REHABILITATION OF OLDER ADULTS WITH MULTIMORBIDITIES

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Abstract
Multimorbidity poses a severe risk to the aged population. Multimorbidity has numerous outcomes, such as disability, impaired quality of life, and mortality. There is growing evidence regarding the use of rehabilitation techniques in the treatment of elderly people with multimorbidity. The benefits of rehabilitation in geriatric care include improvement in physical function and disability, prevention of polypharmacy, improvement in quality of life, and benefits related to the underlying diseases. Rehabilitation may consist of a broad range of therapeutic methods (i.e., exercises, electrotherapy, and multi-modal therapy). The current narrative review aimed to provide the recent evidence regarding the role of rehabilitation in the management of older adults with multimorbidity.

Keywords: comorbidity; elderly; multimorbidity; older adults; rehabilitation.

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Key Messages for Research and Practice

- The likelihood of having multimorbidity increases with age.
- Multimorbidity is related to disability, impaired quality of life, and mortality.
- The role of rehabilitation methods in the care of older adults with multimorbidity is apparent with certain benefits, such as prevention of polypharmacy, benefits related to the underlying diseases, improvement in physical function, disability, and quality of life.
- Individualized rehabilitation programs should be directed meticulously by considering patients’ needs and preferences.
Introduction

The American Geriatrics Association defines multimorbidity as the presence of two or more chronic medical illnesses, such as common chronic diseases, geriatric problems, and syndromes [1]. Multimorbidity is an important threat to the elderly population, especially in light of the changing demographics and rising number of older patients worldwide. Chronic diseases have become the world’s most significant disease burden and the leading cause of death [2, 3]. Chronic disease-related fatalities were estimated to have accounted for 73.9% of all deaths in 2019 [4]. Because of the high frequency and protracted course of chronic diseases, an increasing number of older individuals are suffering from various chronic diseases [2].

Multimorbidity is related to a variety of negative outcomes, such as mortality, disability, institutionalization, increased use of healthcare resources, and impaired quality of life [1]. It is also related to higher costs before and after a rehabilitation program [5]. Proper management of comorbid conditions is essential. On the other hand, utmost attention should be paid while following single-disease clinical practice guidelines in older adults with multimorbidity, as treating every single disease could result in care that is inappropriate, particularly related to polypharmacy. Management of older persons with multimorbidity include not only treatments/interventions for their illnesses, but also screening, preventive and advanced care. American Geriatrics Society Expert Panel on the Care of Older Adults with Multimorbidity recommends conducting a complete review of the management plan or focusing on a specific aspect of care while evaluating and managing elderly with multimorbidity. Inquiring about the primary concern and paying attention to patient preferences are important. Besides, interactions within and among treatments should be considered meticulously [1]. In this regard, non-pharmacological strategies such as electrotherapy and exercise can be used where appropriate to provide a comprehensive management of the morbidities [6], and prevent from polypharmacy.

The role of rehabilitation methods in the care of older adults with multimorbidity has been extensively studied in recent years [7-9]. The researchers focused on various techniques from home-based practices to technology-assisted rehabilitation protocols [10]. The aim of this article was to review recent evidence regarding rehabilitation techniques in older adults with multimorbidity.

Search methodology

PubMed/MEDLINE and Web of Science databases were searched through. The search included these keywords: “comorbidity”, “elderly”, “older adults”, “rehabilitation”, and “multimorbidity”. Articles written in English, published within the last 5 years were given priority. Case reports, study protocols, and congress abstracts were excluded. The search methodology was set in line with the recommendations for narrative reviews [11].

Comorbid conditions in older adults

The likelihood of having one or more chronic health conditions increases with age [12]. There are numerous comorbidities that elderly people may face. Marmamula et al. studied the prevalence of and risk factors for multi-disability and multimorbidity among elderly individuals in residential care. Of the participants, 37.6% had multimorbidity and 23.6% had disabilities. The researchers proposed a holistic healthcare system that combines health and well-being with rehabilitation to accomplish healthy aging at senior care facilities for the elderly [13].

The diversity of comorbidities/multi-morbidities depends on several factors, such as gender and biopsychosocial factors. Stieglitz et al. investigated the patterns of comorbidity/multimorbidity in middle-aged and elderly women. Hypertension (49.8%), obesity (39.9%), anemia (36.9%), depressive symptoms (32.5%), and diabetes (30.9%) were the five most frequent chronic illnesses and comorbidities. Multimorbidity was assessed to be present in 73.8% of cases. Women 70 years or older were 4.1 times more likely to be impacted by multimorbidity than those 40 to 44 years old. A higher risk and level of multimorbidity was also linked to being widowed, worse childhood health, being unemployed, and a higher level of food insecurity in the home [14].

The benefits of rehabilitation protocols in patients with multimorbidity

Rehabilitation methods have several benefits in the care of older adults with multimorbidity. These include, but are not limited to, the prevention of polypharmacy, benefits related to the underlying diseases, improvement in physical function, disability, and quality of life (Figure 1).

