# Using Disablement Models and Clinical Outcomes Assessment to Enable Evidence-Based Athletic Training Practice, Part I: Disablement Models

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**Objective:** To present and discuss disablement models and the benefits of using these models as a framework to assess clinical outcomes in athletic training.

**Background:** Conceptual schemes that form the basic architecture for clinical practice, scholarly activities, and health care policy, disablement models have been in use by health care professions since the 1960s. Disablement models are also the foundation for clinical outcomes assessment. Clinical outcomes assessment serves as the measurement tool for patient-oriented evidence and is a necessary component for evidence-based practice.

**Description:** Disablement models provide benefits to health professions through organization of clinical practice and research activities; creation of a common language among health care professionals; facilitation of the delivery of patient-centered, whole-person health care; and justification of interventions based on a comprehensive assessment of the effect of illness or injury on a person's overall health-related quality of life. Currently, the predominant conceptual frameworks of disability in health care are those of the National Center for Medical Rehabilitation Research and the World Health Organi-

zation. Disablement models need to be understood, used, and studied by certified athletic trainers to promote patient-centered care and clinical outcomes assessment for the development of evidence-based practice in athletic training.

**Clinical and Research Advantages:** For clinicians and researchers to determine effective athletic training treatments, prevention programs, and practices, they must understand what is important to patients by collecting patient-oriented evidence. Patient-oriented evidence is the most essential form of outcomes evidence and necessitates an appreciation of all dimensions of health, as outlined by disablement models. The use of disablement models will allow the athletic training profession to communicate, measure, and prioritize the health care needs of patients, which will facilitate organized efforts aimed at assessing the quality of athletic training services and practices and ultimately promote successful evidence-based athletic training practice.

*Key Words:* patient-centered care, International Classification of Functioning, health-related quality of life, evidence-based practice, National Center for Medical Rehabilitation Research, Nagi model

Evidence-based practice (EBP) has recently received attention in athletic training, although it is not a new concept in many other medical and allied health professions. EBP is the "conscientious, explicit, and judicious use of current best evidence"<sup>1</sup> that incorporates clinical expertise, the patient's values, and best available evidence when caring for patients. The incorporation of EBP into the athletic training profession, both in clinical and research settings, is imperative to facilitate the best care for our patients.

Clinical studies examining the diagnostic procedures and treatment strategies used by athletic trainers are essential to build the scientific foundation for evidence-based clinical athletic training practice.<sup>1–3</sup> The profession of athletic training has made great strides in research during the past 2 decades, but it has failed to transition from a focus on disease-oriented evidence to an equal focus on patient-oriented evidence that matters (POEM).<sup>4</sup> Disease-oriented evidence is based on studies that examine the disease itself, such as cause, pathology, mechanisms of disease development and progression, prevalence, and prognosis.<sup>5</sup> These studies typically include clinician-oriented measures and

variables that are not intuitively meaningful to patients. A casual review of the *Journal of Athletic Training* suggests that disease-oriented evidence studies dominate our literature. For example, of the 15 original research articles published in a recent issue of the *Journal* (volume 42, issue 1), 12 (80%) involved participants who were not patients and the studies were mostly carried out under controlled laboratory conditions.

Alternately, POEM is focused on identifying the effect of a disease on a *patient's* health status, assessing the ability of the clinical examination procedures in determining diagnoses, and evaluating the efficacy and effectiveness of treatment and prevention strategies. Such measures as morbidity, mortality, symptom improvement, cost reduction, and health-related quality of life (HRQOL) are included in POEM<sup>5–7</sup>; these measures are patient oriented because patients inherently care about them. As an example of a POEM measure, HRQOL is a rich concept that "refers to the physical, psychological, and social domains of health, seen as distinct areas that are influenced by a person's experiences, beliefs, expectations, and perceptions."<sup>8</sup> Emphasizing HRQOL in patient care assists clinicians and researchers in understanding more thoroughly the true effect of illness and injury on a patient's daily experience.<sup>9</sup> Furthermore, the Institute of Medicine<sup>6</sup> stresses the provision of patient-centered care—care that identifies, respects, and appreciates patients' differences, values, preferences, and expressed needs—as fundamental to providing high-quality health care. According to EBP principles, POEM-based research yields data that are patient centered and more clinically meaningful for patient care than disease-oriented evidence.

Recent activities demonstrate efforts toward a formal focus on EBP in the athletic training profession. Such activities include specific EBP requests for proposals by the National Athletic Trainers' Association (NATA) Research & Education Foundation, an increased number of editorials on the subject,<sup>2,3,10,11</sup> and the successful 2006 summit, "Infusing Evidence-Based Medicine into Athletic Training and Clinical Practice." Collectively, these activities suggest that the initial transition of our profession toward the incorporation of EBP is underway, which should promote widespread acceptance of, and an equal focus on, POEM. However, despite this apparently growing acceptance of EBP philosophy in athletic training practice, a significant void remains. To date, references to and emphasis on conducting clinical outcomes research have been insufficient.

