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ORIGINAL RESEARCH

Athletic Trainers' Current Knowledge and Envisioned Use of Foundational Evidence-Based Practice Concepts

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Context: The Board of Certification (BOC) requires 10 continuing education units (CEUs) in evidence-based practice (EBP) each reporting period. It is unknown whether participation in programming in the Foundations category for CEUs results in improved knowledge of and confidence in EBP.

Objective: To examine a continuing professional education (CPE) program in relation to perceived knowledge of and confidence in EBP concepts among athletic trainers (ATs) and to determine ATs' perceptions regarding barriers to, use of, and resources for EBP.

Design: Mixed-methods, within-subjects design; preintervention-postintervention evaluation of ATs' EBP knowledge and perceptions.

Setting: A CPE workshop hosted at 2 Division I universities.

Patients or Other Participants: Convenience sample of 123 AT workshop attendees.

Intervention(s): Five-hour BOC-approved Foundations of EBP workshop.

Main Outcome Measure(s): The Evidence-Based Concepts: Knowledge, Attitudes, and Use survey. The ATs' EBP knowledge was assessed via multiple-choice questions. Descriptive statistics, differences between scores, and correlations were ascertained. Open-ended questions were classified according to common themes and coded.

Results: The 11-point knowledge score showed knowledge increased significantly ($t = -12.42$, $P < .001$, d = 1.31, 95% confidence interval = –2.41, –1.75) preworkshop (mean = 6.39 ± 1.63) to postworkshop (mean = 8.47 ± 1.55). Confidence in knowledge increased significantly ($z = -9.51$, $P < .001$) preworkshop (median = 26) to postworkshop (median = 38). The ATs identified barriers to EBP use as time, resources, environment, and experience in EBP; envisioned use of EBP included implementing patient-reported outcomes and internet resources.

Conclusions: This workshop demonstrated improved immediate perceived knowledge and confidence in EBP concepts. Although a larger number of clinical EBP programs have been approved by the BOC, Foundations of EBP programming is valuable for CEU opportunities to narrow the gap regarding EBP knowledge. Future investigations may evaluate transference of EBP knowledge into professional practice.

Key Words: Continuing professional education, professional development, mixed methods

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Athletic Trainers' Current Knowledge and Envisioned Use of Foundational Evidence-Based Practice Concepts

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As described by Sackett et al (1996)[1] and Guyatt (2003),[2] the 5-step process of evidence-based practice (EBP) has become a foundational component of health care that is used to identify and integrate the best available evidence with clinical expertise to maximize patient outcomes. In addition, the National Academy of Medicine, formerly the Institute of Medicine, declared EBP as a competency that all health care providers should possess.[3] The athletic training profession has adopted EBP as an appropriate mechanism for patient care and has solidified EBP as a foundational element of athletic training education in the 5th edition of the National Athletic Trainers' Association (NATA; 2011) *Athletic Training Educational Competencies*.[4] Other health care professions have also expanded the instruction and use of EBP due to its individualized approach to patient care.[5]

Evidence-based practice has seen additional emphasis in athletic training because the board of certification (BOC) requirements for continuing professional education (CPE) first directed professionals to obtain 10 continuing education units (CEU) in the category of EBP every 2 years during the 2015 reporting cycle.[6] In comparison, for other professions, including physical therapy and occupational therapy, continuing education/professional development requirements are monitored at the state level rather than national, and a specific designation for EBP credits does not currently exist.[7,8] However, the national organizations associated with these professions do recommend that continuing competence/professional development be achieved through programs that are based on contemporary referenced information that reflects evidence in practice.[7,8]

Continuing professional education programs approved by the BOC for the Level 1-EBP category designation are classified as either Foundations of EBP or Clinical EBP programming.[9] Foundations programs help to promote EBP within the profession by emphasizing the ability to locate, evaluate, and apply evidence to clinical practice as well as to provide an overview of the EBP process, suggest integration methods for practice or education, or suggest methods of measuring patient outcomes. In comparison, clinical EBP programs focus on a clinically relevant topic formatted around a clinical question that must be supported by current evidence. Clinical EBP programs should discuss not only the clinical question but also the search strategy, critical appraisal, and application of the evidence found. Both types of programs must undergo review by a BOC-approved panel of EBP experts who evaluate submissions on the following criteria: (1) faculty qualification, (2) course purpose and objectives, and (3) instructional content.

Previous research[10–14] in athletic training shows that foundational knowledge of EBP concepts is low. Stand-alone workshops, journal clubs, and clinically integrated teaching improve knowledge of EBP and critical appraisal in medicine,[15] whereas web-based modules increase foundational EBP knowledge in athletic trainers (ATs).[12,14] In addition to knowledge, information has been previously disseminated regarding barriers to use and implementation of EBP.[16–21] Although valuable in content, these previous studies were conducted before the implementation of the BOC requirement regarding EBP continuing education. There is a structured process to obtaining these EBP-category CEUs through the BOC, but little information is available regarding the outcomes of EBP-approved CPE programs on ATs' knowledge and subsequent implementation of skills into practice. In addition, there is a lack of information regarding how ATs access and use EBP concepts and resources. Therefore, this study aimed to evaluate a BOC-approved Foundations 1-day program in regard to ATs' perceived knowledge and confidence in foundational concepts of EBP. A secondary aim of this study was to describe and compare participants' preworkshop and postworkshop perceived barriers and AT practices regarding access to and resources for, as well as current and envisioned use of, foundational EBP concepts.

METHODS

Study Design

A mixed-methods, within-subjects design with preintervention and postintervention evaluation of ATs' EBP perceived knowledge via the Evidence-Based Concepts: Knowledge, Attitudes, and Use (EBCKAU) survey.[11] The study was approved by the university institutional review board of the primary researcher.

Participants

The EBCKAU was administered to a convenience sample of ATs who attended a 5-credit BOC-approved EBP CPE workshop entitled "Understanding Evidence-Based Practice and Patient-Reported Outcomes." This 5-hour workshop, offered exclusively to ATs, was held during spring 2015 at 2 Division I universities in District 2 and 3 of the NATA and was attended by 149 ATs. Advertising of the workshop was sent to local medical organizations and athletic training professionals as well as alumni and affiliated AT preceptors of each university.

Of the 149 attendees, 123 ATs consisting of 63 men and 59 women (1 participant elected to not disclose sex) completed the EBCKAU at both preworkshop and postworkshop time points for an 83% participation rate. Consenting participants were excluded from analysis if they did not fully complete the survey on either the preintervention or postintervention administration. Table 1 portrays demographic information for all participants.

