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Defining, Valuing, and Teaching Clinical Outcomes Assessment in Professional and Post-Professional Athletic Training Education Programs

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Objective: To provide a basic introduction for athletic training educators about the importance of clinical outcomes measures and to recommend strategies for implementing clinical outcomes assessment education in professional and post-professional athletic training education programs.
Background: Outcomes is a frequently used term amongst healthcare professionals; in the contexts of both education and clinical practice. Clinical outcomes assessment refers to the end result of healthcare services taking into account the patient's experiences and expectations. Clinical outcomes assessment education and implementation are critical to the successful implementation of evidence-based practice in athletic training.
Description: Clinical outcomes assessments are categorized as either clinician- or patient-based measures. Clinician-based measures are often referred to as objective measures and include things such as range of motion (ROM) and strength, whereas patient-based measures are obtained via questionnaires and interviews that address the patient's perspective on his/her health status. Athletic training education programs should incorporate instruction on the use of both types of measures into their curricula.
Clinical Advantages: Educating athletic training students to use clinical outcomes assessment will enable students to practice patient-centered care and provide them with an understanding of how to critically evaluate the evidence to determine optimal patient care. In addition, efforts to educate athletic training students about clinical outcomes assessment may support more widespread implementation of outcomes data collection and strengthen collaborations between clinicians and researchers to determine the effectiveness of athletic training clinical practice.
Key Words: quality of life, scales, patient-self report, evidence-based practice

Leaders of the NATA have called for more clinical outcomes assessment by the athletic training academic and research communities.[1,2] An activity supporting this call is the pledge of 1 million dollars towards outcomes research by the NATA.[3] Additionally, the NATA and NATA Research and Education Foundation co-sponsored a one day summit titled, "Advancing Outcomes of Care in Athletic Training Summit: A Road Map for the Future."[3] A recent editorial in the Journal of Athletic Training further outlines the need for outcomes research.[4] Given the interest in outcomes and its importance in modern healthcare delivery, clinicians, researchers, and educators should become thoroughly familiar with this concept.

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While immediate action to address these concerns is needed, the best approach to developing a culture of evidence-based practice that values clinical outcomes assessment as an important form of patient-centered evidence, is to begin to educate athletic training students regarding clinical outcomes assessment. Therefore, athletic training educators play a vital role in the advancement of this key initiative. Educators must learn about clinical outcomes assessment and then transfer this knowledge to athletic training students. The objective of this paper is to provide a basic introduction for athletic training educators about the importance of clinical outcomes measures to athletic training and to provide strategies for implementing clinical outcomes assessment education in professional and post-professional athletic training education programs.

Defining Clinical Outcomes

The recent movement towards evidence-based practice (EBP) has highlighted the need for better clinical information (evidence) from which to make sound clinical decisions. EBP involves the integration of 1) the best research evidence, 2) clinical expertise and

3) each patient's unique values and circumstances into patient care.[5, 6] Clinical outcomes assessment, on the other hand, is the study of the end result of healthcare services that take patient's experiences, preferences, and values into account.[7] The most valuable forms of evidence needed for EBP come from the measurement of clinical outcomes.

Clinical outcomes assessment considers measures of effectiveness (i.e., what actually works) in healthcare using various complementary measures, ranging from traditional clinical measures, such as range of motion (ROM) or strength, to patient-centered measures, such as quality of life and patient satisfaction.[8] Clinically, patient-centered outcome measures such as pain, function, and patient satisfaction are appropriate assessment methods to determine the effectiveness of medical treatment and rehabilitation interventions. [9]

Clinical Outcomes and EBP

Clinical outcomes assessment in the area of patient-oriented evidence is needed to provide the best research evidence for evidence based athletic training.[10, 11] The best research evidence is produced by outcomes studies focused on patient-oriented evidence that matters (POEM).[9] These studies investigate patient-centered variables that include symptom improvement, morbidity, cost reduction and quality of life that provide information to the clinician that he/she can readily use in his/her clinical practice. [9, 12] POEMs can be used in all aspects of athletic training, including prevention, diagnosis and treatment and can give the clinician insight into what matters the most to the patient. There is a need for high quality studies that investigate POEM and provide evidence for the clinical effectiveness of treatments or interventions that are relevant to clinicians and have the ability to change the athletic trainers' way of practicing.

