ATHLETIC TRAINING EDUCATION JOURNAL

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PERSPECTIVES IN ATHLETIC TRAINING

Incorporating Foundational Evidence-Based Practice Concepts and Skills Across an Athletic Training Education Program

Lisa S. Jutte, PhD, ATC, Stacy E. Walker, PhD, ATC

Ball State University, Muncie, IN

Objective: The purpose of this article is to provide an example of how to develop and implement an evidence-based practice (EBP) concepts and skills plan in an athletic training education program (ATEP).

Background: Evidence-based practice is an integral part of medical practice today. As stated in the *Athletic Training Educational Competencies 4th edition,* athletic training educators are expected to develop their students' abilities to engage in EBP. However, foundational concepts and skills are needed to effectively practice EBP.

Description: To eliminate redundancy and better prepare our students for EBP, a plan based on incorporating foundational concepts and skills concepts in small, sequential doses in our ATEP was devised and implemented.

Clinical Advantage(s): Exposure to foundational EBP concepts and skills is necessary for students to actively engage in EBP.

Conclusion(s): Despite the challenges for both students and faculty, the plan ensures we expose our students to EBP concepts and skills, therefore better enabling them to engage in EBP.

Key Words: evidence-based medicine, evidence-based athletic training, teaching evidence-based practice, pedagogy

Dr. Jutte is currently assistant professor of Athletic Training Education at Ball State University. Please address all correspondence to Lisa Jutte, PhD, ATC, HP223K, Ball State University, Muncie, IN 47306. lsjutte@bsu.edu

Full Citation:
Jutte LS, Walker SE. Incorporating foundational evidence-based practice concepts and skills across an athletic taining education program. *Athl Train Educ J*. 2010;5(3):119-125.

Incorporating Foundational Evidence-Based Practice Concepts and Skills across an Athletic Training Education Program

Lisa S. Jutte, PhD, ATC and Stacy E. Walker, PhD, ATC

There are many reasons why evidence-based practice (EBP) concepts and skills should be integrated into an athletic training education program (ATEP). First and most importantly, integrating the most current evidence into patient care can improve patient outcomes.[1] Improved patient outcomes ensure that our graduates are competitive in the health care industry. Other health care professionals, such as physicians, nurses and physical therapists, embrace EBP. In addition, the *Athletic Training Educational Competencies 4th edition*[2] states that athletic training educators are expected to develop their students' abilities to practice EBP. Despite the overwhelming support by various health care professions, may clinicians do not engage in EBP, citing a perceived lack of personal research and evaluation skills as the major barriers.[3, 4] Therefore, to increase the engagement of athletic trainers in EBP, educators must ensure that future clinicians possess the necessary skills and knowledge for EBP.

The process of properly searching for, evaluating, and applying evidence in clinical practice cannot be learned quickly by novice students. For students to actively engage in EBP, educators must progressively teach them foundational concepts and skills derived from evidence-based medicine (EBM);[5] only then will they be able to effectively practice the 5 steps of evidence-based health care[6] (Table 1). Therefore, in the spring of 2006, we developed a plan to integrate foundational EBP concepts and skills across our curriculum. The purpose of this article is to provide an example of how an ATEP can foster students' abilities to engage in EBP.

ATEP ASSESSMENT

Our program assessment began by informally evaluating our curriculum to identify EBP concepts and skills currently taught. This was accomplished at a weekly meeting where the three full-time faculty members discussed what types of EBP concepts and skills were being taught in the various classes. Prior to this project, none of the faculty had formal training in EBP, but all had read books and articles and attended conferences on the subject. During our discussions, we realized that we already taught many of the foundational concepts and skills needed to practice EBP. Unfortunately, these concepts and skills were unorganized, did not necessarily build on one another, and did not include common EBP terminology (eg levels of evidence, gold standard). After identifying which EBP principles were currently taught, we developed a plan to incorporate the remaining foundational concepts and skills and organize all of them into a logical sequence across the curriculum.