Instrumentation

The EBCKAU survey was administered online and has been previously deemed valid and reliable among a student population learning foundational concepts of EBP.[11] Because

Table 1. Participant Demographics

Characteristic	N (%)
Age	
22–29 y	52 (42.3)
30–39 y	29 (23.6)
40–49 y	24 (19.5)
50–59 y	15 (12.2)
60–69 y	2 (1.6)
Not reported	1 (0.8)
Sex	
Male	63 (51.2)
Female	59 (48.0)
Prefer not to answer	1 (0.8)
BOC certification route	
Professional bachelor's	98 (79.7)
Professional master's	5 (4.1)
Internship route	20 (16.3)
Time in clinical practice, y	
1–9	62 (50.4)
10–19	29 (23.6)
20–29	18 (14.6)
30–39	8 (6.5)
40–49	2 (1.6)
Not reported	4 (3.3)
Clinical practice setting	
Collegiate	34 (27.6)
Secondary school	39 (31.7)
Junior/middle school	1 (0.8)
Industrial	1 (0.8)
Clinic/rehab facility	18 (14.6)
Professional sports	3 (2.4)
Performing arts	2 (1.6)
Other	25 (20.3)
Highest education level	
Bachelors	36 (29.3)
Masters, CAATE-accredited program	28 (22.8)
Masters, other	45 (36.6)
PhD or EdD	9 (7.3)
DPT	3 (2.4)
MD	1 (0.8)
Other terminal degree	1 (0.8)

Abbreviations: BOC, Board of Certification; CAATE, Commission on Accreditation of Athletic Training Education.

the participants in this study were considered students in an EBP workshop, the instrument was deemed appropriate for the population. Among this certified AT population, the knowledge section of the EBCKAU demonstrates a Kuder-Richardson (K20) value of 0.435. Ordinal values of the EBCKAU have an established Cronbach α of 0.70. Although the K20 value of 0.435 is not high, it does take into account the increased level of difficulty of EBP questions for novice foundational EBP course attendees, thus contributing to the consistency and reliability of the instrument.

Eleven multiple-choice questions were used to assess knowledge of the foundational steps of the EBP process and patient-reported outcome measures (PROMs). After each knowledge question, confidence in knowledge was rated on a Likert scale by asking participants to respond to the following statement: "I am ___ confident that I answered this question correctly," with one of the following Likert scale responses: (1) *not at all*, (2) *mildly*, (3) *moderately*, and (4) *extremely confident*.

Participant perceptions of EBP were assessed via questions aimed toward describing ATs personal practice and resources for, barriers to, and envisioned use of EBP. The personal practice–oriented questions included ranking, checklist, and open-ended formats targeting how ATs access and use EBP resources. The ranking question asked participants to list and rank literature-search tools they use in order from *most preferred* (1) to *least preferred* (5). In addition, each participant was given a checklist and asked to identify which resources he or she uses more than 2 times per week when determining patient treatment plans; possibilities for this list included 13 options of intrinsic factors such as personal experience, extrinsic factors such as patient feedback, educational materials including previous course notes, published evidence, and colleague discussion. Open-ended questions were also included and permitted participants to describe their perceived barriers to the use of EBP concepts in clinical practice as well as ways in which they envision using EBP skills in future athletic training practice. Demographic questions aimed to describe the sample and determine representation of the population.

Intervention

This 5-hour BOC-approved Foundations of EBP educational program was designed by 3 athletic training educators considered to be experts in EBP. A primary aim for this workshop was to increase attendee competency in knowledge and application of EBP. Through the EBP techniques instructed in this workshop, participants learned how to establish clinically based questions specific to patient care via the patient, intervention, comparison, outcome (PICO) method; search the literature for information relating to the patient; critically appraise information; and apply information appropriately to clinical problems including selection and implementation of PROM. Specific examples and resources for clinical application, as well as a review of the importance of PROM athletic training clinical practice, were included. The structure of the course included lecture, guided practice, discussion, and group analysis.

Procedures

The EBCKAU survey was administered online (Survey Monkey, 2015 version; Survey Monkey Inc, San Mateo, CA) both before the associated workshop intervention and within 48 hours afterward. Delivery of the workshop was conducted by the primary research team with identical content at each workshop. Workshop location 1 (March 2015) featured 3 speakers considered experts in evidence-based practice, whereas workshop location 2 (May 2015) featured 1 of the original speakers presenting all information; instructional content remained consistent between locations and was presented in accordance with initial presentation of the workshop. Delivery of the workshop occurred over a consecutive 5-hour period at both locations.

Two weeks before the presentation of each workshop, the primary investigator (S.M.) sent an e-mail to registered attendees detailing the overview of the workshop, purpose of the study, invitation to participate in the research study,

Table 2. Knowledge Scores by Location

	Workshop Location 1	Workshop Location 2
No. of participants	83	40
Preworkshop knowledge score	6.35 ± 1.69	6.48 ± 1.50
Postworkshop knowledge score	8.59 ± 1.41	8.23 ± 1.79

and link to the EBCKAU survey. Participants who had not completed the survey online before the workshop were given the opportunity to complete the survey on-site using either an online device or paper format. Immediately after the conclusion of the workshop, participants were e-mailed a link to complete the online postworkshop survey. Participants self-selected a unique identification number based on their initials and birthdate to track completion of the survey between preworkshop and postworkshop time points. The majority of participants completed the survey, via the online link, on-site before receiving their continuing education credits. The paper option was made available immediately postworkshop as well. Surveys completed in paper form (n = 5) were manually entered into the online platform by the research team. A follow-up e-mail was sent at the conclusion of the workshop requesting completion of the postworkshop survey from those who did not complete the survey on-site.

The survey included an introductory page with informed consent followed by the EBCKAU survey. Although all workshop attendees were required to complete the survey before and after to confirm attendance and serve as verification of completion for continuing education credit, the first question of the survey allowed the participants to opt into or out of the research study. Participants were given this opportunity on both preworkshop and postworkshop administrations of the survey.

Data Analysis

Data analysis was conducted at the conclusion of both workshops using SPSS Base for Windows, version 22.0 (IBM Corp, Armonk, NY). Descriptive statistics including means, standard deviations, and frequency values were analyzed and a Shapiro-Wilks test was conducted to support the assumption of normality. Knowledge scores were tabulated by giving a score of 1 to each correct answer and then summing all correct responses, for a maximum score of 11. After summation, a paired *t* test was conducted to determine differences in knowledge scores from preworkshop to postworkshop EBCKAU survey administrations.

