

TENDENCIES IN DEVELOPMENT OF MEDICAL REHABILITATION, FROM PAST TO FUTURE

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ТЕНДЕНЦИИ В РАЗВИТИИ МЕДИЦИНСКОЙ РЕАБИЛИТОЛОГИИ, ОТ ПРОШЛОГО К БУДУЩЕМУ

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Introduction: definition, principles and historical roots

A definition as stated by the American Academy of Physical Medicine and Rehabilitation in 1975 is: "Medical rehabilitation services can be defined as a coordinated multi – disciplinary approach to disability under a qualified physician who directs a plan of management for one or more of the categories of chronic disabling diseases or injuries, specifying realistic goals for maximal recovery" (1). The Main rehabilitation principles include patient and family centeredness, a multidisciplinary approach and holistic attitude towards physical and mental health. From early in its development and until today, rehabilitation is represented as the third phase of medical care – after diagnosis and treatment. Physical and Rehabilitation Medicine (PRM) is a growing and a developing discipline. Gutenbrunner et al wrote: "Various societal and medical trends, including the ageing of populations, the increasing number of people with functional limitations due to improving survival rates in different disease entities (e.g. stroke, spinal cord injury, multiple trauma) and the need of elderly workers to remain integrated in the workforce despite the presence of chronic illnesses, call for an increasing importance of rehabilitation in the future" (2).

The establishment and evolution of PRM are closely linked to the needs of veterans returning from wars, but the roots of the specialty go back to ancient times. Initially physiatry had close ties to the application of different physical modalities in the care of injured patients (3). The Greek physician Herodicus described an elaborate system of gymnastic exercises for the prevention and treatment of diseases in the fifth century BCE (4). The concept of "motor re-education" as proposed by the French neurologist Fulgence Raymond, was of paramount importance for the management of disabled persons and a key factor to the elaboration of different rehabilitative techniques developed in the course of the nineteenth century (5).

It can be stated that a rehabilitation as a modern, science based medical specialty started its climb at the beginning of the 20th century, between the 2 world wars. The first university department of PRM was founded by Dr. Frank Krusen at Temple University Medical School in 1929 (4). In those years a leading approach was the use of physical modalities such as: temperature, water, movement and other "spa" treatments for the healing of an injured part of body. Practical experience and the research of the Rehabilitation pioneers lead to turn towards disability management approach at the early 1940's. On October 17, 1940 The UK Minister of Health, Malcolm Mac Donald, asserted that: "It is not sufficient that the wound should be healed; the wounded part of the patient must be enabled to function again so that he may once more play his part in society as a worker" (6). In 1947, Dr. Howard A. Rusk directed a program in the USA which focused on comprehensive rehabilitative services including physical, neuropsychological, and occupational therapies (3).

The first rehabilitation facility in Israel (Feinston House – today Loewenstein Hospital Rehabilitation Center – LHRC) was also established at this period (1944) and was directed by Dr. Ludwig Ginsburg (7). The development of rehabilitation medicine was, and still remains, as a direct response to the tremendous needs of wounded soldiers returning from the battlefields of war, and growing and aging populations after injuries and diseases – to recuperate and return to duty, work or other types of individual and social activities at appropriate quality of life (8).

From old to new disability paradigm, International Classification of Functioning

The theoretical and conceptual basis of tendencies in rehabilitation medicine in last few decades is undergoing a change in the disability paradigm, led by the World Health Organization (WHO). The "old" paradigm has presented disabil-

ity as the result of a deficit in an individual that prevented him from performing certain functions. The International Classification of Impairments, Disabilities and Handicaps (ICIDH), developed in the 1970s, was issued by the WHO in 1980 as a tool for the classification of the consequences of disease and of their implications to the life of an individual (9).

The “new” paradigm or the ‘International Classification of Functioning, Disability and Health’ (more commonly known as ICF), is the WHO framework for measuring health and disability at both individual and population levels. The ICF was officially endorsed by all 191 WHO Member States on 22 May 2001, as the international standard to describe and measure health and disability (10). The ICF has provided the framework for the most appropriate conceptual model of rehabilitation – on a practical, informational and investigational level (11). From a practical point of view, the new model allows for a better understanding of the patient’s basic function and structure, activities and participation characteristics in framework of health, and environmental and individual aspects. This understanding helps to define more precisely a recent decline on all 3 levels, to create a best rehabilitation program and to access an appropriate way for success in the patient’s rehabilitation (2).

