

Mini review

Impact of Rehabilitation Medicine in Gerontology and Geriatrics: Basic Principles

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Abstract

Geriatric rehabilitation has evolved in recent years due to the increased life expectancy and the increased relative proportion of elderly and old people in the population, including in the European Union and in our country. We present the basic principles of geriatric rehabilitation, emphasizing its specificity in the elderly and old people. We present our own algorithm for functional assessment and geriatric rehabilitation (kinesio- and ergotherapy, electro- and light therapy, cryo- and thermotherapy). Particular attention is paid to autonomy in everyday life. Some measures of physical prevention, therapy, and rehabilitation for the most common problems of patients in the clinical practice of geriatric rehabilitation are highlighted. We emphasize the rehabilitation of some "geriatric giants": hypodynamia; impaired balance, posture, and gait with frequent falls; reduced memory capabilities; sarcopenia, frailty, and cachexia.

Keywords: Activities of daily living; Autonomy; Exercise; Frailty; Geriatric rehabilitation; Physical activity; Physical medicine; Sarcopenia

"Old Age: the crown of Life, our play's last act." Marcus Tullius Cicero

"Caregiving for an elderly parent is an ongoing learning experience." Unknown

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Citation: Koleva IB, Yoshinov BR, Yoshinov RR (2023) Impact of Rehabilitation Medicine in Gerontology and Geriatrics: Basic Principles. J Gerontol Geriatr Med 9: 178.

Received: June 28, 2023; **Accepted:** July 10, 2023; **Published:** July 17, 2023

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Motivation

Ultimately, we observe a rise in the average lifetime [1], respectively an expansion of the part of old people in the total population structure [2]; which determines the increased interest in the problems of these types of patients. According to the United Nations prognosis [3], the number of people, aged 60 and over, will double by 2050 and triple by 2100. The population of the over-60s is growing at a faster rate than that of younger age groups [4,5]. According to EUROSTAT, an increased life expectancy is detected [6]. Life expectancy per newborn child in the European Union is around 81 years (2016 data); with the highest data for Spain (83.5 years) and Italy (83.4 years); and the lowest for Bulgaria, Latvia, and Lithuania (around 74.9 years). We do not yet have the final version of these data and projections following the COVID-19 pandemic, which was characterized by relatively higher mortality among the elderly and old people.

Physical Medicine, Rehabilitation, Occupational Therapy

It is well known that in medical practice, the major clinical disciplines decide the patient's prognosis *quo ad vitae*, but physical factors ensure his quality of life. Physical medicine stands on the solid foundation of medical sciences. According to the European Definition of the Medical Act [7]: "The medical act includes all professional activities, including science, teaching, specialisation and training, clinical and medico-technical steps; aimed at health promotion, disease prevention, provision of diagnosis and of curative care to patients, individuals, groups and communities. It is the responsibility of, and must be exercised at all times by, a registered MD/Physician - in person or under his/her direct supervision and/or prescription."

In the context of this definition, physical factors are primarily aimed at health promotion, disease prevention and curative recovery of patients and persons with disabilities. Physical methods and means are able to provide a better quality of life, both for the healthy and the sick person. Physical and Rehabilitation Medicine (PRM), as defined by the PRM Section of the European Union of Medical Specialists [Union Européenne des Medecins Specialistes (UEMS) - PRM Section], is "an independent medical specialty focused on the promotion of physical and cognitive functioning, activities (including environment), participation (including quality of life), and modification of personal and environmental factors. PRM is responsible for the management of the prevention, diagnosis, treatment, and rehabilitation of people with health-related disabilities and comorbidities of all ages." [8-10].

The regulations of the Bulgarian School of Physical and Rehabilitation Medicine (including the Medical Standard on PRM [11]) have been harmonized with those of the European Union and the European Union of Medical Specialists - PRM Section. According to the World Health Organization (WHO), Rehabilitation is "the use of all means aimed at reducing the degree of incapacity and disability, and at training people with permanent incapacity to obtain optimal social integration". Rehabilitation is a set of medical, social, educational, and

vocational activities carried out jointly and in a coordinated manner in the case of persons with reduced working capacity due to illness or other impairments, with a view to achieving the maximum possible physical, mental and working capacity. Its main sections are medical-psychological, occupational, and socio-legal rehabilitation.

According to the World Report on Disability of the WHO and the World Bank [12] the goals of rehabilitation include prevention of the loss of function; slowing the process of loss of function; improvement or restoration of function; compensation for lost function; and maintenance of current function. According to actual understanding [13], rehabilitation is a functional therapy, based on a detailed functional assessment. Contemporary Physical Medicine [9,10,11,13] uses a combination of methods for functional evaluation and physical therapy, as well as multiple physical factors (PF):

- Natural PFs: water (incl. mineral), air (incl. ions and aerosols), temperature (heat or cold); movement (active & passive), activities; with corresponding parts of PRM: hydro/balneo/therapy, aero-therapy; thermo-or cryo-therapy, kinesiotherapy, ergo-therapy
- Preformed PFs : electric currents, magnetic fields, light (incl. laser), ultrasound; corresponding sections of PRM: electrotherapy, magneto-therapy, photo-therapy, laser, ultrasound-therapy

In geriatric rehabilitation, ultimately we emphasize kinesiotherapy and occupational therapy, using also some treatments with preformed factors, especially functional electrostimulation (in case of motor deficits), Transcutaneous Electroneurostimulation (TENS) and magnetotherapy (for pain relief); laser therapy (in case of autonomic dysfunction).

Ergotherapy (ET) has recently started to develop in our country [14]. Etymologically, the term ET originates from the Greek words: ergon - work and therapeia - therapy, i.e., treatment with work or activities. According to medical definitions [15], ET represents the application of various activities for the treatment of diseases. According to modern conceptions [16], ET applies targeted, problem-oriented activities to improve the quality of life of people with disabilities. It is based on the following postulate: Purposeful activity can be used for the prevention of physical or psychosocial dysfunction and also for functional recovery. ET includes three main elements, namely: training the disabled person to cope alone in the environment; adaptation of the environment to the needs of the disabled person; and assistive devices (splints, belts, crutches, canes, canes; wheelchairs, etc.). In many countries, occupational therapy is a separate profession [17,18]. In the rehabilitation of the elderly and the aged, we emphasize ET areas related to self-care activities, recreation, and rest.