Confidence in knowledge scores were attained by taking the score that correlated to the Likert response for each statement and then summing the 11 individual scores for an overall possible confidence score of 44. A higher score indicated higher confidence in knowledge. Wilcoxon matched-pairs signed ranks (*T*) were used to determine differences in confidence in knowledge. Pearson product moment correlations (*r*) were used to establish relationships between knowledge change scores and participant factors including prior EBP workshop experience and level of degree. Spearman rank correlations (ρ) assessed the relationship between postknowledge scores and post–confidence in knowledge scores. Statistical significance was set a priori at $P = .05$. Ranking and checklist questions were analyzed through frequency counts.

Due to the focused context of questions used in this survey (perceived barriers and envisioned use of EBP), open-ended responses were analyzed qualitatively through inductive content analysis to condense the raw data into brief summary format.[22–23] One researcher, with 7 years of qualitative research experience, performed the initial textual coding by assigning conceptual labels to all responses. Thematization then occurred as coded concepts were placed into common subthemes. As the data analysis process advanced through continued review of the data, subthemes were reorganized, as appropriate, to establish higher-order themes. Reevaluation and reorganization continued until all appropriate data had been thematically categorized into higher-order themes and subthemes.[22–25] After this thematic determination, the second researcher, who also has qualitative experience, served as the peer debriefer and conducted content analysis on the basis of the initial researcher's findings. Any discrepancies between researchers were discussed and resolved. This qualitative analysis process is consistent with other qualitative strategies.[26–28]

Member checking and the previously described peer review process contributed to data triangulation, thus establishing trustworthiness of the data.[22–23,26] Member checking occurred after open-ended responses were retrieved and coded; the researchers shared the results with a convenience sample of consenting participants to member check themes and categories for accuracy and clarity. In addition, triangulation of sources was accomplished because the EBCKAU was administered as pretest and posttest, allowing for further corroboration of findings.[22,26]

RESULTS

Perceived Knowledge and Confidence in Knowledge

Of the 149 attendees at the workshops, 123 completed the preworkshop and postworkshop EBCKAU surveys and consented to use of their responses, for an 83% response rate. For the knowledge scores, the Shapiro-Wilks test of normality indicated nonnormality ($P = < .001$); however, all other indices suggested that normality was a reasonable assumption including skewness (–0.143), kurtosis (0.526), histogram, and Q-Q plots. There was no significant difference in preworkshop or postworkshop knowledge scores between workshop locations (Table 2). Before workshop attendance, participants had a mean knowledge score of 58%, demonstrating low knowledge of EBP concepts; this value increased to 77% postworkshop, indicating moderate knowledge of EBP concepts. On average, knowledge-change scores were equivalent to an increase in total score by 2 points with a range of –3 to 7; 59% of participants increased their score by 2 points or more. Table 3 depicts preworkshop and postworkshop knowledge and confidence in knowledge results for all participants. Confidence scores improved from a 2.35 (*mildly confident*) to 3.38 (*moderately confident*) on the 4-point confidence scale. In addition, postworkshop knowledge was found to positively correlate to postworkshop confidence with a weak to moderate relationship ($\rho = 0.408$, $P < .001$). No

Table 3. Evidence-Based Concepts: Knowledge, Attitudes, and Use (EBCKAU) Knowledge Scores

Portion of EBCKAU	Maximum Possible Score	Pretest	Posttest	*P* Value	Change Score, Mean ± SD	Effect Size	95% Confidence Interval
Knowledge	11	Mean ± SD		<.001[a]	2.08 ± 1.86	1.309	−2.41, −1.75
		6.39 ± 1.63	8.47 ± 1.55				
Confidence in knowledge	44	Median		<.001[a]	11.38 ± 5.4		
		26	38				

[a] Indicates statistical significance at $P < .05$.

significant relationship was identified between age, years of BOC certification, years of clinical practice, or hours of internet use and either knowledge or confidence in knowledge scores.

Resources for EBP

Both preworkshop and postworkshop, participants were provided a checklist of resources to identify which items they use more than twice per week when determining treatments for their patients. The resultant identified items were similar from preworkshop to postworkshop due to the short time that elapsed between assessments; therefore, only postworkshop findings are presented. After the workshop, the most often identified items were the internet, previous experience, coworker conversation, and discussion with other health care professionals. Figure 1 displays a frequency count of the resources identified by participants.

At both survey-administration time points, participants were also asked to list and rank in order, from most used to least used, up to 5 databases/sources they use most often when conducting literature searches. Of the responses recorded by participants postworkshop, the most commonly reported databases/resources were Medline/PubMed, Google Scholar, and EbscoHost, collectively accounting for approximately 66% of all responses. Figure 2 shows the hierarchal rating of each commonly used database.

Barriers to EBP

Participants were asked to identify their perceived barriers to the use of EBP in clinical practice via open-ended questions both preworkshop and postworkshop. All 123 matched presurvey and postsurvey participants provided these responses, and thematic trends were consistently identified at both time points in the areas of time, accessibility of evidence,

Figure 1. Evidence resources identified by participants as used more than 2 times per week. Abbreviation: PICO, patient, intervention, comparison, outcome.

