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Review Article

Application of International Classification of Functioning (ICF) in Sports Medicine

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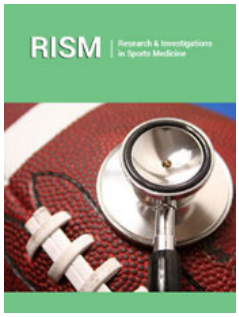

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Abstract

Healthcare providers who work in physical, mental and emotional rehabilitation specialties work to regain an individual's ability to perform activities of daily living and occupation specific function that has been altered by disease, injury or natural processes. This functional impairment can affect far beyond the functional outcome and can have significant adverse effects on patients' emotions, sleep and ability to perform tasks associated with daily living. Within the international healthcare community, the International Classification of Functioning, Disability and Health (ICF) is used as a framework to help describe and organize information on functioning and disability. The ICF seeks to approach the deleterious effects of disease, injury, and aging from a standardized process that incorporates the numerous variables associated with living functionally. Given its global usage, the ICF can provide a standard language for defining as well as measuring health and disability. Standardizing this language has the potential to enhance interprofessional collaboration as healthcare providers seek to provide optimal outcomes for patients. This review of the current literature highlights the benefits of the ICF, while also detailing how the ICF can be used to enhance sports medicine care.

Introduction

Healthcare providers who work in physical, mental and emotional rehabilitation specialties work to regain an individual's ability to perform activities of daily living and occupation specific function that has been altered by disease, injury or natural processes [1]. This functional impairment can affect far beyond the functional outcome and can have significant adverse effects on patients' emotions, sleep and ability to perform tasks associated with daily living [2-4]. Within the international healthcare community, the International Classification of Functioning, Disability and Health (ICF) is used as a framework to help describe and organize information on functioning and disability [5]. The ICF seeks to approach the deleterious effects of disease, injury, and aging from a standardized process that incorporates the numerous variables associated with living functionally. Figure 1 details the interplay of the variables accounted for by the ICF. Given its global usage, the ICF can provide a standard language for defining as well as measuring health and disability [5]. The ICF allows for uses in multiple situations and settings, including public health, rehabilitative, health education, and community outreach. The ICF can also be applied well within the sports medicine setting. For example, an Anterior Cruciate Ligament (ACL) injury can have significant physical, emotional and functional limitations leading to long periods of absence from competition and work. Furthermore, the financial costs of injuries are high, estimated to cost $24,707 per patient for ACL reconstruction [6]. Other athletic injuries such as fibular fractures can lead to a loss of 72 to 145 days to return to play as seen in male elite football players [7]. As such, the components of the ICF lend themselves well to standardized language healthcare providers can use to communicate when providing interdisciplinary care for patients who are recreationally or competitively physically active. Therefore, the purpose of this review is to provide further information about the ICF, and how it can be applied within the sports medicine setting.

Importance of communication in healthcare

Interprofessional collaboration is growing more common in healthcare [8-10]. With an increased emphasis on providing efficient healthcare that maintains high quality and safe practices, collaborative healthcare has become more popular [11]. Well-structured and executed collaborative care can also mitigate the negative effects of financial constraints and comorbid pathologies [10]. Unfortunately, the best methods of implementing a framework for collaborative healthcare are not well studied [10]. This paucity of research makes it difficult to establish guidelines for healthcare providers interested in developing a system of collaborative care. There does appear to be general agreement that clear and thorough communication between providers is necessary for establishing a well-functioning model for interprofessional healthcare teams [11-13]. The ICF model can help further facilitate this growing interprofessional collaboration and allow health care providers for better communication as well as advance understanding of the holistic nature of injuries and how it affects functioning [14,15]. Numerous international governmental agencies have already used the ICF to inform their disability program. In fact, Canada, France, Germany, Italy, Russia, South Africa, and Sweden use the ICF at the regional and national level [16]. Additionally, Australia, Canada, Denmark, France, Italy, South Korea and Sweden have used the ICF as the basis for social policies in their legislative bodies [16]. Taiwan has also incorporated the ICF model, using it to help facilitate the implementation of their disability eligibility determination system using an ICF based measure of activity and participation [17]. The use of ICF can support better care in integration of disabilities, including mental disorders that will help with targeting resources appropriately as well as reimbursement policies [18]. The ICF model thus provides a platform for improving the communication of healthcare workers by standardizing a common language and improving the allocation of healthcare resources appropriately.

