

# Hospital-associated functional decline and possible interventions based on physical activity, a review of the literature

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## Summary

Hospital functional impairment is defined as the loss of the ability to perform at least one of the basic activities of daily living with respect to the baseline situation of the person (2 weeks before the onset of acute illness). Its prevalence has been increasing due to the demographic transition of the last few years, which has caused aging to become a challenge with great impact on the health of people, their families and the health system. One of the main consequences of the increase in hospitalizations in the elderly is hospital functional impairment. This condition has multiple consequences in the short, medium and long term, which include increased hospital stay, increased costs of care, increased morbidity and mortality, among others. One of the stages of hospital functional impairment, which corresponds to the functional decline during hospitalization, is modifiable; hence the importance of identification and timely management to intervene at risk patients. Among the interventions that are proposed to deal with this condition are specialized geriatric care, comprehensive management with a multidisciplinary team, nutritional support and physical activity. The latter has been shown to have beneficial effects on physical, cognitive and neuropsychiatric symptoms in the elderly; therefore, it has been included in multiple hospital protocols as the main non-pharmacological intervention to reduce dependence and impact on functional hospital deterioration.

The objective of this literature review is to describe the definition, epidemiology, risk factors, complications, factors associated with functional recovery and intervention programs described for the treatment. Additionally, describe the interventions that include physical activity in elderly patients hospitalized for acute pathologies and possible functional outcomes in this population.

## Key words:

Functional decline. Dependence.  
Physical activity. Hospitalization.

## Deterioro funcional hospitalario y posibles intervenciones desde la actividad física, una revisión de la literatura

### Resumen

El deterioro funcional hospitalario (DFH) se define como la pérdida de la capacidad de realizar al menos una de las actividades básicas de la vida diaria respecto a la situación basal de la persona (2 semanas antes del inicio de la enfermedad aguda). Su prevalencia va en aumento por la transición demográfica de los últimos años que ha generado que el envejecimiento se convierta en un reto con gran impacto en la salud de las personas, sus familias y el sistema sanitario. Una consecuencia importante en la hospitalización de los ancianos es el deterioro funcional hospitalario. Esta condición tiene múltiples consecuencias a corto, mediano y largo plazo dentro de las que se incluyen: aumento de la estancia hospitalaria, aumento de los costos en la atención, aumento de la morbimortalidad, entre otros. Una de las etapas del DFH, que corresponde a la declinación funcional durante la hospitalización, es modificable; de allí la importancia de la identificación y manejo oportuno para intervenir a los pacientes en riesgo. Dentro de las intervenciones que se plantean para lidiar con el DFH se encuentra la atención geriátrica especializada, el manejo integral con un equipo multidisciplinario, el soporte nutricional y la actividad física. Esta última, ha demostrado tener efectos beneficiosos sobre la función física, cognitiva y síntomas neuropsiquiátricos en el adulto mayor; por lo que se ha incluido en múltiples protocolos hospitalarios como principal intervención no farmacológica para disminuir la dependencia e impactar en el deterioro funcional hospitalario.

El objetivo de esta revisión de literatura es describir la definición, epidemiología, factores de riesgo, complicaciones, factores asociados a la recuperación funcional y programas de intervención descritos para el tratamiento del DFH. Adicionalmente describir las intervenciones que incluyan actividad física en los pacientes adultos mayores hospitalizados por patologías agudas y los posibles resultados funcionales en esta población.

## Palabras clave:

Deterioro funcional. Dependencia.  
Actividad física. Hospitalización.

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## Introduction

The demographic transition that has been taking place in recent decades has meant that aging has become a global challenge with major implications for the health of people and their families, and health systems<sup>1</sup>.

The World Health Organization (WHO) states that most of the population has a life expectancy of over 60 for the first time in history<sup>2</sup>. In addition, the aging pattern is much faster than in the past<sup>2</sup>; and these demographic alterations have led to changes in health conditions which have become prevalent, affecting public health<sup>3</sup>.

It is estimated that about 10% of the elderly require hospitalisation for acute medical conditions at least once a year<sup>4</sup>. One of the most frequent consequences of this hospitalisation in this population group is hospital-associated functional decline (HFD)<sup>4,5</sup>. HFD has short-, medium- and long-term consequences, and some of these can be severe, leading to a significant consumption of social and health resources<sup>6</sup>.

Physical activity is known to be a fundamental non-pharmacological strategy for healthy aging<sup>7</sup>. It has been shown to have beneficial effects on physical and cognitive functions, and the control of neuropsychiatric symptoms in the elderly<sup>8</sup>. For this reason, it has been included in many health maintenance programmes for such patients and in geriatric rehabilitation plans as an important therapeutic intervention to prevent frailty and dependence<sup>4,9</sup>, conditions which have an impact on the physical and cognitive functions<sup>9</sup>.