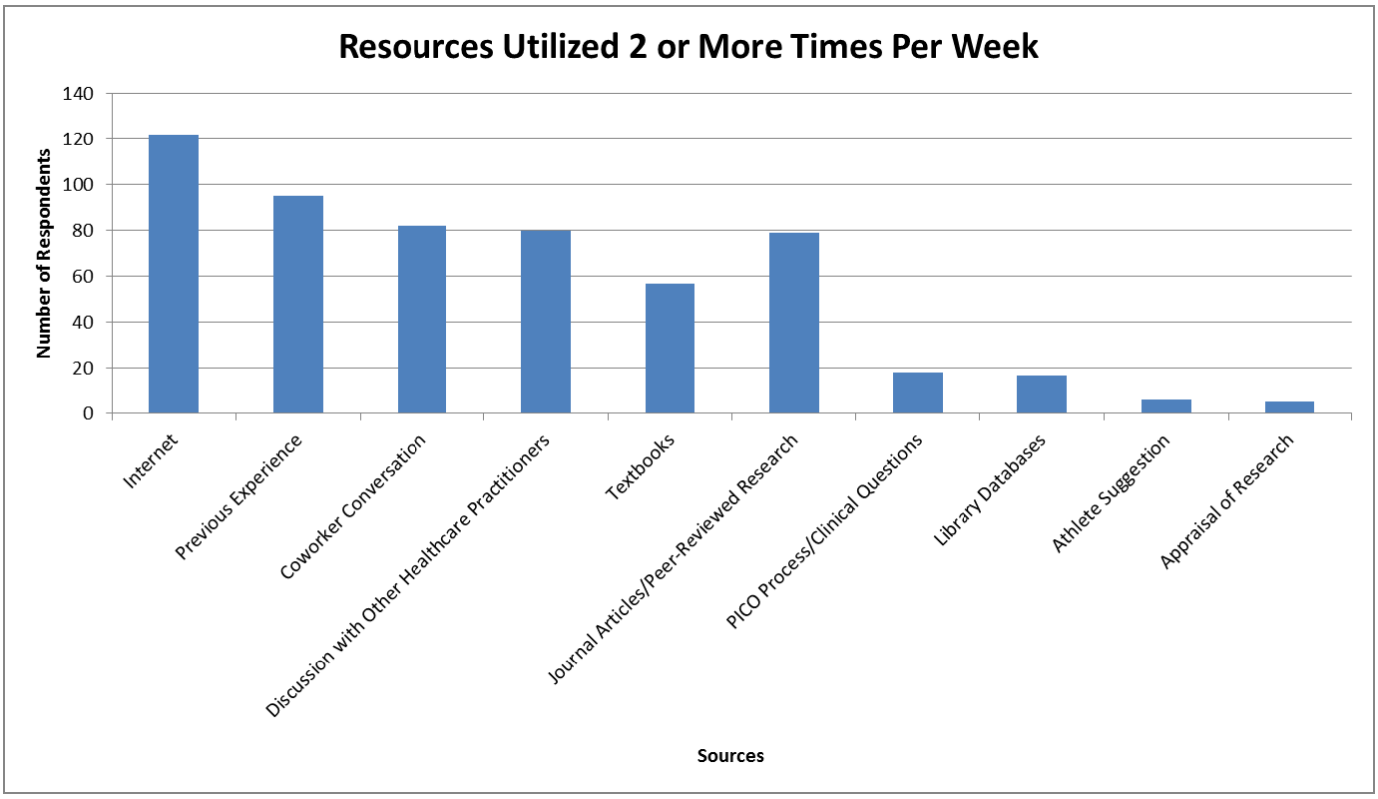
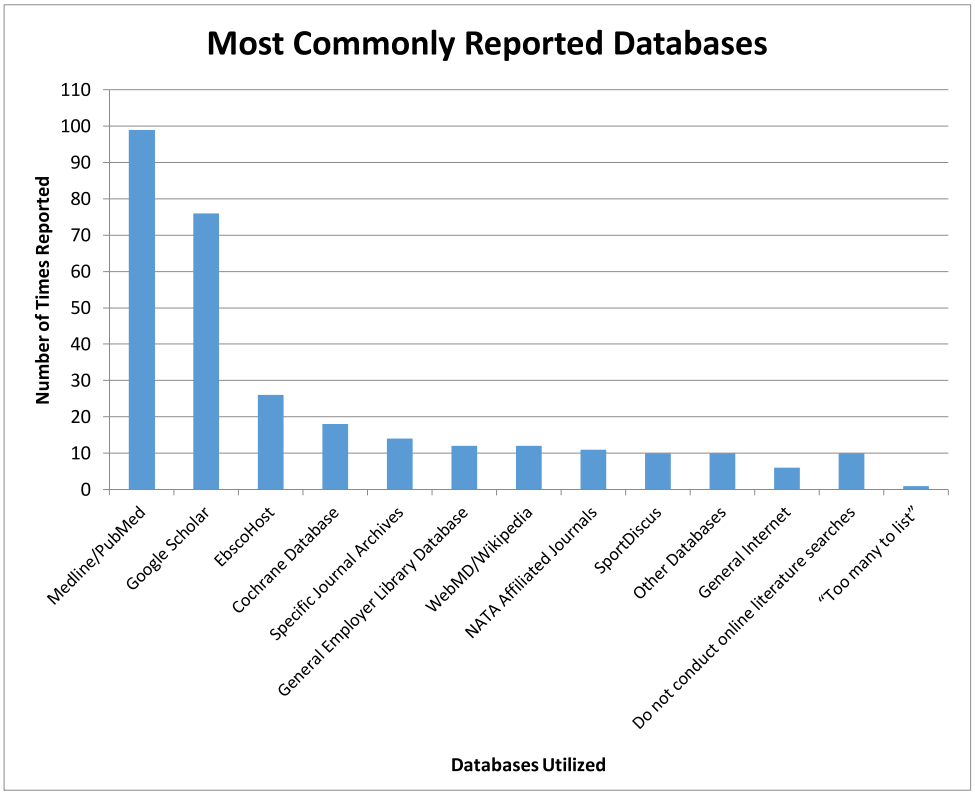


Figure 2. Participant responses regarding databases used to locate evidence. Abbreviation: NATA, National Athletic Trainers' Association.



knowledge related to EBP, applicability of evidence, and the culture of their practice environment. Figure 3 provides an overview of themes and supportive quotes for each theme.

Envisioned Use of EBP

In an attempt to further define the value of the workshop, ATs were asked both preworkshop and postworkshop to identify how they envision using EBP concepts in future athletic training practice. Responses were distributed among 3 common themes before the workshop: patient care, knowledge of EBP, and teaching of EBP. After the workshop, participant responses demonstrated continued envisioned use in these 3 theme areas; however, an additional theme of envisioned incorporation of the EBP process within AT practice was identified. Within the theme of patient care, a new category was also delineated for incorporation of PROMs and justification of care. Figure 4 depicts the conceptual framework of themes and categories for both preworkshop and postworkshop responses.

Patient Care. Within the patient care theme, 4 categories were established to further delineate AT responses related to envisioned use of EBP and included approach to patient care, to determine patient outcomes, and to assist in selection of interventions, as well as to assist in clinical decision-making. After the workshop, more specific responses related to the incorporation of patient-reported outcomes and justification of care were identified. Table 4 provides select supportive quotes for these categories from preworkshop and postworkshop responses.