The ICF model was initially introduced in 2001 by the World Health Assembly and has since been broadly used internationally by various healthcare and sports organizations. The United States Centers for Disease Control published an overview of the ICF in 2012 discussing the applications and recommending its usage for classifying functions [5]. Other organizations such as the National Athletic Trainers Association (NATA) have also embraced the ICF model, endorsing the ability for clinicians to understand care at a holistic level [19]. The NATA has further discussed ways to integrate the ICF model into clinical practice such as using subjective and objective information like the Short-Form Survey 12, upper extremity functional scale and lower extremity functional scale [19]. Integrating these holistic assessments allows the athletic trainer to be able to assess how treatments and therapy are progressing. In addition to being supported by the American Medical Association, nurses, physical therapists, and occupational therapists have also begun using the ICF in the United States [20-23]. With better communication and discussion on how disability affects the ability of a person's functioning, the ICF can help further raise awareness and facilitate access to optimal healthcare.

Emotional components of injury and dysfunction

The importance of including emotional components in evaluating a person with disability has been emphasized in recent sports medicine literature [24,25]. Emotional vitality can influence both physical and emotional adaptations for people living with illness or disability and needs to be incorporated in the assessment and treatment plan to optimize the rehabilitation outcomes [1]. In a meta-analysis of studies on patients with Ehlers-Danlos Syndrome Hypermobility Type (EDS-HT)/Hypermobility Syndrome (HMS), fatigue and psychological distress were found to be associated with disability [26]. Furthermore, fatigue and symptoms of anxiety and depression had stronger associations with disability than pain itself, which had a moderate association [26]. The meta-analysis highlights that it is insufficient to rely solely on pain to evaluate disability and the emotional components are just as if not more important [26]. The ICF model takes this into account by adding a personal component when evaluating a patient's level of functioning [5].

One example of how sports injuries specifically can affect the physical and mental wellbeing of patient was detailed in a study examining sports-related Femoro Acetabular Impingement (FAI) and the impact of hip arthroscopy on the emotional impact of male athletes [27]. The study used a 36-Item Short Form (SF-36), a generalized health and well-being Patient Reported Outcome Measure (PROM). The authors found that patients with baseline psychological impairment had higher levels of disability after surgery compared to patients without psychological impairment [27]. These findings highlight how mental health can affect outcomes even with improvement of functional outcomes post-surgery. Furthermore, even if a patient was found to be physically functional after treatment and rehabilitation for sport related pathology, psychological and emotional factors may still be impeding function [27].

Traditionally, sports medicine healthcare providers have conceptualized healing in three distinct physiological phases: Acute injury phase, repair phase, and remodeling phase [28]. However, the use of the integrated model prompts providers to consider the emotional and behavior responses associated with a sport related injury. Previous research has shown that an injured athlete's emotional response varies during the different phases of the injury-rehabilitation process [28]. Injured athletes often had a negative cognitive appraisal and emotion from the initial injury [28]. As the patient progressed from reaction to rehabilitation phase, their cognitive appraisals were often mixed, and frustration was the main emotional response [28]. Once a patient progressed to the stages of returning to sport, their cognitive appraisals shifted and became more reflective [28]. Patients also began to experience doubts on their ability to return to play [28]. Other emotional responses from returning to sports included excitement on ability to return to sport participation, as well as fear or anxiety of being reinjured [28]. The study illustrated the importance of ensuring that the entire treatment team understands how emotional and behavioral phases affect a patient's view on their injury and rehabilitation progress

[28]. The role of rehabilitation and healthcare professionals is crucial for aiding physical activity individuals experiencing disability. For physically active people experiencing disability, the influence of health professionals is likely more important than in the general population [29]. Often times, musculoskeletal injuries that result in varying levels of dysfunction create short term disabilities. As such, these otherwise healthy individuals are having to cope with a functional state that they have not experienced previously. This places more emphasis on the sports medicine healthcare professional to be able to understand and empathize with their patients as they experience dysfunction. Doing so provides these healthcare professionals with an increased level of insight when determining the best course of treatment for a patient.

