*Review*

# THE BULGARIAN NEUROREHABILITATION SCHOOL AND THE INTERNATIONAL CLASSIFICATION OF FUNCTIONING, DISABILITY AND HEALTH (ICF): INTEGRATING ICF REQUIREMENTS INTO CLINICAL PRACTICE

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## Summary

The review presents characteristics of Bulgarian Neurorehabilitation School (traditions and actual situation) and the impact of International Classification of Functioning, Disability and Health (ICF) on the development of clinical practice. Principal bases of the specialty Physical and Rehabilitation Medicine are also presented, with an emphasis on functional evaluation scales that are based on ICF principles and applied in clinical neurorehabilitation practice. The importance of functional evaluation and functional recovery of neurological patients aiming to improve independence in activities of daily living and quality of life is highlighted.

Key words: physical medicine, neurorehabilitation, occupational (ergo) therapy, activities of daily living, disability

*«Medicine is the art to follow health principles of Nature."*
*Hippocrates*

## Introduction

There is an ever-increasing frequency of some socially relevant disabling neurological conditions. On the other hand, the awareness of people of the negative consequences of unhealthy life-styles, including medical drug abuse, is a fact that cannot be underestimated. Probably, the combination of the two has provoked a " back to Nature" orientation in medical practice, covering a wide range of prevention and rehabilitation procedures, and focusing on physical modalities (natural and preformed), applied on the human organism: light, heat and cold, water (including mineral waters), peloids, movement; electric currents, magnetic field, ultrasound. We observe a process of breaking free of the traditional therapeutic thinking and of modernizing methods for improving the health of

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healthy people and a better quality of life of disabled patients through applying light therapy, thermo- and cryotherapy, hydro- and balneotherapy, peloidotherapy, kinesiological and manual techniques; electro- and magnetotherapy, ultrasound therapy, reflexotherapy. Modern health care has adopted the fact, that in medical practice the "great" medical specialties make a prognosis *quo ad vitae*, while physical modalities guarantee the quality of life of patients [1, 2].

Physical and rehabilitation medicine (PRM) is steadily based on traditional medical science. According to the European Definition of Medical Act, adopted in Munich (2005) by the European Union of Medical Specialists (Union Européénne des Médecins Spécialistes - UEMS): "The medical art encompasses all the professional action, e.g. scientific, teaching, training and educational, clinical and medico-technical steps, performed to promote health, prevent diseases, provide diagnostic or therapeutic care to patients, individuals, groups or communities and is the responsibility of, and must always be performed by a registered medical doctor/physician or under his or her direct supervision and/or prescription" [3].

In the context of this definition, physical modalities (and especially physical exercises) are oriented to health promotion and prevention of diseases, to treatment and rehabilitation of patients. Physical factors and methods can help provide a better quality of life of healthy people and of patients [4]. They may be applied for health and beauty, and can significantly help medication and recovery of patients - concerning the diagnosis, eventual complications and consequent functional deficiency; and other diseases and risk factors [5, 6, 7, 8]. Physical therapy is cheap, non-invasive and easy to apply. There are a sufficient number of rehabilitation practices in this country, although capacities of physical modalities (especially of analytic exercises and electric stimulations) for improving functional recovery, independence in activities of daily living and quality of life of patients (including disabled people) are underevaluated [9]. In our opinion, PRM specialists can be of help in patient education in self-control, self-care, and in primary, secondary and tertiary prevention [10].

## The Bulgarian neurorehabilitation tradition - principles

### *Physical modalities*

Physical medicine includes a number of sciences for the application of physical modalities on the human organism, in health and in disease, aiming at prevention, treatment and recovery of healthy and sick individuals [9,11].

We divided physical factors (PhFs) or physical modalities into two groups [9, 11, 12]: natural and pre-formed. Natural PhFs are as follows: water (including mineral water), air (including ions and aerosols), heat and cold, movement (active and passive). Each factor corresponds to a part of PRM: *hydro- and balneotherapy, aero- and ionotherapy, thermo- and cryotherapy, kinesitherapy - passive and active, with ergotherapy (ET) as a part of the latter*. Preformed PhFs are *electric currents, magnetic field, light sources (including laser); correspondent fields are electro- and magnetotherapy, light therapy, lasertherapy*.

