rehabilitation courses at nine CAATE-accredited institutions participated.

### *Participants*

The EBTM was implemented in a stratified purposeful sample of nine CAATE-accredited programs representing five NATA districts (Table VI.1). Of the 82 students (33 males, 49 females, average age 20.18 years +/- 1.12) enrolled, all completed the instructional sessions, while 78 (95%) completed both pre- and post-*knowledge* portions of the associated survey, and 68 (83%) completed all aspects of the survey (*knowledge, attitudes,* and *use*). Students were excluded from section analyses if they did not complete the part of the respective section of the survey. Approval for data collection was obtained from the human subjects committee at the University where the EBTM was developed and participating schools when applicable.

### *Educational Intervention*

The EBTM consisted of lecture materials and class assignments over the course of two class sessions, and guided discussions for students and clinical instructors to have during clinical experiences. Model materials were developed through consideration of EBP concepts, reference to teaching literature of nursing and medicine (Dinkevich, Markinson, Ahsan, & Lawrence, 2006; Straus, 2005; Thom, Haugen, Sommers, & Lovett, 2004), as well as qualitative instructor discussion of implementation strategies for

EBP in athletic training (Manspeaker & Van Lunen, 2010a). Through the EBTM, students received instruction of the EBP process including, 1) defining a clinical question through use of the PICO format, 2) searching for evidence, 3) critical appraisal skills, 4) using clinical expertise, 5) and determining appropriate treatment approaches (Straus, 2005). Three assignments were given to reinforce EBP knowledge and focused on clinical question formation with CI discussion, article review, and a cumulative assignment involving a case scenario requiring implementation of the full 5-step EBP process as related to treatment decisions.

Instructors associated with the courses for implementation were trained in the EBTM through an online tutorial during August 2009. To demonstrate understanding of the model, instructors had to answer 80% or more of questions included in the tutorial correctly; all instructors achieved the target score or higher on the first attempt. They also participated in a post-tutorial qualitative interview, prior to implementation within their courses, to further ensure that they understood the content of the EBTM, how to implement the model, as well as to answer any questions regarding the model. Freedom to implement the model into a portion of the course that best matched their required course content was granted to each institution. Instructors were provided with all lecture materials for course inclusion, a time-line for each class session, assignments for student completion, and communication access to the primary researcher (SM) if additional questions arose. Additional information provided to the course instructors as a courtesy, though not required for their use during the EBTM implementation, included suggested course objectives related to EBP, questions to include on written examinations, and rubrics to assist in grading student assignments. Following EBTM implementation, these

educators also participated in a post-interview related to their perceptions of ease of use and goal attainment.

***Instrumentation***

The *Evidence Based Concept Knowledge, Attitude and Use* (EBKCAU) survey was developed by the research team and was used to assess changes in student knowledge, familiarity, confidence, interest, perceived importance, intended use, and perceived barriers of EBP. Knowledge, attitudes and use relating to the five steps of the EBP process were assessed through their respective sections of the survey.

*Knowledge* of EBP concepts, as related to treatment decisions, was addressed through six multiple choice questions and one fill-in the blank question, for a maximum knowledge score of seven. *Attitudes* were assessed through Likert-scale items relating to familiarity, confidence in use of EBP concepts, student interest and perceived importance of EBP. Scales included four ordered choices ranging from "1," which indicated "Not at all," to "4" which indicated "very," for the sections of familiarity, confidence, interest, and perceived importance. *Use* of resources were measured through checklists and ranking of items that students regularly use to conduct EBP such as course notes, peer-reviewed articles, previous experience, and discussion with CIs. Open-ended questions were provided to gain students' perceived *barriers* and *intended future uses* of EBP concepts. Demographics included questions that were aimed to describe the sample and to determine representation of the population.

The EBCKAU Survey was examined for content validity through blueprint design and examination by a panel of Athletic Trainers. In a previous pilot study (n=86), reliability of the EBCKAU survey was determined in a sample of students enrolled in

therapeutic modalities or rehabilitation courses. The *knowledge* section was analyzed using Kuder-Richardson (K20) analysis for internal consistency of multiple choice items, and percent agreement for fill-in the blank. Knowledge multiple choice questions achieved consistency values per question ranging from .360 to .786, with an overall K20 value of .250. The fill-in question on the knowledge section earned a percent agreement of 100%, as all students answered this question incorrectly on both administrations. Cronbach's alpha was calculated for the ordinal data with values for familiarity ($\alpha$ = .814), confidence in use ($\alpha$ = .813), interest ($\alpha$ = .669), and importance ($\alpha$ = .707), for an overall attitudes section reliability of satisfactory, at the value of .70 or higher. Reliability of *barriers* and *intended use* were not conducted due to the qualitative nature of information collected in these sections. Within our study, the EBCKAU survey was administered as a pre/post-intervention evaluation before the EBTM and within two weeks of its completion at each participating institution. The average time between survey administrations was four weeks.

***Data Analysis***

Data analysis was conducted using SPSS v.16.0.1 (SPSS Inc. Chicago, IL). Normality of the data was attained through descriptive statistics of means, standard deviations, and frequencies. A paired t-test was used to determine differences in knowledge scores from pre- to post-EBTM implementation. Wilcoxon matched pairs signed ranks were used to assess differences in familiarity, confidence in use, interest, and importance of EBP concepts. Pearson product-moment correlations (r) were used to determine relationships between knowledge change scores and student factors of number of semesters accepted in an ATEP and GPA, as well as instructor teaching experience.

Spearman's rank correlations (p) were used to detect relationships for familiarity, confidence in use, interest, and importance with the same student and instructor factors previously described. Additional categories of barriers and future use were analyzed qualitatively for themes and patterns of student responses.

## Results

### *Knowledge*

Of the 82 students enrolled our study, 78 completed both pre- and post-EBTM *knowledge* portions of the EBCKAU survey for a 95% response rate. Before implementation of the EBTM, students achieved a mean knowledge score of 50%, showing that they had low knowledge of EBP concepts. Post implementation, the mean percentage increased to 66%, for a significant increase in overall knowledge ($t$ (78) = -6.39, $p < .001$, $d = .72$) with a moderate effect size (Table VI.2). Average overall knowledge change scores were equivalent to an increase in score by 1 question (SD=2) with a range of -2 to 5, while 23% of participants increased their score by 3 points or more.