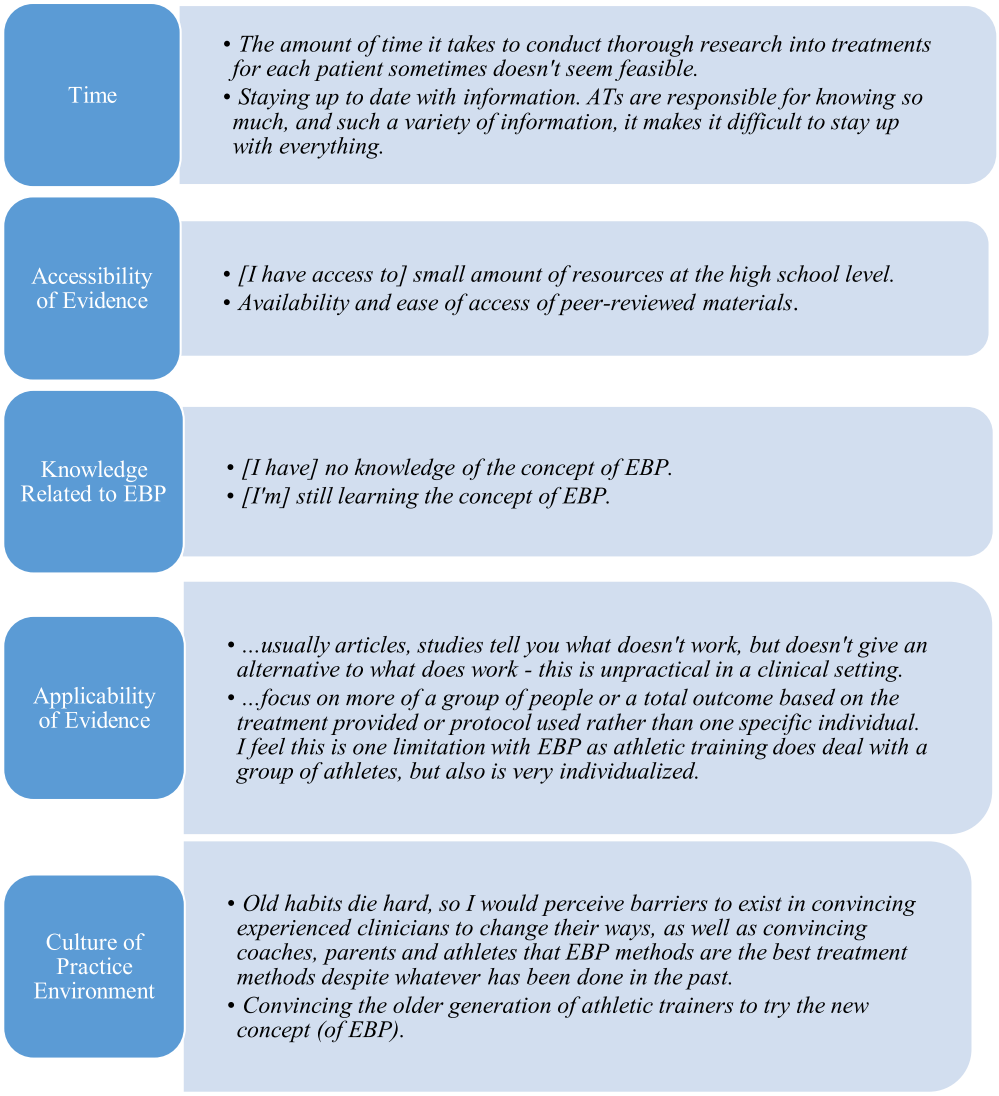
Approach to Patient Care. Before the workshop, specific to approach to patient care, participants responded that they envisioned incorporating EBP concepts when preventing, evaluating, and treating patients. One participant stated envisioned use as incorporation of "Guidelines in treatment prescriptions, creating standards of care." Another participant envisioned, "Seeking out new effective treatment options. Supporting/debunking current treatments utilized, increasing efficiency and quality of treatment utilized." An additional participant stated, "Essentially I see EBP as current best practices for determining the best way to complete my job successfully for my patient. Identifying how to determine those best practices will aid in using those skills."

After the workshop, approach to patient care was also identified as a category but in more specific terms. One participant wrote, "I see myself utilizing [EBP] in helping make better decisions in regard to treatment options and their successes." Another participant responded in a related fashion by stating, "I want to use evidence based [practice] when I have a patient whom I have tried out all my known options and see what else has been done."

Determine Patient Outcomes. Before the workshop, many participants responded that they envisioned using EBP to address patient outcomes. One participant wrote, "I will look to use it [EBP] to a greater extent when working with patients and trying to come up with the best treatment options to optimize outcomes." Another participant envisioned, "utilizing current research, as well as previously established literature in order to provide the most successful patient outcomes."

Selection of Interventions. Participants identified that they envisioned using EBP to determine intervention choices before the workshop. For example, one participant envisioned

Figure 3. Emergent themes and supporting quotes for pereceived barriers to evidence-based practice (EBP). Abbreviation: AT, athletic trainer.



use during "evaluation of an athlete, use of modalities, and writing out a rehab plan." Another individual provided further insight by stating,

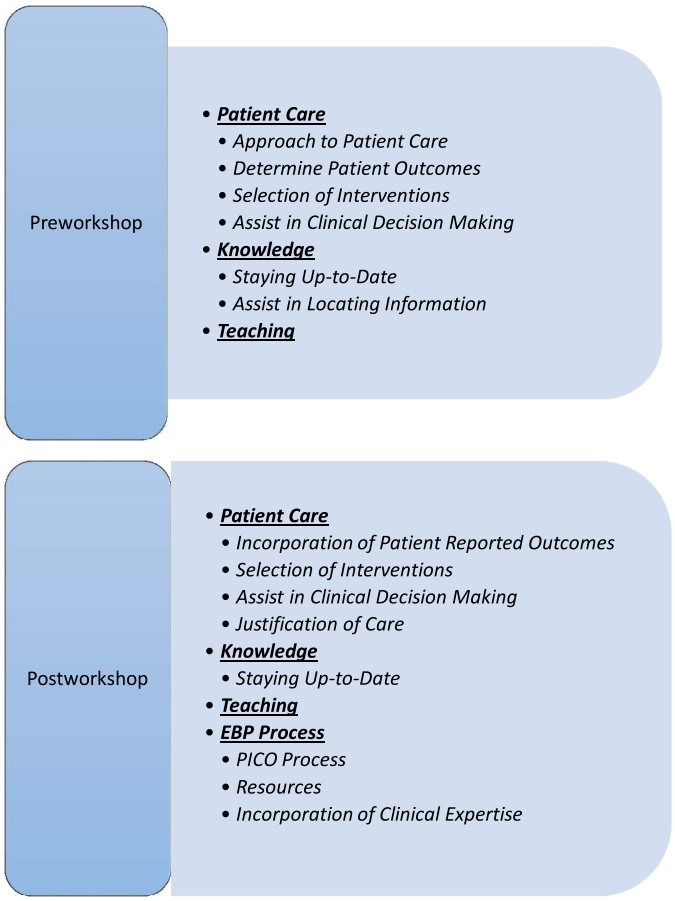
> *[I envision] utilizing EBP journal articles, case studies, peer-reviewed research for the use and outcome(s) of modalities, such as ultrasound, that is not typically used during my treatment. Whether or not it [ultrasound] does provide a true benefit for certain injuries. Dependent on these outcome(s) might change the way I view ultrasound and possibly incorporate this modality while practicing as an ATC.*