PhFs have different effects on the cellular level, they act on the intracellular biochemical processes, on the mechanisms of cell permeability and trophic, and on neural irritability and conductibility. On body system level, they provoke vasodilatation and ameliorate the trophic, stimulate metabolic patterns, have an anti-flogistic and analgesic effect, stimulate the function of the organ/system. On organism level, PhFs have an effect on the vegeto-vasal and general reactivity, on the risk factors of disease and on patients' life quality [9, 11-17].

The action of PhFs is *non-specific and regulatory,* and can be *local, segmentary (reflectory)* and/or *general.* In the case of hypoactivity of processes, a stimulating effect is observed on circulation, tissue trophic, metabolism, regeneration, neural activity, an example of which is electrostimulation (ES). In the case of hyperactivity of processes (pain, pathological neural irritability, metabolic dysfunction, etc.), an inhibiting effect is detected, e.g. physical analgesia. In some cases, stimulation of the inhibiting systems is applied with inhibition as a final result, e.g. transcutaneous electroneurostimulation (TENS) [17, 18].

When the right combination of different PhFs is applied, a synergic effect is obtained. This is the case of multiplication of the final result by

applying preformed modalities with trophic effect (Nivalin iontophoresis, ES, interferential currents), peloids (therapeutic mud), massages, analytic exercises. An inappropriate combination of PhFs with antagonistic action minimizes the final effect, e.g. the application of heat and cold (paraffin and cryotherapy) [17].

The application of physical modalities involves a number of reflectory connections: *cutaneous-visceral (*zones of *Zacharin - Head)*, subcutaneous-*connective-tissue*-visceral *(*zones of *Leube-Dicke), proprio*-visceral *(*zones of *Mackenzie), motor*-visceral *(*zones of *Mackenzie)* and *periostal*-visceral *(*zones of *Vogler-Krauss)* [17].

## *Rehabilitation*

Rehabilitation uses all methods to reduce the degree of disability or impairment with the goal of optimal social integration of patients [19]. Rehabilitation is a complex of coordinated medical, social, pedagogic and professional activities with disabled people with the goal to achieve a maximum of physical, psychic and social capacity [20]. Rehabilitation is divided into three principal parts: *medico-psychological, vocational-professional and social-juridical* [12, 20]. We consider rehabilitation to be a ***functional therapy,*** based on a detailed and correct ***functional evaluation*** [9, 21].

Rehabilitation, like a basic part of clinical PRM, plays an important role in the pre-morbid phase and acute stages of diseases but it is most important in the recovery stage, with the goal of maximal functional recovery and effective resocialization, as well as throughout the chronic stage for maintenance of functional status and limitation of pathological sequalae. During all recovery processes, rehabilitation has the following principal objectives: to measure the effect of complex treatment applied; to effectuate rehabilitation with an evaluation of the rehabilitation potential; to guarantee a better quality of life of patients making a timely, competent and correct choice of physical modalities and methods; to contribute during the preparation of a medical expertise for the resolution of professional and social problems of the disabled people [12, 20].

## *Physical and rehabilitation medicine*

According to the definition of UEMS - PRM Section [22, 23], physical and rehabilitation medicine (PRM) is an independent medical specialty, oriented to the promotion of physical and cognitive functioning, activities (including environment), participation (including quality of life) and change of personal factors and environmental factors. PRM is responsible for the management of prevention, diagnosing, treatment and rehabilitation of patients with health impairment and comorbidity of all ages.

## *Modern concept of PRM*

The Council of Europe and World Health Organization declare that the possibility to receive treatment and rehabilitation is a principal human right [24-27].

According to the *White Book on PRM* [28] the doctor - specialist of PRM is a teacher of the patient with a temporary or permanent impairment. He has teaching functions during patient rehabilitation, especially in the context of new concepts of plasticity and motor education and re-education [22]. He needs to know the principles of functional anatomy, muscular activity and structural kinesiology [29, 30, 31], adaptation and plasticity [32, 33], and to understand the details of teaching, education and training [34, 35]. The final objective is to help the patient develop capacities, necessary for activities of daily living - *"how to do" and "how to perform a task"*.

