

Perspectives of inpatient neurological rehabilitation in elderly patients

MUREȘAN Dorin Alexandru^{1,3}, STĂNESCU Ioana^{2,3}, BULBOACĂ Adriana Elena²,
FODOR Dana Marieta², BULBOACĂ Alexandra Ina²

Corresponding author: **Ioana C Stanescu**, E-mail: ioana.stanescu.umfcluj@gmail.com



1. Department of Sport and Physical Education Science, Babes-Bolyai University, Cluj-Napoca
2. University of Medicine and Pharmacy "Iuliu Hatieganu", Cluj
3. Clinical Rehabilitation Hospital, Cluj

Abstract

Demographic data record an increasing number of people aged over 65 years, with specific health conditions and a high probability to suffer from chronic diseases, cognitive impairment or loss of autonomy, and with limited functional reserve. The prevalence of disability increases with age, affecting 33% of men and 42% of women aged over 85 years. Many neurodegenerative disorders increase in prevalence with age. Thus, the need for rehabilitation treatment in this segment of population is very high, loss of functioning being the most prominent condition for admitting elderly persons in rehabilitation facilities. Rehabilitation in the elderly is an important tool in regaining autonomy, associated with substantial reduction in the burden of health and social costs. Patients aged over 80 years need a comprehensive geriatric assessment (CGA) to establish the global capabilities of the person for inclusion in a coordinated therapy plan and a long term follow-up. CGA will identify patients with severe or complicated medical conditions and important disability who require a multidisciplinary team and a coordinated rehabilitation program, accessible only in rehabilitation hospitals. Rehabilitation treatment should start from the intensive care unit, and continues until the patient reaches a plateau of maximal functional improvement. The most useful therapeutic interventions in old people are physical and occupational therapy, and, for selected and stable patients, therapy in a balnear resort is an option to improve their quality of life.

Key words: *geriatric population, rehabilitation, loss of autonomy, old patients,*

Introduction

Worldwide, life expectancy of population is rising, with an increasing number of people aged more than 65 years: more than 800 million (about 12% of world population) are older than 60 years (1). According to World Health Organization (WHO), octogenarians are currently about 15% of the elderly population over 65 years, the "oldest old" (aged over 85) representing 12% of this population in highly developed countries and 6% in countries under development. There is a prediction for increase in population aged 85-and-over with 351% between 2010 and 2050, compared with an increase of 22% in population younger than 65 years. Furthermore, the number of centenarians is predicted to increase 10 times until 2050 (2) and by 2047 the number of old people is projected to exceed the number of children (1).

Aged persons frequently suffer from chronic illness: 17,4% have four or more chronic conditions, 50% have at least two and 80% have at least one (3). Elderly people have a high probability to suffer from severe health conditions; most common causes of

years lived with disability (YLDs) are mental and behavioral disorders and musculoskeletal pathology (4). Moreover, the functional reserve of old persons is limited, and mild events such as falls, infections or hospitalizations may decrease the ability of patients to return home. Loss of autonomy could also appear without a precipitating event, due to limited functional reserve of geriatric population (5).

Neurologic disability in the elderly and importance of rehabilitation

The prevalence of disability increases with advancing age; some authors report that 33% of men and 42% of women over 85 years had severe disability (6). Multiple chronic conditions in the elderly, including neurologic diseases, are associated with increased levels of disability. Other factors involved in disability are high vulnerability of older population, with potential rapid deterioration after acute injuries, combined with physical deconditioning, poor diet or smoking (6).

According to epidemiological studies, 10-20% of people aged between 60 and 80 years are estimated to have one of the three most frequent neurological diseases: stroke, Alzheimer's disease or Parkinson's disease (7). Many neurodegenerative disorders increase in prevalence with age. The prevalence of Parkinson's disease is 1,902.98 per 100,000 in persons over 80 years (8). Stroke and vascular dementia, highly prevalent conditions in elderly population, are preventable. According to Bejot, total number of strokes will increase with 55% by 2030, related to increased incidence of strokes in people over 75 years old (65% versus 25% stroke incidence in < 75 years old) (9-10). The prevalence of dementia increases with age, affecting almost 50% of octogenarians (11).