Clearly, EBP and clinical outcomes are associated. In fact, the predominance of evidence required for EBP is provided by clinical outcomes research studies that measure the effectiveness of healthcare interventions. Therefore, in order to advance the promotion of EBP for our clinicians, it is imperative to understand and implement clinical outcomes assessment education in our professional and post-professional athletic training education programs. Furthermore, it is imperative to understand that clinical outcomes research is in fact the foundation of EBP.

Clinician-Based and Patient-Based Outcomes

Clinical outcomes measures are generally defined as either clinician-based outcomes or patient-based outcomes. Several disablement models have been developed to conceptually demonstrate the different forms of outcomes measures one may wish to evaluate (Table 1).[13-19] Clinician-based outcomes measures include a variety of different measurement methods that assess patient healthcare outcomes from the perspective of the clinician.[20] Clinician-based measures comprises a large component of athletic training education as is seen in the Athletic Training Educational Competencies and Proficiencies.[21] For example, ROM, muscle strength, limb length, swelling, response to special tests and bony alignment are all clinician-based outcomes measures that are regularly taught in athletic training education programs.

Because the clinician assesses these components directly, clinician-based outcomes have been labeled "objective"[20] and often target impairments, such as ROM and strength, as opposed to functional capacity.[22] Clinician-based outcomes measures have a variety of limitations. Objective measures must be reliable and reproducible within and between clinicians.[20] Often, however, they are not.[23-31] Until recently, it was generally accepted that patient quality of life and clinician-based outcomes were highly correlated. This is an inaccurate assumption; there may be a large difference between a patient's perspective of a condition and the severity of the injury as measured through clinician-based outcomes.[32] Similarly, measures of impairment, functional capacity, and disability are not always strongly correlated[22] which presents a problem if the athletic trainer is using a reduction in impairment as the primary indicator of patient function. Additionally, objective measures frequently relate to impairments as opposed to disability and quality of life, again de-emphasizing what is most important to the patient. Because of these limitations, it is necessary to compliment clinician-based outcome measures with patient-based measures in order to assess the true effectiveness of healthcare interventions and patient satisfaction.

Patient-based self-report outcomes, unlike clinician-based measures, are based on the patient perspective and allow the collection of information regarding functional limitations, task performance, activity, disability, roles, participation, and other domains such as environmental factors, personal factors, and societal limitations. In general, these outcomes are obtained through questionnaires or instruments that the patient completes in order to gain information related to functional ability, symptoms, health status, health-related quality of life (HRQOL), results of specific treatments, and patient satisfaction.[20] Health-related quality of life "refers to the physical, psychological, and social domains of health, seen as distinct areas that are influenced by a person's experiences, beliefs, expectation, and perceptions" [33]and is measured through the evaluation of person, societal, and other domains (See shaded areas of Table 1). The addition of patient self-report outcomes measures is meant to compliment the clinician-based outcomes and provide a better understanding of how a particular injury or condition is affecting that patient from a patient-centered, whole person healthcare standpoint. While patient-based measures provide more information regarding disablement domains, they are not without limitations. Clinician's must choose scales that are valid, reliable, and responsiveness to their condition of interest.[20,22,34] In addition, some scales may not be feasible based on the costs and the time it takes to administer, score, and interpret the scale.[34] However, there are criteria for evaluating patient-based measures to help the clinician identify appropriate measures for their particular patient need.[20,22,34]

Classification of Patient-Based Outcome Measures

Patient-based outcomes can be categorized as general/generic self-report measures or as regional or disease specific self-report

Table 1: General Classification and Definitions of Disablement Models

General Classification	Definition	Example	Specific Model Domains
Origin	The illness/pathology giving rise to disability	Fx humerus, muscle strain, concussion	Nagi[a]: Pathology NCMRR[b]: Pathophysiology NCMRR[c]: Pathophysiology ICF[d]: Health Condition
Organ Level	Organ or body system level of impairment arising from the illness/pathology	Muscle weakness, swelling, decreased ROM	Nagi[a]: Impairment NCMRR[b]: Impairment NCMRR[c]: Organ Dysfunction ICF[d]: Body Structure & Function
Person Level	Limitations in performance at the level of the whole person	Inability to throw a baseball, inability to walk w/o crutches	Nagi[a]: Functional Limitations NCMRR[b]: Functional Limitations NCMRR[c]: Task Performance ICF[d]: Activity
Societal Level	Limitations in normally assumed/desired social and personal roles	Inability to play football, inability to run with friends	Nagi[a]: Disability NCMRR[b]: Disability NCMRR[c]: Roles ICF[d]: Participation
Other Domains	Additional factors that may impact a person's level of disability	Loss of scholarship (societal limitation), Age or education (personal factors)	Nagi[a]: None NCMRR[b]: Societal Limitations NCMRR[c]: None ICF[d]: Environmental & Personal Factors

