

**Review Article**

A Review of Conceptual Models for Rehabilitation Research and Practice

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Abstract: *Background:* Since rehabilitation practice focuses on working in multidisciplinary teams to optimize the physical, psychological, and social outcomes of the patient, conceptual models are extremely important in providing a theoretical basis for advancing scientific knowledge and improving professional practice. *Aim:* Although rehabilitation-related conceptual models have appeared in the literature more than fifty years ago or so, there has been no systematic efforts to review them. The purpose of this paper is to explore the existing rehabilitation models and to link these models to the ICF model of the World Health Organization. *Methods:* A structured literature search was performed in different databases including Medline and PubMed using terms such as: “rehabilitation” AND “Model” OR “Framework” OR “conceptualization”. 43 citations were identified and further evaluated by two judges according to pre-defined inclusion/exclusion criteria. *Results:* Six conceptual rehabilitation models were identified in the literature: the Biomedical Model, the Social Model, the Bio-Psycho-Social Model (BPS), the International Classification of Impairments, Disabilities, and Handicaps Model (ICIDH), the Community Based Rehabilitation Model (CBR), and the Health-Related Quality of Life Model (HRQoL). The concepts on which the models are built were linked to the International Classification of Functioning, Disability, and Health (ICF) domains. The strengths and limitations of each model are discussed. The majority of the concepts from the six models could be linked to the ICF model. *Conclusion:* By applying the conceptual models, an additional perspective can be added by rehabilitation therapists to multidisciplinary teams that use the ICF model. When relationships are highly complex, as they are in rehabilitation processes, it is challenging to develop models that are applied in different contexts. However, it is possible to establish relationships between different variables that are observable.

Keywords: Rehabilitation Models, Health-Related Quality of Life, ICF, Community-Based Rehabilitation Model, Social Model

1. Introduction

Rehabilitation is a complex area of practice, with complex interventions, and challenges. These interventions need a common framework to understand clinical practice problems and research issues, or to contribute to the scientific knowledge. As Sally Davis, the rehabilitation author, reported, “rehabilitation and medicine are not exact sciences. Conceptual models can give order to particular perspectives on the relevant bodies of knowledge” [1].

Many people with disabilities all over the world use

rehabilitation services due to mobility limitations or other health-related impairments. According to Statistics Canada, between 9% and 12% of Canadians report having mobility impairment [2]. Rehabilitation practices are also common among the population of seniors. A large and growing number of people aging with disabilities have contributed to the widespread call for research on the effectiveness of rehabilitation practices, particularly for studies that document the experiences of people with disabilities and their use of rehabilitation interventions [3].

The gap between theory and practice in rehabilitation is

obvious, especially in developing countries where rehabilitation profession is not regulated. Notably, conceptual models of healthcare delivery are often not considered. As a result, the treatment plans are usually based on the medical opinions and clinical judgements only. Other significant dimensions that influence wellbeing of the individuals, like social, and other environmental factors, are not included in the assessment and the decision process. Research has proven that effective rehabilitation plans are based not only on medical decisions, but also on other determinants of health-related quality of life such as: social, cultural, and psychological factors [4]. These factors are essential components in the rehabilitation process and should be considered along with the medical factors (or biological factors) to improve healthcare quality.

In fact, health and disability are broad terms that include many interconnected concepts, and because of this diversity, they are difficult to explain and to communicate to others. Thus, conceptual frameworks and models have been created and developed to ease explanation, measurements, and translation of the factors related to disability. The development and effective use of these models paves the way for rehabilitation professionals to better communicate with each other and with other healthcare professions, and to participate effectively in clinical practice by using the same language, which is the “health language”. According to Davis [1], a good model for practice should identify three important points: 1) what is believed about the nature of people and participation, 2) how the elements of that nature enable function or lead to dysfunction of non-participation, and 3) how one moves from a situation of dysfunction to fuller participation. Since rehabilitation practice focuses on working in multidisciplinary teams to optimize the physical, psychological, and social outcomes of the patient, conceptual models are extremely important in providing a theoretical basis for advancing scientific knowledge and improving professional practice. Although rehabilitation-related conceptual models have appeared in the literature more than fifty years ago, there has been no systematic efforts to review them. The purpose of this paper is to explore the existing rehabilitation models and to link them to the ICF model of the World Health Organization.