Gerontology and Geriatrics. Geronto-Rehabilitation and Geriatric Rehabilitation

Gerontology and Geriatrics investigate the medical aspects of aging - in norm (healthy aging) and pathology. Gerontology studies the factors leading to aging, or the mechanisms of the aging process. Geriatric medicine treats diseases in elderly patients. The terms derive from Greek: γέρων (geron) -- "elderly person" ιατρός (iatros) -- "healer", λογος (logos) -- science. According to the World Health Organisation's motto, the aim is: "to add life to years, not just years to life"; i.e., to improve the quality of life of the elderly and old people. Geriatrics is considered an interdisciplinary scientific field that deals with problems mainly in the fields of internal medicine, orthopedics,

neurology and psychiatry (gerontopsychiatry). It focuses on the biology of aging [19,20]: decline in biological functions; polymorbidity; slow reconvalescence; delayed tissue regeneration (including wounds); multiple complications.

Dr. Leo Nascher of Mount Sinai Hospital in New York is considered the "father" of geriatrics in the United States. As "mother" of geriatrics in Europe is considered Dr. Marjorie Warren, a physician from London who was the first to emphasize the need for a holistic approach and for rehabilitation in the elderly [18]. After her, other physicians and authors emphasized polymorbidity, the holistic approach, and the role of rehabilitation in this contingent of patients [21,22].

The British physician Dr. Bernard Isaacs emphasized on the specifics of the clinical picture in the elderly. He formulated the rule of the four letters I: Immobility, Instability, Incontinence, Intellectual Impairment (Impaired intellect) [23]. To these 'geriatric giants', described by Professor Isaacs, a fifth has been added recently: Impaired vision and hearing loss. All these 'geriatric giants' can be observed in most elderly and aged people, leading to difficulties in treating their illnesses and impairments, as well as more serious complications and deterioration in their quality of life [24-28]: weight loss, muscle weakness, reduced physical activity, delayed ambulation; social isolation, depression; frequent falls; medication errors; and incorrect financial management. Consequences are complex: Limited autonomy in daily life; Restrictions in activities; Restraints in participation; Impaired quality of life; Dependence on others' help; Social isolation; Need for social assistance at home or from specialized facilities - rehabilitation hospitals, hospices, etc., i.e., two contradictory laws are valid in these patients: the razor of Ockham (the role of age - Lex parsimoniae: Entia non sunt multiplicanda sine necessitate; Wilhelm of Ockham), but also the rule of Hickam (Hickam's dictum-polymorbidity).

In the area of gerontology and geriatrics, we observe several thematic fields, sub-fields and sub-specialties, namely:

- Medico-clinical area: Cardio-geriatrics; neuro-geriatrics or geriatric neurology [treating Neuro-degenerative changes and diseases (Parkinson's disease; Degenerative dementias: Alzheimer's disease, Lewy Body dementia) and vascular diseases (ischemic strokes and vascular dementia)]; Geriatric Oncology (psycho-geriatrics (dementia, delirium, depression); Geriatric rheumatology (polyarthrosis and osteoporosis); Geriatric rehabilitation or geronto-rehabilitation
- Medico-surgical area: ortho-geriatrics (osteoporotic fractures, of the femoral neck); geriatric traumatology; geriatric cardio-surgery
- Other geriatric subspecialties: geriatric occupational therapy and geriatric physical therapy (parts of geriatric rehabilitation); geriatric pain control

Geriatric rehabilitation comprises a detailed functional assessment and complex functional therapy. The development of Geriatric rehabilitation began towards the end of the last century, with the Mayo Clinic in the USA considered to be the most advanced in the field [29]. The main goal of geronto-rehabilitation is to support the functioning of the elderly and old people despite their physical and mental disabilities [30]. The rehabilitation is performed by a team consisting of medical specialists (gerontologist, cardiologist, orthopedist, rheumatologist, PRM), medical specialists (nurse, rehabilitation specialist) and non-medical specialists (kinesiotherapist, occupational

therapist, social worker, etc.). In the majority of cases, the final goal is obtained - amelioration even restoration of the quality of life of geriatric patients.

Its basic principles are prevention of disability and therapy, restoration and preservation of function as much as possible, and adaptation to lost function (due to aging) [29,30]. All authors stress the extreme importance of functional training (of movements, activities, cognition), according to the principle "Train the function or you will lose it" ("Use it or Lose it") [31].

For rehabilitation clinical practice, the most important signs of normal aging are [32]:

- Changes in body composition (loss of muscle mass, decrease in bone mineralization and qualitative changes in bone structure)
- Postural changes (progressive forward bending of the head, cervical spine extension, marked thoracic kyphosis, flattening of lumbar lordosis, scapular protrusion; ulnar deviation of the wrist; flexion contractures at the hip and knee joints, decrease in ankle dorsiflexion; forward shift of the center of gravity)
- Changes in gait pattern (decrease in relative duration of the swing phase; increase in the period of double support and slowing of walking, with an increase in energy expenditure; men take smaller steps but on a wider base; women step on a smaller base)
- Neurological changes (decrease in muscle strength; hypotrophy / atrophy of interossei muscles; distal decrease in vibratory sense; increase in pain thresholds, touch; Achilles hypo to areflexia)
- Skin changes (reduced elasticity and delayed regeneration)
- Cardiopulmonary changes (decrease in cardiac reserve; reduced contractile capacity of the heart muscle; reduced functional capacity of the heart; reduced vital capacity of the lungs, respectively reduced ability to exercise)
- Urological changes (reduction in bladder capacity, an increase of residual urine; bigger susceptibility to uro-infections; prostatic hypertrophy in men)

Basic objectives and tasks of gerontorehabilitation include:

- Maintenance of preserved functions
- Continuous monitoring with control of impaired physiological reactions, co-morbidities, and possible complications
- Inclusion in the rehabilitation team of co-therapists - family, partner and relatives
- Identification of the most important goals for the individual patient
- Stimulating the motivation of the patient and relatives
- Avoiding immobilization
- Exercises focusing on the most important activities for the patient
- Exercise based on the principle - from simpler to more complex activities, with control over the intensity of exercise according to individual tolerance
- Pursuing additional opportunities for functional stimulation, motor activity, and socialisation (group exercises, accompanied walks)