Aspects of the ICF model

As previously illustrated in Figure 1, there are four components of the ICF model, body functions and structures, activities, participation, personal and environmental factors [5]. Body functions and structures detail the functioning at the level of the body. This is where most of the research in sports medicine has traditionally focused on understanding the pathophysiology of how a disorder or disease affects the body and structures. However, recent literature has shown that focusing on the physical aspect of injury does not allow for holistic care of sports related injuries [30-33]. When providing care for a patient suffering from a sport-related pathology it is vital to consider all factors covered by the ICF.

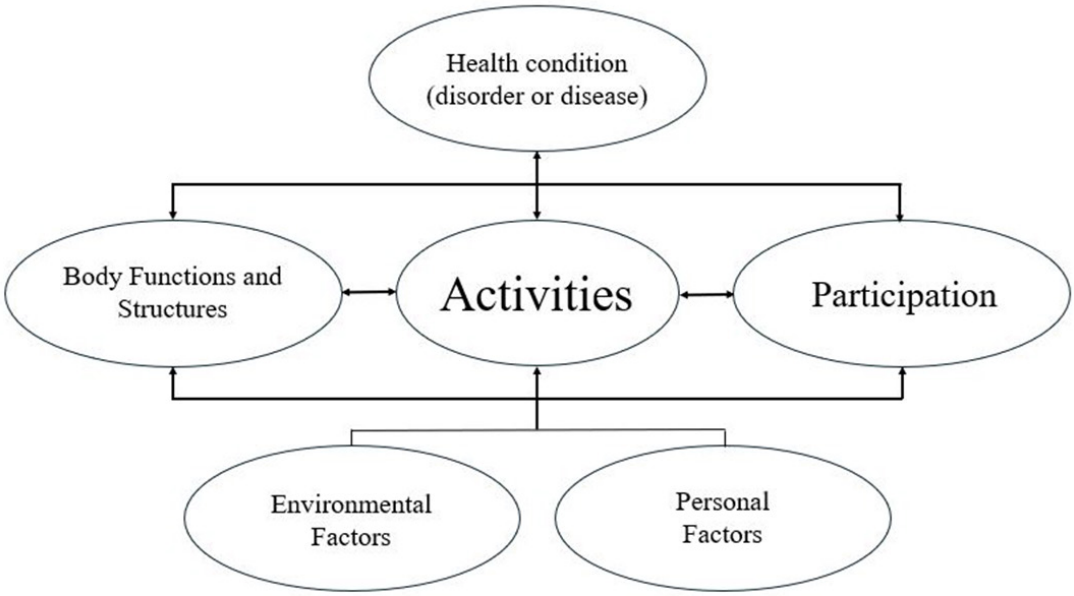

Figure 1: Intervariable relationships within the ICF.