Student confidence in EBP knowledge also increased significantly from pre- to post-EBTM implementation ($z = -7.04$, $p < .01$). The mean pre-intervention confidence in EBP knowledge score was 14.06 out of a possible 28. Following EBTM implementation, the confidence in EBP knowledge score increased to 21.03.

There was no significant relationship between semesters accepted in an ATEP or GPA and knowledge change scores. Additionally, no correlation was identified between instructor years of teaching experience and student knowledge change scores.

***Attitudes and Confidence in Use***

For the *attitudes* and *confidence in use* portions of the EBCKAU, 68 of the 82 enrolled students completed all associated questions for a response rate of 83%. Students not completing part of scale were omitted from analysis. Significant differences were found in students' *familiarity* ($z = -6.55, p < .01$) and *confidence in use* ($z = -6.37, p < .01$) of EBP following implementation of the EBTM. *Familiarity* mean pre- and post-intervention scores were 12.34 and 16.10, respectively; while *confidence in use* means were 12.19 pre- and 15.59 post-EBTM.

Student interest and perceived importance were not significantly influenced as a result of the EBTM. Additionally, no significant differences were identified for number of semesters accepted in an ATEP or GPA and familiarity, confidence in use, interest, or perceived importance of EBP concepts. A negative correlation was identified for confidence in use of EBP concepts and instructor years of teaching experience ($r = -.29, p < .05$). No correlations were found between years of teaching experience and familiarity, interest, or perceived importance.

***Barriers and Use***

Several themes emerged through the open-ended questions relating to *barriers* and *intended future use* of EBP resources. Students expressed time, available resources, relevance of literature to athletic population, CI open-mindedness, and agreement with class information as barriers. Students identified their intention to use EBP skills and knowledge in graduate school, if a treatment was not working, with chronic injuries, and during peer/CI discussions. Students also indicated that they use the following resources more than two times per week both when studying and determining treatments: course

notes, discussion with CI, classmate conversation, textbooks, and previous experience. General web-sites also were provided as a resource students use more than twice per week when studying, but not when determining patient care.

**Discussion**

We anticipated that athletic training students would have limited knowledge of EBP at the beginning of EBTM instruction, with associated low familiarity, confidence, interest, and perceived importance. Our results suggest that athletic training students benefited from instruction of EBP through the EBTM, particularly in the areas of knowledge, familiarity, and confidence in use of EBP. As with other research findings regarding attitudes toward EBP (Thom et al., 2004), the EBTM did not appear to increase students' interest or perceived importance regarding EBP.

***Knowledge***

Evidence-based practice concepts are relatively new to students within CAATE-accredited programs. As demonstrated on the EBCKAU, initial student knowledge was 50%, or 3.5 questions correct out of a possible 7, which is considered low. Following implementation of the EBTM, student knowledge increased an average of 1 point to 66%, or the equivalent to 1 letter grade. While the final knowledge score obtained in our study is still somewhat low, it is similar to findings of teaching strategies in other professions. For example, Wanvarie (2006) found that medical residents had an average score of 63% (out of 30 multiple choice questions) following a full semester course on EBP. Additionally, Thom et al (2004) showed increases in knowledge following a two-week block residency rotation. Burns and Foley (2005) qualitatively reported that freshman nursing students improved knowledge and skills following a semester course in EBP.

It should be noted that the knowledge portion of the EBCKAU was comprised of questions relating to the 5-step EBP process thus, representing the introductory concepts of EBP. Knowledge was evaluated at the lower levels (remembering and understanding) of the revised Bloom's Taxonomy (Anderson LW, 2001). The EBCKAU survey was not designed to assess higher levels of learning such as applying and evaluating EBP (Anderson LW, 2001), nor did we target framing concepts of EBP such as sensitivity, specificity, or likelihood ratios.

***Attitudes and Use***

Student interest and perceived importance scale scores were high during the pre-test with values of 16.01 and 16.04 respectively, indicating that EBP concepts were "very" interesting and important to students. As the maximum attainable score on these scales was a 20, there was a ceiling effect for these section scores. Familiarity and confidence in use were appropriately low during the pre-test, as it can be assumed that if students were not familiar with an EBP concept, their confidence in using that concept would also be low. Students reported greater familiarity and confidence in all aspects of the EBP process, including forming clinical questions and literature searching skills, following completion of the EBTM assignments. Similar to our results, Thom (2004) found that medical residents' confidence in the skills of clinical questioning through the PICO format and critical appraisal of literature, were increased after a short block rotation. Additionally, Wanvarie (2006) demonstrated increased confidence in formulating clinical questions and appraising literature following longitudinal instruction within a curriculum.

Previous studies have identified several barriers to use of the EBP process, in both the student and practice realms (Bhandari et al., 2003; Brown, Wickline, Ecoff, & Glaser, 2009; D Ciliska, 2006; Jette et al., 2003; Yousefi-Nooraie, Rashidian, Keating, & Schonstein, 2007). Similar to our findings, these barriers include time, available resources, relevance of the literature to target population, CI open-mindedness, and agreement with class information. Identification of these barriers is important to the transition toward inclusion of EBP concepts. Educators and clinicians should understand these barriers and identify potential implications on instruction and act proactively to overcome them. Specific strategies for surmounting these barriers should be embraced by ATEP faculty through goal setting and alignment with new NATA educational competency requirements (Manspeaker & Van Lunen, 2010b).

Intended use of EBP concepts beyond educational sessions emerged as a theme within our study. Most specifically, students identified their intention to use EBP skills and knowledge in graduate school, if treatment was not working, with chronic injuries, and during peer/CI discussions. While these findings regarding future use are in agreement with other investigators (Thom et al., 2004), most other studies do not specifically identify subcategories of the overarching theme of intended future use as we have provided. The addition of open-ended questions to the EBCKAU survey allowed for students to express their own personal intentions for EBP, rather than trying to make their thoughts "fit" into more structured-form of questions.

Although EBP teaching strategies are evident in health professions, few specifically analyze pre/post-quantitative results. Most publications focus on presenting the strategy itself, and the results are typically qualitative in nature (Brancato, 2006;

Lusardi, Levangie, & Fein, 2002; Schmidt & Brown, 2007). These studies have focused on displaying enabling factors for student understanding of EBP, student perspectives on the teaching strategy, or faculty perceptions of the model. Therefore, our study and the EBCKAU, is unique in that it assessed multiple aspects of the EBTM that most other research has not evaluated. Unlike other teaching strategies, the EBTM was implemented in multiple institutions of varying size and focus from several NATA districts, in courses that already were in existence, while most other strategies were implemented in individual programs or workshops. Also, the EBCKAU survey assessed knowledge, attitudes, use, and barriers through various types of quantitative and qualitative questions, thus determining a broader scope of influence of the EBTM. Lastly, instructors were interviewed regarding their experiences in implementing this model in order to establish a full program evaluation of the EBTM. Results relating to instructor experience are presented in separate publication.