- Minimizing medication
- Accepting that sometimes overall function may not be restored and adapting to limited capabilities
- Understanding that achievements are obtained slowly (in small steps)
- Differential diagnosis between depression, dementia and delirium
- Training in activities of daily living - self-care, grip, posture, balance, gait
- Prevention of falls and lower limb fractures respectively

Most Frequent Geriatric Dysfunctions and Diseases for Rehabilitation

The three main areas of geriatric rehabilitation are: 'normal' ('healthy') aging, cardiovascular problems (heart failure and stroke), and skeletal problems (osteoporosis, osteoarthritis, and polyarthritis; hip and knee arthroplasty).

Indications for gerontorehabilitation include:

- "Standard" diseases that are more common and course more severely in the elderly: degenerative osteoarthritis, osteoporosis, femoral neck fractures, decubitus; herpes zoster; atrial fibrillation; chronic lymphocytic leukemia...
- Diseases specific to old age: urinary incontinence, Alzheimer's disease...
- Conditions that are more common in the elderly and that require "emergency" treatment: metabolic decompensation in diabetes mellitus; iron-deficiency anemia; depression; vitamin B12 deficiency...

There are a number of dysfunctions and deficits in diseases of the nervous system and musculoskeletal system. The most common include somatosensory and motor deficits, disorders of postural adaptation and motor planning; balance and coordination disturbances; cognitive dysfunctions; emotional lability; limited autonomy in activities of daily living.

Algorithm for Functional Evaluation of Patients in Clinical Practice of Geriatric Rehabilitation

Rehabilitation clinical practice requires precise diagnostics - according to the International Classification of Diseases [33] and the International Classification of Functioning, Disability and Health [34]. In order to analyze the patient's condition in detail, multiple clinical, paraclinical, and instrumental methods are applied, both standard for each type of rehabilitation [35-38] and specific for gerontorehabilitation [39]. Especially important are the investigations applied to diseases and injuries of the nervous system [40,41] and of the musculoskeletal system [42].

Clinical methods of investigation

Include Somatic exam; Neurological exam - with an evaluation of the motor function (weakness, paresis, paralysis); ataxia; radicular signs; Orthopedic exam with assessment of the range of motion, joint stability, and functional tests; Rheumatologic exam with tests of Ott, Schober, Patrick, Bonnet; Evaluation of the functional grasp and

grip (0-5); Balance and Gait assessment with a prognosis of risk of falls; Kinesiological analysis, including Manual muscle test (MMT - Lovett, 0-5); Evaluation of autonomy in Activities of Daily Life (ADL) and need of assistance; Assessment of the quality of life (WHODAS 2.0. - 12 and 36 points; Psychological exam.

Paraclinical methods

Blood exam, evaluation of glycemia, lipid parameters; emphasizing on Hb, Leuco, CRP; in men - PSA.

Instrumental investigation methods

Electrocardiography and Echocardiography; Neuro-imagery (X-Rays, Computer tomography, Magnetic resonance imagery); Neurofunctional methods (Electroneurography, Electromyography, Excitomotoryelectrodiagnostics, Doppler-sonography, Laser-Doppler-flowmetry).

Functional assessment (activities of daily living, ICF)

During the investigation of the rehabilitation potential of a patient, the holistic approach should be mandatory, i.e. the performance of a comprehensive assessment of cognitive ability (orientation, attention, memory, ability to collaborate in the implementation of treatment interventions; awareness of the precautions to be observed in relation to the underlying neurological suffering); pain (localization, type, severity /verbal or visual-analog scale/; activities that lead to increased pain); range of motion (active and passive); muscle strength (weakness), presence of motor deficit; coordination (static, locomotor and dynamic ataxia); mobility (need for aids, appliances, tools, and devices); endurance (exercise tolerance, need for breaks during the examination and functional activity); testing of the autonomy in everyday life (bathing, dressing, feeding, personal hygiene; need for assistance with self-care).

Specific scales are applied for the general assessment of the geriatric patient and for the assessment of autonomy in Activities of Daily Living (ADL). We emphasize autonomy during everyday functional activities; the necessity of assistance and of technical aids; balance, gait, and falls; manipulative capacities with upper limbs; cognition. For the evaluation of autonomy in Activities in Daily Living (ADL), we apply the scale of Katz (for self-service) and the instrumental scale of Lawton.

If possible, the final complex assessment should be based on the ICF and includes:

- Body functions (pain, range of motion, motor deficits, coordination disturbances)
- Activities (mobility, getting up, walking, transport, grasping objects, ADL)
- Participations (family relationships, leisure and recreation, social life, political participation)
- Environmental factors (workplace, home and transportation conditions, family and friends, health care and insurance, social relationships)
- Personal factors (health culture, comorbidity, age, gender)

Complex geronto-rehabilitation algorithm

The general strategies to influence the most common socially significant diseases (including in geriatric patients) comprise systemic drug treatment, periodic courses of rehabilitation, as well as mandatory hygienic and dietary measures to optimize lifestyle: strict control of certain blood parameters (lipid profile, glucose, rheological indices), balanced diet and weight control, active exercise regime (kinesitherapy), minimization of harmful habits [43,44]. Most authors emphasize the importance of movement: basic motor activity and specific exercises [45,46]. A multi-disciplinary multi-professional team is needed [32,47,48]. The treatment algorithm is based on the synergism between physical factors [49]. This is the concept of the rehabilitation puzzle - a synergic combination between different natural and preformed physical modalities and treatment methods. The group of natural factors includes physiotherapy (active and passive movement), ergotherapy (activities), aerotherapy (respiratory techniques, inhalations), balneotherapy (mineral baths, douches), balneo physiotherapy (underwater exercises, underwater massage), thalassotherapy (influence of the seawater and sea climate). The group of preformed physical modalities contains electrotherapy (low, middle, and high-frequency electric currents), magnetotherapy (low-intensity magnetic field), ultrasound therapy (ultrasound and phonophoresis), photo-therapy (infra-red and ultra-violet light beams, laser) [50,51].