Health condition

The health condition affecting a person's function is an understandably important aspect of the ICF model. It is important to consider characteristics of the condition including timing of the pathology, type of diagnosis, severity of pathology, and comorbidities [34]. Timing of the pathology relates to whether or not the condition affecting the patient had an acute or chronic onset. Often times, chronic pathologies can be associated with prolonged emotional demands that increase a patient's psychological and emotional distress [35]. This type of diagnosis can help healthcare providers determine what additional referrals to make. For instance, a patient suffering from an orthopedic pathology would be best served by being referred to a provider with a background in managing orthopedic pathologies. The severity of a pathology can provides a clinician with a variety of information that relates to the patient's prognosis. This can be valuable when working to manage a patient's expectation of the recovery process [36]. Knowledge of a patient's comorbidities can serve to better inform a clinician of a patient's prognosis and other psychological and emotional stressors the patient is experiencing [37]. Sports medicine healthcare professionals focus the majority of their training as well as research on the specific pathology impacting their patients. Unfortunately, there appears to be less emphasis on how these injuries can lead to dysfunction or disability [30-33]. When providing care for sports medicine pathologies, functional outcomes do not always represent the true impact of injuries. In a previous study regarding wrist and finger flexor tendon injuries, the main surgical outcome was the restoration of maximum flexor tendon gliding and digit function [38]. Within the study, the measured functional outcome did not fully represent the impact on flexor tendon surgery patients. Previous research has shown that wrist and hand surgery that is considered successful can still lead to altered function during activities of daily living for patients [39]. Additionally, patients undergoing wrist and hand surgery have also reported feelings of insecurity, loneliness, and concern over lack of information and control regarding their surgery [40]. These are key points to emphasize as measurable functional outcomes of the injury for healthcare providers involved in a patient's recovery process. While a patient may appear to be

physically improving, there are multiple factors to consider when evaluating a patient's recovery process [38-40]. The ICF model takes this into account by including various aspects such as activity, participation, personal factors and environmental factors.

Activity & participation

Activity and participation are another aspect of the ICF model that pertains to how people engage with their community and how well they are able to carry out activities as they recover from a pathology. The ICF model has been used to help frame the narratives of patients participating in sports after experiencing a disability [29]. Previous research has shown that sports can be one of the ways individuals with a disability can continue to participate and engage in activities within a community [29]. This research has suggested that various benefits can be obtained from participation in sport, including enhanced health promotion, relationship development, increased optimism, functional capacity, and inclusion in life activities and roles [29]. There are several factors that influence the participation and activity in people with temporary or permanent disabilities. For example, one study identified and described contextual factors that have influenced sport participation among blind and deaf individuals in India [41]. The ability to access resources such as assistive technology, social support, and disability specific services were found to be the main enablers for sport participation [41]. Of note, personal factors also played a role in a person's level of activity and sport participation, such as the age of onset, nature of impairment, and the willingness to explain the condition [41]. The authors of the study also noted that there were several environmental barriers that affected sport participation of deaf and blind individuals in India, including lack of services, support systems, policies related to deafness and blindness, and negative societal attitude toward disability [41]. The study also found that access to adaptive technology had enabled participation for deaf and blind individuals [41]. Findings such as these have the potential to provide healthcare providers with insights when attempting to facilitate participation in sport and physical activity for patients suffering from temporary or permanent disabilities.

Environmental factors

The environmental factors of the ICF are subcategorized into physical, social, and attitudinal factors [29]. These subcategories provide healthcare providers with a more complete picture of the situations being experienced by their patients. These environmental factors not only reflect the physical space that a patient interacts with, but also the patient's perception of the social and attitudinal environment in which they live [29]. These factors can be characterized by their presence or their absence [29]. Negative attitudes toward a patient with a temporary or permanent disability is an example of an environmental factor that is present [41]. Conversely, a lack of space and facilities to participate in physical activity spaces would constitute an absence within a patient's environment [41]. A qualitative study on university students in Spain examined environmental factors that acted as barriers or facilitators to participation in physical activity for individuals with limiting disabilities [42]. Twenty-seven Spanish university students were interviewed in the study and three common themes were identified: organized sports associations, space and facilities for physical activity, and non-humans [42]. During the participants' interviews, many of them noted that they had participated in an organized sports association for persons with disabilities [42]. Some of the participants had noted that these associations provided information on physical activity opportunities or sponsored activities themselves such as aquatic or sporting activities [42]. Specifically, an association that one of the participants had been involved in had an adapted gym designed by and for people with disabilities [42]. The participant also noted feeling a sense of unity that was facilitated by the environment within the association [42]. Furthermore, this sense of unity served to create relationships with other individuals and provide further incentive to go to the gym [42].

