

# CONSENSUS DOCUMENT ON FRAILTY AND FALLS PREVENTION AMONG THE ELDERLY

THE PREVENTION AND HEALTH  
PROMOTION STRATEGY OF THE SPANISH  
NHS

Document approved by the Inter-territorial  
Council of the National Health System  
on 11 June 2014.

This document has been updated in 2026. You can find the new document *Update of the consensus document on prevention of frailty and falls in elderly people (2026)*, via the following link:

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# Consensus Document on Frailty and Falls Prevention among the Elderly

The Prevention and Health Promotion Strategy of the Spanish NHS

Document approved by the Inter-territorial Council of the National Health System on 11 June 2014.

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Declaration of interest:

All participants have signed a declaration of interest through a specific and pre-designed model and process.

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## Table of contents

<b>Acronyms List</b> .....	3
<b>Preamble</b> .....	4
<b>Proposal for the development of intervention</b> .....	10
<b>Assessment and screening</b> .....	11
1) Requirements for inclusion in the programme .....	11
2) Frailty / functional limitation screening.....	11
3) Assessment for determining risk of falls.....	12
<b>Preventive intervention</b> .....	13
Intervention for preventing functional decline .....	13 -
Interventions for the prevention of falls .....	14 -
<b>Monitoring and evaluation</b> .....	16
<b>Annexes</b> .....	17
Annex 1. Situation analysis.....	17 -
Annex 2. Justification of the proposal.....	24 -
Annex 3. Assessment scales for ADL .....	30 -
Annex 4. Performance tests .....	33 -
Annex 5. Frailty scales.....	37 -
Annex 6. Basic recommendations for a multicomponent physical activity - programme.....	39 -
Annex 7. Guidelines for the management of geriatric symptoms .....	44 -
Annex 8. Check List for risks in the home .....	46 -
<b>References</b> .....	49

## Acronyms List -

2DM	Type 2 Diabetes Mellitus
AACC	Autonomous Communities
BADL	Basic Activities of Daily Living
BGS	British Geriatric Society
BMDS	Basic Minum Data Set
COPD	Chronic Obstructive Pulmonary Disease
CVA	Cardiovascular accident
CVD	Cardiovascular disease
DALY	Disability-Adjusted Life Year
DGT	Spanish Directorate-General of Traffic
EHS	European Health Survey
ENSE	Spanish National Health Survey
EU	European Union
GBDS 2010	Global Burden of Disease Study 2010
GDP	Gross Domestic Product
HBP	High Blood Pressure
IADL	Instrumental Activities of Daily Living
INE	Spanish National Statistics System
ISPHC	Information System of Primary Healthcare
KINHS	Key Indicators of the Spanish National Health System
MMSS	Member States
MSSSI	Spanish Ministry of Health, Social Services and Equality
NHS	Spanish National Health System
OECD	Organisation for Economic Co-operation and Development
PHC	Primary Healthcare
PHCCB	Primary Healthcare Clinical Data Base
TFEU	Treaty on the Functioning of the European Union
UII	Unintentional Injuries
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNICEF	United Nations Children's Fund
WHO	World Health Organisation

# Consensus Document on Frailty and Falls among the Elderly

Prevention and Health Promotion Strategy of the Spanish NHS

## Preamble

The Prevention and Health Promotion Strategy of the Spanish National Health System is implemented within the framework of the Strategy for Addressing Chronicity in the NHS. It advocates the progressive development of interventions aimed at improving health and preventing diseases, injuries and disabilities. It was adopted by the Interterritorial Council of the National Health System on 18 December 2013. This document is part of the implementation plan for this Strategy.

Global ageing is great achievement but also a challenge as it is causing important social and political changes, and it will place greater economic and social demands at all levels, especially at the healthcare systems.

Our country has one of the highest life expectancy rates in the world, however, other neighbouring countries are ahead us in terms of healthy life expectancy<sup>1,2,3</sup>. Good health is one of the pillars of a socially and economically thriving society; to achieve years of life free from disability must be one of our society's goals.

The real challenge is to maintain autonomy and independence as people age. Medium-term projections indicate a progressive increase in disability and dependence, which not only relies on the change in the population pyramid but also on other factors that are modifiable and, therefore, for which intervention applies.

