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ORIGINAL RESEARCH

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

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Context: Professional athletic training education must transition toward instruction of evidence-based practice in order to maintain progress with other health professions' clinical practices and educational standards.

Objective: To evaluate athletic training educators' experience with implementation of evidence-based practice concepts in CAATE accredited professional athletic training education programs in order to establish the current state of instructional approaches and incorporation of evidence-based practice concepts.

Design and Setting: Interviews of emergent design and modified-grounded theory. Instructors currently teaching at 11 undergraduate institutions were interviewed regarding their experience and perceptions of teaching evidence-based concepts. Participants: Eleven educators (3 males, 8 females; average [SD] years teaching 14.73 [7.06]) were interviewed to evaluate their implementation of evidence-based concepts within their courses.

Measure(s): Instructors' experiences regarding teaching of these concepts was explored qualitatively through coding by the researcher. Established categories were triangulated and member checked to establish trustworthiness of the findings.

Results: The analysis determined that instructors have three primary approaches to evidence-based practice concept implementation within their programs: curricular emphasis, teaching strategies, and student activities. Analysis also revealed that teaching objectives for concept implementation transcended the cognitive levels of Bloom's revised taxonomy.

Conclusions: Athletic training educators should be creative in how they implement EBP within their programs and share their experience with the profession. The teaching objectives, strategies, and activities presented should provide other educators with a foundation to initiate evidence-based instruction. Educating the future of our profession in EBP concepts will promote critical thinking, potential research interest, and further development of the available body of knowledge of our growing clinical practice.

Key Words: Bloom's revised taxonomy, pedagogy, curriculum

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

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Evidence-based practice (EBP) has become a foundational component of health professions in the United States, particularly in the fields of medicine,[1,2] nursing,[3] physical therapy,[4] and occupational therapy.[5] 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.[6-9] The aforementioned professions have embedded EBP concepts within their professional educational standards and programs to encourage the development of evidence-based practitioners.[6-9] As Steves and Hootman,[10] 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[11] include curricular emphasis on critical thinking, clinical skill development, and research, making undergraduate professional 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 asking, "is EBP an important concept to teach?"[12]

In 1992, the *Journal of the American Medical Association*[13] published "Evidence-based medicine: A new approach to teaching the practice of medicine" as a catalyst to establishing EBP within health care professions. Health professions, such as medicine[1,2] and nursing,[3,14-17] 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,[7] most notably in the area of how to implement EBP into professional 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,[7] 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.[2] Evidence-based practice must evolve more fully in the athletic training profession, as only anecdotal data regarding known numbers of practitioners and educators using and incorporating EBP is available. Furthermore, the Commission on the Accreditation of Athletic Training Education (CAATE) graduate tracking data[18] indicate that of the 46 percent of undergraduate students pursuing advanced education upon graduation, only eight percent continue on to study for an post-professional 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 ensure 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 professional athletic training education programs must be performed.

The purpose of this study was to examine select undergraduate professional 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 was 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 professional level.[19]

METHODS

Participants

Eleven educators (3 males, 8 females) currently instructing in CAATE-accredited undergraduate professional athletic training education programs (ATEP) were interviewed regarding their teaching experience, program use, and recommendations for implementing evidence-based practice concepts. Table 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 methods used 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 they provide names of others they believe to have knowledge in the area.[19] Participants were contacted after their name had been 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 use evidence-based concepts within their instructional methods. Use 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.[19,20]

Table 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
House	F	No	23	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

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.[19] 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.[19,22]

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 (Table 2). These questions were initially 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 professional education. In accordance with emergent design,[19] 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.[19] Patterns were initially 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.[19-21] 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.[19, 20]

Triangulation, peer review, and participant checking were performed to assess the trustworthiness of the findings and further define the context of information.[19-22] Triangulation[19] occurred via multiple-analyst evaluation as two members of the research team analyzed transcriptions and thoroughly discussed the emergent themes. Peer review[19] was accomplished by having an athletic training educator with knowledge of qualitative research review identified themes for consistency and significance. Participant checking[21] 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. Figure 1 contains the conceptual framework of themes and associated categories. The data revealed that of the eleven programs examined, only one institution has incorporated an

Table 2. Protocol of Interview Questions

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

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 already 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 (Table 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.