The second theme identified was space and facilities for physical activity, in which a gym with adaptive equipment was often the most valued setting for the university students [42]. While some participants cited facilities for physical activity as facilitating their exercise and sport participation, others stated that the facilities they had access to have a negative impact on their sport participation [42]. Some participants remarked being stared at by others as having a negatively affecting their willingness to utilize facilities for physical activity [42]. As such, it is important to create and provide a physical environment where athletes with temporary or permanent disabilities will be able to feel more comfortable and accepted. The third theme identified by the authors was non-humans [42]. Non-referred to objects inanimate objects that either facilitated or hindered physical activity participation [42]. One study found that water often acts as a facilitator for physical activity [42]. A participant in the study even noted that the water allowed her to be herself while when she was outside of her water, she felt that she was disabled [42]. Other participants commented that they used objects to help hide their disability [42]. A participant who had a colostomy, used a fanny pack to cover his colostomy bag for walking and exercising on the beach [42]. This allowed him to feel less self-conscious about the participant colostomy bag and allowed him to participate in beach activities [42]. These environmental factors all play key roles in influencing an individual's functioning ability and play a role in their success in maximizing their functioning level. Notably, the fact that college students felt that their campus was not an accessible place for physical activity should emphasize how crucial adaptive infrastructure is when designing new facilities. In the ICF framework, any environmental factor can be a facilitator or a barrier not only due to its presence, but also its absence.

Personal factors

When examining personal factors, it is important to note that many factors are more stable than environmental factors. As such, these factors can be more difficult to modify. For instance, the age at which a patient develops a disability is a personal factor that a clinician cannot change [41]. Nevertheless, personal factors are still important considerations when applying for the ICF.

Other personal factors that are taken into account by the ICF are a patient's willingness to discuss how their disability is affecting them, motivation to improve, ability to perform activities of daily living and occupational tasks [6,18,41]. It can be difficult to build a relationship with a patient that lends itself to communication about their condition and motivation to improve. However, it is important to work to build a connection and trust with a patient. These can be facilitated through the ICF based off two important principles. First, the ICF allows for a more universal approach to plan of care for patients [6,18]. This allows members of an interdisciplinary team to approach a patient's care in the same manner. The universality of the ICF lays a foundation for the second principle, which is continuity [6,18]. The continuity created by a team of healthcare providers approaching a patient's care in the same manner has the potential to build a relationship that fosters better communication and motivation to improve [6,18]. The values of the ICF were intentionally created to make sure that personal factors are addressed. Namely, the ICF emphasizes the consideration of patient dignity and the individual worth of each patient [18]. When keeping patient dignity and worth in mind, it allows for clinicians to work toward ensuring that their patients with disabilities are included in their societal activities as much as possible [18]. Lastly, diligent application of the ICF framework spurs clinicians to advocate for their patient population [18]. By creating more advocates for individuals with disabilities, it can create an environment in which patients with disabilities have the best opportunity to function as independently as possible.

Outcome measures

Not only does the ICF take into account the subjective experiences of people with disabilities, but the framework also allows for more objective outcome measures. Objectivity can help provide a more detailed measure of functioning that can be universally evaluated by healthcare providers. In a study evaluating various instruments to help measure the burden of sport and active recreation injury, the authors found that the Short Form-36 (SF-36) was most commonly used instrument in areas relevant to individuals who were involved in sports and active recreation [43-49]. The SF-36 evaluates eight health concepts: Physical functioning, bodily pain, role limitations due to physical health problems, role limitations due to personal or emotional problems, emotional well-being, social functioning, energy/fatigue and general health perceptions [43]. The SF-36 also includes one item that allows the individual to indicate their perceived change of health [43]. These items are totaled, and higher scores indicate a more favorable health state. The study also detailed other instruments that were used to assess function and overall health. While certain instruments such as the Sickness Impact Profile-36 were comprehensive, the usefulness of such instruments is limited due to the length of the questionnaires [43].