## *Rehabilitation patients*

Rehabilitation is accomplished in cases of limited capacity and social functioning, consequences of disease, trauma or congenital anomaly (this is the rehabilitation patient). The classification of rehabilitation patients is based on several criteria: *medical expertise and prognosis, probable possibilities for resocialization, age, priority,* etc.

Rehabilitation is applied in patients with impairments of *the motor system* (neurological, rheumatologic, traumatic and orthopaedic), *the cardio-vascular system* (ischemic heart disease, hypertension and its complications; cardiomyopathies; arterial and venous vasopathies; surgical lesions and anomalies of the circulatory system); *the respiratory system* (impairment of respiratory pathways and pulmonary parenchyma), as well as other

diseases such as gastro-intestinal and hepatobiliary conditions, urogenital tract disorders, endocrinological, metabolic and hematological, psychiatric disorders, impairments of sensory organs, and surgical conditions.

Patients can also be divided into groups, featuring prolonged bed regimen and immobilization, loss of physical and psychological function, motor deficiency, motor weakness and loss of personality, spasticity; deformities of the respective extremity or extremities and problems of self-cognition; vesical and intestinal dysfunction (frequent in impaired people); trophic and pressure ulcers (risk of loss of mobility in medullar traumas, diabetic and old patients); dysphagia; pain; communication difficulties; sexual dysfunction; personal and behavior changes; moderation of family dynamics, personal communications, professional capacities and financial security [28].

## *Objectives and tasks of PRM*

*The main goal of PRM* is functional recovery of the patient, oriented to optimization of social activities and to amelioration of the life quality. This implies assisting patients to achieve possible levels and patterns of autonomy and independence, including participation in professional, social and leisure activities, as part of their human rights.

*The tasks of PRM* are as follows: treating pathology, reducing level of impairment, prevention and treatment of complications, amelioration of functioning and activity, stimulating patients to participate in various activities.

## *Multidisciplinary neurorehabilitation team*

The neurorehabilitation team includes the following specialists: a doctor - specialist in PRM, a general practioner, specialists in neurology, cardiology, orthodaedics, a physiotherapist, a medical physiotherapist (ergotherapist), a nurse; a kinesitherapist; a sociologist; a speech therapist, a clinical psychologist, and last but not least a patient**,** whose active participation is crucial for a successful treatment. Each member of the rehabilitation team has an important role in the rehabilitation process.

Teamwork with the patient and with his family is oriented to define realistic and patient-tailored objectives and tasks for every stage of the rehabilitation process. The team defines the tasks for the patient at each stage and monitors the work of every specialist. This is the way to stimulate active participation of the disabled patient and his family.

The team is responsible for the qualification of the staff and the quality of patient care. The rehabilitation team controls the *professional capacities* (theoretical knowledge, practical skills and competences) of every member of the staff. For example, the PRM specialist, working in the neurorehabilitation field, should be trained not only in the field of rehabilitation but also in neurology (including neuroimaging and neurofunctional investigations, clinical characteristics of socially relevant and rare neurological diseases, drug therapy) and specialized activities (diagnostic and therapeutic) in the neurorehabilitation area (kinesiological and pathokinesiological analysis, electro-diagnostics, electroneurography, manual diagnostics and manual therapy (tractions, mobilizations, manipulations); post-isometric relaxation; proprioceptive neuromuscular facilitation; hydro and balneotherapeutic methods).