**Limitations**

Limitations to our study exist primarily in threats to internal validity. One such factor includes that of the stratified purposeful sampling method, rather than that of randomization. An additional concern for the sample entails the self-report nature of the EBCKAU survey. It is possible that student responses were based upon what they felt was the "socially desirable" answer to survey questions rather than their true knowledge or attitudes. The high response rate (95% knowledge, 83% attitudes/use) assists in increasing the external validity of our study.

## Conclusion

Our EBTM curriculum, based on a two-day interactive didactic lecture format combined with clinically-integrated activities, seems to be successful in improving athletic training students' knowledge and confidence. Such EBP teaching structures have been recommended to maximize knowledge, skills, and attitudes among students (D. Ciliska, 2005; Khan & Coomarasamy, 2006). A primary aim of the EBTM was to provide a method for inclusion of EBP concepts in athletic training education that would promote critical thinking in students (Steves & Hootman, 2004). The EBTM is one example of an effective mechanism to implement EBP concepts in athletic training education. As future competencies relate specifically to the skills and knowledge of EBP, programs should begin to place these concepts into the curriculum, whether it occurs through this teaching strategy, or other methods.

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**Table VI.1**

***Participant Demographics***

| Institution | NATA District | Course of Implementation | Number of Students | Instructor Teaching Experience |
|---|---|---|---|---|
| A | 4 | Modalities | 7 | 10 |
| B | 4 | Modalities | 9 | 5 |
| C | 4 | Modalities | 12 | 14 |
| D | 2 | Rehab | 12 | 10 |
| E | 9 | Modalities | 9 | 3 |
| F | 3 | Modalities | 6 | 3 |
| G | 6 | Rehab | 7 | 10 |
| H | 6 | Modalities | 4 | 5 |
| I | 3 | Modalities | 12 | 16 |

N = 78.

**Table VI.2**

***EBCKAU Survey Scores***

| *Portion of EBCKAU* | *Mean* | *SD* | *Effect Size* |
|---|---|---|---|
| Knowledge Pre[a] | 3.49 | 1.28 | |
| Knowledge Post[a] | 4.63 | 1.27 | .72 |
| Knowledge Change | 1.14 | 1.58 | |
| Confidence Knowledge Pre[b] | 14.06 | 3.33 | |
| Confidence Knowledge Post[b] | 21.03 | 3.27 | |
| Confidence Knowledge Change | 7.15 | 3.90 | |
| Familiarity Pre[c] | 12.34 | 2.94 | |
| Familiarity Post[c] | 16.10 | 2.22 | |
| Familiarity Change | 3.76 | 3.06 | |
| Confidence in Use Pre[d] | 12.19 | 2.95 | |
| Confidence in Use Post[d] | 15.59 | 2.05 | |
| Confidence in Use Change | 3.40 | 3.05 | |
| Interest Pre[e] | 15.62 | 2.87 | |
| Interest Post[e] | 15.60 | 2.70 | |
| Interest Change | -.01 | 2.98 | |
| Importance Pre[f] | 16.01 | 2.95 | |
| Importance Post[f] | 16.24 | 2.75 | |
| Importance Change | .22 | 3.32 | |

[a] Knowledge high score = 7
[b] Confidence in knowledge high score = 28
[c] Familiarity high score = 20
[d] Confidence in use high score = 20
[e] Interest high score = 20
[f] Importance high score = 20

# Chapter VII

## Conclusions

Overall, the two projects have bestowed insight as to the needs and presence of EBP in undergraduate athletic training curricula. In the first project, we identified perceived needs for EBP in athletic training due to clinical decision making and third-party reimbursement. We also found that select educators are in fact incorporating EBP into curricula via curricular emphasis, teaching strategies, and student assignments. Additionally, educators described barriers to curricular implementation as time, role strain, knowledge, and the gap between clinical and educational practices. The second project determined the Evidence-Based Teaching Model to be a successful mechanism for implementation of EBP within athletic training education courses. Particularly, we found that instructors valued the EBTM, its contents, and the promotion of discussion between students and clinical instructors. Additionally, the EBTM was found to be effective in increasing student knowledge, confidence in knowledge, familiarity, and confidence in use of EBP as measured by the Evidence-Based Concepts: Knowledge, Attitudes, and Use survey.

These projects have demonstrated the need for EBP in athletic training education while providing methods for implementation within curricula. Based on these findings, it is evident that EBP can be included within athletic training education through faculty commitment, program evaluation, and establishing of goals for implementation.

Existing literature related to EBP knowledge, attitudes, use, and teaching strategies is limited in athletic training. Future research should focus on student retention of EBP knowledge and skills beyond a single semester. Additionally, more teaching

methods should be evaluated and disseminated to the profession so as to provide a basis for comparison between techniques. The effectiveness of different methods should be evaluated between different types of institutions and student populations. Teaching strategies aimed at different areas of EBP including treatment, diagnostics, and patient outcomes should also be evaluated. Finally, longitudinal studies should evaluate outcomes relating to clinician use and patient care following implementation of EBP at the undergraduate level.

# APPENDIX 1

## The Evidence-Based Teaching Model

# The Evidence-Based Teaching Model: Training Tutorial

Instructor tutorial including concepts relating to evidence-based practice.


Created by
Sarah Manspeaker, MSEd, ATC
Old Dominion University
Human Movement Science Doctoral Program

Purpose of the EBTM

The evidence-based teaching model (EBTM) was designed to provide instructors with a module to help in implementing evidence-based practice within their courses. This module is intended to serve as an introduction to evidence-based practice (EBP) concepts for athletic training students at the undergraduate level.

During the tutorial, please be sure to navigate to the bottom of each page and click, "next," to be forwarded to the next page of content.

The purpose of this project is to determine the ease of use of the EBTM by instructors, as well as to determine the effects of the model on student knowledge, attitudes, and use of evidence-based practice concepts.

Thank you for your interest and support of this project.

All information obtained throughout the project including demographic information, interview transcriptions, and student survey results will remain confidential and in the possession of the researcher. Results of this project may be published, but again will have no direct link to you as the instructor or your institution.