Outcomes research is "the study of the end result of health services that take [the] patient's experiences, preferences, and values into account."<sup>12</sup> The athletic training research community is largely overlooking the central importance of outcomes studies and POEM.13 Consequently, as a profession, we have largely failed to recognize that outcomes research is the nucleus of EBP. Given the lack of POEM outcomes studies for athletic injuries, incorporating EBP into our profession is difficult because athletic training outcomes evidence is largely absent. It may be appropriate for athletic trainers to use POEM generated from other professions in some instances; however, this cannot be the sole source of evidence for our profession. The athletic training profession needs to investigate the efficacy and effectiveness of our own clinical practice. Otherwise, we impede our professional credibility and jeopardize the long-term viability of our profession.

The sole example of outcomes research produced by the athletic training profession is a 1999 study, which drew on data collected by the athletic training outcomes study of the mid-1990s.<sup>14</sup> The absence of further outcomes research in the profession is quite striking. The importance of clinical outcomes assessment has been reinforced in a recent call for increased outcomes research and EBP by NATA President Chuck Kimmel,<sup>15</sup> the NATA Strategic Implementation Team's identification of clinical outcomes research as one of the top priorities for the profession,<sup>16</sup> the allocation of \$1 000 000 earmarked for outcomes research by the NATA,<sup>17</sup> and the cosponsoring by the NATA and the NATA Research & Education Foundation of a 1-day summit, "Advancing Outcomes of Care in Athletic Training Summit: A Road Map for the Future."<sup>17</sup> These actions demonstrate some understanding of the importance of these issues at the highest levels of the profession with tangible allocation of financial and educational resources.<sup>18</sup> The ability of a health care profession to demonstrate its value to both the consumer and the broader health care system through high-quality outcomes research will be critical for its future viability.

Identifying an appropriate conceptual framework to guide POEM and athletic training outcomes research is imperative for 2 reasons. First, a framework is necessary to guide and stimulate the questions whose answers can only be found in high-quality outcomes research. Guided by a framework, these questions are necessarily and subjectively meaningful to both patients and payers alike. Second, the conceptual framework should provide a requisite flexibility by being broad enough to accommodate ongoing and important mechanistic athletic training research while providing the necessary tools to aid the interpretation and application of that research in a conceptually consistent<sup>19</sup> and, more importantly, a clinically meaningful way.<sup>20</sup> Disablement models provide the necessary conceptual framework to meet both of these criteria. In the absence of such a framework, we risk continuing to pursue mechanistic research that, although valuable in many ways, may be perceived by both the patient and the broader health care system as clinically meaningless and "research for research's sake." Moving forward, we find it essential for athletic trainers to understand that (1) outcomes research is the necessary foundation of EBP, and (2) disablement models offer the necessary framework for conducting outcomes research.

Precedent exists for the adoption of a disablement model by an entire health care profession. The American Physical Therapy Association's Guide to Physical Therapist Practice21 represents the clearest example of the use of disablement models to guide a profession and its clinical practice. In fact, disablement models form 1 of 3 building blocks on which the guide is based. After exploring the basic components of all disablement models, The Guide settles on the Nagi model because it "incorporates the broadest possible interpretation of [disability-related] terms."21 Ādditional evaluative criteria for the selection of the Nagi model have been identified in other sources.<sup>22</sup> However, in the time since the publication of the last edition of The Guide, the physical therapy profession has continued to explore the applicability of contemporary disablement models and, at the time of this writing, appears poised to replace the Nagi model with the World Health Organization's (WHO's) International Classification of Functioning (ICF).<sup>23,24</sup> In addition, the American Physical Therapy Association is collaborating with other health care disciplines to create a manual to interpret the ICF for clinical practice.<sup>25</sup> Other health professions, such as speech pathology, are considering the ICF for use in their practices.<sup>26</sup> Although momentum toward the ICF may be occurring because of a concern for uniformity over substance, the Institute of Medicine's recent decision to officially adopt the ICF as the primary conceptual model for disability intervention and research in the United States may end debate on the matter.<sup>27</sup>

Therefore, the purpose of our 2-part series is to define and discuss disablement models and clinical outcomes assessment and to describe how disablement models serve as the conceptual framework and clinical outcomes assessment as the measurement tools that collectively enable evidence-based athletic training practice. The specific aims addressed in part I of this series are to (1) present and discuss disablement models, and (2) discuss the benefits of using



Figure 1. Nagi disablement model.

disablement models as a framework to assess clinical outcomes as a result of athletic training services.

## DISABLEMENT MODELS

Disablement models have become standard components of clinical practice in most health care professions, including medicine, nursing, speech pathology,<sup>26</sup> occupational therapy,<sup>28</sup> and physical therapy.<sup>19,24,25</sup> In general, disablement models are conceptual schemes or scientific models that form the basic architecture for clinical practice and research as well as health care policy.<sup>19,22,24,25</sup>

#### Nagi Disablement Model

The first disablement model was introduced in 1965 by Saad Nagi,<sup>20</sup> a sociologist, who noticed semantic and conceptual confusion in the disability literature regarding disability and its associated concepts. Nagi recognized the importance of the environment and that family, society, and community factors could all influence disability.<sup>29</sup> Based on this assumption, the consequences of disease and injury for an individual should be described at both the level of the person and at the level of society.