In the current social and economic context, where society and health and social systems are being strained, a shift towards prevention and health promotion is mandatory; this will provide double benefits. First of all, to increase wellbeing and social cohesion, and secondly, to work on the system's sustainability over the medium and long term. This document, and the strategy within which it is framed, is proposed as a means to achieving this goal.

In Annex I of this document, the Strategic framework of this work is presented, as well as a detailed situation analysis.

Keeping autonomy and independence as people age is the target of active ageing, a term established by the WHO in the late '90s that can be useful to deal with many challenges regarding ageing. It is defined as “the process of optimising opportunities for health, participation and security in order to enhance quality of life as people age.” This concept encompasses healthy ageing, which includes the maintenance of a good physical and cognitive functional capacity.<sup>4</sup> This concept entails a great strategic relevance; it brings together many measures adopted at international level, like the “European Innovation Partnership for Active and Healthy Ageing” (EIP on AHA), currently implemented at an EU level and completely in line with the interventions proposed in this document.

## **Frailty**

The health of the elderly needs to be measured in terms of function and not in terms of disease as it is this first element that determines life expectancy, quality of life and the resources and support the population will need. The goal is to maintain a level of function that allows the highest degree of autonomy possible for each individual.

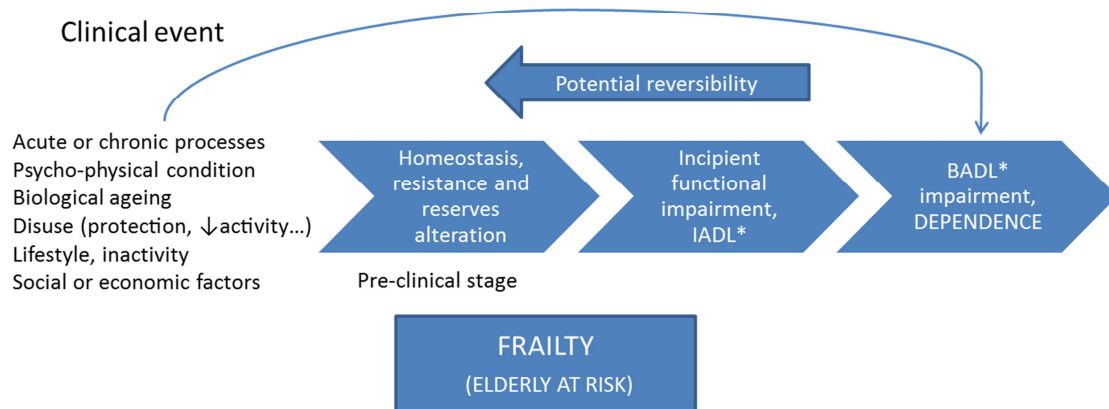
The functional situation previous to the development of disability and dependence is one of the best indicators of health status and it is a better predictor of incident disability than morbidity<sup>5,6</sup>. An approach to this is the concept of **frailty**. Preventing disability acting on frailty is possible, as it can be detected and allows intervention.

Frailty is a state of pre-disability, where there is a risk of developing a new disability from a situation of emerging functional limitation. Its importance comes from the fact that it focuses on the functionality and not on the diagnosis of disease<sup>7</sup>. Frailty is a good predictor of adverse health events in the short, medium and long term<sup>8</sup>. An increasing number of studies support the fact that, among the elderly, it is a better predictor of adverse events and disability than other parameters such as co-morbidity or multi-morbidity<sup>9</sup>. In spite of the important association between frailty, disability and co-morbidity, around 23% and 26% of the elderly who experience frailty do not suffer from disability or co-morbidity<sup>10,11</sup>.

The term frailty was coined several decades ago and has since become a fundamental concept in Geriatrics. Nowadays, there is an overall consensus regarding frailty's core element as that of an increase in vulnerability facing low-intensity stressors. This increase is due to an alteration of multiple and interrelated systems and it leads to a decrease in the homeostatic reserve as well as in the body's adaptability, that predisposes to adverse health events<sup>12</sup>. It allows, therefore, for the identification of a sub-group of people aged over 65 who remain independent unestably and who are at risk of functional decline<sup>13</sup>.

In a recent international consensus document to call for action on frailty<sup>14</sup>, it is recommended that individuals aged over 70 and those with a loss of body weight over 5% within a month due to a chronic disease, should be screened for frailty. Primary Healthcare is the ideal point of care for the detection and handling of frailty, as stated in the most recent update of the Programme of Health Promotion and Prevention Activities (PAPPS, Spanish acronym) in regards to "preventing activities among the elderly"<sup>15</sup>.