If you have any questions during participation, please direct them to:

Sarah Manspeaker, MSEd, ATC
Old Dominion University
Doctoral Candidate--Human Movement Science
(410) 845-9149
sarahmanspeaker@gmail.com

This project has been approved by the Old Dominion University Human Subjects Committee and has been deemed exempt.

Dissertation Chair
Dr. Bonnie Van Lunen
bvanlune@odu.edu
(757) 683-3516

Human Subjects Committee Chair
Dr. Edwin Gomez
egomez@odu.edu
(757) 683-6309

The contents of this tutorial include:

---An introduction to evidence-based practice via navigation through the EBTM
---Review questions for each section

Each section of evidence-based practice content will end with a short series of questions to insure that you have reviewed the material contained within the tutorial. You must answer 80% of the questions correctly to be able to instruct the model. In the event that you do not answer 80% correctly on the first try, you will be permitted to take the tutorial again to reach an 80%. Again, please be certain to click, "next," on every page to progress through the tutorial.

The instructor manual, which has been provided via email as an attachment, includes:

---An overview of student assignments
---Sample test questions
---Syllabi objectives
---Suggested timelines for course inclusion
---Grading rubrics for assignments

Section 1: Developing an Evidence-Based Inquiry

This section will guide you through the steps of evidence-based practice.

A case scenario will be utilized throughout the tutorial, as it will be during model instruction, to maintain continuity of topics. This tutorial is very similar to the EBTM itself, so feel free to take notes as you go as to additional comments you would potentially make during delivery of the model.

**Case Scenario**

In your experience as an athletic trainer, you have seen many athletes present to the athletic training room post-lateral ankle sprain. Signs you observe include moderate effusion over the anterior talofibular ligament and limited range of motion due to discomfort. You have seen differing results for each patient, and wish to gain more insight into an effective therapeutic modality treatment for such patients. You believe that therapeutic ultrasound could be an option for the treatment of such cases. You decide to embark on an inquiry to help you assess this course of treatment.

*Clinical Note*: Though you personally may not choose ultrasound as a course of treatment, this example is good at promoting discussion in comparison with other modalities, such as electrical stimulation and/or infrared options, as well as serves as a good base question for a research inquiry. Even if this selection does not match your personal practice, the inquiry process will assist you in determining the presence or lack of support for your decision, which is in essence evidence-based practice.

As you are determining the appropriate treatment for you patient, you may ask yourself, "*Why should I use evidence-based practice*?"

Most simply, your clinical decisions should be supported. This support should be more concrete than, "*That's what I was taught.*" Clearly clinical decisions are influenced by your professional experience, and what you learned as a student, but it should also be consistent with current research and clinical practice.

As an example, in the early 1980's it was rare that a torn anterior cruciate ligament was surgically repaired. Today, it is common practice. ACL reconstruction has been well documented over the years as to different surgical techniques, rehabilitation programs, return to play criteria, as well as other facets. And there is still much developing on this topic as to best practice. Today, if you were to use a rehabilitation protocol from 1992 it would likely look very different from one published in 2005, and would certainly run the risk of not being the best treatment plan for your patients. It is necessary to think critically, beyond the typical tool box, and provide the best, most current care for your patient.

To create the most appropriate plan of action, you should...

*---Know the goals of the person/population you are working with*

*---Examine your experience as a clinician and that of others*

*---Evaluate what treatment options might be warranted*

*---Determine what evidence you already have to support or oppose your current options*

*---Determine if your treatment options and experience match to create an effective treatment*

What primary items must be considered in treatment decisions?

Referring back to the ankle sprain case,
?--What are the patient's goals
?--What experience and input do you, the clinician, have regarding this type of injury, the patient, and available treatment options
?--What evidence do you have to support the treatment options

To answer these questions, it is best to follow the steps of evidence-based practice.

The initial five-step process, as described by Sackett (1996), involves answering a clinical question by evaluating the combination of patient goals, current literature and clinical practice trends. The chart below assists the clinician in providing a clear, concise breakdown of the topics at hand.

| Step | Process |
|---|---|
| 1. Clinical question & patient consideration | Define the problem you wish to investigate<br>Establish the goals and values of the patient |
| 2. Search the literature | Search literature to expand knowledge base relating to clinical question |
| 3. Appraise the literature | Determine quality and applicability of what you fine |
| 4. Clinical expertise | Utilize experience and justification of your own and of colleagues |
| 5. Patient outcome | Combine above resources to determine plan for patient and assess outcome potential |

The initial step, defining the clinical question, allows you to identify the clinical case and determine a course of action for the remaining inquiry based upon the patient. After presentation of the 5 steps of EBP, more time will be spent on how to develop the clinical question utilizing the PICO format.

After you have established the clinical question involving the problem and patient details, you move toward identifying literature sources that will help to support or oppose your treatment options. These literature sources can include, though are not limited to, journal articles, text books, case reports, and clinical workshop notes.

Once you have gathered literature references you must determine their clinical value. A portion of this tutorial will review how to appraise literature to determine its potential ability to influence your treatment based on reliability and validity.

It is important to include your clinical experience and expertise as a level of evidence. While professional experience is not as high on the appraisal scale as a randomized control trial (to be reviewed later), it is in fact a level of evidence, and should, therefore, weigh into clinical decision making.

The final step in evidence-based practice is to evaluate the process you went through to achieve your clinical decision particularly in regard to the patient outcome. This evaluation should include objective measures of outcomes, perhaps including other clinical measures and patient outcome assessments, rather than relying solely on subjective information provided from the patient.

Section 1 Review Questions

The first step in the evidence-based practice process is to...
{Choose one}
( ) Search for research literature
( ) Critically appraise the current research
( ) Define a clinical question
( ) Choose a research database

The final step, and underlying reason to utilize evidence-based practice, is to...
{Choose one}
( ) Improve patient outcomes
( ) Alleviate time burden on clinicians
( ) Maximize playing time for athletes
( ) Emphasize clinician experience

Section 2: Developing the Clinical Question

Now that we have established the desire to utilize an evidence-based approach to patient care, let's begin with the first step, developing the clinical question.

Defining the clinical question allows you to identify specific components related to the patient and desired outcome that should be evaluated and considered.

PICO

The PICO format is one way to form a clinical question. This process is viewed as a learning tool to address the needs and values of the patient.