Nagi created a model with 4 components (Figure 1). To illustrate the components of this model, consider a collegiate baseball pitcher with a shoulder injury that limits his ability to throw. Active injury occurs at the cellular level and is identified as a disruption or damage to the integrity of body structures. Given our patient scenario, examples may include a partial-thickness supraspinatus tendon tear or a posterior-superior labral injury. Impairments are defined as the loss or abnormality at the tissue, organ, or body system level and include clinical signs and symptoms, such as diminished internal rotation range of motion, decreased strength of the supraspinatus, and shoulder pain during throwing. Functional limitations are attributes that refer to the person, are described as restrictions in performance at the level of the whole person,<sup>19</sup> and are particularly related to the social roles and normal daily activities of those with disabilities. Functional limitations in the baseball pitcher example may include the inability to throw at greater than 75% of maximum effort and shoulder pain that occurs while lifting a 9.07-kg (20-lb) weight to shoulder level. Functional limitations are the most direct way that disease and impairments contribute to disability because they involve tasks that are necessary for completion of important roles, both personal and social. Finally, *disability* is defined as the inability of a person to fulfill his or her desired or necessary social or personal roles.<sup>30</sup> Examples of disability for a baseball pitcher with a shoulder injury would be the inability to fulfill his role as the starting pitcher or the loss of identity as a team leader and diminished self-esteem.

The Nagi model was influential because it successfully reconfigured the perception of disability away from a focus on physical limitations by defining disability more broadly as the product of a change in the expected interaction between the individual and the environment. According to Nagi, disability is a relational concept, which indicates that it cannot be entirely accounted for by the attributes of the individual and must also consider the role expectations of the individual as well as the patient's perspective of the disability, other people's definition of the disability, and the characteristics of the environment.<sup>19,20</sup> Therefore, to truly understand why someone becomes or does not become disabled, consideration must be given to both the capacities of the individual (a function of active disease, impairment, or functional limitations or a combination of these) and the capacities of the individual in relation to the social situations.19

Consequently, disability is the result of a change in the expected interaction between the individual and the environment, which means that impairments do not have to result in functional limitations and functional limitations do not have to result in disability.<sup>24</sup> For example, a significant loss of glenohumeral internal rotation may not result in the inability to successfully pitch a baseball, and the inability to pitch a baseball may not mean that an



Figure 2. National Center for Medical Rehabilitation Research disablement model, 1993.

athlete is unable to participate in team activities.<sup>30</sup> Furthermore, it is possible that 2 people with the same injury (eg, a rotator cuff tear) could exhibit similar clinical signs and symptoms, including significant impairment as indicated by decreased range of motion and pain. These 2 individuals may also demonstrate similar functional limitations (eg, inability to throw a ball and difficulty with some activities of daily living, such as lifting heavy items). However, these individuals may present with 2 completely different levels of disability. One person may maintain an active social life, continue attending school classes, sustain his commitment to the baseball team, and express an overall positive attitude. In contrast, the other person may shy away from social events, stop attending school classes, remove himself from team obligations, and maintain a depressed and gloomy outlook on life. The potential for drastically different outcomes from 2 very similar injuries highlights the importance of assessing the patient from a disablement model perspective when providing patientcentered health care. The Nagi model provides a framework for understanding why 2 people with the same injury have the potential for such drastically different treatment, performance, and disability outcomes.

The Nagi model is historical and provided standardized terminology for disability. More recent models of disablement, however, have evolved from the Nagi model in an attempt to better encompass all the dimensions of disability and the external factors that influence disablement. Some adaptations have included the addition of sociocultural factors, such as the social and physical environment and personal factors (including attitudes and lifestyle behaviors), as well as an emphasis on quality of life and focus on the interaction between health conditions and contextual factors.<sup>24</sup>

Although a number of disablement models have been created, including work from the Institute of Medicine,<sup>31,32</sup> the 2 most recent models are the disablement model of the National Center for Medical Rehabilitation Research (NCMRR)<sup>33–35</sup> and the WHO ICF.<sup>36,37</sup> In reviewing each model, we describe the key components, provide insight

into the history and evolution, and demonstrate utility by applying it to patient encounters relevant to the athletic training profession.

#### National Center for Medical Rehabilitation Research Disablement Model

The stated mission of the NCMRR, a center within the National Institutes of Health, is to enhance the quality of life of people with disabilities through the development of scientific knowledge.<sup>33</sup> As a result, in 1993, the NCMRR created a model that encompassed the dimensions of disablement and adapted the Nagi model by including a specific component related to societal influences as contributors to disability. Figure 2 illustrates the original NCMRR disablement model. The NCMRR model defined disability as limitations in performing tasks, activities, and roles to levels expected in personal and social contexts.33 Focus was placed on how a person with a disability adapts to functional limitations in the family, work, and local community. The major difference between the Nagi and NCMRR disablement models is that the latter includes the concept of societal limitations as a distinct dimension of the disablement process.<sup>33</sup> Societal limitations refer to the restrictions resulting from social policy or barriers, which limit fulfillment of roles or deny access to services and opportunities associated with full participation in society.