## *General neurorehabilitation - algorithm*

*Evaluation of the rehabilitation potential* [21, 36-40]

The detailed and correct observation and clinical investigation of the patient includes: history of the disease; somatic status (accentuating on motor, cardio-vascular and respiratory systems); neurological status; functional status. Rehabilitation uses basic clinical diagnostic methods of internal medicine, surgery, neurology, orthodaedics and traumatology and of PRM (somatoscopy and antropometry), accentuating on the pathokinesiological analysis, manual and functional muscle test, basic scales for evaluation of independence in *activities of daily living (ADL)*, with particular attention to grip, balance, mobility, gait. Evaluating the spastic paresis in cases of lesion of the central motor neuron, we test both components: central motor weakness (hemi-, para-, quadriparesis) and muscular hypertonus (spasticity) (test of E. Michels, test of Sarah Brunnstrom). In some invalidating

diseases, specific scales are applied: in multiple sclerosis - the Expanded Disability Scale of Kurtzke - EDSS, in Parkinsonism - the Unified Rating Scale of Parkinsonic Disease - URSPD, in paraparesis - the Barthel index, in diabetic neuropathy - the scale of J.P.Dyck, in vertebrogenic radiculopathy and plexopathy - the scale of Drivotinov, Pozniak & Lupian. In some cases, there arises the need for some laboratory tests, neuroimagery and neurofunctional tests, evaluations and investigations - especially radiography (static and dynamic), computed tomography, magnetic resonance tomography; excitomotory electrodiagnostics, electroneurography, electromyography (including kinesiological electromyography), sonography of joints and muscles, Doppler sonography, laser Doppler flowmetry, etc.

*Rehabilitation plan and programme*

Depending on the results from evaluation of the rehabilitation potential of a patient, we apply a tailored selection of physical modalities, methods, and combinations of all these. At every stage of the rehabilitation process it is necessary to define the goal, tasks and algorithm of neurorehabilitation [10, 12, 13, 17, 19, 20, 22, 28, 40]. The complex neurorehabilitation must include physical and drug therapy, diet, self control of the patients [10, 17, 18, 40]. In our clinical *practice we combine (synergically) one (maximum two) electrotherapeutic and one hydro/balneo/thermotherapeutic procedure with two (or three) kinesitherapeutic methods* (Fig .1) [10, 17, 40]. The tailored PRM-programme should include [10, 17, 18, 40]:

- in a case of *motor weakness* - kinesitherapy, ergotherapy, electrostimulations of paretic muscles (in motor points);
- in a case of *spasticity* - cryokinesitherapy and electrostimulation of antagonists of paretic muscles;
- in a case of *altered self-care* - autopassive exercises and ergotherapy for both the healthy and the paretic extremities;
- in *depression cases* - functional and entertaining ergotherapy;
- in all patients - education in self-training gymnastics exercises, massages, post-isometric relaxation.