--Patient Characteristics
*Primary problem, disease, other conditions present
*Important characteristics (gender, age, activity level, etc)

--Intervention
*Main intervention(s) you are considering as treatment options

--Comparison
*Main alternative(s) to compare with the intervention

--Outcome
*Short and long-term goals for the patient
*What do you want to accomplish for the patient

The following slides will detail how to create a chart relating to your specific patient suffering from an ankle sprain.

Formation of a clinical question via the PICO process involves a simple 2 x 4 chart such as that seen below. You can then fill in the cells to the right with information targeted toward your patient.

| | |
|---|---|
| Patient | |
| Intervention | |
| Comparison | |
| Outcome | |

Remember for the ankle sprain, our patient has limited ROM due to edema. Therefore, our patient details would include the information below. Further information such as age, sport, height, and other medical conditions could be included in this cell. A good rule of thumb is to include any historical or subjective information that could influence the outcome of the treatment.

Once the patient details have been established, it is important to determine the primary treatment you are considering. While these options can vary greatly from one condition or person to the next, we will continue to use the ultrasound example from the scenario. To answer our clinical question from a truly evidence-based stand point, we must compare our primary treatment to at least one other available treatment. From a therapeutic modalities perspective, we could certainly compare ultrasound to infrared modalities or electrical stimulation. From a rehabilitation perspective, we could evaluate a surgical approach in comparison to a conservative course of action. And in research, we could compare a treatment to no treatment to establish an increased level of control.

The finalized PICO chart could include the anticipated short and long-term outcomes for the patient. These outcomes should relate to the demographics in the first cell and be achievable through use of the potential treatment options.

| | |
|---|---|
| Patient | Ankle sprain, athlete |
| Intervention | Ultrasound |
| Comparison | None, Electrical stimulation |
| Outcome | Primary: Decrease swelling, increase range of motion/tissue extensibility<br>Secondary: Return to play |

*The Clinical Question*

It is important to note that each level of the PICO helps to determine the next. For example, your intervention should be compared to other possible treatments and relate to potential outcomes for your patient, thus resulting in an effective clinical question.

So for the case of the ankle sprain, the clinical question might be:

In athletes with ankle sprains, is therapeutic ultrasound effective in reducing swelling and increasing tissue extensibility?

***There are many possibilities for final clinical questions regarding this scenario, this is just an example. During model instruction students will be asked to create their own clinical questions. Typically, students are encouraged to word the question in the manner that seems most appropriate to them, no one specific way is considered correct.*

Section 2 Review Questions

When defining a clinical question using the PICO technique, which factor should you consider first?
{Choose one}

( ) Return to play criteria
( ) Patient goals
( ) Patient age
( ) Clinician experience

Please place the following steps of developing a clinical question in sequential order.
{Rank the following from 1 to 4}

[ ] Intervention
[ ] Outcome
[ ] Patient
[ ] Comparison

Continuing the Case Scenario

We have now defined the clinical question related to the ankle sprain.

By doing so, we have accomplished the first two steps of
the evidence-based practice process.

--Establishing the clinical question to investigate
--Considered the patient's goals and values

*What's next?*

--Searching and appraising the available literature

Section 3: Searching the Literature

It is important to reference the existing literature related to cases similar to those being investigated, and to examine treatment options. Several sources should be examined for potential inclusion.

Factors to consider when beginning evaluation of the literature include:

*What sources are you currently using*?
--Library Database
Good for general searches, typically have good results
Relatively easy to specify to area of expertise
As an example, the Cochrane database is a well-documented source for health care research that is typically summarized and interpreted to allow results of high quality research available as a resource
--Google Scholar
Often relied on by students
Can be good early in search if topic is recent or looking for a specific author

*What sources are available?*
--Be familiar with what you have on campus or at your clinical setting

*How do you search?*
--Identify what your priorities are for your search, such as
Population, condition, treatment, or desired outcome

When beginning a search, it is best to identify the words that will provide you with the most specific, successful results. *Boolean search terms* allow you to accomplish this task. Specificity of your search will narrow your results.

For example, when searching athletic trainer, the following suggestions can be helpful. The suggestions on the following page will yield very different results.

Boolean Search Suggestions

*Athletic trainer finds rows that contain at least one of the two words*
*--no symbols indicate that the word is optional*

*+athletic+trainer finds rows that contain both words*
*-- the + sign indicates that the word must be present in every item returned*

*+athletic-trainer finds rows that contain the word 'athletic' but not 'trainer'*
*--the - sign indicates that this word does not need to be in every item returned, thus athletic would need to be in the returned items, but not trainer*

*Athlet* finds rows that contain words such as athletic, athlete, athleticism*
*--the * indicates that you wish to finds words or root words*

*"athletic training" finds rows that contain this exact phrase*
*--matches only items containing the literal phrase as it was typed*

Search Results

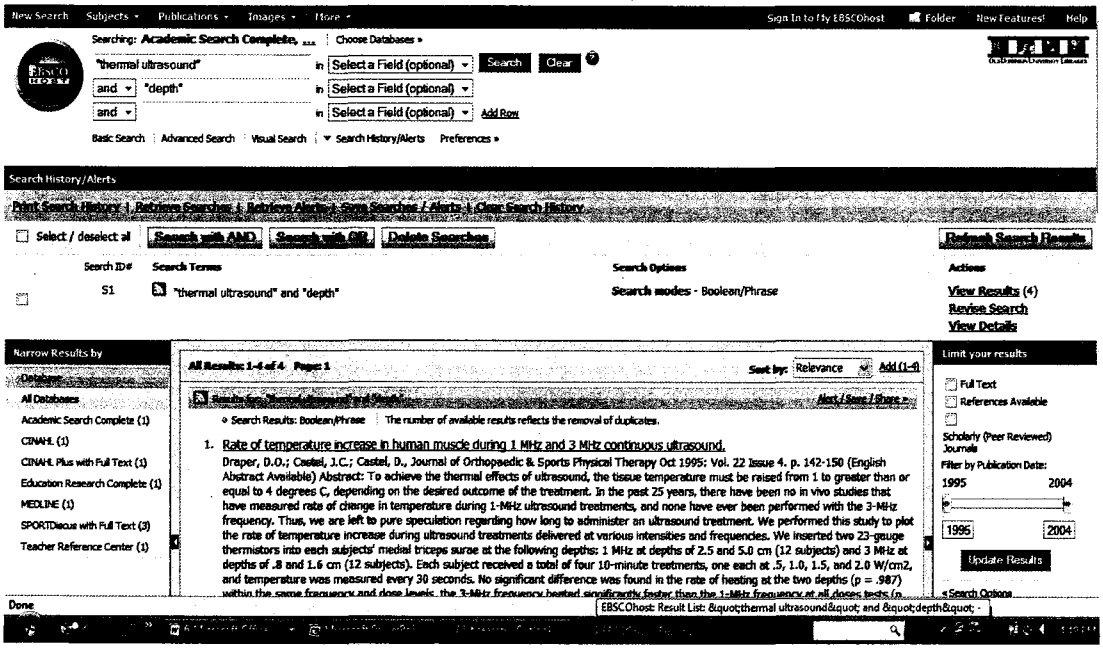
Once you have obtained your search results in the appropriate database, you can narrow down the results returned.