In the pediatric population, outcome measures have been created for certain instances. The Pediatric Internal Knee Documentation Committee Form (Pedi - IKDC) was created specifically for pediatric patients with various knee procedures, including Anterior Cruciate Ligament (ACL) reconstruction [49]. The Pedi-IKDC captures all ICF domains and measures pain, symptoms, and physical functioning in relation to the individual's daily and sports activities [49]. It is important to note however that review of literature shows that there is no standardized core set of outcome measures in evaluating pediatric ACL injuries. For competitive athletes, the ICF provides a method of classification that ensures athletes with similar levels of functional ability are being provided with equitable care. The ICF-37 has been able to assist in quantifying levels of disability among individuals with musculoskeletal pathology and has been shown to have good psychometric properties that can potentially be used as part of injury evaluations and re-evaluations [50]. Providers must make sure to balance the utility of these instruments with the burden responding can place on the patient. To this end, there remains a need for an efficient and holistic instrument for providing objective data that can be valuable when using the ICF.

Clinical application

Although the mental health aspect disability is recognized in current literature, there has been limited focus on the clinical application of ICF framework [18]. As mentioned before, the etiological neutrality principal places mental and physical disability on equal footing [5]. A Delphi study on evaluating the factors that affect functional capacity in patients with musculoskeletal pain found that motivation, chronic pain behavior, and sensation of pain were found to be the most important factors that influence a patient's ability in tolerating repetitive movements [51]. These factors are all addressed within the ICF framework, further highlighting its utility in clinical practice. The ICF framework was created with the values of dignity and worth of all people, inclusion of people with disabilities in society to the fullest extent possible and the need for advocacy to provide people with disabilities the best opportunity returns to independent functioning [18]. To this end, multiple countries such as Germany, Argentina and Scandinavian countries have now used the ICF framework to better integrate health services, specifically for psychological treatments to people with suffering from temporary or permanent disability [18]. As previously discussed, sports can be a way for patients experiencing disability to address the crucial emotional component of the ICF. In many cases, patients with disabilities find themselves disengaged from previous activities and communities. One article using the ICF to frame the analysis and discussion of narratives of 12 women and men with a disability highlighted how sport can be a way to enhance patients' function, health promoting behaviors, relationships, optimism, and feelings of inclusion [29]. This enforced the value of sport for individuals experiencing disability, and highlighted the need for clinicians to find means through which patients can engage in sport specific activities.

The ICF model has also been used for determining when patients are able to Return to Play (RTP). The model emphasizes an individualized approach and considering multifactorial domains of human functioning when determining RTP [6]. A systematic review evaluated how the ICF can be applied to return to play considerations for individuals who had anterior cruciate ligament

sprains Within the review, the authors noted that these guidelines often did not address biopsychosocial domains satisfactorily and some failed to address all of the ICF conceptual model components [26]. Increasing knowledge of psychosocial factors can create positive and successful rehabilitation programs while improving return to sport rates after ACL reconstruction [26]. Despite many athletes choosing to undergo ACL reconstruction with the goal of returning to their previous level of sports participation, only about 55% of athletes do so [52]. This creates the potential for detrimental mental and emotional experiences in this injured population. Additionally, a study on the psychological readiness of adolescents returning to play after ACL reconstruction, found that emotional response had more influence on self-appraisal of risk than their confidence in their performance [53].

Benefits, criticisms & barriers to implementation

There are numerous benefits of applying the ICF model in sports medicine. The increased emphasis on the psychological components of injury is valuable for clinicians attempting to facilitate function [6,41]. Improved communication between health professionals is an additional benefit of the ICF, and helps build better interprofessional collaboration when attempting to attain optimal patient outcomes [8-10]. This common language allows for a standardized method of evaluating and re-evaluating patients as they move through the injury and disability process. On a broader level, the ICF can help clinicians gain a better appreciation for how complex improving a person's functioning can be. By determining which areas of the ICF the patient needs the most improvement in, clinicians can be more intentional and targeted in their interventions. Knowing the areas of the ICF in which patients are stronger also allows clinicians to use these strengths to augment areas of need. It is also important to note the limitations of the ICF model. The ICF does not provide enough specificity in the codes to detail the problems of the patient suffering from hand conditions. For example, in a patient with a nerve injury to their arm or hand, the most specific code is s120, "spinal cord and related" structures which is often not specific enough for clinical purposes. This places more emphasis on clinical notes written by clinicians and requires more time for assisting clinicians to review a patient's records.