[a] Nagi Disablement Model (1965)
[b] National Center for Medical Rehabilitation Research (NCMRR) Disablement Model (1993)
[c] NCMRR Disablement Model (2006)
[d] World Health Organization International Classification of Functioning (2001)
* Shaded region indicates emphasis on health-related quality of life (HRQOL)

measures. General/generic self-report measures are used to evaluate HRQOL. They allow comparison between different conditions and/or different demographic and cultural groups[35-37] and can be used to assess health status for a range of conditions.[7] There are a variety of general/generic self-report measures (Table 2) of which two of the most common are the Short Form 36 Health Survey Questionnaire (SF-36)[38] and the Short Musculoskeletal Function Assessment (SMFA).[39,40] While these measures provide a comprehensive and general overview of HRQOL, they are more likely to detect the unexpected effects of an intervention and are less responsive to health status changes from specific interventions or healthcare changes.[35] For example, we may expect to see less change in HRQOL through a generic questionnaire in an athlete who suffered a grade 1 ankle sprain, with few functional limitations and minimal pain, as opposed to an athlete who dislocated his ankle and may require surgery.

Table 2. Examples of General/Generic Self-Report Scales for Assessing Health-Related Quality of Life (HRQOL)

Scale
SF-36[38]
EuroQoL[55]
Child Health Questionnaire (CHQ)[56]
Sickness Impact Profile[57-59]
Short Musculoskeletal Function Assessment (SMFA)[39,40]

Region or disease specific measures, on the other hand, are intended to measure aspects of HRQOL that focus on a specific injury (e.g., ligament tear or fracture), disease (e.g., osteoarthritis), anatomic area (e.g., shoulder, knee, ankle) or a population of interest (e.g., athlete, pediatrics).[35, 37] Region and disease specific measures are complementary to general/generic measures (Table 3).[7] The specificity of region and disease specific measures to an area or condition of interest with a particular patient makes them more responsive to smaller and more meaningful changes over time.[35, 41] For example, the Lower Extremity Functional Scale [42] may detect changes in function with a grade 1 ankle sprain because it asks specific questions about lower extremity function. However, generic scales may not be sufficiently sensitive to detect subtle differences in lower extremity function because they are designed to assess health at a more general level and may fail to ask enough specific questions about lower extremity impairments and functional loss.

Outcome Measures and Clinical Evaluation

It is important to determine which clinical outcomes measures should be taught in athletic training education programs and used in clinical practice. Clinician-based outcomes have historically been

Table 3. Examples of Region Specific Self-Report Scales

Region/Condition	Scale
Region	
Upper Extremity	Disabilities of the Arm, Shoulder, and Hand (DASH)[49]
	Upper Extremity Function Scale[60]
	Shoulder Pain and Disability Index (SPADI)[61]
Lower Extremity	AAOS Sports Knee Scale[62]
	Lower Extremity Functional Scale[42,50]
	Foot and Ankle Outcome Score[63]
Spine	Oswestry Low Back Pain Disability Questionnaire[51]
	Roland Morris Disability Questionnaire[64]
	Quebec Back Pain Disability Scale[65]
Disease/Condition	
Asthma	Asthma Quality of Life Scale[66]
	Asthma Control Test (ACT)[67,68]
Arthritis	Arthritis Impact Measurement Scale[69]
	Knee Injury and Osteoarthritis Outcome Score (KOOS)[70]
Shoulder Instability	Western Ontario Shoulder Instability Questionnaire (WOSI)[71]
Headache	Headache Impact Test (HIT-6)[72,73]
	Migraine Specific Quality of Life (MSQOL)[74-76]
Pain	Numerical Pain Rating Scale[77]
	Faces Pain Scale[78]
	McGill Pain Questionnaire[79]

taught as part of the normal physical examination and documentation processes. The teaching of these clinical tests and measures will of course continue; however, clinician-based outcomes measures should be presented in conjunction with patient self-report measures. In isolation, clinician-based outcomes measures (e.g., strength, ROM, etc.) fail to provide comprehensive information about patient health status. Optimally, a general/generic HRQOL measure and a region or disease specific measure of patient-based outcomes should be added to any clinician assessment to provide the athletic trainer with patient-centered evidence. It is important to note that educators and clinicians should consider the measurement properties of various scales and instruments and the populations for which they were developed before implementing any clinical outcomes measure. A number of excellent resources have been published that review the measurement properties of patient self-report outcomes scales including works by Suk et al.[20] and Fitzpatrick et al.[34]