After the workshop, the category of selection of interventions was still evident in participant responses. One participant noted this envisioned use: "When I encounter an injury or condition I am not familiar with, to add new rehab exercises to what I am currently doing." Several participants simply stated that rehabilitation decisions would be an envisioned area of use of EBP by stating, "mostly with patient rehabilitations"; "developing rehabilitation protocols for future patients"; and improving ability "to select the best treatment protocols for the patients I serve."

Assist in Clinical Decision-Making. Clinical decision-making also maintained category classification both before and after the workshop. Going into the workshop, one participant responded quite specifically by stating the anticipation of "Using evidence-based research in order to help me make clinical decisions." A separate participant responded, "EBP skills help me to make educated decisions based on current trends in treatment." After the workshop, this category was also reflected in the statement, "I see myself utilizing research in helping make better decisions in regards to treatment options and their success."

Incorporation of Patient-Reported Outcomes. Whereas many responses preworkshop reflected a general interest in using EBP in relation to patient outcomes, the distinct category of incorporation of patient-reported outcomes emerged postworkshop. At that time, participants specifically stated envisioned use of outcome measures within their clinical practice. For example, one participant identified a specific type of assessment tool for envisioned use: "Using a functional assessment survey on an athlete—repeating it with the athlete and use for comparison purposes." In a similar vein, 2 other participants responded that they now see a role

Figure 4. Emergent themes and categories for envisioned use of evidence-based practice (EBP). Abbreviation: PICO, patient, intervention, comparison, outcome.



for PROMs in their future clinical practice: "I can very easily see now how I can implement evidence based practice in a variety of ways including the use of PRO[M]s"; and "I will likely start using outcome measure scales with my patients to monitor progress." Another participant stated that he/she would "hopefully be able to implement some PRO[M]s in my setting."

Justification of Care. A new category emerged postworkshop as ATs indicated that using EBP concepts could help to justify the care they provide. Specifically, participants stated using EBP as a "Justification in clinical decision-making." Explaining decisions to stakeholders was described by one participant who stated, "I would mostly use EBP for [communication with] coaches in why I'm treating the athlete a certain way. Also to show parents what is working and that I'm trying to be up-to-date on new treatments available."

Knowledge. Within the theme of knowledge, preworkshop participant responses were further delineated into categories of envisioned use of EBP to staying up-to-date on AT topics and to assist in locating information. After the workshop, staying up-to-date remained as a category but the category of assist in locating information was no longer specifically identifiable.

Staying Up-to-Date. Responses preworkshop indicated that participants envisioned using EBP when seeking new knowledge by "investigating rapidly changing areas of clinical practice." Others combined the notions of up-to-date evidence and patient care by stating, "[I will] keep up with the current research so I can tell parents and patients up-to-date information about their injury and therapy," and "I would want to [use] EBP skills so I could discuss most current research with the physician in order to improve patient care."

After the workshop, participants responded succinctly within the up-to-date category by stating they envisioned using EBP when "Learning new treatments," "To be a better clinician and stay current," and last, "Keeping up-to-date with new trends and techniques." Another respondent indicated that remaining up-to-date would influence clinical expertise by stating a desire to use EBP to "continue to build upon my practice and expertise in clinic-based setting." An additional participant indicated that EBP would enable progress "to be a better clinician and stay current."

Assist in Locating Information. Preworkshop, the theme of knowledge was strengthened by AT responses regarding the envisioned EBP skills to access and assist in locating information. One participant stated that locating information could be accomplished by "access [to] databases with mobile devices and attempt to synthesize data 'on the run.'" A similar response was provided by a participant who stated an envisioned "use of technology for better patient care." A separate participant noted that use of EBP concepts "can decrease the amount of time searching for articles and more time reading and learning EBP and apply[ing] the information when practicing as an ATC." This category of assist in locating information was not evident during postworkshop analysis.

Teaching. Both preworkshop and postworkshop participants indicated envisioned use that did not directly relate to patient care. These findings were coded within the theme of teaching based upon participant responses. Within the teaching theme, before the workshop, several participants stated that they envisioned using EBP for educational purposes within the populations they serve. One participant indicated use of EBP "as a basis to educate athlete(s), family, or co-workers on safe treatments." Another participant indicated that there was use for EBP in the role as a preceptor: "I work with athletic training students daily and since they are required to use the practice I will continue to use my [EBP] skills." Given that AT educators were included in this study, several indicated envisioned incorporation of EBP within the classroom setting by using "EBP for teaching students techniques and outcomes."

After the workshop, participants continued to identify the teaching aspect of envisioned use of EBP. Responses included a combined link of teaching to clinical relevance through statements such as "[Envisioned use] mainly in the classroom to disseminate information to students [for use] in their clinical practice." Another participant simply stated that he envisions using EBP for teaching via mechanisms such as "Class projects, supporting lecture with new information."

Evidence-Based Practice Process. A novel theme was identified postworkshop as ATs provided envisioned-use responses that reflected specific workshop content related to the EBP process. This theme was further delineated into categories of the PICO process, access to resources, and an envisioned goal of incorporation of clinical expertise; each of

Table 4. Selection of Supporting Quotes for the Theme of Patient Care

Describe ways in which you envision yourself using evidence-based practice (EBP) skills in your future work as an athletic trainer (ATC).