Fortunately, disability episodes in the elderly could be brief and reversible in one to two months, making rehabilitation treatment an important tool in regaining autonomy. Moreover, patient's needs and abilities could fluctuate over time, requiring readjustments of treatment goals and methods (5).

Thus, improvement of disability in the elderly through rehabilitation treatment, will lead to an increase in self-care and autonomy, with a substantial reduction in the burden of health and social costs for this category. The primary goal of rehabilitation is to enable functioning at highest level possible, with the presence of an impairment. The need for rehabilitation treatment in this segment of population is very high, explained by the growing number of persons older than 80 years and by the severe health conditions specific to this category (12). WHO defines rehabilitation as an active process by which those affected by injury or disease achieve a full recovery or, if a full recovery is not possible, realize their optimal physical, mental and social potential and are integrated into their most appropriate environment (13).

Assessment of elderly persons before admission in a rehabilitation facility.

Loss of functioning is the most prominent feature related to rehabilitation requests in older adults. Worldwide, accurate identification of older patients which are at risk for poor health outcomes and require geriatric management, is a necessity. Implementation of screening tools for such patients is a health priority in many countries. Proposed scores were Barthel Index (BI) (14) and the Identification of Seniors at Risk (ISAR) score (15).

The ISAR score is one of the most commonly used screening tools with high sensitivity for the prediction of poor health outcomes in older persons (16). This score consists on six yes/no answers regarding need of help and hospitalizations prior to the actual medical visit, and questions about drug treatment, visual problems and memory complaints (17). An ISAR score ≥ 2 indicates risk of poor outcome, and states the necessity of a specialized geriatric evaluation before admission in hospital or in rehabilitation facility.

People over 80 years are frail because they usually have multiple and complex medical problems. During hospital admission, a decline in patient's independence is expected, possibly induced by acute illnesses, decline in physical and cognitive functioning, increased risk for falls and delirium. Each patient over 80 years with ISAR score ≥ 2 needs a comprehensive geriatric assessment (CGA) before inclusion in a rehabilitation program. CGA consists in assessing patient's medical, functional and psychological capability to undergo a rehabilitation program. The key domains evaluated during CGA are: presence of specific medical conditions, cognition, language and psychological status, vision and hearing, swallowing and nutrition, sphincterian continence, physical function and activities of daily living (ADL). Also, risk evaluation (for falls, or pressure sores) and social environment (home, caregiver or family support) are included (6). CGA is in fact an interdisciplinary diagnostic process used to determine the global capabilities of a frail elderly person to be included in a coordinated plan for treatment and long term follow-up (18). A Cochrane systematic review which evaluated CGA utility on 10,000 inpatients, has demonstrated that patients which had CGA assessment had a longer life expectancy and were less likely to be institutionalized at 12 months than patients with general medical care (19).

CGA should usually be performed by a specialized geriatric team, either on a geriatric ward, or on a rehabilitation facility (20). With CGA, old patient's needs of care are appropriately identified, leading to a better management of medical and rehabilitation treatment to maximize recovery and return to previous levels of functioning. Abnormal geriatric risk assessment by CGA is associated with longer hospitalization and higher amount of nursing and physiotherapy during hospital stay, greater risk of falling, and a lower percentage of successfully terminated treatment in older in-patients (21).

Settings of rehabilitation services for elderly people

Patients with single or uncomplicated health conditions require usually access to outpatient rehabilitation services, therapy being delivered by a single specialist (e.g. physiotherapist, speech-language therapist, etc.). Patients with severe or complicated medical conditions and with important disability require a multidisciplinary team and a coordinated rehabilitation program to address their complex needs, accessed only in rehabilitation hospitals (12).