In general, we recommend a combination of one or two procedures with preformed physical factors, one or two procedures of cryo-thermo-peloido-balneotherapy, and two or three physiotherapy and ergotherapy techniques. However, for adult patients, we prefer a combination of one treatment with preformed physical factors (electrical stimulation, deep oscillation, laser, magnetic field), one thermo-procedure (with paraffine, peloid, or sea lye), two physiotherapy procedures (exercises, post-isometric relaxation, stretching, massage), and certainly one occupational therapy procedure.

Rehabilitation Prescriptions in Common Geriatric Problems

The most frequent complications among the geriatric population include specific complications and require specific rehabilitation approaches [52].

Musculo-skeletal and mobility changes

In older patients, we observe numerous musculoskeletal problems: osteoporosis, osteoarthritis and arthritis [47,53]. Muscular changes include a reduction in myocytes, lipofuscin deposits in muscles, muscle hypotrophy, reduction of muscle force and muscle contractility, and muscle tone [53]. Bone changes include osteoporosis, osteopenia and reduction of the body height [53]. The ability of bones to tolerate mechanical stress is reduced. Over time, due to stress, micro-fissures develop in the bones. I.e., the quality of the bone decreases, leading to an increased risk of fracture. The quality of the bone is diminished and osteoporosis is developed, with microarchitectural changes, decreased bone mineral density, and increased risk of fragility fractures. Mobility decreases with age. Movements become more difficult, painful and ineffective. Between 40 and 70 we observe a loss of muscle strength of about 10-20%. Between 70 and 80 - the loss becomes 30- 40% [54]. Decreased physical activity or even immobility (a consequence of hospitalization) may provoke deconditioning with reduced strength and flexibility [55].

Muscles and bones need movement, active exercise, and sports. Classic recommendations comprise regular physical activity: walking, running, cycling – three or four times weekly. Physical activity is beneficial for both athletes and people who have a sedentary lifestyle. We recommend periodic osteodensitometry and consultation with a rheumatologist and/or endocrinologist. Clinicians also require laboratory monitoring of the following key parameters: ionized Calcium levels; 25-OH vitamin D, phosphorus, BUN, creatinine, albumin, total protein, Thyroid-Stimulating Hormone (TSH), and T3/T4, cortisol, alkaline phosphatase. In men: testosterone bioavailability. In women: estrogen levels; Liver function tests.

Apart from medication and standard phototherapy, specialists in Physical and Rehabilitation Medicine (PRM) recommend regular physical activity with active exercises, walking in the parc or in the mountain (cross-country route); thalassotherapy (swimming; underwater exercises). The main elements of the specialized PRM program include aerobic exercises; Low-intensity prolonged exercise: mechanotherapy; low-intensity aerobics; steppers; walking (treadmill); low-intensity sports and activities; High-intensity short or intermittent exercise and activities: walking, stair climbing, dancing, fast walking or running, jumping jacks, step aerobics, tennis, garden work. According to the prescription of the physician-PRM specialist we can include procedures with preformed physical modalities: magnetotherapy, interferential currents; transcutaneous electroneurostimulation.

Altered proprioception, disbalance and falls

Proprioception and proprioceptive stimulation

The role of proprioception in balance and gait is well known [25,26]. It is an established fact that proprioception is impaired with aging [56], requiring systemic proprioceptive stimulation (primarily of the proprioceptors in the joints and tendons of the lower limbs). In geriatric rehabilitation clinical practice, we investigate proprioception by assessing the joint position and the sensation of movement of the lower limbs, at the hip [57], knee [58,59], and ankle joints. The effects of regular motor activity [57,60] as well as some low-intensity whole-body movements, such as Tai Chi [61], were objectified. Targeted proprioceptive stimulation [62] is performed with analytical exercises, vibratory massage and proprioceptive neuromuscular facilitation (PNF techniques). In turn, improved proprioception leads to stabilization of balance [21] and reduces the risk of falls and fractures, respectively, in the elderly and old people.

Falls - Risk Factors [19]: Often falls are observed in older white women with low Body Mass Index (BMI), greater height, lower Bone Mineral Density (BMD), and a history of cerebrovascular accident in the vertebrobasilar system (vertebrobasilar insufficiency). Alcohol consumption-related falls are more common in men. A surprising fact: 14% of adult patients in the urgency are alcohol-dependent. Women more often fall on the glutes (with femoral neck fracture). Craniocerebral injuries are more common in men.

Authors mention some intrinsic factors predisposing to falls in the elderly and aged [19]: history of previous falls, possibly fractures; impaired proprioception; gait characteristics: slow gait; variability between different walking cycles increases the likelihood of falling by about 5 times (uneven gait - stride-to-stride variability); particularities in the end push-off phase; the presence of multiple risk factors. Old patients usually present some gait peculiarities [21]. They have a slow gait; with variability between different walking cycles; and

end-phase push-off peculiarities. Patients who fall forward usually have increased hip flexion and decreased knee flexion in the pre-swing phase, and decreased knee stability in the pre-swing phase.

Age-related risk factors for falls include [24,26]:

- Decreased muscle mass
- Decreased muscle strength
- Postural changes in the hip joints (increased valgus-type deformity)
- Shift of the gravity center behind the hip joints
- Increased postural instability (sway)
- Decreased balance reflexes; Balance disorders
- Increased reaction time
- Visual and perceptual dysfunctions
- Reduced vibratory sensation
- Impaired proprioception in the lower extremities (poor lower-extremity sensory input)
- Reduced mobility
- Orthostatic hypotension (sharp drop in systolic blood pressure by < 20 mm Hg)
- Vaso-vagal syncope

Strategies for the reduction of the risk factors include [29]:

- For visual impairment: vision correction, cataract extraction, home adaptations
- For auditory and vestibular dysfunction: cerumen cleaning; audiological evaluation; hearing aid; white noise reduction; avoid medications with effects on vestibular system; neurologic and otoneurologic testing; CT and ET
- Proprioceptive dysfunction: screening for vit. B12 deficiency; X-rays for cervical osteochondrosis and spondylosis; balance exercises; walking aids / cane, canard, etc./; hard-soled orthopedic shoes; home adaptations
- In dementia: search for and treat reversible causes; avoid sedatives; supervise gait training
- In musculoskeletal disorders: correct diagnostic, balance exercises, and gait training, with aids
- For foot problems: podiatric consultation, nail care, calluses, corns if needed; shoe fitting
- For orthostatic hypotonia /due to baroreflex response impairment/: Diagnostic clarification and treatment; control of fluid intake; exercise with horizontal position - swimming, bed exercises with the involvement of the muscle pump of the lower legs; habituation to slow standing through sitting in bed; elastic or compression stockings with periodic control of arterial pressure after standing; frequent meals with small portions; avoidance of very hot showers and exertional heat; avoidance of strong straining during urination and defecation

Mandatory elements of the geronto-rehabilitation complex are Regular physical activity (in nature), Hiking; Training of proprioception; Balance exercises; Coordination Exercises; Gait training /with aids, if necessary); Training in activities of daily living; Assessment of fall risk and precautions to reduce it.

Limited autonomy in daily activities. Role of occupational therapy

Ergotherapy (ET) or Occupational Therapy (OT) is the most adequate method for the amelioration of the autonomy of geriatric patients in daily life. It includes both patient education and training for self-care activities; the use of assistive devices, also home adaptation. We cite the main stages in Activities in Daily Living (ADL) for an increase of patient mobility in the clinical practice of geriatric rehabilitation (especially in cases with conditions and diseases of the nervous system and the locomotory system): Turning in bed; Long sitting; Sitting in bed with legs lowered; Verticalization; Balance training; ADL training; Gait training - flat; then climbing stairs up, then down.

We propose to our patients some examples of home adaptations tailored to individual needs:

- In case of falls due to visual problems: lamps with photo-cells; automatic switching on of the lamp when moving
- For falls due to slipping: Shoes, no slippers; Replace carpets and rugs with carpeting or non-slip wood flooring
- For falls in the shower or tub: Rough patches on the bathroom floor; Grab bars; Bath benches; Other bathroom adaptations - in the shower, in the tub

Examples of assistive devices that could improve the independence of geriatric patients are canes, crutches, walkers, and wheelchairs. Some orthotic devices are also recommended to maintain body posture: thoracic belts, lumbostats, elastic stockings, etc.

Cognitive dysfunction and dementia. Training of cortical functions

Both degenerative and vascular dementias are common. Differential diagnosis with delirium and agitated depression is important.

In rehabilitation clinical practice, ergotherapy is recommended to train both the right and left cerebral hemispheres - i.e., engaging in a variety of logical thinking activities as well as artistic and orientation activities. To train the dominant hemisphere, we apply various puzzles, logic tasks and tests are applied. To train the nondominant hemisphere, different variants of art therapy are recommended.

Art therapy is a specific form of therapeutic influence. The root of the term "art therapy" is of Latin origin: "art" means art, and "therapia" - treatment, healing, medical care, i.e., treatment with or through art. Art therapy was originally created as a healing tool applied to psychiatric patients. Gradually it became more and more extended to other clients (patients, but also healthy persons). According to the Association of British Art Therapists, art therapy is "the use of artistic means for self-expression and self-awareness in the presence of a trained art therapist". Clients, who are referred to an art therapist, do not need previous experience or skills in the arts; the art therapist does not seek to make an aesthetic or diagnostic assessment of the images created by the client. The practitioner's primary goal is to help the client achieve personal change and development through the use of

art materials in a safe and supportive environment. Art therapy is used for functional disorders of the nervous system in adults with mental problems - depressive or aggressive behavior, irritability, fears, etc. It has both distracting and training effects on the elderly - healthy and ill patients. In art-therapeutic work, there is a synchronization and linking of the activities of different specialists - educators, psychotherapists, psychologists, doctors, social workers, rehabilitators, etc.

Sarcopenia, frailty, cachexia

The term Sarcopenia was proposed by Rosenberg for the age-related reduction of muscle mass. It comes from the Greek words 'sarx' (flesh) and 'penia' (loss). Sarcopenia is characterized by a progressive and generalized loss of skeletal muscle mass and strength; resulting in physical dysfunction, impaired quality of life, and ultimately death [63-65]. The loss of muscle mass impairs strength, immunocompetence and metabolic homeostasis of the body [66]. Reduction of muscle mass leads to functional impairment, frequent falls and loss of autonomy in activities of daily living [67]. Several consensus definitions of sarcopenia have been published [68]. The measured parameters are walking speed, grip strength and muscle mass. Several authors consider that the development of sarcopenia is a continuing process. Some introduce the term Skeletal muscle function deficit [69], others - Presarcopenia [70]. The European Working Group on Sarcopenia in Older People proposed three conceptual stages of sarcopenia: Presarcopenia, Sarcopenia, and Severe sarcopenia [70].

In some conditions (malignancy, rheumatoid arthritis), we can observe sarcopenic obesity with decreased body mass, but preserved or even increased fat mass [71].

The "gold standard" in the treatment of sarcopenia is physical training with resistance-type exercises with progressive load [72,73]. A specific diet with high protein intake is considered synergistic [74]. According to some studies, resistance exercise is always useful, without non-responders [75].

Frailty is an age-dependent condition [76], including a decrease in reserves and increased vulnerability [77]. This multi-dimensional loss of reserves comprises declines in energy production and utilization, resulting in functional insufficiency and altered stress response [78]. Linda Fried from the Johns Hopkins University's Center on Aging and Health defines a frailty phenotype (physical frailty) with a minimum of three of five criteria: weakness, slowness, low physical activity, exhaustion (or fatigue), and unintentional weight loss [78]. A concept of "Cascade of functional decline of older adults" is described, with several stages: Robustness, Pre-frailty, Frailty, and Disability, demanding assistance in ADL [79].

A total of 36 experts from different countries (Australia, Europe, USA, Canada, Asia) - members of the task force of the International Conference of Frailty and Sarcopenia Research (ICFSR) published in 2019 Guidelines for Identification and Management of physical frailty [79]. The prescription of physical activity is included as a strong recommendation with moderate certainty of evidence. We can cite: "Recommendation No 5: Older people with frailty should be offered a multi-component physical activity program (or those with pre-frailty as a preventative component)."