Disease-related benefits of rehabilitation

Disease-specific rehabilitation protocols provide certain benefits in terms of the underlying conditions. Examples include the prevention of falls, enhancement of balance, and improvement in gait and mobility. Exercise programs can also be tailored to address specific comorbidities, such as diabetes, by incorporating glucose-lowering activities or foot care routines. Rehabilitation can also help delay the need for institutionalization and improve the quality of life by reducing pain and improving mood.

In summary, multimorbidity poses a significant challenge for healthcare providers and requires a comprehensive approach to management. Rehabilitation plays a crucial role in addressing the multiple health needs of older adults, promoting functional independence, and improving overall well-being.
diseases. Some examples are cardiac rehabilitation, pulmonary rehabilitation, neurorehabilitation, and orthopedic rehabilitation [15-21]. In terms of cardiac rehabilitation, the goal in elderly population should be to avoid impairment and maintain remaining functional capability. A comprehensive assessment that considers the clinical, functional, emotional, cognitive, and social domains should be used to evaluate every patient. By lowering disability and age-related deconditioning and favorably influencing improved health outcomes in an aging population, exercise-based cardiac rehabilitation programs have been found to be helpful in enhancing function and quality of life. The potential benefit appears to be even more significant for elderly and frail individuals, and the post-hospital syndrome can be avoided by starting treatment early after an acute occurrence. Despite these established advantages, cardiac rehabilitation is frequently underutilized. Given the fact that cardiovascular diseases are frequent and the leading cause of major disability and death in people aged 75 years and above, much work has to be done to persuade elderly individuals to participate in these programs [22].

Neurological conditions such as cerebrovascular diseases (e.g., stroke) are common among older adults. Post-stroke rehabilitation is an essential component of management. The protocols can vary from home exercises (e.g., strengthening exercise with exercise bands) to device-assisted muscle strengthening programs (e.g., isokinetic strengthening) [23] and virtual reality-based rehabilitation [24]. Given the increased frequency of multimorbidity in stroke survivors, adding rehabilitation protocols to concurrent pharmacological regimens would also help reduce the number of medications.

Older adults face numerous musculoskeletal problems, such as inflammatory and non-inflammatory rheumatic conditions [25]. Rehabilitation is an integral part of the management in rheumatological diseases. For instance, exercise therapy is a vital component of fibromyalgia treatment. Self-modified and symptom-limited exercise with sufficient intensity can enhance health and fitness while reducing symptoms [26]. Regarding autoimmune inflammatory rheumatic diseases, exercise therapy can help by improving mitochondrial activity, decreasing endoplasmic reticulum stress, modulating gene expression, and reconditioning immune/inflammatory pathways [27].

![Figure 1](image.png)

**Figure 1.** The benefits of rehabilitation in the management of older adults with multimorbidity.
Vestibular diseases (vestibular hypofunction and benign paroxysmal positional vertigo) are among the main risk factors for falls and fractures in older adults. The risk even gets higher when accompanied by other comorbidities such as vision problems and musculoskeletal diseases. The management of peripheral and central vestibular system diseases includes not only pharmacological therapies but also vestibular rehabilitation, which aims to engage the brain’s adaptive and compensatory systems. Vestibular rehabilitation is particularly indicated in stable vestibular lesions with an insufficient compensating mechanism. There are both specific and non-specific therapy approaches available. Specific strategies include habituation, substitution, adaptation, and otolith relocation. Non-specific methods include endurance training and strengthening exercises targeting balance-related muscle groups. Other vestibular rehabilitation techniques include vibrotactile feedback, vestibular electrical stimulation, and virtual reality [28].

There is a broad range of disorders and disease-specific rehabilitation methods. An individualized rehabilitation protocol targeting the comorbid conditions would improve disease symptoms and disease-related quality of life.

**Improvement in physical function and disability**

Aging adults experience several comorbidities during their lifespan. Many of those conditions interfere with the physical activity of the individuals [12]. Moreover, functional limitations cause a deterioration in quality of life. Findings from the longitudinal analysis of the 2013-2020 Survey of Health, Ageing, and Retirement in Europe (SHARE) showed that middle-aged and older persons with multimorbidity had a lower quality of life overall and were more likely to have functional limitations than those without multimorbidity. Therefore, reducing the likelihood of multimorbidity can improve quality of life and reduce functional limitations [29]. He et al., in their longitudinal study, determined that sleep impairment and low physical activity were individually and strongly linked to a greater chance of multimorbidity. The researchers concluded that the link between multimorbidity and sleep might be altered by physical exercise [30]. A randomized controlled trial by Lo et al. showed that 12-week aerobic training in a rehabilitation center, in combination with telephone-based interviews, could improve vigorous and total physical activity, along with cardiorespiratory fitness in middle-aged and older persons with multiple chronic conditions [31].