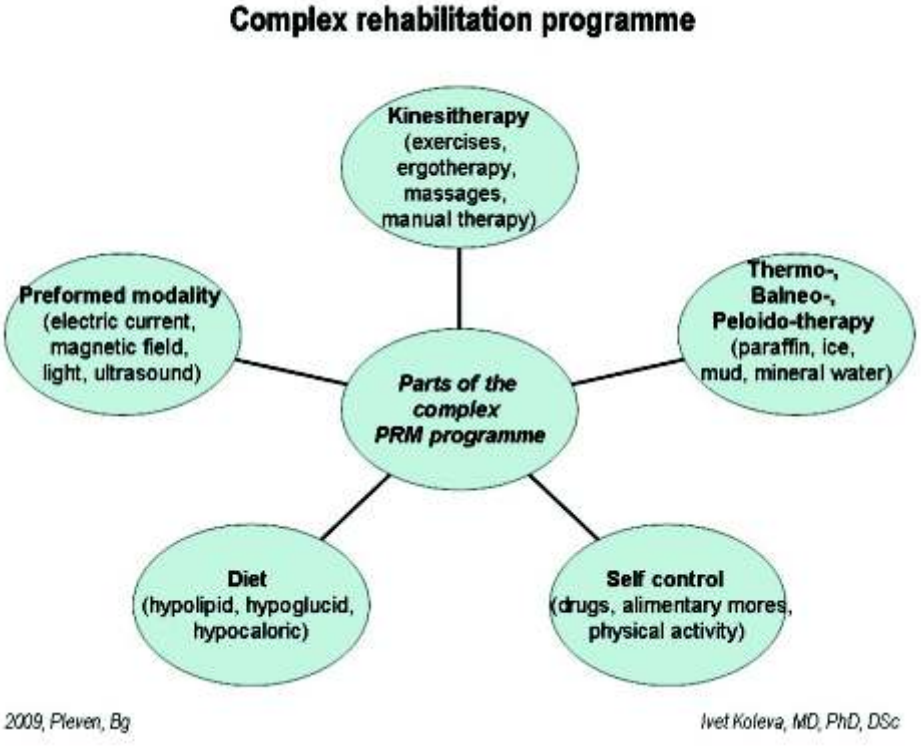


**Fig. 1.** Elements of the complex rehabilitation programme.

Complex neurorehabilitation stimulates functional recovery of patients with disabling neurological diseases and ameliorates their independence in every day life [40].

The *neurorehabilitation algorithm in diseases of the central nervous system* should include kinesitherapy, ergotherapy, and education in activities of daily living [40]. In post-stroke hemiparesis, cryotherapy is added. In a case of hemiparetic shoulder with a significant pain syndrome, we add low-frequency low-intensity magnetic field, in humero-scapular periarthritis plus ultrasound therapy or phonophoresis with non-steroidal anti-inflammatory drug, in trophic alterations - plus interferential currents. In multiple sclerosis patients we include cryotherapy and low-frequency low-intensity magnetic field; in urinary incontinence galvanic "slips" or iontophoresis. In Parkinsonism, the complex motor program for every day self-training is obligatory.

The *neurorehabilitation algorithm in diseases of the peripheral nervous system* with peripheral paresis could include iontophoresis with galantamini hydrobromicum (Bulgarian drug Nivalin), electrostimulations (in motor points of nerves and of paretic muscles, depending on electrodiagnostics), peloidotherapy (mud applications), analytic exercises (according to the results of Manual muscle testing), ergotherapy, massages [40].

In all cases, our objective has been to provide high-quality rehabilitation care, optimal for the clinical form of the basic illness, adapted to the concrete stage, with attention to the other diseases, tailored to the capacities and desires of the concrete patient, with the strategic goal to obtain the best result in view of quality of life of patients.

*Control after a rehabilitation course*

At the end of every PRM-course, we effectuate a clinical, paraclinical and instrumental *evaluation* of the results obtained through *rehabilitation*, and prescribes regular control and courses of rehabilitation for outpatients of medical centres and in-patients of specialized rehabilitation hospitals, resorts, hospices. In cases when proper *synergic combination of different types of procedures and between physical and drug therapy* was provided, there were statistically significant favorable effects on motor weakness, coordination, grip, balance, gait, independence in activities of daily living, quality of life of patients [9, 10, 11, 17, 18, 40].