The term "Cachexia" derives from the Greek: 'cac' (bad) and 'hexis' (condition). Cachexia is defined as a loss of muscle mass (eventually muscle and fat mass), due to an underlying illness (cancer, congestive cardiomyopathy, or end-stage renal insufficiency) [80]. Every type of physical activity can be useful.

Physical activity and exercise for older adults

Physical inactivity and a sedentary style of life are typical for older adults. So, regular physical activity is recommended by many authors. The beneficial effects are numerous [81]: reduction of risks of chronic diseases and all-cause mortality; preservation of functional capacity and improvement of the quality of life; a decrease in the effects of aging; lessening oncologic risks, risks of overweight and obesity, and risks of falls; reduction of anxiety and depression.

The U.S. National Institute on Aging recommends four types of exercise to improve health and fitness:

- Aerobic exercises to increase physical condition (for stimulation of respiratory and cardiac functions): Fast walking and running, Working in the garden, Dancing, Swimming, Cycling /including velo-ergometer), Climbing stairs, Playing tennis or basketball. A minimum of 150 minutes/week is recommended
- Exercises to increase muscle strength: Resistance exercises (with weights or bands) - minimum of two sets of 10 to 15 repetitions - for each major muscle group, at least 2 times a week (not done on consecutive days). The inhalation must be during the muscle effort, the exhalation is during muscle relaxation. Examples include Weight lifting (weight machine or gladiator); Elastic band exercises (Theraband against resistance); Push-ups (on the ground or against the wall)
- Balance and gait training (for prevention of falls) - balance exercises on one or two legs, on a firm or unstable surface, walking on tiptoes and on heels, walking sideways, lower limb exercises, Tai Chi, standing on 1 leg, Swiss ball games, standing from a sitting position
- Flexibility exercises-Stretching (back stretch exercise, inner thigh stretch, back of leg stretch, ankle stretch). Stretch is done after warming up the muscles. After exercises for muscle strength and after cardio-training. The respiration must be calm and profound

Interdisciplinary Approach

An interdisciplinary approach is necessary for the assessment and management of aging [82,83]. According to our national consensus on geriatric rehabilitation: the necessary staff includes some permanent members of the rehabilitation team: attending physician - PRM specialist; physiotherapist, occupational therapist; patient and family. If necessary and according to the needs of the patient's main disease, the team also can contain other doctors (general practitioners and specialists - cardiologist, neurologist, orthopaedist-traumatologist, obstetrician-gynecologist; radiologist and radiologist, functionalists); nurse; midwife; kinesiologist; sociologist; speech therapist; clinical psychologist, psychotherapist, massage therapist, representative of a religious or patient organisation, etc.

Conclusion

Physical and Rehabilitation Medicine is very useful in the clinical practice of gerontology and geriatrics. Our opinion is the future development of this interdisciplinary field has enormous potential. Properly structured and conducted PRM program ameliorate various clinical signs, symptoms and syndromes - it reduces pain (physical analgesia), increases the range of motion of the spine and limbs, supports the independence of the disabled in the activities of daily living, improves the quality of life of every old patient.

References

1. World Health Organization (2015) World report on ageing and health. WHO, Geneva, Switzerland.
2. United Nations (2013) World Population Ageing 2013. United Nations, New York, USA.
3. United Nations (2002) World population ageing 1950-2050. United Nations, New York, USA.
4. Federal Interagency Forum on Aging Related Statistics (2000) Older Americans 2000: Key Indicators of Well-Being. Federal Interagency Forum on Aging Related Statistics, Washington DC, USA.
5. Kinsella K, He W (2009) An Aging World: 2008. U.S. Census Bureau, Washington, DC, USA.
6. Centers for Disease Control and Prevention (CDC) (2003) Trends in aging--United States and worldwide. *MMWR Morb Mortal Wkly Rep* 52: 101-104.
7. UEMS (2009) European Definition of the Medical Act. UEMS, UK.
8. UEMS (2005) PRM-section: Definition of Physical and Rehabilitation Medicine. UEMS, UK.
9. Gutenbrunner C, Ward AB, Chamberlain MA (2007) White Book on Physical and Rehabilitation Medicine in Europe. Produced by the Section of Physical and Rehabilitation Medicine, Union Européenne des Médecins Spécialistes (UEMS), the European Board of Physical and Rehabilitation Medicine and l'Académie Européenne de Médecine de Réadaptation in conjunction with the European Society of Physical and Rehabilitation Medicine (ESPRM). *Journal of Rehabilitation Medicine* 45: 1-48.
10. European Physical and Rehabilitation Medicine Bodies Alliance (2018) White Book on Physical and Rehabilitation Medicine (PRM) in Europe. Chapter 7. The clinical field of competence: PRM in practice. *Eur J Phys Rehabil Med* 54: 230-260.
11. State Gazette (2004) Medical Standard in Physical and Rehabilitation Medicine. State Gazette, Bulgaria.
12. World Health Organization (2011) World Report on Disability. WHO, Geneva, Switzerland.
13. Koleva I (2006) Repetitorium Physiotherapeuticum (Basic principles of modern physical and rehabilitation medicine). SIMEL, Sofia, Bulgaria.
14. Koleva I (2015) Bases of physical medicine, physical therapy and rehabilitation (incl. ergotherapy and Medical SPA) (2ndedn). SIMEL, Sofia, Bulgaria.
15. Elsevier (2009) Mosby's Dictionary of Medicine, Nursing & Health Professions. Elsevier, Amsterdam, Netherlands.
16. AJOT (1981) The practice encompasses evaluation, treatment and consultation. Resolution Q: Definition of occupational therapy for licensure. *AJOT* 35: 798-799.
17. Evans KA (1987) Definition of occupation as the core concept of occupational therapy. *Am J Occup Ther* 41: 627-628.
18. Denham MJ (2011) Dr Marjory Warren CBE MRCS LRCP (1897-1960): The Mother of British Geriatric Medicine. *Journal of Medical Biography* 19: 105-110.
19. Maddox GL (2001) The Encyclopedia of Aging: A Comprehensive in Gerontology and Geriatrics. Springer, New York, USA.
20. Eccles M, Diliberti M (1994) Thesaurus of Aging Terminology: AgeLine Database on Middle Age and Aging (5thedn). Washington (DC): American Association of Retired Persons, Research Information Center, Washington DC, USA.
21. Wedgwood J (1985) The place of rehabilitation in geriatric medicine; an overview. *Int Rehabil Med* 3: 107-109.