Figure 1 Evolution of the frailty and functional capacity in the elderly



\* IADL (instrumental activities of daily living); BADL (basic activities of daily living)

Source: Martín Lesende I, Gorroñoigoitia A, Gómez J, Baztán JJ, Abizanda P. *El anciano frágil. Detección y manejo en atención primaria*. Aten Primaria 2010; 42 (7): 388-93.

Frailty is a risk factor regardless of how severe the adverse health issue is, bearing a relative risk of 2.54 for institutionalisation and a relative risk of death of between 1.63 and 6.03, according to studies<sup>16, 17, 18, 19</sup>. Furthermore, frailty is a powerful predictor of disabilities, hospitalisation, falls, loss of mobility and cardiovascular disease<sup>19,20, 21</sup>.

The Frailty and Dependence Study in Albacete (FRADEA; in Spanish) has shown that among people aged over 70, frailty results in a 5.5 higher adjusted risk of mortality, a 2.5 higher risk of new disability, and a 2.7 higher risk of loss of mobility<sup>22</sup>.

Frailty is associated with being older, being a woman, bearing more disease burden, disability and cognitive impairment, among other factors. Among its causes, several factors have been identified, such as genetic, hormonal, inflammatory, neuromuscular energetic, nutritional factors and oxidative stress<sup>19</sup>.

Research and action on ageing and frailty is a current priority in Europe, as various initiatives have shown. Thus, one of the prioritised actions of the European Innovation Partnership for Active and Healthy Ageing (EIP on AHA) is the early prevention and diagnosis of functional and cognitive impairment, with interventions aimed at tackling frailty. Moreover, the Framework Programme for Research and Innovation 2014 (Horizon 2010) has 6 sub-programmes directly focused on frailty. One of the four programmes of the 9<sup>th</sup> call for proposals from the Innovative Medicines Initiative 2013 focus on "developing innovative therapeutic interventions against physical frailty and sarcopenia, as a prototype geriatric indication."

Spain currently plays a leading role in the frailty research at a European level; it has provided data of 6 longitudinal cohorts such as the FRADEA Study in Albacete<sup>22, 23</sup>, the study on Healthy Ageing in Toledo<sup>24</sup>, the Peñagrande and Leganés Studies<sup>10, 25, 26</sup> (in Madrid), the Octabaix Study<sup>27, 28</sup> in Barcelona and the FRALLE Study in Lleida<sup>29, 30</sup>.

The estimated prevalence of frailty in various international studies ranges from 7% to 12%. In a recent systematic review, the average prevalence of frailty in people over 65 living in the community was 9.9% (CI95%: 9.6-10.2%). Prevalence was higher in women

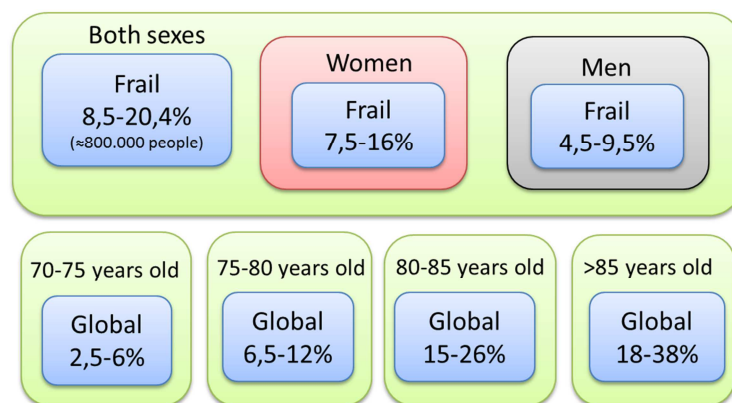
(9.6% compared to 5.2% amongst men) and older people, reaching more than 25% in people aged 85 years or older<sup>31</sup>. In this review, an estimated 44.2% of the studied population were at risk of becoming frail in the two following years.