2. Methods

A structured literature search was performed in Medline, PubMed, and Cinahl using terms such as: “rehabilitation” AND “Model” OR “Framework” OR “conceptualization” in titles, abstracts, and key words from 1960 to 2017. A total of 43 citations were identified and further analyzed. Two judges evaluated the identified articles according to pre-defined inclusion/exclusion criteria by using an analysis grid covering 1) the models' level of conceptualization; 2) their relevance to rehabilitation practice and research; 3) the distinction between factors that may influence subjective wellbeing; and 4) the availability of a validated tools to measure different dimensions of each model. Out of the 43 studies retrieved, 24 were excluded because they did not

meet the inclusion criteria. A total of 19 full-text articles were reviewed, and among them, 8 were critique papers, 5 focus on the application of the conceptual models in rehabilitation settings, and 6 were theoretical papers.

3. Results

Six conceptual rehabilitation-related models were identified in the literature: the Biomedical Model; the Social Model; the Bio-Psycho-Social Model (BPS); the International Classification of Impairments, Disabilities, and Handicaps Model (ICIDH); the Community Based Rehabilitation Model (CBR); and the Health-Related Quality of Life Model (HRQoL). The concepts on which the models are built were linked to the domains of the International Classification of Functioning, Disability, and Health (ICF) Model. The strengths and limitations of each model in comparison to the ICF model are presented in the following section.

3.1. The Biomedical Model

Throughout the history, the development of biology has been accompanied by the development of medicine. “The Cartesian paradigm” was introduced for the first time and was developed in Western culture. This paradigm shows the person is absolutely independent of his/her environment, where his rationality, feeling, his body and soul are totally separate. This world view is referred to as the influence of the Cartesian paradigm on medical thought, which resulted in the creation of biomedical model.

In the biomedical model (Figure 1), also called the medical model, which is the conceptual foundation of modern medicine, the main focus is on how the human body parts work, and how diseases can be terminated or treated by medical therapeutics (chemical or physical) [5]. According to its definition, the human body is regarded as a machine that can be analyzed in terms of its parts. The disease is considered to be as a defect of the biological mechanisms at cellular and molecular levels; the clinicians' role is to correct the defect either physically or chemically and to restore the previous normal function. About three decades ago, George Engel wrote, “A Modern Science of medicine still tends to be based on the notion of the body as a machine, of disease as the consequence of breakdown of the machine, and of the doctor's task as repair of the machine” [6]. Disability was considered to be the result of a disease, trauma, or some other health conditions. Individuals with disabilities were therefore commonly considered as abnormalities, or people with deviations from the normal health condition. As a result, individuals with a disability were commonly described by the pathological condition that they have (e.g., “an amputee”, “a muteness or a mutism”), rather than a person with a medical condition (e.g., “an individual with an amputation” or “an individual with speech problems”). This model ignores everything related to the environmental or social factors and to some extent the individuals' perception of their health. However, the biomedical model has been in use in healthcare systems since the nineteenth century until today as the main medical model [7].

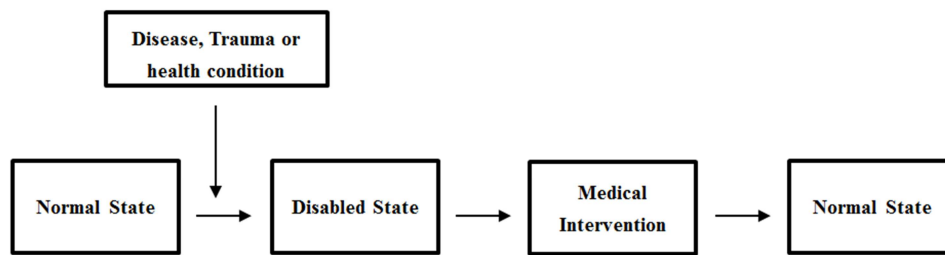


Figure 1. The Biomedical Model.