Recently, the NCMRR has started work on a new version of its disablement model that shifts the focus of disablement toward emphasizing the possible health care interventions in the disablement process.<sup>34,35</sup> The key dimensions (ie, components) in this new model and measurable influences are provided in Table 1. In the evolving NCMRR model, rehabilitation interventions are considered *influences* and have the potential to affect the degree of *organ dysfunction* resulting from tissue damage, as well as the quality of *task performance*.<sup>34,35</sup> Because influences act in parallel, the eventual effects of deficits in task performance on a person's roles in society can be the

Table	1.	National (	Center for	r Medical	<b>Rehabilitation</b>	<b>Research</b>	Disablement	Model.	2006
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Dimensions of the Model	Pathophysiology	Organ Dysfunction		Task Performance		Roles
Factors influencing	Genes		Environment		Environment	
transition between	Acute care		Rehabilitation		Rehabilitation	
dimensions of the model	Anatomy		Education		Attitudes	
	Pharmaceutic	als	Experience		Preferences and values	
			Preferences and		Socioeconomic status	
			values		Technology	
			Technology		Laws and regulations	
					Family	

result of the attitudes and laws at the individual and societal levels, respectively.<sup>34,35</sup>

For an injured collegiate baseball pitcher, influences concerning the transition from pathophysiology to organ dysfunction might include the anatomy of the injury (supraspinatus tendon tear or posterior-superior labral injury), pharmaceuticals that the athlete may be taking (anti-inflammatory medications), and acute care or treatment provided to the athlete (therapy or surgery). Influences affecting the transition from organ dysfunction to task performance might include the experience level of the athlete (high school, college, professional, recreational), the components of rehabilitation (aggressive early postoperative mobilization versus prolonged immobilization), and the preferences and values of the athlete (desire to return to full competition versus the decision to end the competitive baseball career). The transition from task performance to roles may be influenced by the environment in which the athlete lives and competes (low-profile small private school versus high-profile Division I university), the socioeconomic status of the athlete (low, middle, or upper class), the attitudes of the athlete (positive versus negative outlook on future career as a competitive baseball athlete or selfperception after injury), and attitudes of the coach (negative versus supportive).

The emphasis of the most recent NCMRR model is on understanding and changing the influences that mediate the progression of disability as opposed to characterizing impairments, functional limitations, and disabilities.<sup>34,35</sup> In this new model, rehabilitation is seen as an active process, requiring the active participation of the patient, with the ultimate goal of improving the patient's quality of life. Through the evaluation of influences, a person's preferences and values in achieving task and role performance are highlighted.<sup>34,35</sup> How a particular patient will participate in rehabilitation activities and overcome the challenges associated with performing tasks and roles and the eventual outcome are central to personal preferences and values.<sup>34,35</sup> The athletic training community should keep abreast of developments regarding the new NCMRR model, as it is still under development and has not been formally adopted (http://www.nichd.nih.gov/about/org/ncmrr/).

# World Health Organization International Classification of Functioning Model

The disablement model created by the WHO in 1980 has been revised several times during the last 2 decades and has been more widely used in European countries than in the United States.<sup>36,37</sup> The most recent model is the ICF, which was introduced in 2001 with the goal of creating a common international language for disability.36,37 One major emphasis in the latest ICF revision was to remove the negative connotations associated with disability by using more positive terms to describe its characteristics, although it can be argued that all modern disablement models make this claim. For instance, reference is made to a patient's "functional abilities" as opposed to "handicaps."29 Like its diagnostic counterpart, the International Classification of Diseases and Related Health Problems, 10th revision (ICD-10).<sup>38</sup> the ICF provides clinicians with a detailed numerical schema that allows for specific coding of disabilities. The ICF codes, while similar to those in the ICD-10, are different in that the ICF classification scheme classifies functioning and disability, whereas the ICD-10 is an etiologic framework that classifies diseases, disorders, and injuries.<sup>36,37</sup> Through the use of the ICF, the WHO hopes to provide both a scientific basis and a quantifiable system for identifying and studying health, health-related states, and health care outcomes. It also creates a mechanism for comparing data across countries and across health care disciplines and formulating health and disability policies.<sup>36,37</sup>

The ICF model is quite different from the Nagi and NCMRR disablement models, both conceptually and in structure. Instead of explicit dimensions and the subsequent relationships among those dimensions, the ICF is a 2-part model organized through a more complex classification of health and health-related domains (Figure 3).<sup>36,37</sup>