A few options include narrowing by
--year

--abstract availability

--or you can search within those results for other terms

The following figure demonstrate results of an Ebsco Host search for "thermal ultrasound" AND "depth" to find articles related to those topics. The narrow search fields resulted in a very limited rate of return on appropriate articles.




Section 3 Review Questions

When conducting a literature search, which of the following on-line sources holds the highest quality content?
{Choose one}

( ) Medline
( ) WebMD
( ) Google Scholar
( ) Cochrane Database

Section 4: Appraising the Literature

You have collected the literature, how do you appraise it?

Depending upon the level of students and course you are instructing, the amount of emphasis on this area will vary. For example, a research class may spend a great deal of time on each of the individual topics. However, a younger class may just need an introduction to the terminology and things to keep in mind.

Regardless of the nature of your class, the questions on the following page will help students determine the quality of research.

Focusing on the following four areas should allow you to determine an accurate appraisal of the literature.

--*Is the purpose of the article clear and related to your topic?*
Identify clear and specific objectives within

--*Are the methods described well?*
Are they understandable
Could someone replicate the study easily

--*What are the results of the study?*
Do the results appear to be valid and applicable to the population evaluated

--*Do you believe the results will benefit your patient?*
Or do the results lead you away from a specific treatment

**Note** no study will be perfect in all of these areas, but the more they satisfy each criteria, the stronger the evidence you have gained.

Important literature appraisal terminology:

Sample Characteristics/Population

- *Does the author describe the participants of the study?* Things to look for include gender, sport, height, weight, criteria for patient inclusion/exclusion.
- Do the subject characteristics match those of your population?
- Would you use a study performed on elderly males to determine a treatment regimen for adolescent female athletes?

Randomization

- *Once the subjects were recruited, did they all stand equal chance of receiving a treatment?* The less rhyme and reason to treatment groups the better. One would also like to see use of a control group for comparison of the treatment to further demonstrate effects.

Attrition

- *How many people that began the study finished*? The higher the number of people that dropped out, the less you can count on those results. It would also be beneficial to see the reasons people did not finish the study, such as injury, illness, time constraints, etc.

Blinding

- Subjects should not know which group they are in (if applicable) nor should they be aware of the desired outcome. This would introduce bias and possible affect the outcome of the study. Ideally, the researchers in the study would be blinded as well.

Reliability

- *Can the study methods be replicated, or can the treatment be reproduced*? The more reproducible the procedure, the higher the reliability.
- Example: Having one researcher perform all ultrasound treatments in the same manner, rather than having 17 researchers performing ultrasound, would increase study reliability.

Validity

- *Did the method selected for evaluation measure what it was intended to measure*? The test should match the outcome being evaluated.
- For example, one would not use an x-ray to determine a ligament tear as this equipment does not evaluate soft tissue effectively.

Benefits to your Patient

- *Do you believe the study results would have a positive impact on your patient's outcome?*
- For example, if a study from 1981evaluated the use of thermal ultrasound on tissue extensibility in recreational athletes age 40-60, would it be truly applicable to our patient? While it may contain information worth considering, it would be

important to gather additional sources of information as well.

*Which types of research contain the highest quality of evidence?*

The following list is certainly not all-encompassing; many levels exist in between the types provided.

Randomized Control Trials

These studies typically distribute treatments between subjects to determine effectiveness. This type of research best accounts for other variables that can influence an outcome and is generally viewed as the highest level of evidence obtained in the field of medicine. The Cochrane database features many summaries of randomized control trials.

Independent Laboratory Investigation

This type of research can vary greatly depending on the laboratory. It is possible that a randomized control trial could be conducted via this form of research institution, such as in determining the effectiveness of a new drug.

It is important to note that some companies may fund an independent investigation that will ultimately sway the results in favor of their product in comparison to others, or may not compare it to anything else at all. It is not always easy to identify if this type of bias has occurred.

Single-Subject Design

This design involves utilizing one subject (or a very small group of subjects) to serve as their own control group. Often you will see multiple treatments conducted on one person over time, with a return to baseline (or no treatment) in between. This design is not necessarily bad, it simply has limited generalizability. One would need to match the subject characteristics very carefully to be applicable. Of additional note with this type of design is that of cross-over effects. It is sometimes difficult to insure that one treatment has not had an affect or influence on another treatment, thus providing a cross-over between interventions.

Case-Study

These studies typically describe how one incident or case was handled. Generally an overview of the condition, treatments utilized, perceived effectiveness by the patient and the clinician are included. It is important to note that while this is a level of evidence, it is similar in value to that of clinician experience.

Section 4 Review Questions

Which type of research design is considered to have the highest quality of evidence?
{Choose one}

( ) Case Study
( ) Independent Laboratory Investigation
( ) Single-Subject Design
( ) Randomized Control Trial

Which of the following is NOT an important component of appraising research literature?
{Choose one}

( ) Reliability
( ) Validity
( ) Grammar
( ) Randomization

Section 5: Clinical Expertise

You are now armed with the clinical question, patient goals, and research relating to both.

*What other information can you gather to assist in your treatment plan?*

- When analyzing your own prior experience, have you seen success with this type of treatment before?
- What approaches have colleagues utilized in similar cases, and were they successful?
- How did other clinicians determine the approaches they used?
- It is important to respect your experience, but not rely solely on what you have always done. Be mindful and reflective in what has worked with your patients. Keeping the patient in mind at all times while staying up-to-date with current practice should help decrease reliance on treatments that are ineffective.

Section 5 Review Question

An athletic trainer's personal experience regarding a specific treatment should primarily be used to...
{Choose one}
( ) Develop expertise that can be passed on to students
( ) Guide future clinical practice and decision making
( ) Provide solid evidence in support of the specific treatment
( ) Create standard protocols for use on all patients

Section 6: Evaluating Patient Outcomes

Outcomes

Determining the outcomes of your inquiry will vary between patients. For the case scenario presented, we identified the desired outcomes as decreased swelling, increased range of motion/tissue extensibility, with a secondary goal of return to play.