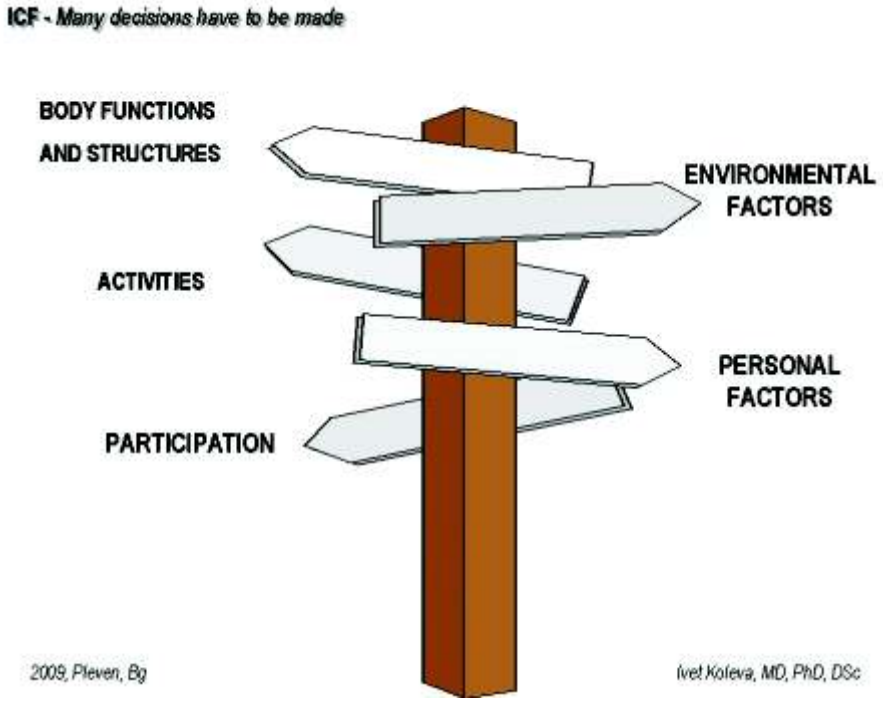


**Fig. 2.** ICF Essentials.

## International Classification of Functioning, Disability and Health (ICF)

PRM refers to the *biopsychosocial model of disability* [28,41], based on the International Classification of Functioning, Disability and Health (ICF), endorsed officially by 191 WHO Member States in the Fifty-fourth World Health Assembly in 2001 (resolution WHA 54.21) [42]. The ICF is the framework of WHO for measuring health and disability at both individual and population levels [43]. The ICF evaluates body functions and structures, activities and participation, with attention to personal factors and environment (Fig. 2). ICF is applied in member states as an international standard for description and evaluation of health and disability, not impairment. The ICF *a priori* acknowledges that every human being can experience a decrement in health, and thereby experience some degree of disability, so disability is not a problem of the minority but a universal model. The ICF shifts the focus from cause to impact and places all health conditions on an equal base [43, 44] (Fig. 3), according to the motto of the European Year-2007 'Equal Opportunities for All'.

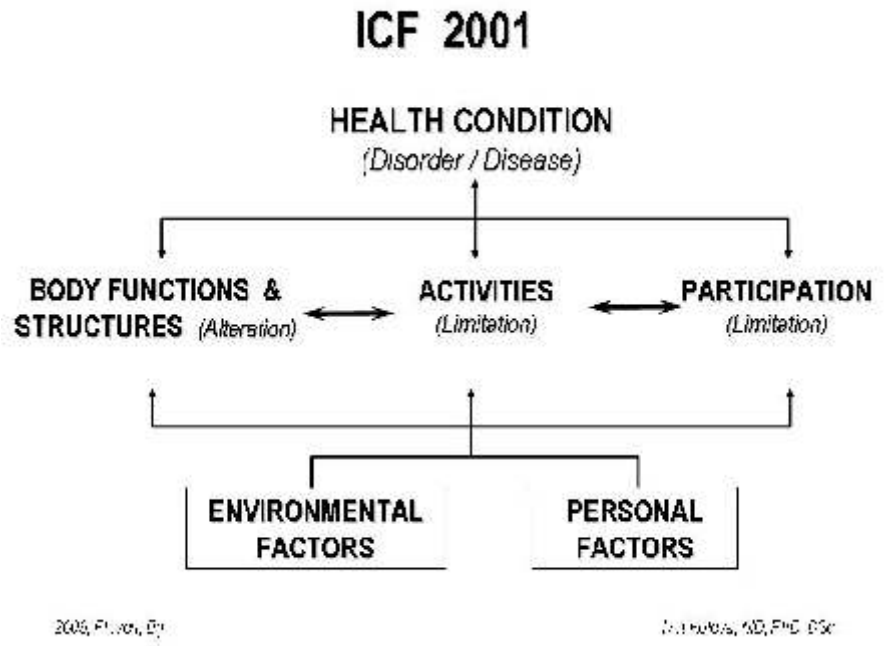


**Fig. 3.** ICF connections between different elements [41, 42].

In the chapter on body functions and structures, the ICF presents a detailed vision on brain functions (including cerebral functions like conscience; and specific mental functions like memory, language, calculation) (Chapter 1); sensory functions and pain (chapter 2); speech functions (chapter 3); functions of the cardiovascular, hematological, immunological, digestive, metabolic, endocrine systems (chapters 4-6); skin and related structures (nails and hair - chapter 8). Special attention is paid to the neuromuscular and motor functions movement and mobility, including functions of joints, muscles, reflexes (chapter 7). Based on a detailed analysis of body functions, the classification proposes an evaluation of personal factors, environment, activities and participation of patient. The ICF considers social aspects of disability and proposes a mechanism for evaluation of the role of physical and social environment on the functioning of one individual (Fig. 4) [42, 45, 46].