Developing the Plan

Beginning with the end in mind, we developed a list of specific student objectives (Table 2). We based these objectives on the five steps needed to practice evidence-based healtcare[6] (Table 1) and the current EBP pedagogy literature from other healthcare professions.[5, 7-19] Many of our objectives were designed to help teach EBP concepts and related terminology because before students can engage in EBP, they must understand the framework and language (eg, peer-review, levels of evidence, gold standard). We also included objectives, such as "conduct a simple clinical experiment," which are indirectly related to practicing EBP to stimulate students' appreciation for how clinical evidence is generated. Lastly, objectives were structured in small sequential units to foster a positive attitude towards EBP and lifelong practice in other health care students.[5, 9]

After establishing objectives, a list of specific foundational EBP concepts and skills (Table 3) students would need to reach our objectives was constructed. A plan to integrate those concepts and skills into various courses in our established curriculum was then devised based on the following factors: 1) which concepts and skills needed to be learned first (eg, finding evidence before applying it to clinical problems); 2) the student class level (e.g, freshman, sophomore); 3) the course content (e.g, injury evaluation verse therapeutic modalities); and 4) assignments and/or activities we could use to reinforce the concepts and skills. For example, there was more connection between EBP and course content if students in the upper and lower extremity orthopedic evaluation had an assignment regarding functional outcome instruments, rather than students in the organization and administration class completing the same assignment. By mapping out in which class or classes the foundational concepts and skills belonged, we ensured the information was presented in an organized fashion with concepts building upon one another.

Plan Overview by Class Level

In this section we present an overview of our current plan (Table 3) based on student class level (eg, sophomore, junior, senior). The

Table 1. Steps to Practicing Evidence-Based Health Care

1. Asking a clinical question based on the need for information.
2. Researching the best evidence, which relates to the clinical question.
3. Critically evaluating the validity, impact, and applicability of the evidence.
4. Applying the evidence to the clinical problem in the context of your clinical expertise and the patient's values and circumstances.
5. Evaluating the effectiveness of the previous steps, and seeking ways to improve evaluation, treatment, etc. of your patients for the future.

Table 2. Objectives of EBP Concepts and Skills Plan

1.	Students will understand what EBP is and how it can affect clinical practice.
2.	Students can efficiently ask clinical questions and obtain current and reliable evidence to answer these questions.
3.	Students can conduct a simple clinical research experiment.
4.	Students will demonstrate positive attitudes regarding EBP during their clinical experiences.
5.	Students are able to incorporate EBP into their clinical practice.
6.	Students are able to evaluate their EBP practice through self-reflection.

plan is arranged according to our ATEP course sequence, with some skills repeated in several classes. For example, the same foundational concepts and skills are taught in both the upper extremity and lower extremity evaluation courses. We have found that the repetition helps the students more fully understand EBP concepts. Since the plan builds through their six semesters in our ATEP, students are neither expected nor prepared to practice the five steps of evidence-based health care[6] until their senior year.

Evidence-based practice is first introduced in the Introduction to Athletic Training class taken by freshman and sophomores prior to admittance into the ATEP. In this course, the students attend a library learning session where a librarian introduces them to basic search techniques, such as the use of Boolean terms, literature databases available at our institution (eg, MEDLINE, CINHAL), and EBP/M databases (eg, The Cochrane Library, Centre for Reviews and Dissemination Databases). Students then practice their research skills for a class assignment.

Once students are introduced to EBP concepts and understand where they can search for evidence, they are then introduced to more advanced concepts and skills in their sophomore level classes after being admitted into our ATEP. For example, in our Prevention and Care of Musculoskeletal Injuries course, we explain the differences between peer-reviewed case reports and original research articles. Students are instructed to select both a case report and original research article from a list (prescreened by the instructor for course relevance and straightforwardness) and write an annotative bibliography for each (format provided). The purpose of this assignment is to understand the difference between a case report and an original research article, which can both be relevant to athletic training. In the upper and lower extremity orthopedic evaluation courses, also during the sophomore year, we again discuss the concept of EBP, but this time we present more advanced ideas, such as the levels of evidence, clinical prediction rules (eg, Ottawa ankle rules, Wells clinical prediction rules), position statements (eg, concussion, cervical-spine management), and clinician and patient-based outcomes. To help students develop their understanding of these concepts, the students complete the following assignments: 1) one of three EBP tutorials, internet-based, interactive guides on EBP (Table 4); 2) complete either the Lower Extremity Function Scale (LEFS)[20] or the Disabilities of the Arm, Shoulder, and Hand (DASH)[21] with a patient at their clinical experience; 3) locate the Wells clinical prediction rule[22] and discuss this clinical prediction rule with your clinical instructor; 4) locate the 2009 NATA Position Statement: Acute Management of the Cervical Spine-Injured Athlete[23] and discuss this position statement with your clinical instructor. The purpose of these assignments is to relate the information learned thus far to their clinical experiences.