Although the biomedical model is considered to be the most common health model in clinical practice today, its use in rehabilitation practice would introduce many queries and concerns regarding its effect on the overall health. This is because the majority of health elements affecting rehabilitation clients, especially older people, are social and environmental rather than biological in nature. Atkinson declared that the biomedical model, which has been used in health care systems in many societies worldwide for more than 200 years, shows health through the reductionism theory [8]. In this approach, impairment is thought to be caused by disease or trauma and there is a complete ignorance to the psychological, social and environmental factors [5]. This model is not useful in rehabilitation practice anymore because in its definition, it presents disability as a series of pathological, physiological, and biochemical changes, and it ignores very important factors such as the role of the person and his/her society and the environment in general. Furthermore, the biomedical model limits the selection of the outcome measurements and tools. Since measuring only the medical condition, rather than the effect of this condition on the person's capability and participation in his/her environment could decrease the possibility to identify important advance in areas of concern to the individual, the healthcare provider, or to the overall health system. In clinical practice, particularly, in chronic diseases management, the external factors have a significant importance in treatment development and planning.

3.2. The Social Model

In contrast, the social model of disability presents disability as a result of a socially created problem, not the personal factors (medical factors). In this approach, the social model professes that the limitations caused by the disease originally come from the environment (physical and/or social environment). Also, it describes these differences from the normal condition are normal and that any disability is, in fact, disability in the society "societal pathology" rather than barriers to participate in life activities [9].

The social model suggests solutions to disability problems in a different way that the biomedical model does. For example, an elderly person with weakness in their arms and legs might have a problem opening the public doors. In the biomedical model, the solution would be physical therapy sessions to address muscular strength in the arms and legs,

while the social model, interestingly, would solve the problem in the environment by advocating for providing automatic doors in public buildings. The social model suggests that all people are equal in terms of functional ability and participation, and everyone can participate successfully in life if the environment is appropriate for both "normal" and "differently abled" individuals [10]. The social model gives great focus on the environment (i.e., the society) and ignores the characteristics of the individuals that might participate in the disability process. This principle constitutes an important part of rehabilitation practice, and the ICF model, but it cannot be considered as the standalone model for rehabilitation professionals. In rehabilitation practice, both environmental factors and personal factors are important, and these factors should be addressed equally along with medical factors to draw a solid conclusion of treatment interventions.

3.3. The Bio-Psycho-Social Models (BPS)

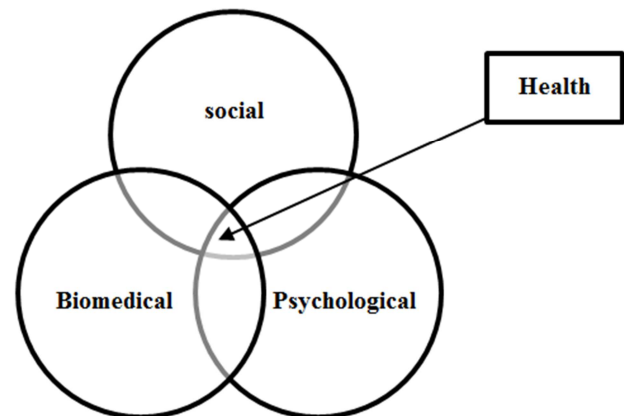


Figure 2. The three components of the Bio-Psycho-Social model.

The combination of the three dimensions, which are biomedical, psychological, and social components, to build a bio-psycho-social model (BPS) was first theorized and created by the American psychiatrist, George Engel in the late 1970's. The BPS model suggests that biological, psychological (e.g., cognition, emotions, and attitudes), and social (e.g., economic, environmental, and cultural) factors have an important role in the functioning and the participation in the context of impairment or disease (Figure 2).