The data from the Spanish studies confirm the seriousness of frailty among elderly individuals living in the community. The studies that share the same perspective on frailty as that of the Fried phenotype show prevalence figures that, in the Toledo Study for a Healthy Ageing (ETES, in Spanish)<sup>24</sup>, is estimated in 8.4% of people aged over 64 years old, with a substantial increase in the population aged over 75, reaching 20% of the population aged between 80 and 84 and 27.3% in the over-85 population. In the FRADEA study, in Albacete<sup>22</sup>, prevalence reaches 15.2% for individuals aged over 69 years and who have not been institutionalised. In the Peñagrande study<sup>25</sup>, prevalence reaches 10.5% in individuals aged over 64, and shows a prevalence of 19.1% in those aged over 74. The Study of Leganés estimates the prevalence in the over-75 population as being 20.4%, while FRALLE, (the Lérida study), estimates prevalence for the same age range to be 9.6% (CI95%: 7,6-11,5%). The OCTABAIX study, focused on people older than 85, studied in Primary Healthcare, shows frailty to be prevalent in 20% of those studied<sup>32</sup>.

Studies of the incidence of frailty are harder to find; The Women’s Health Initiative Observational Study, which analysed data from more than 4000 women, shows an incidence of frailty, after three years of follow-ups, that attains 14.8%, and the Cardiovascular Health Study (CHS), with more than 5000 men and women, reports an incidence of 7.2% in 4 years<sup>16</sup>.

Frailty is directly linked to age. Furthermore, it is normally more prevalent in women (see Figure 2).

Figure 2. Prevalence of frailty in the elderly in Spain, by sex and age ranges.



Source: Prepared by the authors based on the data of longitudinal cohorts surrounding ageing in Spain; FRADEA Study (Albacete)<sup>22, 23</sup> Toledo Study for a Healthy Ageing<sup>24</sup>, Peñagrande Study (Madrid)<sup>10, 25</sup>, Leganés (Madrid)<sup>26</sup>, FRALLE Study (Lleida)<sup>29,30</sup>.

In order to reduce frailty it is necessary to act on its main risk factor, inactivity. Inactivity is a core element in the development of frailty, as it is essential for determining cardiovascular health, insulin response and muscle and muscle- skeletal impairment (sarcopenia), while it may also contribute to cognitive damage and depression. Interventions that have focused on physical activity have demonstrated the effectiveness of physical activity in delaying and even reversing symptoms of both

frailty and disability<sup>33</sup>. Physical activity has also been proved to be effective for improving cognitive status and fostering emotional wellbeing<sup>34</sup>. If, in addition, interventions are group-based have the added benefit of promoting wellbeing and social networks among the elderly.

### **Falls**

Falls are defined as involuntary events that cause a loss of balance and hitting the body on the ground or on another firm surface that stops it (WHO, 2012).

Falls are an important cause of disability among the elderly and, at the same time, one of the adverse outcomes of frailty. Approximately, 30% of people aged 65 and older, and 50% of people aged over 80 who live in the community, fall at least once a year<sup>35</sup>. Among the elderly, half have recurrent falls and 50% fall a second time within the same year. Falls are, therefore, a risk factor for suffering new falls. Falls among the elderly have serious consequences: more than 70% of individuals have clinical consequences such as fractures, injuries, sprains, etc. and more than 50% suffer subsequent complications of some sort<sup>36</sup>. 50% of people suffering from a fracture due to a fall do not recover their previous level of function. In addition, one out of every ten falls causes serious injuries, including hip fracture.

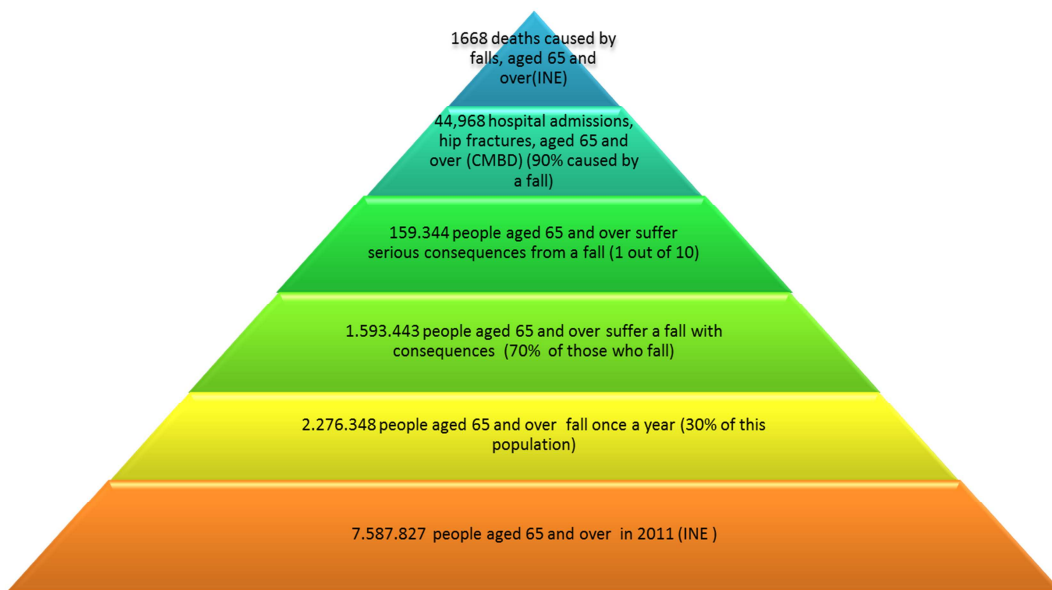
Age is the greatest risk factor for injuries due to falls; older adults are admitted to hospital five times more frequently as a result of falls than they are for other injuries.