Identified Category Within Theme of Patient Care	Preworkshop Responses	Postworkshop Responses
Approach to patient care	[Use as] guidelines in treatment prescriptions, creating standards of care. Seeking out new effective treatment options. Supporting/debunking current treatments utilized, increasing efficiency and quality of treatment utilized.	I see myself utilizing [EBP] in helping make better decisions in regard to treatment options and their successes. I want to use evidence-based [practice] when I have a patient whom I have tried out all my known options and see what else has been done.
Determine patient outcomes	I will look to use it [EBP] to a greater extent when working with patients and trying to come up with the best treatment options to optimize outcomes. [When] utilizing current research, as well as previously established literature in order to provide the most successful patient outcomes.	This category was not identified in postworkshop responses.
Selection of interventions	[I envision] utilizing EBP journal articles, case studies, peer-reviewed research for the use and outcome(s) of modalities, such as ultrasound, that is not typically used during my treatment. Whether or not it (ultrasound) does provide a true benefit for certain injuries. Dependent on these outcome(s) might change the way I view ultrasound and possibly incorporate this modality while practicing as an ATC.	When I encounter an injury or condition I am not familiar with, to add new rehab exercises to what I am currently doing. . . . to select the best treatment protocols for the patients I serve.
Assist in clinical decision-making	Using evidence-based research in order to help me make clinical decisions. EBP skills help me to make educated decisions based on current trends in treatment.	I see myself utilizing research in helping make better decisions in regards to treatment options and their success
Incorporation of patient reported outcomes	This category was not identified in preworkshop responses.	Using a functional assessment survey on an athlete—repeating it with the athlete and use for comparison purposes. I can very easily see now how I can implement evidence based practice in a variety of ways including the use of PRO[M]s; I will likely start using outcome measure scales with my patients to monitor progress.
Justification of care	This category was not identified in preworkshop responses.	Justification in clinical decision making. I would mostly use EBP for coaches in why I'm treating the athlete a certain way. Also to show parents what is working and that I'm trying to be up-to-date on new treatments available.

Abbreviation: PROMS, patient-reported outcome measures.

Figure 5. Postworkshop supporting quotes for the theme of the evidence-based practice process (EBP). Abbreviation: PICO, patient, intervention, comparison, outcome.

these categories are considered to be steps of the EBP process. Figure 5 presents select participant quotes for this theme and associated categories.

DISCUSSION

It was anticipated that ATs would have limited knowledge of foundational concepts of EBP before this 5-hour educational workshop. The results of this study indicate that the instruction provided on EBP resulted in immediate improvement in perceived knowledge and confidence in knowledge of EBP concepts. In addition, participants reported several methods in which they envisioned use of EBP in the future, with specific changes illustrated in their postworkshop responses related to the EBP process in general and PROMs in particular.

Knowledge and Confidence in Knowledge

Because the 2015 BOC reporting cycle designated the requirement of 10 EBP category CEUs per 2-year reporting period,[6] programming is needed to provide varied and applicable BOC-approved topics to athletic training professionals. According to the BOC Credentialing Program coordinator, as of May 2016, there are approximately 725 unique programs approved in the EBP category. Of these approved programs, 99 are approved as Foundations programs and more than 580 are approved as Clinical programs. After implementation of the new BOC guidelines for approved providers in January 2016, the number of approved providers has decreased from approximately 1200 to 510. This decrease in providers has also led to an approximate 10% decrease in the number of Foundations-category programs available for CPE (e-mail communication, May 2016). Although more clinical than foundational programs have been approved, it is imperative that clinicians understand the foundational concepts and have a strong EBP knowledge base in order to properly understand and apply information obtained from clinical EBP programming. Because clinical EBP programming requires a focused clinical question, evidence of search strategy, and appraisal, ATs may develop a better understanding of, and appreciation for, EBP-approved clinical programming by having increased knowledge of foundational concepts. Because the first 2-year reporting period for this requirement closed in December 2015, a future need exists to establish more approved foundational EBP programs to allow ATs to gain more EBP-category CEUs without repeating courses.

Although athletic training knowledge is improving at a similar rate today to that of the last 5 years,[10,12,13–16] a knowledge gap still exists and there is a need for foundational EBP CPE programs. Given that EBP became a required portion of the NATA Athletic Training Education Competencies[4] in 2011,

there is still a large portion of the practicing athletic training population that has not received formal education in foundational EBP content. Continuing professional education programs should continue to target this gap and offer programming that reviews foundational components of EBP that could translate to better understanding and appreciation of clinically based CPE programs.

Participants reported a mild level of confidence in EBP knowledge before the workshop, which is lower than the previous mild to moderate comfort level reported by various groups of ATs[13] but similar to those of athletic training students.[11] After the workshop, confidence increased to a moderately confident level exceeding that of confidence reported in previous athletic training research.[13] This increase in confidence correlates positively to the gain in EBP knowledge and may, in theory, translate to overall improved confidence in the process of EBP, which is an important factor in support of implementation and potential transference to practice. Athletic trainers having moderate to extreme confidence in the EBP process could, in the future, transition to expanded use of EBP in clinical practice and better understanding of the clinical EBP programming approved by the BOC.

Evidence-Based Practice Resources and Barriers

Transference of EBP knowledge to practice is not without barriers. Participants in this study specifically identified perceived barriers in the areas of knowledge related to EBP, time, accessibility of evidence, and the culture of their clinical practice environment. These results are consistent with barriers cited within athletic training[16–20,27] as well as other health care professions.[28–33] Although these barriers are not novel, thought and reflection should be given to if and when we can anticipate changes to these barriers, particularly now that all ATs are required to obtain 10 EBP CEUs every 2 years. Continual improvement of EBP knowledge and related confidence may help to decrease ATs' perceived barriers to implementation. Although our study did not show a change in barriers despite an increase in perceived knowledge, it will be important to assess the long-term effects of CPE interventions to better understand how EBP implementation changes.

Lack of identified resources (ie, knowing where to seek evidence) is a common barrier to incorporation of EBP.[17,18,20,21,35] The acknowledged lack of accessibility, availability, and applicability of evidence is also supportive of previous findings.[16–21] Participants within this study addressed resources within both the barriers question and the envisioned-use question, thus suggesting that resources are a barrier to envisioned use of EBP. Although the short 5-hour course did not demonstrate change in specific resources used by ATs, participants did indicate that as a result of the workshop they learned how to better access and streamline information in a manner that is easier to process. Future CPE opportunities should not lose sight of the fact that many clinicians do not fully understand how to best access information and process it in a manageable way.