Objective measures including range of motion assessments, soft tissue evaluation, and functional tests will allow to determine the effectiveness of the treatment and the evidence-based process utilized. Patient outcome assessments could also be incorporated to obtain further specific information that can be compared to baseline measures.

This section of the evidence-based practice process has great room for discussion and application within your courses. Encourage students to develop different clinical scenarios and questions to promote critical thinking of potential outcomes, and ways to effectively measure the results.

Section 6 Review Question:

When evaluating the outcome of an evidence-based inquiry, primary concern should be given to...
{Choose one}
( ) Subjective patient feedback
( ) Time to return to activity
( ) Objective measures as related to patient goals
( ) Literature findings

Overview

Evidence-based practice is an evolving topic within athletic training education and clinical practice. Current and future clinicians are encouraged to utilize evidence-based approaches in treating patients to help support treatment decisions and obtain the best available outcomes.

This tutorial has introduced you to the Evidence-based Teaching Model and provided you with an overview of the steps of an evidence-based inquiry that you can pass on to your students. Again, you are encouraged to place your own experience within instruction of this model and adapt to the conversations created with your students. The assignments have been generated to promote active learning and will be reviewed in detail in the Instructor Manual.

In alignment with other health care professions, athletic training educators have listed time and knowledge as barriers to implementing evidence-based practice concepts within their instruction. While this model does not remove these barriers, I hope you have found it to ease them slightly and allow you to move closer toward a more full integration. If you have suggestions regarding the model at any point during instruction, please do not hesitate to contact me to discuss these ideas.

Thank you for your support and I look forward to your continued participation.

Sincerely,

Sarah Manspeaker, MSEd, ATC

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# APPENDIX 2

## The Evidence-Based Concepts: Knowledge, Attitudes, and Use Survey

Evidence Based Practice Concepts: Knowledge, Attitudes, and Use Survey
Informed Consent

By completing this survey, you are agreeing to participate in a research study through Old Dominion University. The title of the research project is: Implementation of the Evidence Based Teaching Model in Undergraduate Athletic Training Curriculum. The purpose of this study is to view the changes in students' knowledge, attitudes, and use of evidence-based practice concepts following the implementation of an evidence-based teaching model.

By agreeing to participate, advancements in instructional methods, student knowledge, professional practice, and patient outcomes could be achieved. Your participation in this study is voluntary. The assessment includes multiple choice questions, a concept-adoption checklist, attitudes checklist and demographic questionnaire. Your scores on the assessments will not be considered as part of your course grade and will only be seen by the researcher. The time to complete this assessment is approximately 15 minutes. You will be asked to complete the assessment twice, once now, and once at the completion of the instructional sessions. Please do not use any educational materials while taking the assessments, though you may review them as many times as you feel necessary between assessments. Please answer each question to the best of your ability. Homework assignments will also be given during this study. Grades will be assigned to this work by your instructor, not the researcher, although the homework will be analyzed by the researcher for themes. All information contained in homework assignments will also remain confidential.

The results of this study may be published; however, your name and identity will be kept confidential and will not be distributed in any way. In order to correctly match your three assessments, please provide the following Participant ID in the space provided at the top of the survey: first letter of your first and last name and birth date (ex. HB031884). In no way will your code be matched to any other information you may provide for this study. This study has been approved by the Old Dominion University Human Subjects Committee. Specific questions should be directed to one of the following people.

Bonnie Van Lunen, PhD, ATC
Email: bvanlune@odu.edu
Phone: 757-683-3516

Sarah Manspeaker, MSEd ATC
Email: smanspea@odu.edu
Phone: 410-845-9149

## *Evidence-Based Concepts: Assessment of Student Knowledge, Attitudes and Use Demographic Questionnaire*

1. Age _____

2. Gender _____ Male _____ Female

3. Ethnicity (check one)
   _____ Asian/Pacific Islander
   _____ African American (not of Hispanic origin)
   _____ American Indian/Alaskan Native
   _____ Caucasian (not of Hispanic origin)
   _____ Other

4. What is the highest degree you have earned? (check one)
   _____ High School Diploma
   _____ Bachelor's Degree
   _____ Associate's Degree
   _____ Masters Degree

5. What athletic level is your collegiate institution? (check one)
   _____ Division I
   _____ Division II
   _____ Division III
   _____ NAIA

6. What is your academic year? (check one)
   _____ Freshman
   _____ Sophomore
   _____ Junior
   _____ Senior

7. How many semesters have you been formally accepted into your school's athletic training education program? If your major is NOT athletic training, please write your major by OTHER. If you are awaiting application to your school's program, please mark the Yet to Apply Box
   _____ Semester(s)
   _____ Yet to Apply
   _____ OTHER My major is
   _____

8. What is your current cumulative overall GPA? _____

9. Are you currently assigned to a clinical instructor for a clinical experience?
   _____ Yes _____ No _____Not Applicable due to Major

10. How many hours per week do you typically spend on the internet searching for information relating to your homework?
    _____ Hours

11. How many hours per week do you typically spend on the internet searching for information relating to your athletes/patients at your clinical site?
    _____ Hours _____ Not Applicable due to Major

**Knowledge Evaluation: Please answer the following questions in the *left column*, and rate your confidence in that answer with the scale in the *right column*. For the confidence questions, circle the answer that best completes this sentence regarding the corresponding question on the left: *I am _____ confident that I answered this question correctly.***

| | Confidence Scale | | | |
|---|---|---|---|---|
| 1. The first step in evidence based practice is to<br>A. Search for research literature<br>B. Critically appraise the current research<br>C. Define a clinical question<br>D. Choose a research database | 1.Not at all | Mildly | Moderately | Extremely |
| 2. When defining a clinical question using the PICO technique, which factor should you consider first?<br>A. Return to play criteria<br>B. Patient goals<br>C. Patient age<br>D. Personal experience | 2.Not at all | Mildly | Moderately | Extremely |
| 3. When conducting a literature search, which of the following On-line sources holds the highest quality content?<br>A. Google Scholar<br>B. Medline<br>C. Cochrane Database<br>D. WebMD | 3.Not at all | Mildly | Moderately | Extremely |
| 4. Which type of research design is considered to have the highest quality of evidence?<br>A. Randomized control trial<br>B. Independent laboratory investigation<br>C. Case study<br>D. Single subject design | 4.Not at all | Mildly | Moderately | Extremely |
| 5. An athletic trainer's personal experience with ultrasound should primarily be used to<br>A. Develop expertise that can be passed on to students<br>B. Guide future clinical practice and decision making<br>C. Provide solid evidence in support of ultrasound<br>D. Create standard treatment protocols for all patients | 5.Not at all | Mildly | Moderately | Extremely |
| 6. When assessing the outcome of a treatment you used what factor would most likely lead you to use it again?<br>A. Patient satisfaction with the outcome<br>B. Outcome agreement with current literature<br>C. Short length of treatment time to achieve outcome<br>D. Outcome achieved consistent with selected goals | 6.Not at all | Mildly | Moderately | Extremely |
| 7. Please list below the steps of the PICO process of developing a clinical question. | 7.Not at all | Mildly | Moderately | Extremely |