Valuing Clinical Outcomes Assessment

Implementing clinical outcomes assessment into athletic training practice is necessary to gather the evidence required for successful EBP. However, the importance of clinical outcomes measures to the profession of athletic training is much greater than EBP alone. Valuing and subsequent implementation of clinical outcomes assessment may also help athletic training with many of the challenges and critical issues facing the profession, including non-restrictive licensure in all states, third-party reimbursement, establishing the value of athletic training services for a wide-variety of patients in a wide-variety of settings, and universal acceptance as a high quality allied health profession.

Licensure and Reimbursement

State licensure and third-party reimbursement will be greatly facilitated if athletic trainers are able to justify that their treatments and services are effective. For this to occur, athletic trainers must document their patients' outcomes with regards to how they feel, how they function, and how they regain their social roles. However, clinicians should be cautious and ensure that their specific interventions are responsible for patient improvement as opposed to the natural course of an injury, illness, disease, or placebo. In the absence of documentation demonstrating the effectiveness of athletic training services, it has been suggested that efforts to obtain non-restrictive state licensure and third-party reimbursement may be a continued challenge.[10] Widespread implementation of clinical outcomes assessment with resulting data that demonstrates that the patients we care for exhibit measurable improvement in their HRQOL will greatly assist in the achievement of the goals of our profession.

Variety in Patients and Practice Settings

Clinical outcomes data are critical to establishing the value of athletic training services for a wide-variety of patients in a wide-variety of settings. One frequently used measure of healthcare outcome in athletics is return-to-play status. However, this measure is specific to athletic populations and may not be appropriately transferred to other practice settings, such as the corporate or industrial settings. Furthermore, simply assessing return-to-play provides a limited assessment of patient response to the care provided and fails to assess the whole person. Athletic trainers should be able to demonstrate that an athlete returns to a pre-injury level of function and ability as a result of treatment and that the athlete's HRQOL returns to pre-injury levels. Moreover, the impact of treatment on preventing re-injury and the cost savings resulting from athletic trainer's services are important considerations. Therefore, documentation of clinical outcomes is based not only on patient function and ability (return to play) but also on the impact of the injury and treatment on the individual's HRQOL, their likelihood of re-injury, and their financial burden. While individual efforts have attempted to measure and assess some of these variables in isolated settings, widespread availability of these types of data are not currently available from which to assess the effectiveness and efficacy of athletic training care. It is imperative that athletic trainers produce and disseminate clinical outcomes data of this nature for every type of patient and in every type of setting that we choose to practice. As long as we lack clinical outcomes

data demonstrating that our services restore function, return or improve HRQOL, decrease re-injury rate, and are cost-effective, our profession is vulnerable to critiques from others about the quality of care we provide and the nature of care that we should be allowed to provide according to patient types and practice settings.

Healthcare Reputation

Finally, athletic training recognition and our reputation as a healthcare profession will also be facilitated through measuring healthcare outcomes. Although athletic training was recognized as an allied health profession by the American Medical Association in 1990,[43] there remain other healthcare professions who continue to challenge our legitimacy as healthcare providers. In order to demonstrate the impact of the care we provide, athletic trainers must be measuring clinical outcomes and practicing in an evidence-based fashion. Steeves and Hootman[11] suggest that the reputation of athletic trainers may be at stake if EBP is not adopted. In the absence of widespread education and implementation of EBP, athletic training is vulnerable to critiques regarding our abilities to critically examine the literature, determine what is important to our patients, and use clinical reasoning skills to implement an appropriate plan of care. At the very heart of any movement towards widespread education and implementation of EBP is education and implementation of clinical outcomes assessment. Clinical outcomes data, in large part, provide the evidence on which athletic trainers must determine how to practice.