In part 1 of the ICF model, the domains body functions and structures and activity and participation attempt to account for function at the levels of the body, individual, and society.36,37 Body functions and structures includes both mental and physical aspects of health, where functions are the physiologic functions of the body and structures are the anatomical parts (ie, sensory organs, limbs). Within these domains, changes or deviations from normal are referred to as impairments. Furthermore, the ICF allows the clinician to numerically code for both functions and structures and to qualify both the extent of the impairment (for both function and structure) and the nature of the change (structure only). Body function codes begin with the letter b, whereas structure codes begin with the letter s. Codes for body function require 1 qualifier, which is identified numerically on a scale of 0 to 4, with 0 indicating no impairment and 4 indicating complete impairment. Body structure codes require a first and second qualifier. The first qualifier captures the extent of the impairment in the same way the function qualifier does, and the second captures the nature of the structural change, using a slightly more expansive scale than the impairment (body function) scale.



Figure 3. World Health Organization International Classification of Functioning model.

Given the previous college baseball pitcher example, consider that the health condition has been established as a supraspinatus tendon tear. To the extent that the athlete was experiencing diminished strength, he would be given a function code of b730, as indicated in the ICF manual for disruptions of muscle power functions.<sup>39</sup> If the problem affected his function only occasionally, say less than 50% of the time, we could assign a qualifier of moderate impairment (2), and the function code would become b730.2. The corresponding structures code for our example might be s7202.24.<sup>39</sup> The structures code for muscles of the shoulder region is s7202, and the 2 indicates a moderate level of impairment. The 4 serves as a second qualifier identifying the nature of the structurel change, which is an "aberrant dimension" to the structure (ie, a tear).<sup>36</sup>

Activities and participation are domains that are essentially responsible for capturing the effect of structural and functional impairment on what a person with a health condition can do in his or her environment. Admittedly, overlap between the domains makes them difficult to distinguish sometimes<sup>36</sup> and correcting this problem is an identified goal of the Institute of Medicine going forward.<sup>27</sup> However, Jette<sup>24</sup> reported success in differentiating one concept from another. In general, activity is best described as a simple task or activity that has a context or meaning, whereas participation is best described as involvement in life situations.<sup>29</sup> Activities include walking, eating, jumping, and throwing. In contrast, participation includes walking in social groups, eating out with friends, and pitching on a baseball team and represents the application of an activity to a life situation. Participation has a performance component; activity does not.<sup>24</sup> As in the previous domains, the assigned codes for both activity and participation can be qualified. The first qualifier of an activity and participation code is a performance qualifier and speaks to the amount of participation restriction. The second qualifier is a capacity qualifier and speaks to the activity limitation, without assistance.

Activities and participation codes begin with the letter d. For the injured pitcher, the activities and participation restriction can be identified as an impairment of hand and arm use (d445), although it can then be further specified as throwing, which receives a code of d4454.39 The activities and participation code also requires performance and capacity qualifiers. Recall that the capacity qualifier accounts for the limitation in executing a task without assistance. The performance qualifier accounts for the extent of the participation restriction as the task is "performed" in a social setting. In this case, the capacity qualifier speaks to the patient's ability to throw, whereas the performance qualifier speaks to his actual ability to pitch in a game. We might assume that although the patient's capacity to throw is only mildly limited, his performance is severely restricted because he cannot pitch at 100% effort. Taking the performance qualifier first, the activities and participation code is adjusted to reflect both

Table 2.	Disablement	Models:	Components	and	<b>Comparison</b> <sup>a</sup>

Model	Origin	Organ	Person Level	Societal Level	Other Domains
Nagi, <sup>20</sup> 1965	Pathology	Impairment	Functional limitations	Disability	
National Center for Medical Rehabilitation Research, <sup>33</sup> 1993	Pathophysiology	Impairment	Functional limitations	Disability	Societal limitations
National Center for Medical Rehabilitation Research, <sup>35</sup> 2006	Pathophysiology	Organ dysfunction	Task performance	Roles	
World Health Organization International Classification of Functioning, <sup>36,37</sup> 2001	Health condition	Body structure and function	Activity	Participation	Environmental and personal factors

<sup>a</sup> Italics indicate dimensions that address health-related quality of life.

qualifiers and expressed as d4454.31, meaning that the patient is experiencing a throwing limitation resulting in severe performance difficulty and mild capacity difficulty.

Part 2 of the ICF model includes contextual factors, which are particularly important because they address the significant effect of environment and personal factors on overall level of functioning and disability.<sup>36</sup> Environmental factors refer to the physical, social, and attitudinal environments in which people live and include support and relationships, attitudes, and services and policies; these can be considered at the level of the individual or society.<sup>29,36</sup> Environment can be delineated further to include both a standard environment (in the domain of activities) and a usual environment (in the domain of participation).<sup>36,37</sup> A collegiate baseball pitcher may identify the athletic trainer responsible for his treatment as an environmental factor. Consequently, the code e355 would be assigned, which is the environmental code for a health professional.<sup>39</sup> The qualifier for environmental codes identifies the factor as either a barrier or a facilitator and suggests a degree of influence for that factor. In this case, we might find that the athlete believes the athletic trainer is a moderate facilitator of his ability to continue to play baseball, so the code would be adjusted to e355+2.