When the ICF model was approved for use in 2001, the hope was that there would be widespread use and application of the model. Unfortunately, adoption of the ICF model has been slow [18]. Various barriers could have contributed to implementation of the ICF model. There has been a lack of emphasis on applying a biopsychosocial model to healthcare professional education. For instance, physiotherapy students reported that they had only a superficial understanding of the biopsychosocial model and application to its practice on patients after ACL injuries [49]. The students did report that they were aware of the potential benefits to incorporating a biopsychosocial model, but did not feel adequately trained to integrate the model into clinical practice. While there have been some European countries that have laws and policies related to disability, the ICF model has largely not been implemented in clinical systems [18]. This speaks to a need for further education on utilizing the ICF model, or a similar system, in order to be able to develop a more complete view of patient care.

Discussion

The ICF provides a holistic approach to understanding and improving the functioning of patients with disabilities. It is a comprehensive tool for clinicians to understand and treat patients through a global picture that includes the emotional and social domains of an injury [6,49]. In particular, the ICF model is able to help bridge the medical and athletic domains together and emphasizes the importance of how emotion affects a patient's ability to return to function. The role of the healthcare provider is critical during a patient's injury course, but many providers are faced with work-related stress responses that can lead to compassion fatigue. Compassion fatigue can result in various negative effects including decreased empathy, burn out, increased turnover, and medication dispensation errors. Future research developing and accessing interventions for addressing compassion fatigue are of vital importance for the healthcare field. The ICF model can be used in a number of areas in sports medicine, including evaluation of the impact a pathology has on function, assessment of activity and participation levels and facilitators and barriers to participation in activity. The ICF is a method of providing guidance for enhancing these facilitators and removing these barriers [41,42]. The outcome measures used in conjunction with the ICF can also provide a better understanding of a patient's function, and when the patient is capable of returning to activity [6,26]. The ICF take into account a patient's activities and goals, and also identifies environmental factors that can help facilitate or hinder recovery [42]. Lastly, the role of adaptive technology such as hearing aids and braces for unstable joints should not be discounted. These aids have the potential to assist individuals with disability in their engagement in activities related to sport and daily life [41].

Conclusion

The ICF model has emerged as an important framework in sports medicine and creates a comprehensive approach to understanding and addressing the holistic nature of an athletic injury and disabilities. The model encompasses the emotional, social and environmental factors that influence the patient's journey towards recovery, rehabilitation and eventual return to play. One of the ICF's most profound strengths that it allows standardized communication, and thus enhances the collaboration among various stakeholders including patients, healthcare professionals, and families. At the core of the ICF is the principle of treating a patient as a multifaceted individual and recognizing that athletic injuries impact more than the involved body part. The ICF model highlights the emotional and psychological aspects of injury and subsequent dysfunction. Incorporating mental healthcare into treatment plans in particular can lead to improving outcomes. The application of the ICF has extended beyond clinical settings and has begun to influence international health and sports policy and practices. However, the ICF model is not without its challenges to implementation particularly in clinical practice. The barriers include insufficient training of the biopsychosocial model among

healthcare providers and a need for more precise coding systems. Focusing on addressing these challenges may be key to broader adoption and effective application of the ICF model at a global level. In the interim, the ICF is still a noteworthy method of evaluating and treating pathologies. When clinicians are attempting to provide a holistic healthcare approach and standardize communication between healthcare professionals, the ICF is the most widely used model. Overall, the ICF has a potential role in advancing sports medicine practice and offers a comprehensive approach to patient care.

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