Rehabilitation therapy in acute hospitals. In medical, surgical or Intensive Care Units (ICU), rehabilitation starts with assessment of patient's physical and mental capacity to participate in the therapy. Close collaboration of therapists with medical staff is needed to evaluate the appropriate time for rehabilitation therapy: patient with hemodynamic stability, appropriate mental status and optimal pain management. Patients in ICU, even on ventilator, and patients with respiratory failure (after pneumonia, for example) can benefit from early mobilization (22). Mobilization could be started, if possible, on postoperative day, even after knee of hip replacement surgery (23). In acute stroke, timing and intensity of very early mobilization are under debate. In AVERT study it has been demonstrated that higher dose and very early mobilization in the first 24 hours post-stroke, was associated with a reduction in the chance of favorable outcome at 3 months (24). Better results were obtained if physical therapy sessions were shorter and more frequent; early occupational therapy could also be beneficial for selected old patients in Stroke Units (25-26). Rehabilitation therapists are also involved in discharge planning of acutely ill patients.

Efficiency of inpatient rehabilitation has been demonstrated in a systematic review of 89 randomized controlled trials including 97,000 old people. Patients which undergone multifactorial care and rehabilitation had reduced nursing home admissions compared with those who did not. Falls and acute hospital readmissions were also reduced, but there was no reduction in deaths (27).

Rehabilitation therapy in post-acute period. Post-acute settings for geriatric patients includes rehabilitation hospitals, geriatric services, long-term care hospitals, outpatient facilities or home-based. In determining the appropriate location for discharge and continuation of rehabilitation treatment, multiple factors need to be considered in patients over 80

years old. Admission in a rehabilitation hospital is recommended for patients with:

- Specific neurologic conditions – such as stroke, spinal cord injury, traumatic brain injury, multiple sclerosis, Parkinson disease or muscular diseases, which implied intensive rehabilitation treatment at highest levels.

- Medical stability : patients with complex medical problems (like spasticity, sphincterian dysfunctions) which require regular physician assessment and close medical and nursing care, are better discharged in inpatient rehabilitation facility.

- Preserved cognitive function: patients which are able to participate in rehabilitation therapy, could achieve their therapeutic goals in a rehabilitation facility. Patient's motivation and therapy tolerance are other important factors in choosing inpatient or outpatient rehabilitation program.

- Complex rehabilitation programs: conditions which required more than one type of rehabilitative intervention, offered only by a multidisciplinary team (e.g. physical therapy, visual rehabilitation, occupational therapy and speech-language therapy) are admitted in rehabilitation hospitals (12, 28).

- Low degree of pre-existent disability: patient which was previously independent; patients which required permanent assistance from another person previous to acute neurologic event, are unlikely to become independent again, and they will be discharged in a nursing home.

All other category of aged persons: patients with orthopedic impairments or amputations, which usually require single therapeutic interventions, patients with uncomplicated health problems which could be followed by specialized nurses under medical supervision, patients with impaired cognitive functions or without tolerance at intensive rehabilitative treatment – should be admitted in long-term hospitals or nursing homes. For this category of patients, implementation during hospitalization of a nursing program centered on basic self-care, will improve functional outcomes (29).

Hospitalization in geriatric units offers important functional benefit in patients aged over 80 years, with improvements in home discharge rates (27).

Rehabilitation therapy for aged persons in balnear facilities - uses natural therapeutic factors with recognized healing properties, based on their chemical, mechanical and thermal body effects (30). Aged patients with medical or neurological disorders could be admitted for balnear treatment if their

medical condition is stable. Effect of combined therapies (mineral water baths, mofettes, crenotherapy, aerotherapy, along with kinesitherapy, massages and electrotherapy) lasts at least 2 months for persons over 80 years old (31). Beneficial effect of natural therapeutic factors, combined with kinesitherapy and specific local techniques (mofettes, mineral waters, carbonated baths) has been demonstrated by many studies in old stable patients, suffering of stroke, cardiovascular diseases (32-33). Also, in older patients suffering of multiple medical conditions, balnear treatments in specific resorts, potentiate the regenerative capacity of the body and neutralize the toxic effect of external substances (e.g. alcohol) (34-35).