The final component of the ICF is *personal factors*, which relate to the age, coping habits, social background, education, and past and current experiences of the patient.<sup>29,36,37</sup> Although important, personal factors are rarely coded because of the myriad of factors that have the potential to influence the situation.

To summarize the ICF disablement model, disability occurs when a health condition leads to dysfunction at the domain levels (*body functions and structures* and *activities and participation*) indicating impairment (*body functions and structures*), activity limitations (*activities*), or participation restrictions (*participation*), as mediated by both environmental and personal contextual factors.<sup>36</sup> The coding mechanism associated with the ICF provides a standardized method for a clinician to classify and monitor patient functioning and disability in a systematic and consistent way. Although the WHO hopes to attain worldwide acceptance and use of its model, the feasibility of this goal remains unknown.

#### BENEFITS OF USING DISABLEMENT MODELS AS A FRAMEWORK TO ASSESS PATIENT-ORIENTED EVIDENCE THAT MATTERS AND CLINICAL OUTCOMES

Despite some structural and theoretic differences, each of the disablement models provides important benefits to

adherents. The first benefit is that it serves as a very powerful organizing tool. Although the Nagi, NCMRR, and ICF models use variations in terminology to conceptualize the components of disablement, they all emphasize the whole person by addressing disablement at the origin, organ level, person level, and societal level, and some models even consider influencing factors from society and the environment (Table 2).29 Each of the models provides important conceptual structure to both clinical practice and research activities, has the potential to influence health care policy, and has the inherent flexibility to evolve with changes in the health care system.<sup>19,24</sup> Disablement models also help with organization by providing a common language for all health care professionals, which potentially increases effective communication among different health care disciplines, thereby reducing barriers to interdisciplinary health care.25

Another benefit of disablement models is that they provide an effective conceptual framework for refocusing health care interventions on the unique needs of each patient. In the past decade within health care, providing patient-centered care<sup>6</sup> and collecting patient-oriented evidence have been emphasized. Patient-centered care, as defined by the Institute of Medicine, requires the clinician to "identify, respect, and care about patients' differences, values, preferences, and expressed needs; relieve pain and suffering; coordinate continuous care; listen to, clearly inform, communicate with, and educate patients..."<sup>6</sup> Both patient-centered care and patient perspective are central components of disablement models. Using disablement models enables a patient's condition to be described in terms of injury or illness, impairments, functional limitations, disability, or societal limitations, which are not different characteristics of the patient but the same patient characteristics considered from different perspectives.<sup>30</sup>

Impairment is often measured through objective assessments of strength, range of motion, and balance, whereas disability is most frequently measured through patient selfreport forms. To determine the values and needs of patients (ie, patient-oriented evidence), health care providers must use patient self-report outcomes measures in clinical practice. These self-report measures are aimed at determining what is important to the patient and are conceptually based on the framework of disablement models.<sup>40</sup> By asking patients to report their injury-related or illness-related level of impairment, functional loss, disability, and societal limitations, we can assess the effect of that injury or illness on their overall health status. Furthermore, these scales help the clinician to determine what is most important to the patient, simultaneously giving patients a voice in their care and enabling clinicians to practice patient-centered health care. Ideally, an impairment should only be a focus of rehabilitation if it is a causal factor in the patient's inability to complete a functional task necessary for fulfillment of expected and desired life activities and roles.<sup>30</sup>

The final, and arguably the most important, benefit of disablement models is that they help to facilitate investigations into the efficacy and effectiveness of clinical interventions. Identification of treatment strategies and interventions that work under ideal situations (efficacy)<sup>41</sup> and in real-world situations (effectiveness)<sup>41</sup> is imperative for the future of our profession. Disablement models highlight those components of the patient experience that matter most to the patient, thereby identifying potential clinical care goals. Identifying patient-centered goals through a disablement model framework leads to patientcentered care, because the treatment plan and intervention strategy are targeted at meeting the goals that matter to the patient. Additionally, creating meaningful goals allows both the clinician and the patient to monitor the rehabilitation process and come to a clear determination of whether the treatment or intervention strategy effectively met the goals. Through this process, patient recovery should be maximized. Measurement of these patientcentered outcomes is central to outcomes research and through outcomes studies, the efficacy and effectiveness of interventions can be determined.