Towards scientific research based on routine functional assessment

Rehabilitation is a holistic field of medicine, defined in the past as “more art than science”. Nothing was measured and little was investigated. Prof. Haim Ring was a pioneer in Israel in using Functional Independence Measure (FIM) in 80th as an obligatory measure of disability after stroke (12). A need for assessment was defined those years by clinicians, researchers and policy makers and only few years later a total of 125 measures were used on everyday basis in 31 rehabilitation facilities of Israel (13).

Today it is impossible to imagine the field of PRM without use of different assessment scales for evaluation, management, clinical decision – making, team work monitoring and research. Rehabilitation team use different scales for evaluation of body function and structure impairment and activities limitation, while the implementation of appropriate and friendly assessment of participation restrictions is still a huge challenge for the future. A big effort is making nowadays by professional international community for the identification of the universal set of ICF categories that can be used in clinical practice for the general assessment of functioning (14). The practical implementation of ICF score set will indefinitely improve the communication between related professionals and expand the scientific level of research in the future.

From late to early and to very early intervention

One of the main changes through last decades is a common time of admission to rehabilitation facility. A normal practice at the end of 20th century in Israel was to transfer the patient after approximately one month after an acute stroke, as an example in LHRC in 1992 an average “transfer” period was about 35 days. The main reasons were a less intensive care in acute department, a belief that “bed rest” in the acute stage make the patient stronger, ready to engage in a rehabilitation program, and wait for a completely stable medical status of the stroke survivor. The situation changed dramatically a decade later (the similar data from LHRC in 2000 was – 18 days!), when the collected research data showed that early admission to rehabilitation has significant benefits.

The accumulation of data was not the only reason for the shortening of admission time. The payers, for example –

Health Funds in Israel, were more than interested in shortening the length of stay in the acute department, along with growing understanding of the huge disadvantages in staying more than necessarily in general hospital (15).

Another trend in the early beginning of rehabilitation treatment was a patient’s activation and mobilization in the first days after an injury in the acute department. The establishment and analysis of Stroke Units functioning gave a strong support to this practice. Bernhardt et al showed that very early rehabilitation, with an emphasis on mobilization at 24 hours after the stroke, appears safe and feasible (16). Early rehabilitation was shown to be safe, effective and cost-effective even in acute care units at very early stage (17).

A Very Early Rehabilitation Trial (AVERT) proved that while early rehabilitation can be beneficial, a very early and intensive rehabilitation has no added value and in some cases, even can be harmful to the patient (18). Our observations in Soroka Medical Center show higher mortality in patients with deconditioning, referred early to rehabilitation. It seems that early rehabilitation must be planned with caution, taking the individual medical situation and patient’s abilities into consideration. We also know that patients can be kept active without necessarily taking them out of bed, using several devices and therapy methods that exist for this purpose (18).

The issue of early transfer to rehabilitation department versus the patient’s activation in acute setting seems to be less important for functional outcome. Gagnon et al. showed no difference in rehabilitation outcomes between patients arriving at the rehabilitation facility after less than 20 days, 20–40 days and more than 40 days. It must be mentioned, that all the acute care facilities assessed in the study, had “in-house” physical, occupational and speech therapy programs, which were rapidly initiated after admission (usually within 72 hours) (19). The preference can be dependent on the availability of a rehabilitation bed, structure and traditions of the local medical system. Delayed mobilization is associated with medical complications; muscle wasting and disuse-related neural changes will create a significant problem when rehabilitation is eventually started at a later stage (18). This knowledge forces today’s and tomorrow’s practice to try and achieve the earliest possible point to start an activation and rehabilitation process.

From “bed rest” to functional activation – passive vs active approach

Rehabilitation had its roots primarily in the century-long tradition of physical modalities and health resort or spa treatments with their holistic approach to physical and mental health. These approaches were widespread in most European countries and were applied mainly for chronic health conditions (11). The role of the patient in this kind of therapy is mostly passive, he is a “recipient” and he is just expecting the curative effect of treatment. This is a “physical medicine” division of PRM specialty. The second PRM’s root is a tradition of physical activity and different systems of gymnastic exercises for the improvement of disabilities (20). This approach is dealing with active patient under the supervision and coaching of a professional therapist. A patient is not waiting for success, he is “in charge” of his own functional improvement. With appropriate professional modifications, as task oriented approach, this is a “rehabilitation” division of PRM.