Rehabilitation interventions for neurologic elderly patients

- **Physical therapy:** Physical activity is beneficial for reducing overall morbidity and mortality in older adults (36). Exercise tended to decrease mortality risk in clinical populations (mostly people with cognitive decline or cardiac disease), which reinforces the role of exercise as a core therapeutic element for treating prevalent diseases in older people (37). Tolerance of cardiac muscle to effort-induced ischemia could be increased by using antioxidant and cardio-protective agents (38). Physical exercises reduces also the risk of falls, a physical activity program have been demonstrated to be more effective in men than in women, in reducing the rate of all serious fall injuries, including fractures and admissions to hospital (39).

The physical activity recommendations intended for all older adults need to be modified for specific medical disorders, such as decompensated cardiac diseases, chronic pulmonary conditions, acute/subacute stroke, or neurosurgical procedures. Physical therapists will adapt exercises to patient's specific condition and needs (12).

Progressive resistance exercise (ie, weightlifting) can significantly improve muscle strength and, to a lesser extent, functional activities (12). Resistance exercises can improve strength and gait velocity, especially in frail patients with slowed gait. Knee extension machines are effective to strengthen quadriceps; chair rises with weight vests or weights attached to the waist (waist belts) are an alternative to leg press machines (40). Vibration therapy provides a non-invasive, cyclic mechanical stimulation that has been shown to improve

quadriceps muscle strength, balancing, and movement velocity (41).

A recent study demonstrated that specific perturbation-based training program may be more efficient in preventing falls in seniors (75 years old) compared to traditional approaches (muscle strength exercises for lower extremity). It has been demonstrated on experimental studies that execution of different motor tasks on unstable surfaces increases the activation of the muscles and the perception of sensory signals used in sensory-motor integration. Unpredictable fluctuations and disturbances in the neural information, which could be simulated by certain exercises, processing facilitates the ability of the nervous system to respond with appropriate motor commands to the changing environment (42).

Dynamic postural training using static and dynamic Biodex balance system had a positive effect on mobility and balance in the elderly (43). Balance training is also an important component of fall prevention for patients with fragility fractures during rehabilitation (41). Pilates exercises improved static and dynamic balance, and increase stability, mobility, flexibility and muscle strength, and decrease the fear of falling and in the number of falls in the elderly (44). Dynamic balance training can involve slow movements in single stance, simple tai chi movements, tandem walking, turns while walking, walking backwards, walking over a virtual object (eg, a 15-cm stripe on the floor), slow forward lunges, and slow dance movements. Multicomponent balance training is probably most effective in improving balance (40)

The best exercise regimen in older people would be moderate-intensity, multicomponent training comprising balance exercises (eg, balance, strength training for the lower limbs, and aerobic exercise - walking), performed 2 to 3 times per week, with 30 to 60 minutes (37).

• **Occupational therapy (OT):** address impairments in dexterity, that that commonly affect patient's ability to complete activities of daily living. It is focused on maintaining or optimizing the meaningful occupational performance of the patient within his living and working environment. OT role is to adapt certain activities, to introduce assistive devices and to modify the environment (45). OT include the use of assistive technology and adaptive methods. Assistive technology includes mobility aids (canes, walkers,

wheelchairs), home safety devices and self-care devices, but also sophisticated computerized and electronic technology. Adaptive methods includes training patients to perform usual tasks safer or easier (12).

Conclusions

In recent years, the demographic distribution is under change, and the population is ageing. Old people, especially octogenarians, are usually frail persons, suffering from chronic medical problems, and being at risk to lose their autonomy after every acute event. Regaining lost functions is a long and complex process, requiring material and human resources and a strong family support. There is a tendency to include such patients for inpatient intensive rehabilitation in hospitals. Admission in a rehabilitation hospital requires a complete evaluation from a geriatric team, which will determine the capabilities of an elderly person to be included in a coordinated and intensive plan for treatment and in a long term follow-up. There is a need for development of specific geriatric inpatient and outpatient units, which will complete the frame of neurorehabilitation and functional improvement in geriatric patients.

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