Also, it highlights that the health state is better understood by combining biological, psychological and social factors rather than medical (or biological) alone [11]. This concept

contradicts the biomedical model, which describes a disease as a deviation from a normal (healthy state) by disease, or injury [6]. Engel presented his model as a substitute to the common biomedical model and pushed for its use not only in health research, but also in education, and as groundwork for health care systems [12]. In 1977, Engel's model was widely discussed in an article titled "The need for a new medical model: A challenge for biomedicine" in the *Science* journal. In the *American Journal of Psychiatry* in 1980, he published his paper, "The clinical application of the biopsychosocial model", and discussed his proposed framework in details [13]. Also, he wrote about an old man in the emergency room with a second heart attack just 6 months after the first attack. The patient's personal behaviour helps to perceive his chest pain, in terms of rejection to the treatment procedure and that it is the only possible therapeutic intervention from his employer. While his heart attack could be understood as a blood clot in his heart arterioles, his wide personal behaviour helps to realize that different outcomes might be achievable if we depend on the person's response and how he reacts with his condition. Afterwards, the man developed heart arrest due to a wrong

arterial puncture, and again systems theory could interpret this incident broader than just a heart arrest. The event is due to the lack of skills and supervision from the staff in the emergency department [13]. In the late 1970's, the World Health Organization (WHO) built up a framework based on the BPS model proposed by Engel. Although it was developed independently, the model addresses many of the same issues as the previous models and revisions did.

3.4. The World Health Organization (WHO) Models

The International Classification of Impairments, Disabilities, and Handicaps (ICIDH) model was published in 1980, and it was the first (WHO) model. In this model, three main concepts were recognized: impairments, disabilities and handicaps (Figure 3). It was a linear model (unidirectional model) [14]. The ICIDH, like the biomedical model, focuses mainly on the disease and related conditions, and it ignores the effect of the individual and the environment in disability. It seems that it repeated the same limitations of the biomedical model.



Figure 3. The ICIDH model of disability (1980).

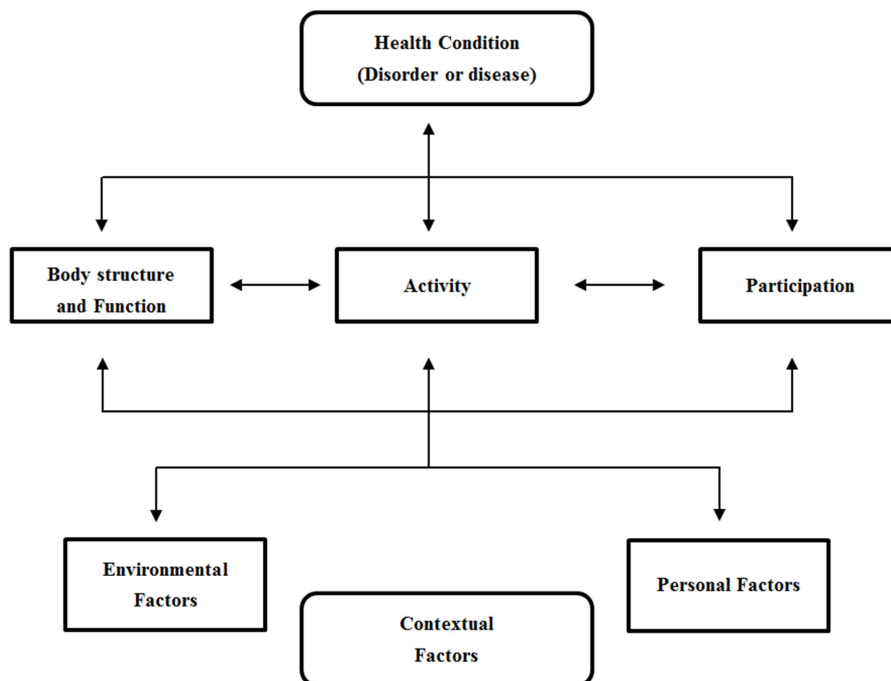


Figure 4. The ICF Model (2001).