In Israel, there was no tradition of spa treatment, so from the beginning – an active rehabilitation approach was almost the only one in our specialty (21). In other countries, as USA

and most European countries, the competition between the physical medicine "passive" approach advocates, and those championing active rehabilitation continued for decades. A "passive" approach lost most of its positions mostly because of weak scientific basis, and a general trend towards active rehabilitation was, and remains, the modern direction of PRM. Today a PRM is a combined specialty with balanced use of all treatment methods from both disciplines, with a preference for active rehabilitation techniques in acute and subacute cases, and intensive use of physical modalities in chronic disabilities (22). It seems that in the modern world an "active" patient is a more effective solution, so we'll see a continuation of the trend towards active rehabilitation in the future.

From "hand of therapist" to "hand of therapist with high technology"

When I started my PRM residency in LHRC in 1991, I was told that the most important thing in our specialty is a "hand of therapist". Three physiotherapists were walking with a subacute patient after severe stroke without any devices or technological assists, one at both sides and one was moving forward patient's paralyzed leg. It was very impressive and I was told that there is no technology that can re-build the right walking pattern as a physiotherapist can. It was a long time ago and today we are definitely in a different reality. The shift from manual work to optimal integration of modern technologies into rehabilitation programs is an important sign of PRM in last decades (23). Current development of advanced rehabilitation technologies makes it possible to construct an effective and friendly patient-device and therapist-device collaboration for a comprehensive use of modern machines in everyday practice. Marone et al wrote about the use of robots for rehabilitation: "The use of robots should not replace the neurorehabilitation therapy performed by a physiotherapist. Robots, as all technological devices, must be considered as tools in the hands of the physiotherapist and never rehabilitative per se" (24).

Rehabilitation technology allows us a task specific repetitive therapy at high intensity. Most of our apparatus let online and offline instrumented, quantitative evaluation of several parameters related to the patient's performance – with visual, audio or other types of accessible feedback. This on-line assessment is important both for patient and therapist, and it assists in optimal management of the rehabilitation program. Training with high technology is mostly conducted in an enriched environment, programs can be more interesting and enjoyable than traditional therapy tasks, and using it can improve a patient's motivation and inspire a rehabilitation participant to engage in a longer period of therapy. Laver et al wrote about Virtual Reality: "Another desirable feature of virtual reality programs is that they may be designed to attempt to simulate real-world activities (such as walking through a park rather than on a treadmill) which may provide enhanced ecological validity when compared with more conventional therapy tasks" (25). Last, but not least: the use of technology can alleviate all labor-intensive phases of rehabilitation, hence allowing the physiotherapist to focus on functional tasks during individual training and to supervise several patients at the same time during therapy sessions. This approach allows optimizing the therapist's use of time, increasing the rehabilitation program's efficacy and efficiency at the same time (26).

Modern rehabilitation technology includes Robot Therapy, Virtual Reality, Functional Electrical Stimulation, different types of Brain-Computer Interfaces and other types of

machines (27). It is well known and approved by multiple studies that technological rehabilitation alone is not superior to individual professional session in its effectiveness. The best results can be achieved by combining both of them in a comprehensive multi-professional program using the strengths of all available approaches. A "hand of therapist" nowadays is not less important than in the past, but a huge technological development strengthens this hand with additional therapeutic opportunities. This tendency is expected to continue.

Inpatient vs outpatient rehabilitation, home-based program and self-training

In 1992 the average Length of Stay (LOS) in LHRC after stroke was 105 days; in 2000 it was shortened to 68, nowadays a patient will stay in Soroka Rehabilitation Department for about 45 days. Indeed, we are using more intensive therapeutic methods, payers (Health Funds in Israeli case) are not ready to pay for long inpatient rehabilitation, but the most important reason behind this tendency is a fast development of Community Based Rehabilitation (CBR) (28). Three interests in win-win interaction pushed the process: Health Fund's will to pay less; patient's motivation to come home earlier; and Center's drive to shorten LOS because of rehabilitation bed's deficit in the whole country, especially at the periphery (29). Most of the patients (92% for Soroka Rehabilitation) continue their rehabilitation in outpatient settings near the house; in some cases CBR can be cheaper, just as effective and safer alternative to inpatient option (30).

There is a wild consensus about the characteristics of patient, benefits from CBR programs. The ability to live at home from medical, functional and social point of view together with the existence of available and appropriate regional professional setting can make a patient a good potential candidate for outpatient rehabilitation (31). A number of clear advantages of outpatient over inpatient rehabilitation were stated in scientific literature. Studies indicate that CBR can contribute to the preservation and maintenance of the patient's continuity in daily life at home and in the community. A long period of absence from home can make a great problem at discharge point, especially for old populations (32). The training process at home is mostly based on natural environments, can improve the patient's motivation, turn him and his caregivers into real active participants of the process and can better set him up to independent life (33).