Both the Institute of Medicine[44] and PEW Foundation[45] identify EBP based on clinical outcomes assessment and the provision of patient-centered care as core competencies for all healthcare professions. Efforts in athletic training to emphasize and promote EBP are to be applauded; however, the athletic training profession has only recently emphasized clinical outcomes assessment.[1,2,4]

Yet, the link between clinical outcomes assessment and EBP has not been made. There is currently a limited amount of patient-centered clinical outcomes information about the services commonly provided by athletic trainers in athletic populations in which to base our clinical decisions. Therefore, a disconnect exists between wanting to practice EBP and actually having a good body of best research evidence from which clinical decisions can be made. This disconnect is hindering the professions ability to move forward. In addition to research efforts aimed at filling this void in the athletic training literature, we must also make efforts to begin teaching current and future clinicians how to incorporate athletic training clinical outcomes assessment into their everyday clinical practice. As a clinical tool, outcomes assessment measures are simple to employ, but it is unlikely that athletic trainers will incorporate these measures unless they are as familiar with their use as other forms of clinical assessment such as assessing ROM and strength.[7]

Teaching Clinical Outcomes Assessment

For athletic trainers to value clinical outcomes assessment as the standard of care, they must learn the importance of measuring outcomes as well as how to evaluate and implement these measures into clinical practice. Both professional and post-professional athletic training education programs should incorporate the principles of clinical outcomes assessment into their respective curriculums.

In addition, continuing education programming should help practicing educators, clinicians, and researchers begin to develop an understanding of, and strategies for implementing, clinical outcomes assessment. However, the building of outcomes databases takes years to complete and a large number of high quality research studies are needed.

Professional Education

Athletic training students must be introduced to the concepts of healthcare outcomes assessment and taught the importance of these measures in providing high quality patient care and supporting the value of athletic training practice. Concepts such as outcomes measures, treatment effectiveness, HRQOL, and patient-satisfaction should be introduced early so that athletic training students begin their experiences with an appreciation for the language of clinical outcomes assessment.

Athletic Training Educational Competencies

The 4th edition of the *Athletic Training Educational Competencies*,[21] provides avenues for implementing the concepts of clinical outcomes assessment into educational programs. *Orthopedic Clinical Examination and Diagnosis*[21] is a significant portion of the athletic training competencies, and there are several opportunities within this content area to address healthcare outcomes. A portion of the clinical evaluation is the assessment of "objective" measures including ROM, strength, swelling, and response to special tests. For example, the 5th psychomotor competency under this content area identifies that entry level athletic training students should be able to "measure the active and passive joint range of motion using commonly accepted techniques…"[21] which is a "clinician-based" outcomes measure. Typically, we identify ROM measurement as an "objective" assessment method. Simply altering the language from "objective" to "clinician-based outcomes" provides a more accurate classification of these measures and highlights their importance as healthcare outcomes measures.

In addition to teaching students to analyze physical elements (such as ROM) with clinician-based measures, they should also be taught to assess the impact of loss of these elements on function through patient-based measures. Patient-self report scales provide a more global assessment of impairment, function, and disability, and help to determine the impact of impairment (diminished ROM) on functional loss, and the impact of functional loss on overall health status (HRQOL). It may be that diminished ROM does not actually influence patient function and/or ability of the patient to perform his/her desired activities and roles in society. The 7th cognitive competency under the *Orthopedic Clinical Examination and Diagnosis* [21] content area indicates that students should be able to "explain the relationship of injury assessment to the systematic observation of the person as a whole."[21] Including a general/generic

HRQOL patient-self report scale into the clinical evaluation makes it possible to address the whole person by considering a patient's experiences, preferences, and values, thus providing patient-centered care.

Because there are a variety of patient-based outcomes measures, we suggest that these scales be introduced at different points in the athletic training education process. For example, in general medical courses it is most appropriate to introduce more global/generic scales of health status, such as the SF-36[38], the Pediatric Outcomes Data Collection Instrument (PODCI)[46,47], or the Musculoskeletal Function Assessment (MFA).[48] These scales could be used to teach athletic training students the concepts of assessment of patient HRQOL and overall health status. Then, in orthopedic assessment courses, more region and disease specific scales could be introduced, such as the Disabilities of the Arm, Shoulder, and Hand (DASH)[49] for shoulder function assessment, the Lower Extremity Functional Scale (LEFS)[42,50] for lower extremity function and the Oswestry Low Back Pain Disability Questionnaire[51] for low back injuries. Students should be encouraged to use the information gained from both clinician-based and patient-based outcomes during the initial clinical evaluation as well as at follow-up examinations during the course of treatment and rehabilitation. Disease specific patient self-report scales should also be introduced at this point in the student's education. Ideally, this should lead to an understanding of trends in care across multiple patients and ultimately across multiple providers and sites.