Twenty years later, WHO conducted a complete revision to ICIDH model, and presented a new more efficient framework called the International Classification of Functioning, Disability, and Health (ICF). The ICF model introduces health changes in a dynamic way in which health condition and contextual factors interact among each other. In the ICF model, like in its root BPS model, health is defined in line with the

three elements: the body, the person, and the environment. In each element, ICF model describes three domains of functioning (structure and function) and related domains of disability (impairments, limitations, and restrictions). For instance, the difference between body function and structure may be indirect [15]. See Figure 4.

The muscle is a biological structure, and its function is to

contract. Thus, both atrophied muscle tissue and decreased muscle strength could be considered as impairments. Likewise, the difference between activity and participation is indirect. Activity is commonly defined in literature as “the ability of the person to perform a specific task”, regardless of whether or not he/she will do it normally, whereas, participation is whether the person will choose to do this task or not and how he/she will achieve it. For example, eating with a family is a participation process, which includes holding a knife and a fork, cutting, picking up the food, drinking etc., while eating comprises many particular activities (specific tasks) like cutting, picking up, drinking etc. Also, to measure the activity, we can ask the question “how much difficulty do you have in holding the fork or cutting the food?” Similarly, to measure participation, the question might be “to what extent do you feel limited in having a dinner with your family?” In the first question, we addressed the ability, whereas in the second one we addressed the independence. ICF model is an ideal guide for rehabilitation practice and research because of the many reasons that will be discussed in details in discussion section.

3.5. Community Based Rehabilitation Model (CBR)

According to the World Health Organization (WHO) and the World Bank (WB) reports (2001), individuals with disabilities represent about 15% of the total population of the world and are concentrated in poor communities in the poorest spots on the earth [16]. In 1978, the WHO published a strategy called community-based rehabilitation (CBR) to decrease the difficulties of disabilities and to improve self-efficacy and independence of disabled individuals in poor countries [17]. According to Iemmi and her colleagues, “People with disabilities include those who have long-term physical, mental and intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others” [18]. Statistics estimate that there are more than 600 million people living with a moderate to severe sensory, motor or intellectual impairments, leading to a disability. About 80% live in low and middle income countries [16]. The objective of the CBR strategy is to improve the quality of life for individuals with disabilities and their families, by doing their daily tasks independently, and by participating effectively in their community. CBR was created to empower people with disabilities to benefit from education, working positions, health, community, and social services. CBR relies on the cooperation between people with disabilities themselves to be implemented effectively. Also, their families, local communities, governmental administrations, non-governmental organizations, associations and other relevant services should take part in the implementation process [18]. More than 30 years have elapsed since the WHO presented the CBR program in their goal to achieve (Health for All by the year 2000) [19]. There are many rehabilitation specialists and researchers that have accepted and adapted the CBR as a guide for their clinical practice. Since most of the assessments and evaluations of CBR have been based in community settings, the approach is quite different from the

other approaches that are based on the institutional settings. The awareness and the attitude of the community are the cornerstones in planning and evaluating of CBR programmes.