This literature review aims to define HFD, describe its epidemiology and the risk factors and complications involved, and report on intervention programmes involving physical activity for elderly patients hospitalised for acute medical conditions.

## Methodology

This paper is based on a review of the available literature on hospital-associated functional decline and physical activity, and is presented as a narrative review.

## Definition

Hospital-associated functional decline (HFD) has been defined on many occasions in terms of loss of function or dependency, decline in the basic activities of daily living (ADLs) and instrumental activities of daily living (IADLs), state of decline and functional impairment<sup>6</sup>. This paper will use the definition most widely accepted and used in recent years. HFD is understood as the loss of the ability to perform at least one of the basic activities of daily living compared to the person's baseline situation (2 weeks before the onset of an acute medical condition)<sup>10</sup>. This deterioration is more related to certain characteristics of the elderly person than the severity of the acute condition itself<sup>11-12</sup>. The literature describes two stages of functional decline: a non-modifiable one corre-

sponding to the acute onset of the condition until admission to hospital and then functional decline once hospitalised<sup>3,4</sup>. This second stage is very important because it can be changed when detected and treated early; hence the importance of hospital protocols for early intervention for patients at risk.

## Epidemiology

The prevalence of HFD is estimated at between 35 and 70% among inpatients over 60, with an incidence on discharge of between 35 and 50%<sup>4</sup>. The literature shows that the prevalence of HFD on discharge is directly proportional to age. It is estimated that it stands at 46% in the over-70s and 88% in the over-90s<sup>4</sup>. Studies with a follow-up after 3 months show the persistence of decline in one or more ADLs in 19% of the population and in 28% after one year<sup>4,5</sup>, this being associated with increased mortality<sup>13,14</sup>.

## Risk factors and identification of patients

HFD is a multifactorial condition more related to the characteristics of the individual and those of hospitalisation than with the severity and characteristics of the acute condition suffered by the patient<sup>4,11,12</sup>.

### Age

The older the patient, the greater the risk of HFD. This has been demonstrated in several studies in which prevalences of up to 23% at the age of 70 and rising to up to 50% in over-85s have been described<sup>5,15,16</sup>.

### Changes with aging

With aging, the expected physiological changes include musculoskeletal changes, loss of muscle mass (sarcopenia), fatty infiltration and decreased bone mineral density, leading to decreased strength, aerobic capacity, frailty and more frequent falls<sup>4,17</sup>. At metabolic level, visceral fat and fatty infiltration of tissues increase, beta-cell mass decreases and the production of adipokines and inflammatory factors augment, leading to proinflammatory states, insulin resistance and a higher prevalence of acute conditions or decompensation of chronic conditions<sup>18</sup>. At cardiac level, the number of cardiomyocytes decreases, and cardiac hypertrophy and vascular stiffness appear, producing greater endothelial dysfunction, vasomotor instability and pulmonary ventilation impairment<sup>4,18</sup>. Neurosensory changes include reduced brain mass and increased cerebrospinal fluid, resulting in a slower processing speed, less focusing of neuronal activity, decreased working memory and, perhaps among the most important consequences, reduced motor skill<sup>18</sup>.

### Baseline situation

The risk factors associated with the individual also include the baseline situation of the patient (2 weeks before the onset of the acute medical condition). Some studies have documented that elderly patients

in a good baseline situation are 2.5 times more likely to recover their baseline state, while those moderately dependent for ADLs (defined as a score lower than 60 on the Barthel scale) are at greater risk of HFD and of it persisting longer beyond discharge<sup>4,19-21</sup>.

## Delirium

Delirium is very frequent among elderly inpatients<sup>5</sup>, with a prevalence of 14 to 24%<sup>22</sup>. Although the mechanism which links them is not known, this is presumed to be due to the increased frequency of falls, incontinence, immobility due to restraints, adverse drug reactions, pressure sores and greater time in hospital<sup>5,23,24</sup>.

## Cognitive impairment

Cognitive decline has been identified in several studies as a risk factor for worse outcomes following hospital discharge<sup>25,26</sup>. Sands *et al.* demonstrated a relationship between cognitive function and functional evolution during hospitalisation<sup>26</sup>. This implies that it is important to carry out an early assessment of the cognitive function of elderly patients admitted to hospital for acute medical conditions.

## Depressive symptoms

The prevalence of depressive symptoms in elderly inpatients ranges from 10 to 25% depending on the diagnostic criteria used<sup>27</sup> and such symptoms are related to a three-times greater risk of HFD<sup>28,29</sup>.