22. Hughes LD, McMurdo ME, Guthrie B (2013) Guidelines for people not for diseases: the challenges of applying UK clinical guidelines to people with multimorbidity. *Age Ageing* 42: 62-69.
23. British Geriatrics Society (2009) A giant of geriatric medicine - Professor Bernard Isaacs (1924-1995) Post 1. British Geriatrics Society, UK.
24. Clair JM, Allman RM (2018) The gerontological prism: Developing Interdisciplinary bridges. Taylor & Francis, UK.
25. Grabbe JW (2017) Recent advances in Geriatric Medicine (An interdisciplinary approach to Geriatric medicine). Bentham Science Publishers 2: 162.
26. Burton JR, Lee AG, Potter JF (2017) Geriatrics for specialists. Springer International, Switzerland.
27. Misiaszek BC (2008) Geriatric medicine survival handbook (revised handbook). McMaster University, Ontario, Canada.
28. National Academies Press (2020) Social Isolation and Loneliness in Older Adults: Opportunities for the Health Care System. National Academies Press, Washington DC, USA.
29. Weber DC, Fleming KC, Evans JM (1995) Rehabilitation of geriatric patients. *Mayo Clin Proc* 70: 1198-1204.
30. Berk B, Cifu D (2017) Geriatric rehabilitation - From Bedside to Curbside. Taylor and Francis Group, Boca Raton, Florida, USA.
31. Koleva I, Avramescu E (2017) Grasp and Gait Rehabilitation-Text - New PDF. SIMEL PRESS, Sofia, Bulgaria.
32. Cucurullo S (2004) Physical Medicine and Rehabilitation Board Review (4th edn). Demos Medical Publishing, New York, USA.
33. World Health Organization (2005) The International Statistical Classification of Diseases and Health-Related problems ICD -10 (2nd edn). WHO, Geneva, Switzerland.
34. World Health Organization (2001) International Classification of Functioning, Disability and Health (ICF). WHO, Geneva, Switzerland.
35. Bethoux F, Calmels P (2003) Guide de mesure et d'évaluation en médecine physique et de réadaptation. Roche, Paris, France.
36. Castaigne A, Lejonc J-L, Schaeffer A (1981) Sémiologie médicale : Initiation à la physiopathologie. Laboratoires Sandoz, Paris, France.
37. Fawcett AL (2013) Principles of Assessment and Outcome Measurement for Occupational Therapists and Physiotherapists: Theory, Skills and Application. John Wiley & Sons Ltd, England, UK.
38. American College of Sports Medicine (2014) ACSM's Guidelines for Exercise Testing and Prescription. American College of Sports Medicine, Indiana, USA.
39. Gupta A (2008) Measurement Scales Used in Elderly Care. Radcliffe Publishing, Oxford, USA.
40. Boubee M (1975) Bilans analytiques et fonctionnel sen rééducation neurologique. Tome 1. Tronc et membres inférieurs, Masson, Paris,.
41. Boubee M (1975) Bilans analytiques et fonctionnels en rééducation neurologique. Tome 2. Membres supérieurs et bilans spécifiques. Masson, Paris, France.
42. Petty NJ, Moore AP (2003) Exploración física. In: Petty NJ, Moore AP (eds.). Exploración y evaluación neuro-musculo-esquelética - un manual para terapeutas. Segunda edición. Madrid, Spain.
43. Levi-Montalcini R (2006) Neurological Disorders: Public Health Challenges. World Health Organization, Geneva, Switzerland.
44. Cyriax JH, Cyriax PJ (1993) Cyriax's Illustrated Manual of Orthopaedic Medicine (2nd edn). Butterworth-Heinemann, Wellington, New Zealand.
45. Keysor JJ (2003) Does late-life physical activity or exercise prevent or minimize disablement? A critical review of the scientific evidence. *Am J Prev Med* 25: 129-136.
46. Kisner C, Colby LA (2007) Therapeutic Exercise: Foundations and Techniques (5th edn). F. A. Davis Company, Philadelphia, USA.
47. Grabbe JW (2017) Recent advances in Geriatric medicine. An interdisciplinary approach to Geriatric medicine. Bentham Books, The State University of New York, Plattsburgh, USA.
48. MacLeod RD, Van den Block L (2019) Textbook of Palliative Care. Springer Nature, Switzerland.
49. Koleva IB, Yoshinov RD, Yoshinov BR (2018) Physical Analgesia. Editions Publibook. Pg no: 143.
50. Koleva I, Yoshinov B, Yoshinov R (2019) Clinical Neurorehabilitation CLINICAL NEURO- REHABILITATION (Monograph). SIMEL Press, Sofia, Bulgaria.
51. Koleva I, Yoshinov B, Yoshinov R (2020) Orthopedic rehabilitation. SIMEL Press, Sofia, Bulgaria.
52. Davis JW, Shapiro MF, Kane RL (1984) Level of care and complications among geriatric patients discharged from the medical service of a teaching hospital. *J Am Geriatr Soc* 32: 427-430.
53. Fabiani-Longo D, Bishop K, Mullen J (2017) Physical Changes in Age. In: Grabbe JW (ed.). Recent Advances in Geriatric Medicine. Bentham Books, The State University of New York, Plattsburgh, USA.
54. Owsley C, Allman RM, Gossman M, KellSh, Sims RV, et al. (2000) Mobility Impairment and Its Consequences in the Elderly. In: Clair JM, Richard M, Allman RM (eds.). THE GERONTOLOGICAL PRISM: Developing Interdisciplinary Bridges. Taylor & Francis Group, University of Alabama at Birmingham, UK.
55. Hoenig HM, Rubenstein LZ (1991) Hospital-associated deconditioning and dysfunction. *J Am Geriatr Soc* 39: 220-222.
56. Ribeiro F, Oliveira J (2007) Aging effects on joint proprioception: the role of physical activity in proprioception preservation. *European Review of Aging and Physical Activity* 4: 71-76.
57. Pickard CM, Sullivan PE, Allison GT, Singer KP (2003) Is there a difference in hip joint position sense between young and older groups? *J Gerontol A BiolSci Med Sci* 58: 631-635.
58. Barrack RL, Skinner HB, Brunet ME, Cook SD (1983) Joint laxity and proprioception in the knee. *Phys Sportsmed* 11: 130-135.
59. Yan T, Hui-Chan CW (2000) The ability to detect movement of the knee joint is decreased with aging. *Arch Phys Med Rehabil* 81: 1274.
60. Petrella RJ, Lattanzio PJ, Nelson MG (1997) Effect of age and activity on knee joint proprioception. *Am J Phys Med Rehabil* 76: 235-241.
61. Tsang WW, Hui-Chan CW (2003) Effects of tai chi on joint proprioception and stability limits in elderly subjects. *Med Sci Sports Exerc* 35: 1962-1971.
62. Gauchard GC, Jeandel C, Tessier A, Perrin PP (1999) Beneficial effect of proprioceptive physical activities on balance control in elderly human subjects. *Neurosci Lett* 273: 81-84.
63. Rosenberg IH (1989) Summary comments. *Am J Clin Nutr* 50: 1231-1233.
64. Evans WJ (2010) Skeletal muscle loss: Cachexia, sarcopenia, and inactivity. *Am J Clin Nutr* 91: 1123-1127.
65. Goodpaster BH, Park SW, Harris TB, Kritchevsky SB, Nevitt M, et al. (2006) The loss of skeletal muscle strength, mass, and quality in older adults: The health, aging and body composition study. *J Gerontol A Biol Med Sci* 61: 1059-1064.