The considerable increase in the proportion of older adults has a significant influence on the number and characteristics of the injuries that tend to occur among this age group.

While secondary deaths related to falls are of interest, other consequences of falls are of much higher impact from the perspective of the general health of the population. For each person that dies as a consequence of a fall, it can be calculated that 24 have been hospitalized due to a fracture of the femoral neck/hip fracture; almost 100 have suffered a fall with serious consequences and almost 1,000 elderly individuals have suffered a fall with consequences (Figure 3).

Frequently, the medical consequences of falls, among which the so-called fear of falling stands out, indicate the beginning of disabilities in the elderly<sup>13</sup>.

Figure 3 Consequences of falls in people over 65

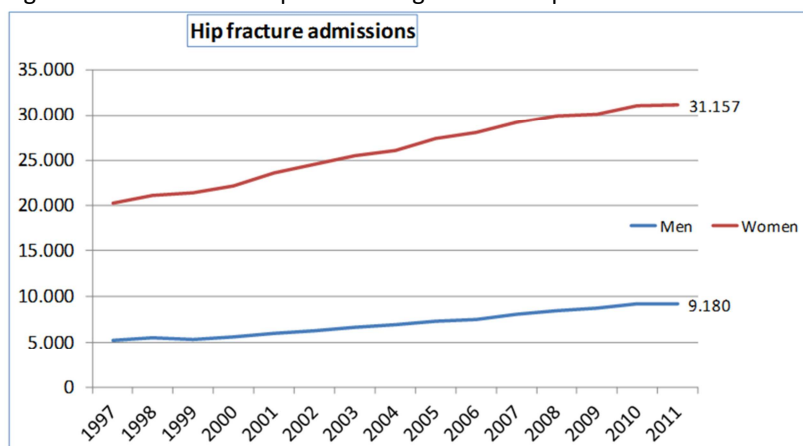


Based on data from the INE, BMDS. 2011

In Spain, the consequences of falls have a high overall cost to the healthcare system. One of the most serious consequences of falls is hip fracture. Among the elderly, hip fracture is the most common reason for hospitalisation in trauma and orthopaedic surgery departments. It is an increasingly significant injury within society as a whole, both in economical and social terms. It is estimated that 90% of hip fractures are due to falls.

The number of hospital visits due to falls has experienced constant increase over the past few years, especially with regard to women. Women have a higher risk of falling than men and also suffer more serious consequences. They also bear a higher rate of hip fractures (three times higher than men, Figure 4). In a 2008 study, it was estimated that the average cost treating patient for hip fracture was €8,365<sup>37</sup>.

Figure 4. Evolution of hospital discharges due to hip fracture.



Source: BMDS. Made by the authors.

# Proposal for the development of intervention

## Goal

To identify and prevent frailty and the risk of falls among the elderly, as a means to avoid and/or delay functional decline and to promote health in the over-70 population.

In order to achieve this, the development of a common basic protocol for the NHS is proposed. This will consist of screening for frailty/ functional impairment and risk of falls and will be implemented in line with preventive intervention in the elderly in the field of PHC.

## Model of intervention and target population

- Organised opportunistic screening for individuals aged 70 and older, who attend Primary Healthcare centres for any reason.
- Active screening for individuals aged 70 and older, integrated in specific programmes already established, i.e. programmes devoted to chronic patients or the elderly.

## Scope of action

Primary Healthcare and community environment, in coordination with specialised and adequate geriatric and hospital resources.