The application of ICF in rehabilitation practice, separately or simultaneously with the tenth revision of International Classification of Diseases (ICD - 10) [47, 48] proposes precise and clear rules for functional evaluation that can help control health care quality and thus improve the quality of rehabilitation (Fig. 5).

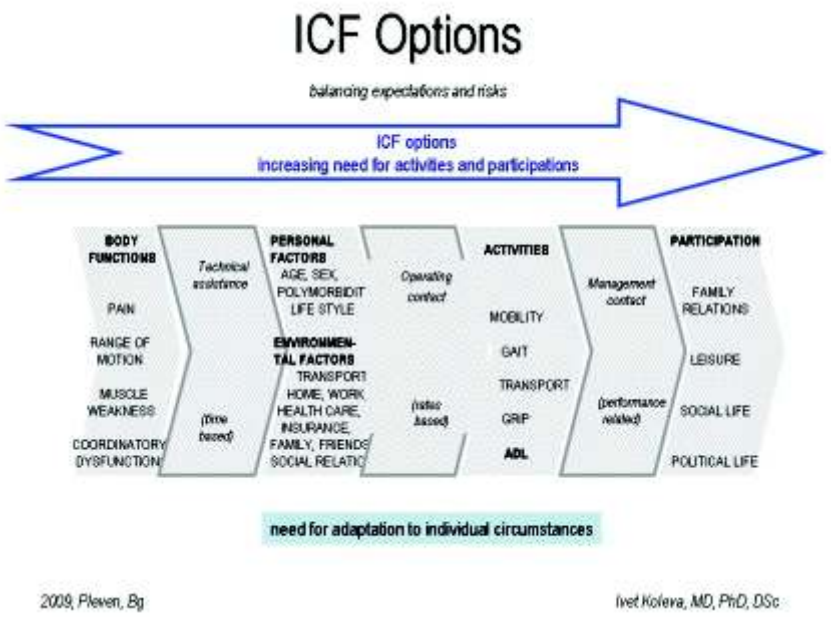


**Fig. 4.** ICF options [42].

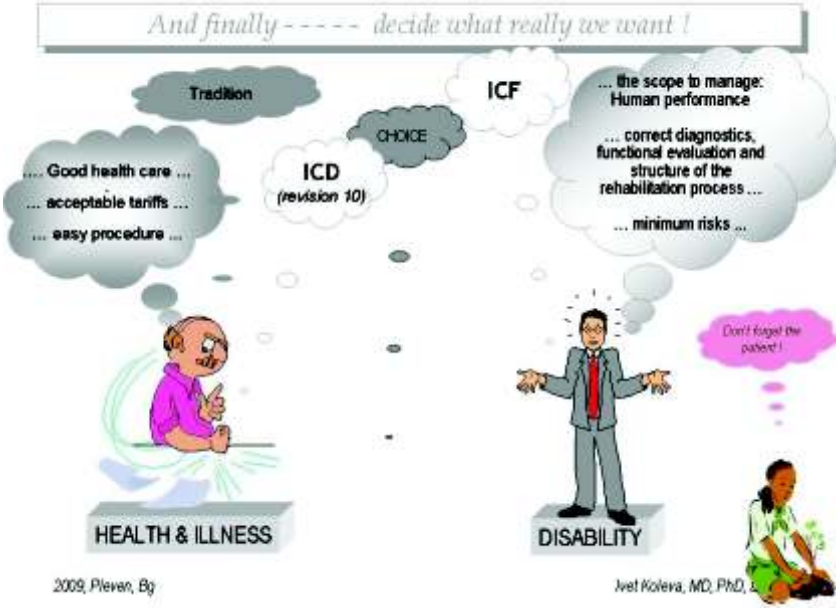


**Fig. 5.** ICF or ICD-10.

## Complex functional evaluation according to ICF principles [40, 49]

Contemporaneous rehabilitation imposes the necessity of a *holistic approach* to the patient, based on ICF, and including: *body functions* (pain, range of motion, motor weakness, coordination alterations); *activities* (mobility, grip, gait, activities of daily living, travelling); *social activities* (family relations, leisure, social life, political activities); *environmental factors* (living and working conditions, access to transportation, family and friends, health care and health insurance, social relations); *personal factors* (life-style, comorbidity, age, sex).