As stated in cognitive competencies number 6 and 7 of content area *Conditioning and Rehabilitative Exercise*,[21] athletic training students should be able to describe basic functional outcomes in therapeutic exercise programs as well as describe the "process and methods of assessing and reassessing the status of the patient using standard techniques and documentation strategies in order to determine appropriate treatment and rehabilitation plans and to evaluate the readiness to return to appropriate levels of activity." This competency provides the rationale for teaching the collection and analysis of clinical outcomes measures for optimal patient care. An appropriate mix of clinician-based and patient-based clinical outcomes measures provides the clinician with the best data from which to assess and document patient health status, determine an appropriate plan of care, and determine when a patient is ready to return to activity.

Athletic training students who learn and ultimately implement clinical outcomes assessment will be prepared to provide optimal patient care and to collaborate with researchers to collect clinical outcomes data. Therefore, we will produce clinicians who are better prepared to help the profession address critical issues, including non-restrictive licensure in all states, third-party reimbursement, establishing the value of athletic training services for a wide-variety of patients in a wide-variety of settings, and universal acceptance as a high quality allied health profession. As described in the content areas of *Health Care Administration* [21] and *Professional Development and Responsibility*,[21] athletic training students should be aware of methods of promoting the profession as well as key issues facing the healthcare of their patients. Instructing athletic trainers to routinely measure and document clinical outcomes will assist in efforts to collect and disseminate data to justify that athletic training services improve function and HRQOL. Since the relationship between measurement of clinical outcomes and the legal right to practice and obtain third-party reimbursement are more advanced concepts, we suggest that they be implemented in the final year of athletic training education, perhaps as a capstone course or as part of an interactive seminar. This could be an excellent mechanism for highlighting the link between the clinical care that our profession provides and healthcare legislation and practice issues.

Learning-Over-Time

Clearly, the competencies and proficiencies provide support for implementing the teaching of clinical outcomes assessment into athletic training professional education. One challenge in academia is to create learning opportunities that recur throughout the entire educational experience, often termed learning-over-time. Teaching clinical outcomes assessment through learning-over-time is necessary, practical, and easy to implement (Table 4). Initially, athletic training students should be introduced to the concepts of measuring clinical outcomes and made aware of a variety of both general/generic and region and disease specific outcomes measures. In class, students can experiment with and become familiar with different scales by personally completing and scoring them. Assignments can target critical assessment of scales such as identifying deficiencies within the scales, rating patient friendliness (how easy is the scale for the patient to complete) and clinical utility (how easy is it for the clinician to administer and score) of the scales as well as reflecting on personal experience with the scales. These activities would allow the student to identify and critically assess the meaning, importance, and ease of use of a variety of scales that may then be implemented into clinical practice. Educators should identify scales that are being currently used in patient care and have been shown to be valid, reliable, and responsive.[22]

Transferring the basic knowledge of scales and their importance to actual clinical practice is the next step in the learning-over-time progression. We suggest that the transfer occur from the classroom to the athletic training clinic as most students are first introduced to clinical practice in this setting. A class assignment could involve choosing one general HRQOL scale, such as the SF-36, and incorporating it into the evaluation of a new athlete injury. The student could then monitor the athlete throughout rehabilitation, making special effort to consistently measure both clinician-based and patient-based outcomes. Future assignments could require the student to provide a qualitative reflective assessment regarding the process of implementing the scale into actual patient care. The student could identify the challenges and successes associated with administering the scale. Incorporating a disease-specific scale is a second step, and similar assignments could be generated to afford the student the opportunity to compare and contrast a region specific from a disease specific outcomes scale. Students may also be asked to review the current literature

Table 4. Suggestions for Teaching Clinical Outcomes so as to Facilitate Students' Learning-Over-Time