## General description of the intervention

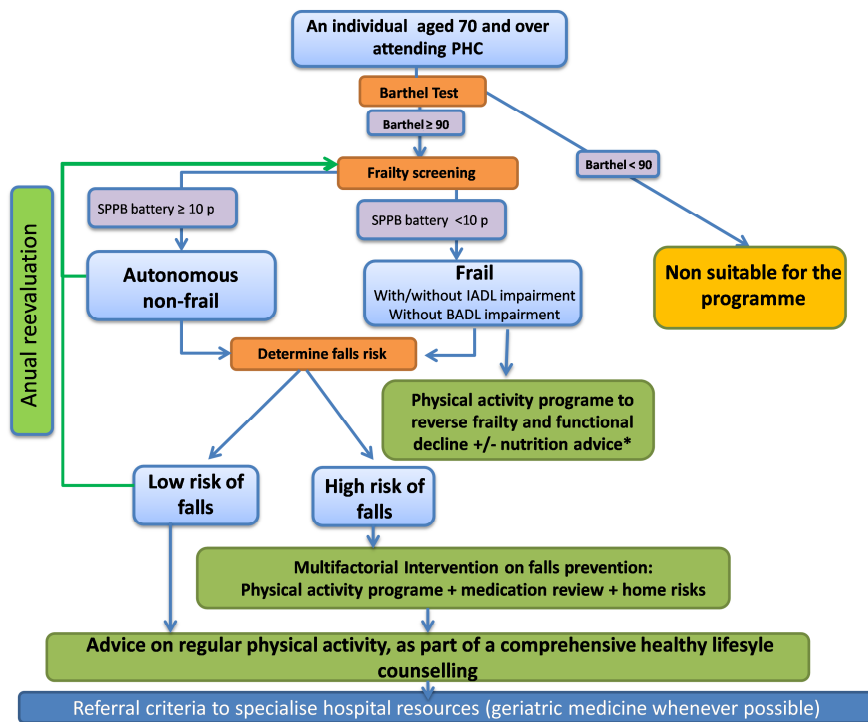
The core element of this intervention is frailty screening for all individuals aged 70 and older, by means of a tool that will allow the detection of early functional decline. An assessment of the risk for falls in the same population will be carried out.

The individual detected as frail will be offered appropriate interventions to reverse this state. The programmes will mostly be designed as multi-competent physical activity carried out in a group environment. Moreover, the population detected as frail will be recipients of a multi-dimensional (clinical-functional-mental-social) assessment, linked to the resolution of the problems detected.

In any case, the intervention proposed here aims to specify the main preventive components included in the eventual plans for intervention and individualised monitoring of these patients:

- In the frail population: specific intervention focused on programmes of multi-component physical activity (that work on aerobic resistance, flexibility, balance and muscular strength), aimed at reverting frailty and preventing functional decline.
- In those where a high risk of falls is detected: multifactor interventions to prevent falls. These include physical activity plan, review of polypharmacy and risk reduction at home.
- In the entire over-70 population: interventions on the promotion of healthy lifestyles, similar to the comprehensive counselling for healthy life styles designed for the adult population by the working group for the implementation of the “The Prevention and Health Promotion Strategy of the Spanish NHS”.

## Intervention algorithm -



\* Preferable framed in a multidimensional assessment (comprehensive geriatric assessment (CGA))

## Assessment and screening

### 1) Requirements for inclusion in the programme

The initial test will be an assessment of the basic activities of the daily living (BADL) by means of a self-rated Barthel scale (see Annex 3).

This assessment will be offered to the patient that comes in for a consultation, regardless of the reason and will be performed by any member of the Primary Healthcare team.

- If an individual's result is equal to, or over, 90, the frailty screening will be performed.
- If the result obtained is below 90 points (indicating a moderate, serious or total level of dependency for BADL), that individual will not be included in the programme, as he or she will not benefit from the intervention described hereby to reverse frailty.

### 2) Frailty / functional limitation screening

The initial screening for determining a situation of frailty/ functional limitation will be performed based on the results of performing tests.

This assessment will be administered by a nurse, or alternatively, by the Primary Healthcare doctor, preferably via a scheduled visit.