## Polypharmacy

The greater the quantity of medications used, the greater the risk of incorrect prescription and adverse drug reactions<sup>30</sup>. Benzodiazepines and neuroleptics are among the medications which most affect mobility and balance<sup>31</sup>. Elderly patients are more sensitive to the effects of these medications and are slower to eliminate them due to changes in pharmacodynamics and pharmacokinetics resulting from the kidney disorders associated with aging, leading to more complications, such as delirium, falls and fractures<sup>5,32</sup>. Drug reactions are involved in the development of 20 to 25% of HFD<sup>6,33</sup>.

## Immobility

During hospitalisation, elderly patients have low levels of activity and mobility and a relationship between time in bed and drop in Barthel scale score has been described<sup>34</sup>. Studies estimate that elderly patients are immobile for 73 to 83% of their time in hospital<sup>35</sup>. Immobility is of the utmost importance in the first 48 hours of bed rest, which is when it has the greatest impact on reducing functional reserve and aerobic capacity<sup>4</sup>. It is one of the most relevant risk factors because it is susceptible to modification<sup>5</sup>.

## Environment and hospital routines

Hospital care usually focuses on the diagnosis and treatment of acute medical conditions and often leaves aside cognitive, social, family

and functional considerations in the elderly<sup>36</sup>. Many practices contribute to the low mobility of patients, such as the prolonged use of catheters, physical restraints, excessive fear of their falling, acts which disrupt their sleep and the overuse of psychotropic drugs. Such measures probably have no major impact on young people but do on the elderly<sup>5,6</sup>. Physical barriers also pose a problem for mobility. These include raised beds, low chairs, non-adapted bathrooms, poor lighting and obstacles that increase the risk of falls<sup>5,6</sup>.

## Identifying patients at risk

The timely detection of patients at risk would facilitate the early initiation of specific interventions to prevent dependency and the need for residential care, and reduce morbimortality and health costs<sup>4,9,37</sup>. Patients at risk need to be detected in the first 48 hours following admission in order to reduce the associated complications<sup>4</sup>. Easy-to-apply screening scales exist to identify patients at risk, including, for example, the tools *Hospital Admission Risk Profile* (HARP), *Identification of Seniors at Risk of Functional Decline* (SHERPA), *Identification of Seniors at Risk* (ISAR) and the social-familial GJJÓN scale<sup>5,38</sup>.

## Complications

Hospital-associated functional decline has multiple consequences for the health in the short, medium and long terms. These include longer times in hospital, greater use of physical resources, higher health costs, higher readmission rates, loss of autonomy, greater functional dependency, more need for residential care and increased mortality<sup>3-6,17,19,39</sup>. Furthermore, a relationship between not recovering functionally following discharge and increased mortality has been described<sup>5,6,40-42</sup>.

## Factors associated with functional recovery

The factors associated with functional recovery include the early detection of risk factors which benefit from early intervention, the baseline situation at the time of admission (good previous functional reserve) and the potential for recovery<sup>4-6,43,44</sup>.

## Interventions

### Specialised geriatric care and a multidisciplinary team

A type of intervention which has shown some of the best results with elderly inpatients is comprehensive geriatric care<sup>5,6</sup>. This includes multidisciplinary care and a suitable environment for the population, monitoring their entire functional development. It involves geriatric units specialised in the hospital setting with detection and treatment protocols for geriatric syndromes, a multidisciplinary team and early planning for discharge<sup>38,45,46</sup>.

## Nutritional support

The backing of clinical nutrition is very important for elderly patients. Protein intake is important for maintaining muscle mass and potentially increasing muscle strength<sup>4-6</sup>. The recommendations indicate a protein intake of at least 1.2 g/kg/day for over-65s, combined with physical activity, in order to maintain and restore lean mass<sup>47</sup>.

## Physical activity

Physical activity is one of the most relevant non-pharmacological strategies for healthy aging. There are many definitions covering it, so we must start by describing them and differentiating concepts.

WHO defines physical activity as any bodily movement produced by the skeletal muscles that requires energy expenditure<sup>48</sup>. AMEDCO (Sports Medicine Association of Colombia) describes it as any voluntary bodily movement requiring muscle contraction and higher-than-baseline energy expenditure, understood as a complex, voluntary, autonomous human behaviour involving components of a biological, psychological and socio-cultural nature<sup>49</sup>. Physical activity should be distinguished from the activities necessary to stay alive and those aimed at improving the health and lifestyle<sup>50</sup>. The American College of Sports Medicine (ACSM) says that physical activity means moving voluntarily and increasing the metabolism as a result of muscle activity<sup>51</sup>.

According to WHO, exercise is a subcategory of physical activity that is planned, structured, repetitive, and purposeful in the sense that its objective is to improve or maintain one or more components of physical fitness<sup>2,52-54</sup>.

The beneficial effects of physical activity on the health are associated with the modification of biological and psychosocial variables which protect against cardiovascular disease, increase the neurotrophic capacity of the brain, support the growth and maintenance of neural circuits, improve cerebral perfusion and circulation, and increase and maintain muscle mass, among other things<sup>8</sup>.