However, there are number of challenges and limitations in this model. First of all, it is true that CBR has many advantages in terms of the types of disabilities; most of the evaluations have focused on mobility-related assessments. The rehabilitation of people with a traumatic brain injury has also been the focus of many country's CBR programmes, especially in developed countries [20–22]. Many projects have used existing instruments and validated them to their local context, while others have developed new measures. Noteworthy among those are the community outcomes scale developed in England [23], and a parental adjustment scale developed in rural India [24]. However, in the existing literature, there are many limitations and weaknesses that make its applicability in rehabilitation practice quite limited. One of the weaknesses of the CBR evaluation, which is obvious, is that there is a lack of consistency in outcome measurement scales. Wirz and Thomas have highlighted this weakness in their study in 2002 [25]. Many of the outcome measures present the practice as controverting to efficacy. The community-based rehabilitation program is also expensive to apply. In the literature there is only one study that has measured the costs of the CBR program [26]. Cost benefits and cost effectiveness studies are needed to discuss these issues. Additionally, more studies are needed to examine the effectiveness in terms of the WHO model. One of the most commonly cited weakness in CBR is the sample size. A larger sample size is needed to evaluate the functional outcomes in a particular population, but in CBR only small samples could be adapted because of the cost. Finally, the time in CBR is quite long (5 – 7 years) to draw conclusions and to find out the effectiveness of the intervention, and it is not always possible in rehabilitation practice and research.

3.6. Health-Related Quality of Life Model

An evaluation of the quality of life, over the past 30 years, has become significantly important in rehabilitation practice and research. This increased interest and focus on quality of life research was accompanied by an improvement in research methodologies. However, this advancement has been obstructed and delayed by many difficulties. One of these difficulties is the fact that “quality of life” has a variety of meanings, such as health status, physical functioning, symptoms, psychosocial adjustment, well-being, life satisfaction, and happiness [27]. As a result, comparing research findings to draw conclusions or to make application in practice is challenging. To help solve this problem, the term “health-related quality of life” (HRQoL) was introduced. This term was intended to narrow the focus to the effects of health, illness, and treatment on quality of life. This term excludes aspects of quality of life that are not related to health, such as cultural, political, or societal factors. Unfortunately, the separation between health-related and non-health-related quality of life is not easy. For instance, smoking contributes to chronic respiratory disease, and working long hours in dust

and smoke-rich environment can also cause lung diseases. Furthermore, in chronic diseases, like rheumatoid arthritis for

example, practically all aspects of life could be concerned by health and become “health-related” [28].

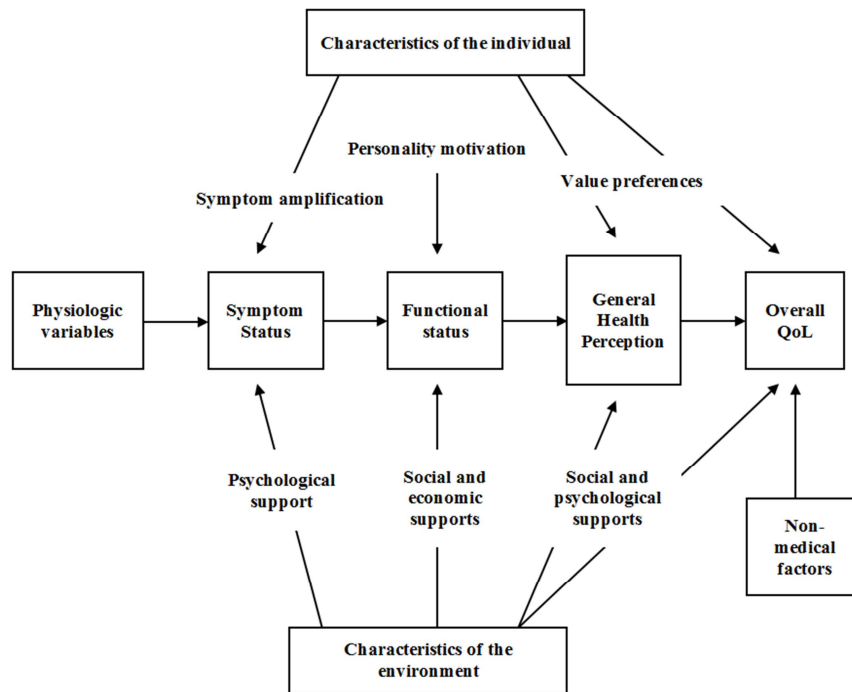


Figure 5. The Wilson and Cleary's model of HRQoL (1995).