Furthermore, disablement models provide a comprehensive schema for the assessment of the effect of disease or injury on a patient's overall HRQOL. The HRQOL is a product of the patient's functional ability as well as the social and psychological abilities that allow the patient to fulfill his or her expected roles in society. Consequently, the more accurate and holistic a picture clinicians have of the true effect of illness or injury, the more precisely and comprehensively interventions can be directed to mediate that effect. The synergy between disablement models and HRQOL is made more attractive by the fact that HRQOL is proving to be a useful concept for explaining patient experiences across a variety of age ranges, including the pediatric and young adult populations often encountered by athletic trainers.<sup>42–44</sup>

Athletic trainers have traditionally focused their interventions on patient impairment and function, with little emphasis on the combination of functional loss, disability, and societal limitations or environmental factors. Patient assessments that go beyond impairment and function (italic columns of Table 2) enable a more holistic picture of overall HRQOL. As a result of our historically limited approach to assessment, we know a great deal about the effect of a lateral ankle sprain or anterior cruciate ligament tear on a patient's ability to participate in sport, recreational activity, or work, but we know very little about how these conditions affect our patients' perception of their HRQOL. Furthermore, we know very little about the effect of athletic training interventions on restoring HRQOL. Disablement models facilitate assessment beyond impairment and functional loss and enable clinicians to identify the effect of a patient's illness or injury on HRQOL, providing a more complete picture of overall health status.

Although several important clinical benefits are associated with adopting a disablement model framework in athletic training, other benefits also align with the goals of the profession that are explored further in the commentary, "Change Is Hard: Adopting a Disablement Model for Athletic Training," following this 2-part series.<sup>45</sup>

### CONCLUSIONS

Three contemporary disablement models are used by health care providers to assess overall health status in their patients: (1) the Nagi model, (2) the NCMMR model, and (3) the WHO ICF model. The NCMRR and WHO ICF models are currently preferable, as they attempt to define disability across a spectrum of dimensions that accounts for personal and broader environmental factors. Using disablement models will enhance our profession by organizing athletic training clinical practice and research activities; creating a common language among athletic training educators, clinicians, and researchers; providing a mechanism for the delivery of patient-centered, wholeperson health care; and facilitating a comprehensive evaluation system for the effect of injury on patient HROOL. We recommend that athletic training clinicians, educators, and researchers familiarize themselves with the concepts of disablement models, as these frameworks facilitate the collection of patient-oriented evidence, the most valuable form of outcomes evidence, and create the environment essential for clinical outcomes assessment.

In this article, the first in a 2-part series, we identified and discussed the 3 major disablement models and their benefit as a mechanism for patient-centered, whole-person health care. The purpose of the second article, entitled "Using Disablement Models and Clinical Outcomes Assessment to Enable Evidence-Based Athletic Training Practice, Part II: Clinical Outcomes Assessment," is to provide an overview of clinical outcomes assessment, discuss the classification of outcomes measures, present considerations for choosing outcomes assessment.<sup>46</sup> Moreover, the critical link between the use of disablement models and clinical outcomes assessment will be further elucidated.

### REFERENCES

- Sackett DL, Rosenberg WM, Gray JA, Haynes RB, Richardson WS. Evidence based medicine: what it is and what it isn't. *BMJ*. 1996;312(7023):71–72.
- Hertel J. Research training for clinicians: the crucial link between evidence-based practice and third-party reimbursement. J Athl Train. 2005;40(2):69–70.
- Steves R, Hootman JM. Evidence-based medicine: what is it and how does it apply to athletic training? J Athl Train. 2004;39(1):83– 87.
- Shaughnessy AF, Slawson DC, Bennett JH. Becoming an information master: a guidebook to the medical information jungle. *J Fam Pract.* 1994;39(5):489–499.
- Hurwitz SR, Slawson D, Shaughnessy A. Orthopaedic information mastery: applying evidence-based information tools to improve patient outcomes while saving orthopaedists' time. *J Bone Joint Surg Am.* 2000;82(6):888–894.
- 6. Institute of Medicine. *Health Professions Education: A Bridge to Quality.* Washington, DC: Institute of Medicine; 2003.
- Pew Health Professions Commission. Critical Challenges: Revitalizing the Health Professions for the Twenty-First Century. Washington, DC: Pew Charitable Trust; 1995.
- Testa MA, Simonson DC. Assessment of quality-of-life outcomes. N Engl J Med. 1996;334(13):835–840.