The complex functional evaluation should include:

- *Cognitive capacities* (orientation, attention, memory, capacity for collaboration in therapeutic interventions, safety measures);
- *Pain* (localization, type, intensity - verbal or visual analogue scale, activities increasing the pain;
- *Range of motion of joints* (active and passive);
- *Muscle force/muscle weakness*, motor deficiency;
- *Coordination* (static, locomotor and dynamic ataxia);
- *Mobility* (necessity of instruments, canes, batons, aids, devices);
- *Fatigability* (endurance to exercise, need of rest during investigations and functional activity);
- *Testing of autonomy in activities of daily living* (bathing, dressing, footing, personal hygiene; necessity of assistance in ADL).

The evaluation of patients' problems could be both qualitative and quantitative, concerning: fatigue, motor weakness, coordination alterations (posture, gait, grip); pain; conscience of necessity of technical aids; difficulties in ADL; limitation of functional mobility.

## Complex rehabilitation as an application of ICF principles [40, 49]

The application of ICF in neurorehabilitation clinical practice imposes the necessity of a holistic approach to the patient - *application of therapeutic methods of different medical (neurology and PRM) and non-medical specialties (sociology, psychology, ergotherapy).*

## Education based on ICF principles [40, 49-52]

This interdisciplinary approach imposes the necessity of introducing ICF in the training modules for students of medicine, general practitioners, specialists and postgraduate students of PRM and neurology, in post-graduate courses, and in the training of physiotherapists and physiotherapists ergotherapists. Currently, neurorehabilitation is guided by specialists with both specialties (neurology and PRM), but maybe in the future it will be useful to introduce an obligatory course for both types of specialists, concerning neurorehabilitation and including ICF.

Since 2007, the Department of Physical Medicine, Rehabilitation, Ergotherapy and Sports at the Medical University of Pleven has organized many post-graduate courses on neurorehabilitation, including ICF principles. In 2005, the Medical University of Pleven started training students of Medical Rehabilitation and Ergotherapy (a bachelor degree for medical specialists, adjuvant to PRM-doctors). Introducing the principles of integrative approach, we included principles of both rehabilitation and occupational therapy (ergotherapy) in the programme, the latter as a type of physical modality, very important for improving life quality and life satisfaction of patients.

To contribute to the development of Neurorehabilitation and Medical Rehabilitation and Ergotherapy as specialties, the Department of Physical Medicine, Rehabilitation, Ergotherapy and Sports organized three scientific conferences at the Medical University of Pleven: a National Conference of PRM on problems of socially relevant diseases of the motor system (in collaboration with the Association of Physical Medicine and Rehabilitation (May 2007); the First National Conference of Medical Rehabilitation and Ergotherapy (in collaboration with the Association of Physical Medicine and Rehabilitation and the Bulgarian Association of Medical Rehabilitation and Ergotherapy (October 2007); the First National Conference of Neurorehabilitation (in collaboration with the Bulgarian Neurorehabilitation Society and the Association of Physical Medicine and Rehabilitation (October 2008). Lecturers of the Medical Universities of Sofia, Pleven, Plovdiv, Sofia University, Military Medical Academy - Sofia, National Sports Academy - Sofia, University of Russe, South-West University - Blagoevgrad participated in the forums. A special guest at the conference of Ergotherapy was a representative of the European Network of Occupational Therapy in Higher Education (ENOTHE).

## Conclusion

The introduction of ICF principles in Bulgarian neurorehabilitation practice (clinical, educational and scientific) is very useful in improving the quality of neurorehabilitation care.

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