- The preferential test to be used will be the performance test, **Short Physical Performance Battery (SPPB)**, which has been validated and standardised in Spain and combines balance, gait speed and chair stand. The reason that this test is prioritised is due to its validity in detecting frailty and its high ability to predict disability, as well as its feasibility of use in Primary Healthcare<sup>38, 39</sup> (see Annex 4).
  - Other options to be used: Timed up-and-go test (TUG) or 4-Meter Walk Gait Speed Test (see Annex 4).
  - There is the possibility of associating the performance test with an assessment scale for the IADL, such as the Lawton scale (see Annex 3), in order to create a benchmark for assessment over time (not as an isolated measurement).
  - In the event that the healthcare centre does not have the physical space required to carry out any of the performance tests, the screening could be done by means of a self-rated scale of frailty, FRAIL or SHARE questionnaire (see Annex 5).

### *3) Assessment for determining risk of falls*

This assessment will be performed after having completed the frailty screening. In order to do this, the following questions will be asked:

- ✓ Have you suffered a fall in the last year that required health care assistance?
- ✓ Have you suffered two or more falls per year? Do you have any significant gait disturbance? (in the event that the performance screening test shows evidence of frailty, a positive response will be assumed).

## Preventive intervention

### *Intervention for preventing functional decline*

After the frailty/ functional limitation screening based on the performance test has been carried out, the person will be classified as one of the following types:

#### 1. - **Autonomous non- frail individuals**

Those individuals with a non-affected result in the performance test (**≥10 points**; alternatively: TUG <20 seconds or gait speed ≥0.8 m/sec).

- A general level of physical activity assessment will be performed, followed by the appropriate counselling, based on the general recommendations for the specific age group of the individual. This will be done according to the agreed protocol for the NHS in relation to comprehensive counselling on healthy lifestyles, within the “Prevention and Health Promotion Strategy of the Spanish NHS”.
- A diet assessment and counselling for a healthy diet will also be performed.
- The steps mentioned above will be included in a comprehensive assessment, along with counselling on healthy lifestyles, following the agreement on “comprehensive counselling on healthy lifestyles in Primary Healthcare linked to community resources”, previously mentioned.

A new frailty screening will be carried out, using the same tool, every year.

#### 2. - **Frail persons**

Those individuals with an abnormal result in the performance test (**SPPB<10 points**; alternatively: TUG≥20 seconds or gait speed <0.8 m/sec.)

- The population classified as frail will receive counselling with simple recommendations on how to carry out a multicomponent physical exercise programme (aerobic endurance, flexibility, balance and muscular strength).
  - ✓ This programme will be developed at a community level, with the resources available in place (centres for the elderly, sport centres, etc.)
  - ✓ The fundamental aspects of the programme (components, characteristics of the exercises, regularity, duration) will be defined in the working group during the implementation process, in order to establish a common standard across the whole of the NHS. In Annex 6, some recommendations are presented to create a multicomponent programme aimed at the frail population.
  - ✓ The Primary Healthcare professionals will hand over a document that has collected the minimum grounds so that it may serve as a guideline for the community resources responsible for implementing the programme.
- The physical activity programme to be advised must be regarded as a real prescription and, as such, will require follow-up visits as deemed appropriate.
- Follow-up visits will be scheduled within six months to assess functional results. This assessment will be developed repeating the same test used for the screening

and assessing the change in the tests over time (see Annex 4 for the level of significant change in each test).

- Furthermore, individuals classified as frail should ideally be eligible for a multidimensional assessment (“comprehensive geriatric assessment”, CGA) within the actions scheduled by the Primary Healthcare team, always with the characteristics and scope appropriate for each territory reality. For an example of guidelines for intervention adapted to the identified issues, please consult Fairhall et al.<sup>40</sup>, translated and adapted with the permission of the author by Martín Lesende et al.<sup>41</sup>. The interesting thing about this example is that it synthesises the findings of relevant cases that can be found to be linked to frailty, and some management guidelines based on evidence or good practices (see Annex 7).
- Referral for hospital care (preferably Geriatrics, wherever this resource is available) will be considered for those individuals meeting any of the following criteria:
  - ✓ Recent functional loss with no evidence of clinical cause
  - ✓ Recent cognitive impairment
  - ✓ Falls: More than two in the past year that required health care assistance or that coexist with impaired balance and walking (BGS).
  - ✓ Situations identified in the multidimensional assessment as eligible for specialised hospital care.

## *Interventions for the prevention of falls*

After assessing the risk of falls, the individual will be classified at high or at low risk for falls.