8. When conducting an on-line literature search, list below which sources you personally utilize and rank your preference in using those sources (1 = most preferred, 5= least preferred).

The remaining questions do NOT require you to complete a confidence scale.

9. Which factors should be considered when appraising literature for potential use as a treatment option for a patient? (Check all that apply)

___ Results of the study ___ Validity of the study
___ Subject characteristics ___ Year of the study
___ Length of abstract ___ Journal of publication
___ Number of authors ___ References listed
___ Location of the study ___ Applicability to patient

***Please rate the following options 1-5, with 1 indicating your most preferred choice, and 5 your least preferred.***

10. Which of the following items influence you the most when choosing an ultrasound treatment for your patient?

_____ Discussion with your clinical instructor of his/her recommendation to use US
_____ Statement from an athlete that ultrasound has worked for him/her in the past
_____ Study findings that determined that ultrasound more effective than another thermal modality
_____ The information and skills learned in therapeutic modalities class
_____ Current protocols used at your clinical site

11. Which of the following items do you use greater than 2 times per week when ***studying***? (Check all that apply)

___ Course notes ___ Creating a Clinical Question ___Textbooks
___ Journal Articles ___ PICO Process ___ Websites
___ Peer-Reviewed Research ___ Previous Experience
___ Classmate Conversation ___ Appraisal of Research
___ Discussion with ACI ___ Athlete Suggestions
___ Library Databases

Which of the following items do you use greater than 2 times per week when ***determining treatments for patients?***

___ Course notes ___ Creating a Clinical Question
___ Journal Articles ___ PICO Process
___ Textbooks ___ Peer-Reviewed Research
___ Classmate Conversation ___ Websites
___ Discussion with ACI ___ Previous Experience
___ Library Databases ___ Appraisal of Research
___ Athlete Suggestions

12. Describe below any barriers you may/will have for using evidence-based practice concepts in Athletic Training.

13. Describe below ways in which you envision yourself using evidence-based practice skills in your future work as an Athletic Training professional?

*Attitude and Use Evaluation*

**The following questions pertain to your *familiarity, confidence, interest, and perceived importance* of evidence based practice concepts. For each of the four sections, please check one box that best describes your answer. A sample has been provided.**

| **SAMPLE** | **Section 1**<br>**To what extent are you *familiar* with this concept?** | | | | **Section 2**<br>**How *confident* are you in your ability to use this concept?** | | | | **Section 3**<br>**How *interested* are you in using this concept?** | | | | **Section 4**<br>**How *important* is this concept to you?** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Concept** | Not at all | Limited | Some-what | Exten-sively | Not at all | Limited | Some-what | Very | Not at all | Limited | Some-what | Exten-sively | Not at all | Limited | Some-what | Very |
| **SAMPLE**: Evaluating a lateral ankle Sprain | | | X | | | | X | | | | | X | | | | X |

Please answer these questions from the perspective of an athletic training student.

| | **Section 1** **To what extent are you *familiar* with this concept?** | | | | **Section 2** **How *confident* are you in your ability to use this concept?** | | | | **Section 3** **How *interested* are you in using this concept?** | | | | **Section 4** **How *important* is this concept to you?** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Concept** | Not at all | Limited | Some-what | Exten-sively | Not at all | Limited | Some-what | Very | Not at all | Limited | Some-what | Exten-sively | Not at all | Limited | Some-what | Very |
| Creating a clinical question | | | | | | | | | | | | | | | | |
| Searching literature for information to support clinical decisions | | | | | | | | | | | | | | | | |
| Critical appraisal of literature | | | | | | | | | | | | | | | | |
| Accessing clinical expertise from your clinical instructor | | | | | | | | | | | | | | | | |
| Improving patient outcomes using evidence-based processes | | | | | | | | | | | | | | | | |

# VITA

Sarah A. Manspeaker, ATC

*Department of Study*

Old Dominion University
Department of Human Movement Sciences
Student Recreational Center
Norfolk, VA 23529

*Education*

May 2010 Doctor Of Philosophy
Human Movement Science
Old Dominion University
Norfolk, VA
May 2001 Master of Science in Education
Old Dominion University
Norfolk, VA

*Professional Experience*

**Anatomical Kinesiology Instructor** (EXSC 322)

- Department of Human Movement Science, Old Dominion University, Norfolk, Virginia, August 2007 – May 2010
- Teaching assistant EXSC 711/811: Motion Analysis, Fall 2008
- Teaching advisor to teaching assistants of Master and Doctoral levels
- Co-author of self-study for NATA post-professional re-accreditation
- Responsible for recruitment and admission of Fall 2008 master students

**Instructor/Athletic Trainer**

- Sports Medicine Department, Marietta College, Marietta, Ohio, August 2004-July 2007, Athletic Trainer providing medical coverage to women's soccer, basketball, track and field, and baseball
- Co-author of self-study for CAATE re-accreditation, focus of clinical education sections
- Committee member: Human Subjects Review, Campus Life and Athletics, search committees for faculty and athletic coaches
- Instructor in Sports Medicine Department: HSCI 201: CPR/AED for the Professional Rescuer/First Aid , BIOL 212: Anatomy Lab, SPTM 210: Fundamentals of Athletic Training 211: Evaluation of Lower Extremity Athletic Injuries, 212: Evaluation of Upper Extremity Athletic Injuries, 213: Evaluation of Lower Extremity Lab, 285: Applied Nutrition (WebCT Online Course), 306: Therapeutic Rehabilitation of Athletic Injuries, 307: Therapeutic Modalities for Athletic Trainers