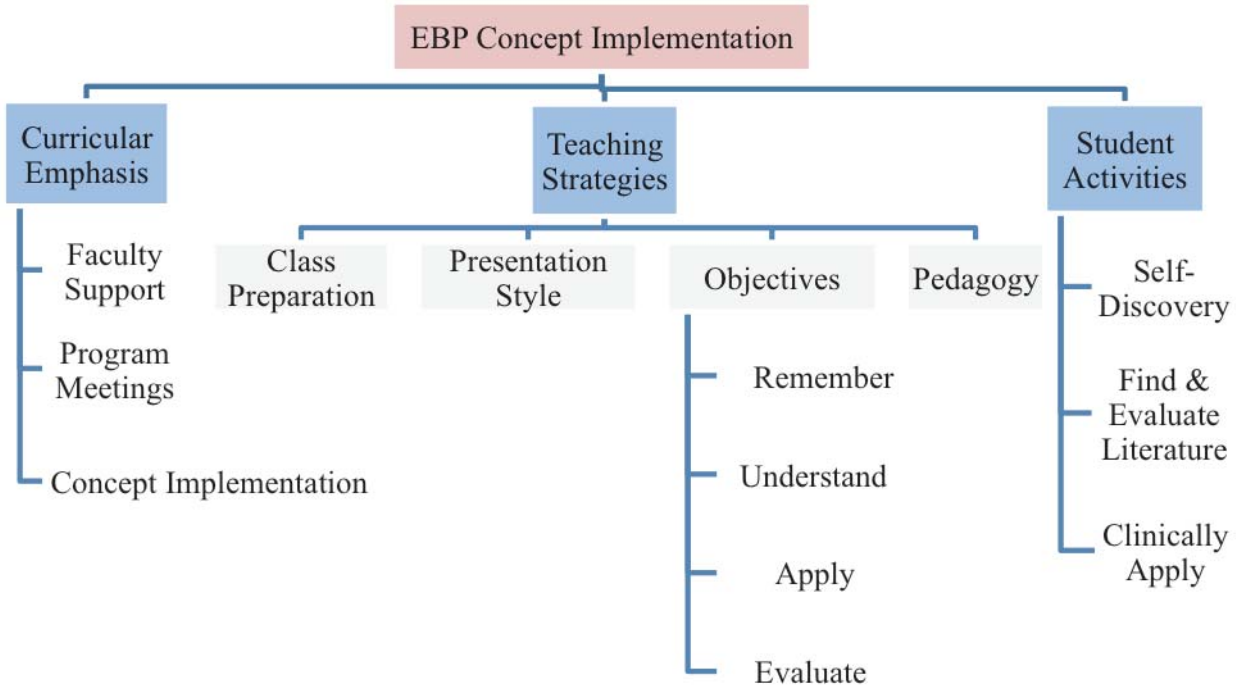

Figure 1. Conceptual framework of overarching theme and associated categories

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

Course	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

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. (House)*

Program Meetings

Educators discussed their initial approaches to EBP concept adoption within the program's curriculum. 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 ya 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. (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 used 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 used 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, and creating.[23-26]

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 posters. (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 tight (small) summaries, and then in the senior level, 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. (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 professional level, participants revealed that it is also important for teachers to use 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.[22]

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 give 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 together formed 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 commitment to providing students opportunities to use evidence-based practice concepts. It is important for educators to share how they are including 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 using evidence-based teaching strategies appear to be valued by educators who have already adopted EBP as part of their athletic training curriculum. 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 approach to implementation.

Curricular Emphasis

The curricular approach presented by the participants lent support to the research engagement model of Martin et al.[27] This model suggests 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,[7] educators must begin to embed these concepts within professional 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 professional 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.[25] 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. [25, 26]

Pedagogy

The pedagogical emphasis presented by the participants illustrates the need discussed by Schellhase,[28] for athletic training educators to reference research on effective teaching methods, which often originates in the broader educational realm. Proven teaching techniques, such as problem-based learning,[29] 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.[30]

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.[24,25] 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.[5] Burns and Foley,[15] 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. 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.[15] Other research[12] 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.[12] Topics for courses later in educational curricula might include critical appraisal, diagnostic probabilities, clinical versus statistical significance, and communicating evidence to others.[12] At the undergraduate professional education 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.[8, 15]

Teaching strategies focusing on EBP concept implementation should be developed for all levels of education, from undergraduate professional to continuing education.[31] 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.[31] 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[11] require that athletic training students develop and master skills 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[2] 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[32] and nursing.[5, 12, 17,31] These barriers include, but 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 that 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 could also 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 included in professional ATEPs. While a full curricular approach is preferred, small steps can be made to incorporate these topics within already existing courses. Though evidence-based concepts have yet to be included in NATA Educational Competencies,[11] instructors should be proactive in placing this information within their didactic curriculum as well as encourage its use during clinical experience. Developing clinical experience that integrates research components[8] 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 topic expands in athletic training, educators should be creative in how they implement EBP within their programs and share their experience with the profession. Professional 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?"[12] 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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