Whereas many clinicians work independently in their setting, identifying a network of professionals to assist in accessing information may help to ease access to resources as well.[36] For those clinicians who serve as preceptors, it may also be possible to gain information from the athletic training program they are affiliated with. Regarding applicability of evidence, the information disseminated, both scholarly research and case reports, should continue to expand. Specifically, evidence targeting clinically based questions, perhaps on topics suggested by practicing clinicians, should help to improve the body of applicable evidence.[17,35]

In further discussion of resources, a portion of this workshop was designated to identification of resources varying from free access to paid subscription and to ranking the preferred sources for information. It is interesting to note that less than 5% of responses for databases and resources used to identify evidence included the Cochrane Database of Systematic Reviews, which is considered to house the highest level of clinical evidence. Whereas the Cochrane database presents the highest quality of evidence, the availability of this database outside of the university or medical setting is extremely limited, which could also lead to its lack of use.

It is somewhat disconcerting that the barriers addressed in this study are the same as those identified for the past 5 years in athletic training despite an increased emphasis on EBP in the profession.[16–20,27] The availability of specific EBP programming, including though not limited to online modules, condensed literature reviews in the forms of critically appraised topics, and clinical bottom lines, has grown exponentially. Whereas these resources are helpful, it is up to individual ATs to actively work to overcome the barriers applicable to their situation. Transitioning to a culture of EBP will come with constant repetition and exposure.[35] In order for athletic training as a profession to be competent and inclusive in all knowledge areas identified by the National Academy of Medicine, formerly the Institute of Medicine,[3] ATs have a professional responsibility to learn and integrate EBP into practice to align with other health care professions. Learning theories indicate that CPE and postgraduate education decisions tend to be driven by self-motivation and clinical practice.[31] One of the biggest factors related to the commonly cited barriers may be a lack of motivation to learn and truly understand the concepts of EBP. Athletic trainers need to see EBP not as a required item to check off their certification maintenance list, but instead as a necessary method of acquiring and retaining information for transference into professional practice.[37]

Envisioned Use of EBP

Our findings regarding envisioned use of EBP are unique to previous research in the AT population. The preworkshop qualitative data were insightful regarding envisioned use but also much less specific than postworkshop responses, which related more to the EBP process and concepts presented in the workshop. These findings posit that instruction on foundational concepts of EBP and improved perceived knowledge, as demonstrated in this study, may influence how ATs envision use of EBP concepts. For example, postworkshop, participants indicated that they envisioned using PROMs during patient care to track progress and outcomes of their patients; there was no reference to patient-reported outcomes by participants in the preworkshop qualitative data. As a component of improving individualized patient care, PROMs are a useful tool in the process of EBP.[38] These outcome measures aim to capture whether health care services provided

by a clinician improve a patient's health as related to his or her impairment, goals, and experience. Emphasis on patient-centered outcomes has increased as effectiveness of care is now being evaluated from both the clinician and patient viewpoints.[37] In addition, patient-centered care is another competency identified by the National Academy of Medicine[3] that all health care providers should possess. In 2008, Valovich McLeod et al[38] presented information intended to enable evidence-based AT clinical practice through use of PROMs. Specifically, this article identified criteria to evaluate patient-based outcome assessment tools for potential use in clinical practice. Despite the publication of this information, ATs are still not universally familiar with patient-reported outcomes and therefore, are not commonly incorporating PROMs into AT clinical practice.[39] A potential theory for this lack of use may be attributed to challenges related to collection of this type of information including time and role strain.

Although teaching EBP was an identified envisioned-use category by some participants in this study, evidence supporting best practices for teaching CPE,[37] particularly in relation to EBP,[20,35] is lacking. Whereas it is recommended that ATs serving in educator and/or preceptor roles not only instruct EBP concepts but also be able to model these skills,[20] it is unknown how often these techniques are occurring and what the resulting impact on patient care is, if any. Interacting with athletic training students, for example, serves as an opportunity to encourage, model, and direct the incorporation of the tenets of EBP into clinical practice.[20] Our participants indicated a desire to contribute to educational opportunities in this manner. However, in order for application of EBP within clinical practice to be successful, ATs must have the foundational knowledge to provide correct instruction and feedback.

The content of this workshop resulted in an increase in perceived EBP knowledge and confidence in that knowledge, which supports previous researchers' recommendations that the success of teaching EBP through CPE and educational interventions be evaluated.[35,37] These increases in knowledge and confidence may translate to improved educational opportunities and modeling of EBP in future interactions with AT students. In addition to these interactions with students, it is plausible that educational opportunities with patients, coaches, administrators, and so forth could be improved through a better understanding of foundations of EBP so ATs can more effectively disseminate information and justify care to stakeholders who request such information.

Limitations

This study is not without limitations. One such limitation exists in the convenience sample used. It is possible that ATs with a self-perceived lower-level knowledge of EBP concepts may have registered for this course. The self-report nature of the survey instrument also could be a limitation because it assumes that participants answered honestly and to the best of their ability. In addition, the EBCKAU survey was created to evaluate knowledge of foundational concepts of EBP only, not advanced or clinically based EBP concepts. Also, the short 5-hour structure of the course makes these results generalizable only to those enrolled in brief courses targeting foundational knowledge of EBP and assessed only immediate perceived knowledge and not long-term changes in knowledge of EBP concepts.

An additional limitation could be the fact that the number of presenters varied between workshop locations. The research team attempted to minimize this limitation by conducting the workshop with all 3 presenters before the 1-presenter format. The lack of statistical significance between locations in regard to preworkshop and postworkshop knowledge scores suggest this instructional change had little effect on the knowledge outcomes of the workshop.

CONCLUSIONS

This 1-day workshop appears to have had a positive impact on reducing the short-term and immediate knowledge gap for foundational EBP knowledge evident in athletic training. Although a larger number of clinical EBP programs have been submitted to and approved by the BOC, Foundations of EBP programming should be perceived as valuable for CPE opportunities in order to narrow the evident gap regarding EBP knowledge. True clinical relevance of this study will be seen longitudinally because it is the aim of the research team to evaluate participants' retained knowledge and transference of knowledge into professional practice through implementation of EBP skills learned in this workshop. Results of this evaluation will be assessed and disseminated when available. In the meantime, we propose that the ATs included in this study begin using available resources to establish a larger body of evidence and determine which facets match best to their clinical practice. In addition, the reported perceptions of ATs regarding barriers to, resources for, and use of EBP can be considered in creation of content for future CPE programming.

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