Physical activity is one of the factors that conditions body activity and favours multiple changes in body composition over the long term, depending on the amount of energy expended and the frequency, intensity and duration of exercise carried out<sup>55</sup>. The benefits of structured physical exercise for the elderly include: decreased incidence of cardiovascular disease; the maintenance of adequate nutritional and metabolic balance; the postponement of insulin resistance associated with aging, reduced bone mineral loss by boosting osteoblastic hormonal activity and bone remodelling; reduced risk of fracture; reduced risk of falls; strengthening of the muscles; improved balance, coordination and agility; the preservation of cognitive function; decreased prevalence of depression; and enhanced social integration<sup>8,56,57</sup>.

A sedentary lifestyle is the main cause of low levels of physical activity and was defined by WHO in 2002 as "little agitation or movement"<sup>58</sup>. In energy terms, a person is considered sedentary when they do not increase on the energy they spend at rest (BMR) by more than 10% in their daily activities<sup>59</sup>.

Studies conducted by WHO and PAHO show that three quarters of the Latin American population have a sedentary lifestyle, with women and the poor leading the trend. The level of physical activity of the elderly population is low compared to studies in some Latin American countries, which highlight lower participation as the population ages<sup>60</sup>.

Prolonged inactivity entails a marked and progressive reduction of muscle mass, flexibility and balance<sup>61</sup>. Inactive behaviour is very common among elderly inpatients. The effects include a loss of muscle mass and aerobic capacity, and increased neuropsychiatric symptoms<sup>62</sup>. In elderly inpatients, physical inactivity is associated with the time patients are alone in their room. They are more immobile in the afternoon, accompanied by neuropsychiatric symptoms<sup>62</sup>.

In the hospital environment, multiple factors are described which prevent inpatients from carrying out physical activity; many of these are modifiable. They include, in addition to the symptoms of the condition itself, the use of medical devices (urinary catheters, prolonged use of venous catheters, fear of falling, etc.)<sup>63</sup>.

As for the standardised creation of physical activity programmes, a major hindrance is the heterogeneity in the way that the mobility of hospitalised adults is measured and defined. In practice, it has been difficult to identify the subgroups of patients who benefit the most from interventions, define the appropriate dose and pinpoint the best time to implement the programmes<sup>64, 65</sup>.

## Exercise programmes described in the literature

It has been reported that physical training, especially of the lower body, can help preserve and improve functional capacity in the elderly<sup>66</sup>. There is evidence that the muscles of older people respond well to intense physical training<sup>66</sup>. Programmes of this kind were first described in 2007 in a Cochrane systematic review with physical activity rehabilitation interventions, walks 3 times a day, changes of position and physical therapy, showing a better functional outcome when physical activity was included compared to conventional hospital care<sup>67</sup>.

Subsequently, physical activity programmes tailor-made for the patient have been described, showing uncertain results; not so when more specific subpopulations or groups of medical conditions have been evaluated<sup>63</sup>.

In another meta-analysis of inpatient rehabilitation programmes for the geriatric population which included 17 clinical experiments that evaluated the effect of rehabilitation (including physiotherapy, occupational therapy or both) compared to conventional care, the results in terms of functional improvement were satisfactory, with a significant decrease in mortality and the need for residential care<sup>67</sup>.

In order to prevent functional decline, physical activity programmes should be initiated within 24 hours of hospital admission<sup>68</sup> and include walking at least twice a day for 20 minutes, and the exercise should be graded, while the optimal dose for prescription is unknown<sup>68</sup>.

As for the duration of interventions, the most recent studies suggest that programmes should be implemented for at least 3 months to

improve physical performance in older adults<sup>69</sup>. Therefore, it is proposed that interventions to prevent physical inactivity should probably be more progressive and adapted to the patient, and not just limited to their time in hospital<sup>62,69</sup>. While the patient is in hospital, it is proposed that the therapy sessions be customised in order to have impact on the times of the day in which greater immobility is displayed (in the afternoon)<sup>61</sup>. One of the most important strategies for effective physical activity programmes is encouragement of the participation of medical staff and family in the comprehensive care of the patient<sup>61,66</sup>.

## Conclusion

HFD is a very common condition among the elderly population of multifactorial origin with multiple associated complications. It is important to identify patients at risk early in order to initiate interventions to promote the autonomy and functional recovery of this population group. Numerous interventions are described in the literature and one of the most important of these is physical activity; however, although its potential benefits when it comes to preventing frailty and dependency, both conditions which affect physical and cognitive functions, are known, there are no methodological models for prescribing exercise for older people in our hospital environment.

## Conflict of interest

The authors declare that they are not subject to any type of conflict of interest.

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