The following year, as juniors in the Therapeutic Modalities and Therapeutic Exercise classes, students are ready to synthesize information from multiple sources (eg, peer-reviewed articles, Cochrane summaries, expert opinion) into a single assignment. One assignment in the Therapeutic Modalities class requires students to determine a treatment plan and provide support for their clinical decisions based on the best evidence for a case study or "paper patient" and present their clinical decision to their fellow classmates for discussion. In the Therapeutic Exercise class, students develop a PICO question regarding a patient with an orthopedic impairment, such as limited range of motion. After a brief review of sources for clinical evidence learned in previous classes, students are instructed to prepare a modified critically appraised topic (CAT) paper explaining the current evidence for treating their patient's impairment (Table 5). At the end of the modified CAT project, students are also asked to reflect and write about their current search for evidence and compare it to past strategies for finding clinical evidence.

Lastly, seniors in the athletic training capstone class complete a semester-long project in which they ask a clinical research question, complete background research, and collect data to answer their question. The project begins with class discussions regarding basic research design, such as clinical trials, cohort studies, case control studies, and as the semester progresses, students develop a research question based on the PICO method and write a literature review. During this process, students critically examine the available literature while developing their literature review for which they receive feedback in a format similar to a manuscript peer-review process. After collecting data, students submit an abstract of their research as a final report.

Revising Our Plan

Our ATEP faculty reviews the EBP concepts and skills plan annually. Revisions are made to the objectives, concepts/skills, lecture content, and assignments as needed. At the end of the 2007-2008 academic year, we revised the objectives to increase focus on the reevaluation skills needed for effectively practicing the 5th step of EBP by adding the objective, "Students are able to evaluate their EBP practice through self-reflection." Other programmatic revisions were based on new resources and/or concepts to which individual faculty member had been introduced over the academic year. For example, the addition of the EBP tutorial assignments to facilitate student comprehension was based on the availability of the online tutorials that were relevant to our purpose. Another example of a class assignment revision was changing the project format used in the therapeutic exercise

Table 3. List of Specifc Concepts and Skills Students Need to Practice, Organized by ATEP Course Sequence

Concept / Skill	Who acquires the evidence?	Example of Activities	Class
Introduce the concept of evidence based practice and review the scientific method	No evidence needed	▪ EBP lecture ▪ Mini class experiment ▪ Library session	▪ Introduction to Athletic Training
Understand the concept of peer-review and the differences between primary sources, secondary sources, popular magazines, and websites	Instructor	▪ Students read examples of each type of evidence	▪ Introduction to Athletic Training ▪ Prevention and Care of Musculoskeletal Injuries ▪ Lower Extremity Evaluation ▪ Upper Extremity Evaluation
Reading comprehension of research articles	Instructor	▪ Students write abstracts	▪ Prevention and Care of Musculoskeletal Injuries
Summarize information	Instructor	▪ Students write abstracts	▪ Prevention and Care of Musculoskeletal Injuries
Understand the concept of EBP and related terminology	Instructor	▪ EBP Lecture ▪ Complete EBM/P tutorial	▪ Lower Extremity Evaluation ▪ Upper Extremity Evaluation ▪ Athletic Training Capstone
Search for evidence	Student after instruction	▪ Students find evidence on a specific topic ▪ Public v. Fee Databases ▪ EBP/M databases such as DARE, Cochrane, etc ▪ Save search results ▪ Email search results	▪ Lower Extremity Evaluation ▪ Upper Extremity Evaluation
Finding & retrieving evidence: library search (hard copy), electronic journals, & interlibrary loan	Students after instruction	▪ Student obtains articles: ▪ Hard copy from library ▪ E-journal (soft copy) ▪ Interlibrary loan	▪ Lower Extremity Evaluation ▪ Upper Extremity Evaluation
Understand differences between levels/types of evidence. (eg difference between basic research and randomized clinical trials)	Instructor Students after instruction	▪ Levels of evidence lecture ▪ Students read examples of different levels of evidence. ▪ After instruction, student find examples of different evidence levels	▪ Lower Extremity Evaluation ▪ Upper Extremity Evaluation

Table 3. List of Specifc Concepts and Skills Students Need to Practice, Organized by ATEP Course Sequence (continued)