66. Müller MJ, Geisler C, Pourhassan M, Glüer CC, Bösly-Westphal A (2014) Assessment and definition of lean body mass deficiency in the elderly. *Eur J Clin Nutr* 68: 1220-1227.
67. Santilli V, Bernetti A, Mangone M, Paoloni M (2014) Clinical definition of sarcopenia. *Clin Cases Miner Bone Metab* 11: 177-180.
68. Sayer AA, Cruz-Jentoft A (2022) Sarcopenia definition, diagnosis and treatment: Consensus is growing. *Age Ageing* 51: afac220.
69. Correa-de-Araujo R, Hadley E (2014) Skeletal muscle function deficit: A new terminology to embrace the evolving concepts of sarcopenia and age-related muscle dysfunction. *J Gerontol A Biol Sci Med Sci* 69: 591-594.
70. Cruz-Jentoft AJ, Baeyens JP, Bauer JM, Boirie Y, Cederholm T, et al. (2010) Sarcopenia: European consensus on definition and diagnosis: Report of the European Working Group on Sarcopenia in Older People. *Age Ageing* 39: 412-423.
71. Prado CM, Lieffers JR, McCargar LJ, Reiman T, Sawyer MB, et al. (2008) Prevalence and clinical implications of sarcopenic obesity in patients with solid tumours of the respiratory and gastrointestinal tracts: A population-based study. *Lancet Oncol* 9: 629-635.
72. Dent E, Morley JE, Cruz-Jentoft AJ, Arai H, Kritchevsky SB, et al. (2018) International Clinical Practice Guidelines for Sarcopenia (ICFSR): Screening, Diagnosis and Management. *J Nutr Health Aging* 22: 1148-1161.
73. Singh NA, Quine S, Clemson LM, Williams EJ, Williamson DA, et al. (2012) Effects of high-intensity progressive resistance training and targeted multidisciplinary treatment of frailty on mortality and nursing home admissions after hip fracture: a randomized controlled trial. *J Am Med Dir Assoc* 13: 24-30.
74. Tieland M, Dirks ML, van der Zwaluw N, Verdijk LB, van de Rest O, et al. (2012) Protein supplementation increases muscle mass gain during prolonged resistance-type exercise training in frail elderly people: a randomized, double-blind, placebo-controlled trial. *J Am Med Dir Assoc* 13: 713-719.
75. Churchward-Venne TA, Tieland M, Verdijk LB, Leenders M, Dirks ML, et al. (2015) There are no nonresponders to resistance-type exercise training in older men and women. *J Am Med Dir Assoc* 16: 400-411.
76. Howlett SE, Rutenberg AD, Rockwood K (2021) The degree of frailty as a translational measure of health in aging. *Nat Aging* 1: 651-665.
77. Rockwood K, Song X, MacKnight C, Bergman H, Hogan DB, et al. (2005) A global clinical measure of fitness and frailty in elderly people. *CMAJ* 173: 489-495.
78. Fried LP, Cohen AA, Xue QL, Walston J, Bandeen-Roche K, et al. (2021) The physical frailty syndrome as a transition from homeostatic symphony to cacophony. *Nat Aging* 1: 36-46.
79. Dent E, Morley JE, Cruz-Jentoft AJ, Woodhouse L, Rodríguez-Mañas L, et al. (2019) Physical frailty: ICFSR international clinical practice guidelines for identification and management. *J Nutr Health Aging* 23: 771-787.
80. Evans WJ, Morley JE, Argilés J, Bales C, Baracos V, et al. (2008) Cachexia: A new definition. *Clin Nutr* 27: 793-799.
81. Mora JC, Valencia WM (2022) Physical Activity and Exercise for Older Adults. In: Whitehead J, Durso SC (eds.). *Reichel's Care of the Elderly* (8th edn). Clinical Aspects of Aging, Cambridge University Press, New York, USA.
82. Institute of Medicine (US) Committee on a National Research Agenda on Aging (1991) *Extending Life, Enhancing Life: A National Research Agenda on Aging*. National Academy Press, Washington, D.C., USA.
83. PPE (1995) *The Threshold of Discovery: Future Directions for Research in Aging*. Report of the Task Force on Aging Research, U.S. Department of Health and Human Services, USA.



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