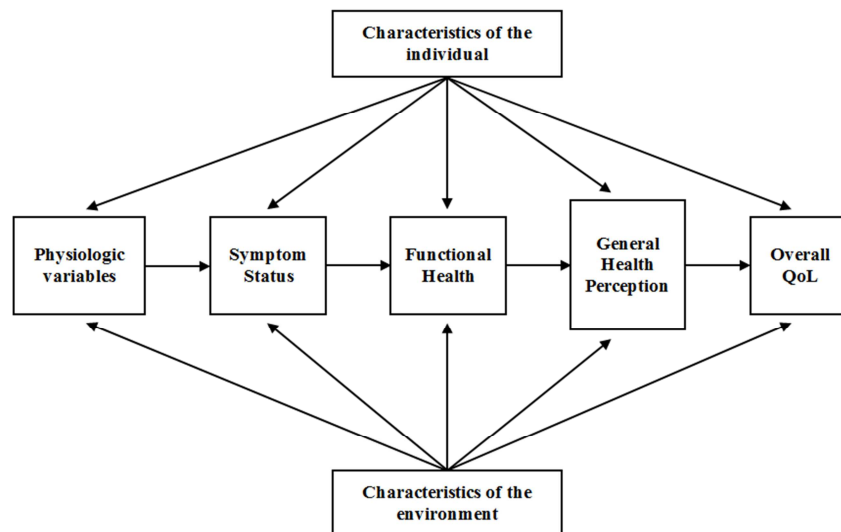


Figure 6. The Ferrans and colleagues revised version of Wilson and Cleary Model.

Health-related quality of life has been identified by healthcare specialists and researchers as a model that guides the clinical practice and research. There are many HRQoL models have been introduced to healthcare practice over the last 30 years, but the need to align HRQoL research priorities with the different patients' needs and values of their communities is increasing every day. Chronic diseases, like Rheumatoid Arthritis for example, has no cure and has a substantial impact on function and quality of life of the patient. In the last 15 years, there have been two HRQoL models have been commonly cited in the literature, Wilson and Cleary's and the revision of Ferrans and colleagues [29]. Wilson and

Cleary's model of HRQoL is based on the biomedical and social science paradigms (Figure 5). It explicitly defines five main domains: biological, symptoms, function, general health perception, and overall HRQoL; personal and environmental characteristics were not clearly mentioned, but they were included in non-medical factors. There are bi-directional arrows between the main domains to indicate reciprocal relationships. They also pointed out that individual factors and environmental factors could affect the overall HRQoL because they are related to the outcomes.

A few years later, Ferrans and colleagues published a revised version of Wilson and Cleary's framework (Fig. 6).

They added two well-defined domains: the individual and environmental characteristics [27]. They also deleted non-medical factors and labels on the arrows. In addition, they provided instruments to ease outcome evaluations [30]. A recent systematic review was conducted in 2012 by Bakas and his colleagues. Out of 100 studies selected from 21 countries, the most common HRQoL models used were: Wilson and Cleary (16%), Ferrans and colleagues (4%). The review pointed out that the Wilson and Cleary model has the potential to guide the research in coming years [31].

Although HRQoL models have been commonly used in literature to guide the research, there are many limitations that make the HRQoL model not ideal to guide rehabilitation professionals. In the Wilson and Cleary model, the strength of the relationships with each component is unclear, and with each additional relationship the complexity increases. In the revised version, Ferrans and his colleagues added propositions with individual and environmental characteristics, but the complexity still exists. Also, according to the existing literature, the relationships illustrated don't always hold true; research evidence supports lack of relationships in some occasions (e.g., biological vs. symptoms). Generally, HRQoL model is complicated with multiple relationships and unique to health-related quality of life. Theoretical borders are purposefully not clear as two theories are combined and the relationships between concepts are added. Finally, it is difficult to apply this model to people who are unable to define their own health or their own quality of life, or those who have a very limited functioning like older people with mobility limitations.