Time Sequence	Setting	Suggested Objectives
Initial Exposure	Classroom	1. Define the concepts and language associated with clinical outcomes measures. 2. Identify generic/general & region specific outcome measures. 3. Utilize and critically assess the strengths & weaknesses of common outcome measures.
Transfer to Athletic Training Clinic	Athletic Training Clinic	1. Implement general/generic clinical outcomes measure into patient care. 2. Implement region/site specific clinical outcomes measure into patient care. 3. Describe successes & challenges associated with implementing clinical outcomes measures into patient care. 4. Compare clinician-based and patient-based outcomes measures and determine discrepancies or similarities between the measures.
Transfer to other Athletic Training Practice Settings	Clinic, Industrial setting, etc.	1. Implement general/generic clinical outcomes measure into patient care. 2. Implement region/site specific clinical outcomes measure into patient care. 3. Describe successes & challenges associated with implementing clinical outcomes measures into patient care. 4. Compare clinician-based and patient-based outcomes measures and determine discrepancies or similarities between the measures. 5. Differentiate between outcomes that are important to athletic and non-athletic populations.

to see if there are published clinical outcomes data available regarding their particular patient population and a specific condition, with the goal of identifying how their patient responds to treatment compared to the published literature. Another, more challenging, activity is for the student to compare clinician and patient-based outcomes measures and to identify their similarities and differences, ultimately determining if there is a discrepancy in the perception of injury severity between the athletic trainer and the patient's assessment of the injury. Differing and valuable information will be provided by including patient-based outcome measures and will confirm to the athletic training student that inclusion of these measures is necessary for the practice of whole person healthcare.

A final step to the learning-over-time progression is for the athletic training student to transfer the experience of clinical outcomes data collection in the athletic training clinic to other athletic training practice settings. Similar activities and assignments could be implemented; however, the difference would be the patient population and practice setting within which care was provided. An athletic training student may have a significantly different experience implementing and evaluating a HRQOL scale in a middle-aged patient who had a knee replacement compared to a young athlete with an ACL tear. Through the transfer of skills to other practice settings, athletic trainers would learn the importance of patient-centered care to all physically active patients, not just athletes.

Although the idea of clinical outcomes assessment is relatively new to the athletic training profession, there are easy and effective ways to implement the basic concepts into professional athletic training education through the *Athletic Training Education Competencies*[21] and learning-over-time. Educating athletic training students about clinical outcomes assessment measurements and requiring them to obtain this important form of healthcare information as a routine aspect of their patients' assessments will greatly increase the likelihood that these future clinicians will incorporate them into clinical practice.

Post-professional Education

While clinical outcomes assessment education is a necessary component of professional athletic training education, there are outcomes concepts that require more advanced understanding, consideration, and critical thought. For example, creating and conducting a clinical outcomes research investigation may be beyond the basic knowledge required for athletic training proficiency. However, post-professional athletic training education programs provide an excellent environment to tackle these more complex issues due to their emphasis on making the graduate student "advanced in knowledge, understanding, scholarly competence, inquiry, and discovery."[52]

Perhaps the easiest and most beneficial mechanism for implementing clinical outcomes into post-professional education is through the research requirement of these programs. Introductory

research courses should familiarize the students to the measurement properties associated with self-report outcomes scales. More advanced measurement topics such as odds ratios, relative risks, and minimal detectable change scores should be introduced. Students could participate in journal clubs where they present articles investigating clinical outcomes to other athletic training students, faculty, and staff, and critically discuss the findings as they apply to patient care. This would help the students learn how to adjust their plan of treatment based on scientific outcomes, using the best available evidence, ultimately furthering their understanding of EBP.

Post-professional athletic training students should also be instructed on how to design and conduct clinical outcomes research. Students should be instructed on proper scale selection, and be able to answer questions such as "Is the scale internally consistent?", "Does the scale detect changes over time that matter to patients?" and "Is this scale feasible to administer clinically?"[20] Considerations for scale development and refinement should be emphasized as well. Additionally, emphasis should be placed on creating sound clinical trials or outcomes projects so that studies investigating therapeutic interventions and treatments can be initiated by future athletic training researchers. If entry-level athletic training students are educated about the use of clinical outcomes scales to direct patient care and post-professional students are taught how to design and conduct clinical outcomes research, we will be positioning our students to work collaboratively together to provide optimal patient care and to help identify the effectiveness of athletic training services.