Results from two cohorts of middle-aged and elderly adults supported a bidirectional association between multimorbidity and disability. The activities of daily living (ADL) disability and the instrumental activities of daily living (IADL) disability in the future were dose-responsively correlated with the number of disorders at baseline. Compared with people with no chronic diseases, patients with 4 or more diseases were at increased risk for ADL/IADL disability [32]. Therefore, supporting the patients with appropriate rehabilitation protocols focusing on functional disabilities would also be of benefit. The presence of myopenia and dynapenia increases the odds of having multimorbidity [33]. Dynapenia is characterized by a decrease in muscle strength without a reduction in muscle bulk. Elderly persons with dynapenia are more likely to have functional limitations and death [34]. In this context, protocols targeting muscle strength and function may provide further benefits in reducing the risk of multimorbidity.

**Benefits in terms of quality of life**

People’s capacity to live independently is being hampered by the rising burden of multimorbidity, which lowers their quality of life [29]. Rehabilitative techniques can improve the quality of life in the elderly. Pizarro-Mena et al. evaluated the effects of a 12-week structured multicomponent physical exercise intervention in older adults. The sessions (60 minutes) were performed 3 times a week and included education, cardiovascular, flexibility, strength/power, dynamic and static balance exercises, and other psychomotor elements. The program improved quality of life and biopsychosocial health in the elderly [35].

The multimorbidity pattern may modify the impact of an exercise program in older adults. A secondary analysis of a randomized controlled trial showed that different disease combinations were related to specific responses to a multicomponent exercise program. For instance, the psychiatric/cardio/autoimmune pattern experienced the greatest differences in quality of life, while the program was most effective for individuals in the metabolic/colitis pattern according to the Short Physical Performance Battery (SPPB) test [36].

**Prevention of polypharmacy**

Polypharmacy refers to the continual prescription of multiple medications to a patient. It is a global threat to the elderly population due to the potential hazards of medications, drug interactions, and even mortality that can result from polypharmacy [37, 38]. A study performed on elderly people in residential care revealed that
72.5% of the participants were taking at least one prescription for non-communicable diseases [13]. The high prevalence of multimorbidity in this group also reflects the increased risk for polypharmacy.

Rehabilitation techniques can be beneficial in preventing polypharmacy in older adults. For instance, exercise strategies are of great benefit in patients suffering from fibromyalgia [39], a common painful disease in older adults [40]. Generalized pain in fibromyalgia can also be improved by electrotherapeutic techniques such as transcutaneous electrical nerve stimulation and interferential current [6]. Multimorbidity may limit the usage of certain drugs in elderly patients with fibromyalgia. Prioritizing non-pharmacological therapies can decrease the risk of polypharmacy and related adverse events in this patient population [39].

Rehabilitative methods

Rehabilitation refers to a broad range of therapeutic methods such as exercises, electrotherapy, and multi-modal therapy [6, 41, 42]. Aerobic exercises are used mainly to improve endurance. Some examples of aerobic training are walking, jogging and cycling [41]. Flexibility exercises help to increase the range of motion in joints. Resistance exercises are performed to increase muscle strength/power in particular. Free weights (dumbbells) and exercise bands can be used in resistive exercises. Balance exercises are beneficial in preventing falls and fall-related fractures in elderly. The rehabilitation protocols can be supported by several adjuvant techniques, such as taping, particularly in patients with musculoskeletal disorders or chronic painful conditions [43, 44]. Rehabilitation in the elderly can be delivered by using digital health technologies. During the last decade, information and communication technologies (ICTs) and virtual reality tools have been increasingly applied to the care of elderly [45]. Such programs can potentially improve physical function and quality of life in older adults [46].

A smartwatch-supported rehabilitation was found to be feasible in patients who had sustained a hip fracture [47]. E-health can be used to support distance healthcare [48]. It is of benefit in circumstances such as pandemics [49].

The goal of geriatric rehabilitation in patients with multimorbidity is to develop an effective multidisciplinary transitional care plan that involves the patient and carers, resulting in continuous care even following discharge [50]. Sarcopenia and frailty are prevalent among elderly population. Sarcopenia is described as a loss of muscle mass and function, whereas frailty refers to a multi-system impairment. There is some overlap between sarcopenia and frailty, particularly in terms of the physical elements of frailty: poor grip strength, decreased walking speed, and muscle mass [51]. Some older adults with multimorbidity can present with frailty [52, 53]. In such cases, it is important to combat with potential painful conditions, nutritional deficits, and physical weakness. Management of pain improves activities of daily living. Management of malnutrition is associated with better clinical function [50]. Besides, it is essential to develop care practices that are centered on the restoration/maintenance of self-care and interpersonal communication, given the functional and cognitive characteristics of elderly persons [54].

DISCLOSURES

There are no conflicts of interest regarding the publication of this article.

AUTHOR CONTRIBUTIONS

Conception or design of the work: ICB, interpretation of the recent data on the topic: ICB, drafting the work and reviewing it critically for important intellectual content: ICB, final approval of the version to be published: ICB, agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: ICB.

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148