Nowadays, the most developing type of CBR is different home rehabilitation programs from multidisciplinary professional team rehabilitation at home to "distant" approaches with use of tele-rehabilitation, different web-based training programs or smartphone applications (34). The second group of techniques allows some kind of rehabilitation treatment without need to transfer the patient or team members for long distances (35). Those new approaches still need to be investigated for a better understanding of optimal ways of use, write protocols, indications and contraindications, but even now it is obvious that they will play a bigger role in future.

The important issue of rehabilitation practice is the patient himself – training to achieve functional improvement during the rehabilitation and to preserve the level of independent life after the program discontinuation. It was shown that home-based self-training program can be effective not only in maintaining, but also in improving patient's abilities even in a chronic stage (36). It is also known that the patient's compliance in maintaining self – exercise program is very low and the increase of motivation for home training

is a real challenge for the rehabilitation team and community (37). The patient's and family education, inclusion of self-training elements in the professional program even at the early stage and add of community staff and volunteers support at late stage can be one of the perspective approaches to overcome said challenge.

Conclusion – Medical rehabilitation in the future

Stucki et al wrote in a recent study that there is strong evidence that fundamental demographic and epidemiological trends (global ageing and the transition to a higher incidence and prevalence of chronic, non-communicable diseases), as well as advances in curative medicine, will profoundly impact healthcare and health policies worldwide. These trends lean towards a significant shift in emphasis

into the long-term management of chronic conditions and impairments, which is the natural domain of rehabilitation. "This is the case for thinking that rehabilitation will become the key health strategy of the 21st century" (11). Analysis of tendencies from past to present practice brings us to the conclusion that in the future we'll see PRM as a rapid developing medical specialty, based on ICF principles and precise functional assessment, with strong scientific evidence, early and active intervention, growing use of high technology, including the web and smartphone – based, organized both in modern in-patient settings, in the community and at home. The process will combine in an effective way a multi-professional team program, led by PRM doctor with active involvement of patient in self – training at home and community.

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ABSTRACT

Определение, сформулированное Американской академией физической медицины и реабилитации в 1975 году, гласит: «Услуги медицинской реабилитации можно определить как скоординированный междисциплинарный подход к инвалидности под руководством квалифицированного врача, который руководит планом управления для одной или нескольких категорий хронических инвалидизирующих заболеваний или травм с указанием реалистичных целей для максимального выздоровления». Основные принципы реабилитации включают в себя центрирование пациента и семьи, междисциплинарный подход и целостное отношение к физическому и психическому здоровью. С самого начала своего развития и до сегодняшнего дня реабилитация представляется в качестве третьего этапа медицинской помощи – после диагностики и лечения. Физическая и реабилитационная

медицина (PRM) – это растущая и развивающаяся дисциплина. Гутенбруннер и др. писали: «Различные социальные и медицинские тенденции, включая старение населения, увеличение числа людей с функциональными ограничениями из-за улучшения показателей выживаемости при различных заболеваниях (например, инсульт, повреждение спинного мозга, множественные травмы) и необходимость пожилые работники, чтобы оставаться интегрированными в рабочую силу, несмотря на наличие хронических заболеваний, призывают к увеличению значения реабилитации в будущем».

Ключевые слова: физическая и реабилитационная медицина, амбулаторная реабилитация, инсульт, спинно-мозговая травма.

ABSTRACT

A definition as stated by the American Academy of Physical Medicine and Rehabilitation in 1975 is: “Medical rehabilitation services can be defined as a coordinated multi – disciplinary approach to disability under a qualified physician who directs a plan of management for one or more of the categories of chronic disabling diseases or injuries, specifying realistic goals for maximal recovery”. The Main rehabilitation principles include patient and family centeredness, a multidisciplinary approach and holistic attitude towards physical and mental health. From early in its development and until today, rehabilitation is represented as the third phase of medical care – after diagnosis and treatment. Physical and Rehabilitation Medicine (PRM) is a growing and a developing discipline. Gutenbrunner et al wrote: “Various societal and medical trends, including the ageing of populations, the increasing number of people with functional limitations due to improving survival rates in different disease entities (e.g. stroke, spinal cord injury, multiple trauma) and the need of elderly workers to remain integrated in the workforce despite the presence of chronic illnesses, call for an increasing importance of rehabilitation in the future”.

Keywords: physical and rehabilitation medicine, outpatient rehabilitation, stroke, spinal cord injury.

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