Concept / Skill	Who acquires the evidence?	Example of Activities	Class
Develop a clinical question	N/A	▪ Students use PICO method to develop a question	▪ Therapeutic Exercise ▪ Athletic Training Capstone
Find and apply current evidence to patient problems	Students	▪ Case studies & Presentation ▪ Treatment guidelines ▪ Students write a modified Critically Appraised Topic (CAT)	▪ Therapeutic Modalities ▪ Therapeutic Exercise
Evaluate EBP process		▪ Students reflect on process of finding and applying evidence	▪ Therapeutic Exercise
Understand different research designs, ie clinical trials, cohort studies, case control studies, cross-sectional surveys, case studies, expert opinion, & anecdotal.	Instructor Students after instruction	▪ Students read different types of articles then compare and contrast articles	▪ Athletic Training Capstone
Critically review evidence	Students	▪ Students criticize study for strengths and weaknesses rather than their understanding & use. ▪ Student uses an appraisal check list to evaluate evidence	▪ Athletic Training Capstone
Generate a literature review	Students	▪ Students write a literature review	▪ Athletic Training Capstone
Develop a research question	Students	▪ Students develop research question / hypothesis	▪ Athletic Training Capstone
Conduct an EBP research study	Students	▪ Students carry out data collection & makes conclusions. Instructor assess with data analysis	▪ Athletic Training Capstone

Table 4. Evidence-Based Practice Tutorials

Duke University Medical Center Library and Health Sciences Library, UNC-Chapel Hill, Introduction to Evidence-Based Practice	http://www.hsl.unc.edu/services/tutorials/ebm/index.htm
SUNY Downstate Medical Center Evidence-Based Medicine Tutorial	http://library.downstate.edu/EBM2/contents.htm
Evidence-Based Practice Tutorial for Nurses	http://www.libraries.psu.edu/psul/tutorials/ebpt.html

Table 5. Description of Critically Appraised Topic (CAT) Assignment

I. Students need a minimum of 5 pieces of evidence and 1 piece should be a EBP summary report or meta-analysis

II. For each article/piece of evidence the following information is given:

- Study Design (e.,g., number of treatment groups, is there a control group, are subjects and/or patients blinded to treatment)
- Participants (e.g, age, gender, activity level)
- Intervention Investigated
- Outcome Measure(s)
- Main Findings
- Level of Evidence
- Conclusion

III. Students provide an overall summary describing which treatments are most and/or lease effective based on the evidence.

class from a series of annotated bibliographies followed by a summary paragraph to a modified CAT paper. While the new Therapeutic Exercise assignments are still very similar to their original counterparts, the modified CAT format reinforces an EBP resource students might use in the future.

CHALLENGES & BENEFITS

Developing and implementing the EBP concepts and skills plan was not extremely difficult, but it did take time and effort. We were already covering several of the concepts/skills but were not relating them to the EBP concepts and skills. For example, prior to the implantation of our plan, we discussed current research in our therapeutic modalities and rehabilitation classes, but had neither introduced the EBP concept of levels of evidence nor clearly used EBP terminology. We suggest those who were not formally taught evidence-based health care to start by reading, *Evidence-based Medicine: How to Practice and Teach EBM.*[6] This book is known as the "gold-standard" and presents the 5 steps of evidence-based health care. It is beyond the scope of this article to provide a detailed list of available resources (eg, articles, books, websites, tutorials, databases) but some of this information can be found elsewhere.[24]

For the plan to be successful, faculty need to not only understand and be able to teach the new concepts and skills, but also develop new class resources and assignments to reinforce them. By linking EBP across our curriculum, students are exposed to the material in a sequential and efficient manner. This has fostered a change in attitude and behavior towards evidence, with students now sharing articles and websites outside of class assignments with faulty and classmates, and inquiring about evidence associated with course content if it is not adequately addressed.

CONCLUSION

Our hope was that by sharing our experiences of incorporating EBP into our ATEP we will encourage others to do the same. We suggest taking the following steps to integrate EBP concepts and skills into your ATEP:

1. Identify if and where EBP concepts and skills are currently being taught in your ATEP;
2. Identify the concepts and skills that need to be added so your students are prepared to practice the five steps of evidence-based health care[6];
3. Develop a plan regarding how and where concepts and skills will be addressed in your ATEP;
4. Implement your plan;
5. Revise as needed.

Practicing EBP can be challenging for clinicians if they are unfamiliar with EBP concepts or how to efficiently find and review current information. By developing EBP concepts and skills in a stepwise approach throughout our ATEP curriculum, we are fostering an appreciation for EBP, and have begun to see changes in students' abilities and attitudes towards practicing EBP.

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