- Guyatt GH, Feeny DH, Patrick DL. Measuring health-related quality of life. Ann Intern Med. 1993;118(8):622–629.
- Hootman JM. New section in JAT: evidence-based practice [editorial]. J Athl Train. 2004;39(1):9.
- 11. Prentice WE, Guskiewicz KM, Perrin DH. Readers demand attention for education, recognition. *NATA News*. April 2006:56.
- 12. Clancy CM, Eisenberg JM. Outcomes research: measuring the end results of health care. *Science*. 1998;282(5387):245–246.
- Merrick MA. "I can't believe we don't know that!" J Athl Train. 2006;41(3):231–232.
- Albohm MJ, Wilkinson G. An outcomes assessment of care provided by certified athletic trainers. *J Rehabil Outcomes Meas*. 1999;3(3):51– 56.
- 15. APTA breaks off relationship with NATA. *NATA News*. November 2005:16.
- 16. Kirkland M. What value an athletic trainer? *NATA News*. October 2006:40.
- National Athletic Trainers' Association. Outcomes research summit coming in May. http://www.nata.org/members1/documents/eblast/ 011907.cfm. Accessed January 19, 2007.
- Snyder AR, Valovich McLeod TC, Sauers EL. Defining, valuing, and teaching clinical outcomes assessment in professional and postprofessional athletic training education programs. *Athl Train Educ J*. 2007;2(2):31–41.
- Jette AM. Physical disablement concepts for physical therapy research and practice. *Phys Ther.* 1994;74(5):380–386.
- Nagi S. Some conceptual issues in disability and rehabilitation. In: Sussman M, ed. Sociology and Rehabilitation. Washington, DC: American Sociological Association; 1965:100–113.
- American Physical Therapy Association. *Guide to Physical Therapist Practice.* 2nd ed. Alexandria, VA: American Physical Therapy Association; 2003.
- 22. Verbrugge LM, Jette AM. The disablement process. Soc Sci Med. 1994;38(1):1–14.
- 23. Jette AM. The changing language of disablement. *Phys Ther.* 2005; 85(2):118–119.
- 24. Jette AM. Toward a common language for function, disability, and health. *Phys Ther.* 2006;86(5):726–734.
- 25. Kaplan SA. Outcome Measurement & Management: First Steps for the Practicing Clinician. Philadelphia, PA: FA Davis; 2007.
- Threats TT. Towards an international framework for communication disorders: use of the ICF. J Commun Disord. 2006;39(4):251–265.
- Board on Health Science Policy, Institute of Medicine. *The Future of Disability in America*. Washington, DC: National Academies Press; 2007.
- Hubbard S. Disability studies and health care curriculum: the great divide. J Allied Health. 2004;33(3):184–188.
- 29. Whiteneck G. Conceptual models of disability: past, present, and future. In: Field MJ, Jette AM, Martin L, eds. *Workshop on Disability in America: A New Look*. Washington, DC: National Academies Press; 2006:50–66.

- Quinn L, Gordon J. Functional Outcomes Documentation for Rehabilitation. St Louis, MO: WB Saunders; 2003.
- Institute of Medicine. Enabling America: Assessing the Role of Rehabilitation Science and Engineering. Washington, DC: National Academies Press; 1997.
- 32. Pope A, Tarlov A. *Disability in America: Towards a National Agenda for Prevention*. Washington, DC: National Academies Press; 1991.
- 33. National Advisory Board for Medical Rehabilitation Research. Research Plan for the National Center for Medical Rehabilitation Research. Washington, DC: National Institutes of Child Health and Human Development, National Institutes of Health, Department of Health and Human Services; 1993.
- National Center for Medical Rehabilitation Research. *Report to the* NACHHD Council. Washington, DC: US Department of Health and Human Services; 2006.
- National Center for Medical Rehabilitation Research. Innovations: Future Solutions Now: An NCMRR Update. Washington, DC: National Center for Medical Rehabilitation Research; 2006.
- 36. World Health Organization. *Towards a Common Language for Functioning, Disability and Health: ICF.* Geneva, Switzerland: World Health Organization; 2002.
- World Health Organization. ICF introduction. http://www3.who.int/ icf/intros/ICF-Eng-Intro.pdf. Accessed October 20, 2006.
- World Health Organization. International Classification of Diseases and Related Health Problems. 10th revision. http://www.who.int/ classifications/apps/icd/icd10online/. Accessed January 26, 2007.
- World Health Organization. ICF-English. http://www3.who.int/icf/ onlinebrowser/icf.cfm. Accessed November 22, 2006.
- Binkley JM, Stratford PW, Lott SA, Riddle DL. The Lower Extremity Functional Scale (LEFS): scale development, measurement properties, and clinical application. North American Orthopaedic Rehabilitation Research Network. *Phys Ther.* 1999;79(4):371–383.
- Gordis L. *Epidemiology*. 3rd ed. Philadelphia, PA: Elsevier Saunders; 2004.
- 42. Zullig KJ, Valois RF, Drane JW. Adolescent distinctions between quality of life and self-rated health in quality of life research. *Health Qual Life Outcomes*. 2005;3:64.
- Zullig KJ, Valois RF, Huebner ES, Drane JW. Evaluating the performance of the Centers for Disease Control and Prevention core Health-Related Quality of Life scale with adolescents. *Public Health Rep.* 2004;119(6):577–584.
- 44. Zullig KJ, Valois RF, Huebner SJ, Drane JW. Adolescent healthrelated quality of life and perceived satisfaction with life. *Qual Life Res.* 2005;14(6):1573–1584.
- Parsons JT, Valovich McLeod TC, Snyder AR, Sauers EL. Change is hard: adopting a disablement model for athletic training. *J Athl Train*. 2008;43(4):446–448.
- 46. Valovich McLeod TC, Snyder AR, Parsons JT, Bay RC, Michener LA, Sauers EL. Using disablement models and clinical outcomes assessment to enable evidence-based athletic training practice, part II: clinical outcomes assessment. J Athl Train. 2008;43(4):437–445.

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