4. Discussion

The bio-psycho-social model was the only model in that time in which an entire approach to health, and consequently health care, was presented. This WHO model, like the rehabilitation sciences itself, views health from different corners (the biomedical, the social, and the psychological), and respectively views "health" as the interaction between these three domains [12], [13]. The bio-psycho-social model also supports the idea that, while the three domains of health (the biomedical, the social, and the psychological) are interconnected, they are also independent in nature [8]. Therefore, if an individual is healthy in medical sense, and perceives him/herself to be sick, then the person might be considered sick (or unhealthy). Contrarily, if an individual is considered to be ill (or diseased) and perceives him/herself to be healthy, he/she might not be considered healthy under the bio-psycho-social model.

The ICF model of health is a development of the previous models. The obvious limitations found in the ICF are its broad description of health and disability [16], and its lack of contributing factors [15]. Similar to the underlying bio-psycho-social model, the ICF also identifies the individual and social elements of health. Additionally, it includes two domains of contextual factors: environmental factors and personal factors. Environmental factors include elements such

as social behavior, architectural or physical characteristics, legal systems, climate, and other characteristics of the psychosocial environment [16].

Individual characteristics include factors like cultural background, education, behaviour, age, gender, style, experience, and other personal factors. Both environmental factors and the context in which the individual lives and interacts will affect the person's perception of disability. The environmental characteristics are external to the person, and thus, they are not controlled by him/her; at the same time, personal characteristics are connected to the individual's attitude, behaviour, and effect on the personal experience to the local context [8]. These factors are very important in the evaluation of people with disabilities and who are dependent on personal assistance, or on assistive devices, regardless of: the biological or medical context, the personal experience of the patient, the perception of the environmental context of his/her participation, and limited functioning, all of which may reflect on the person's experience [7-9]. As a result, the overall quality of life of the person may be improved. The ability of the ICF model to assess and to measure health and well-being, functioning, and participation from these multiple perspectives offers this framework as a potential multifunctional and multi-dimensional tool. That might be useful not only in evaluating personal experiences of individuals with assistive devices, but also in using in health systems' planning, policy making, and rehabilitation clinical practice [15].

Furthermore, what makes the ICF model applicable in rehabilitation practice and research is the new ICF-CY framework. Published in 2007, this framework was proposed for use by healthcare professionals, researchers, educators, policy-makers, family members, and the users to document characteristics of health and functioning in children and adolescence [15]. This framework provides common language and terminology for documenting functional and structural problems of the body, activity limitations and participation restrictions, and environmental factors [1]. Thus, it can be used both in research and in clinical practice in the evaluation process of patient outcomes with respect to the main domains of functioning addressed by the ICF model. The ICF Model also grasps the idea that any intervention can be directed to change people's behaviour, to modify systems, and to adapt the environments that are related to the individual. By using the ICF model and its domains of function, rehabilitation professionals are able to conduct an overall comprehensive evaluation of individual's well-being. This, in sequence, will help the clinician to choose those measures easily to assess the patient's outcomes that he/she really needs.

5. Conclusion

There is a significant consensus among researchers that rehabilitation practice is more beneficial when it is built on the ICF framework. This means that both interventions and outcomes should take the ICF into consideration. A large number of rehabilitation authors have recommended the ICF

framework for health description and some other health-related elements of well-being which might be useful to develop a common language for rehabilitation outcomes practice and research. Moreover, it is important to include all the factors that might influence the rehabilitation process to draw a solid conclusion and recommendations that might improve clinical practice and healthcare delivery. This could be achieved by considering all dimensions that ICF offers. According to the ICF, the outcomes and their evaluation tools are as follows: body structures and functions, which is measured by the impairments; the person's activity, which is measured by the person's limitations; and participation, which is measured by mobility restrictions. It is still essential to consider the environmental factors, such as the characteristics of the individual, his/her community (e.g., friends, family etc.) and the society as a whole which participate in people's satisfaction, self-efficacy and overall quality of life.

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