The accreditation standards and guidelines for post-professional graduate athletic training education programs require that all students are involved in an original hands-on research experience.[52] Historically, the research conducted and disseminated by students enrolled in these programs has contributed significantly to the advancement of the athletic training profession and the athletic training body of knowledge. The vast majority of students enrolled in accredited post-professional athletic training education programs are primarily interested in learning how to provide optimal patient care, and research is often improperly viewed as extraneous to their goal of becoming better clinicians. Clinical outcomes research provides a perfect mechanism for post-professional students to integrate patient care and the research process and to truly engage in evidence-based practice. Additionally, promoting clinical outcomes research in post-professional programs will help to produce the outcomes data that the leaders in our profession have called for. A summary of the suggested process for implementing clinical outcomes assessment into post-professional programs is provided in Table 5.

Clinical outcomes assessment is becoming a central theme of the NATA Post-Professional Education Committee (PPEC) whose mission is to, "promote accredited post-professional education programs and credentials that prepare athletic trainers for advanced clinical practice, and research and scholarship, in order to enhance the quality of patient care, optimize patient outcomes, and improve patients' HRQOL."[53] Currently, the PPEC is exploring the possibility of embedding clinical outcomes assessment education and utilization and EBP into the standards and guidelines for post-professional athletic training education programs. In addition, clinical outcomes assessment and EBP will be foundational in the future development of accredited residency programs and specialty certification for athletic training.[54] In order to develop advanced practice athletic training clinicians, post-professional education, in all of its forms, must prepare students for EBP that is based upon clinical outcomes assessment.

Table 5. Post-Professional Education Course and Content Suggestions

Course	Content
Introductory Research Course	1. Introduction to measurement properties associated with self-report outcome measures. 2. Discussion of EBP and outcomes terminology (e.g., odds ratios, relative risks, minimal detectable change scores)
Journal Clubs	1. Presentation and discussion of articles by students, faculty, and staff pertaining to clinical outcomes, with emphasis on how the findings influence patient care (EBP).
Research Design (Thesis Courses)	1. Instruction regarding the methodology and conduction of clinical outcomes research. 2. Instruction on proper scale selection. 3. Instruction on scale development and refinement. 4. Development of sound clinical trials and/or outcomes projects.

Educational Resources

One challenge in implementing new material onto the curricula is finding helpful resources. Table 6 identifies some key resources that we have found helpful in understanding clinical outcomes assessment. While there are many more resources available, we have found these to be essential in defining, valuing and teaching clinical outcomes assessment in athletic training education.

Conclusions

In summary, clinical outcomes assessment refers to clinician- and patient-based measures aimed at measuring the end result of healthcare. An integral component of any outcomes assessment is the patient's preferences and values, which are measured using patient self-report scales. Without clinical outcomes measures from

Table 6. Clinical Outcomes Assessment Education Resources

1. Binkley J. Measurement of functional status, progress and outcome in orthopaedic clinical practice. *Orthop Phys Ther Pract*. 1999; 11:14-21
2. Clancy CM, Eisenberg JM. Outcomes research: measuring the end results of health care. *Science*. 1998; 282: 245-246
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7. Katz DL. *Clinical Epidemiology & Evidence-Based Medicine*. Thousand Oaks: Sage Publications, 2001 (ISBN: 0761919392)
8. Principles of Outcomes Research. In: *Outcomes Research Resource Guide*: American Medical Association, 1996/97
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which to assess the effectiveness of healthcare services, it would be essentially impossible to successfully engage in EBP.

Valuing, and subsequent implementation, of clinical outcomes assessment will help athletic training with many of the challenges and critical issues facing the profession. Ultimately, clinical outcomes assessment is central to preparing graduates recognized as healthcare professionals. Such recognition may be ultimately essential for obtaining non-restrictive licensure in all states, third-party reimbursement, establishing the value of athletic training services for a wide-variety of patients in a wide-variety of settings, and universal acceptance as a high quality health profession.

Together, both professional and post-professional athletic training educators have the opportunity to produce better clinicians who are prepared for EBP and to move the athletic training profession forward by emphasizing clinical outcomes in their curriculums. A clinical outcomes assessment focus in athletic training education programs will produce clinicians that understand patient-centered care and can utilizing patient self-report measures to determine the best interventions to improve HRQOL. Future generations of athletic training clinicians must understand the need for, and be able to adequately provide, clinical outcomes data for the athletic training profession.

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