### **1. - Individuals at low risk of falls**

Those with negative answers to all the three screening questions:

- They will be offered the same assessment and counselling on regular physical activity and healthy diet offered to the autonomous and non-frail population, within the comprehensive counselling about healthy lifestyles.

A new assessment of risk of falls will be performed every year.

### **2. - Persons at high risk of falls**

Those with affirmative answers to any of the three screening questions.

- A preventive intervention will be developed focused on three components:
  - ✓ Physical activity programme of multiple components (aerobic endurance, flexibility, balance and muscular strength), integrated with the programme for the prevention of frailty.
  - ✓ Medication review: Focused on the review of drugs that negatively affect people at high risk of falls according to the STOPP/START criteria. The drugs under consideration are: Benzodiazepines, neuroleptics, first-generation

antihistamines (chlorpheniramine, diphenhydramine, hydroxyzine, promethazine, etc.), vasodilators and long-term use of opiates (see Annex 2).

- ✓ Assessment of home risks through self administered checklists (see Annex 8) +/- “in site” home assessment, taking advantage of the home visits made by the centre's staff (nurse, social worker).
- In addition, those classified as being at a high risk of falls may receive a multifactor and individualised assessment for the risk of falls and a multicomponent intervention focused on the identified risks, within the actions planned by the Primary Healthcare team, always with the characteristics and scope appropriate for each territory reality<sup>42</sup>.
- Referral for hospital care (preferably Geriatrics, wherever this resource is available) will be considered for those persons matching some of the aforementioned criteria for the frail elderly individual.

An annual assessment of the developed intervention will be performed.

## **Implementation**

### **Implementation requirements**

Organisational and technological adaptation throughout the health service.

Motivation of professionals:

- Awareness-raising and training (i.e., through an on-line training tool).
- To consider the incorporation of this programme as a strategic goal in the Primary Healthcare services' management plan.

### **Schedule for implementation:**

It is expected to be a progressive implementation, tailored to the needs and characteristics of each territory.

Schedule for implementation:

- 2015, all Autonomous Communities and Autonomous Cities have initiated the implementation of this intervention.
- 2020, coverage of at least 50% of the target population in each of these territories.
- 2025, national coverage greater than or equal to 80%.

## Monitoring and evaluation

All indicators will be disaggregated (as long as made possible by the source) by age group, sex, socio-economic status and geographic units. Unless otherwise specified, figures will refer to calendar years.

Initial group of Indicators to complete during the implementation:

Table 1: Summary table of impact indicators.

INDICATORS	SOURCES
Healthy life expectancy	
Healthy life expectancy at age 65 .	ENSE
Perceived health status	
% population aged over 65 with negative assessment of their health status.	ENSE-EHS
Functional decline	
% population aged over 65 with limitations for the activities of daily life. Global and by specific dimensions (physical/ mental/ both).	ENSE-EHS
Falls	
Rate of hospitalisations due to hip fracture	BMDS
The number of elderly individuals (65 or older) who died as a result of injury	Deaths according to cause of death SNSI
Impact of interventions	
% population experiencing improved result (significant change) in the initial performance test 6 months after the counselling-intervention.	PHC Information systems
% population at high risk of falls that suffers any fall after the intervention.	PHC Information systems

Table 2: Summary table of process and structural indicators

INDICATORS	SOURCES
Coverage (%) of Primary Healthcare areas that has implemented interventions for prevention of frailty and falls.	Prepared by the authors (periodic survey)
% population aged over 70 assessed for functional situation/ frailty screening.	PHC Information systems
% population aged over 70 assessed for risk of falls.	PHC Information systems
% frail population aged over 70 among whom an intervention has have been implemented (physical activity programme).	PHC Information systems
% population aged over 70 with higher risk of falls among whom an intervention has been implemented.	PHC information systems

## **Annexes -**

### *Annex 1. Situation analysis*

#### **Strategic framework**

##### International strategic framework

Supranational institutions with responsibilities for the protection of health have developed different strategies and instruments, which have been adopted by their member states. Generally, these propose the development of integrated strategic plans to tackle some of the major challenges for health, such as ageing, equity and the increasing burden of chronic diseases as a whole, whilst placing emphasis on active ageing.

##### *Chronic Diseases*

In order to tackle this growing health problem, there was an essential step: the high-level meeting of the General Assembly of the United Nations Organisation (UN) of 2011 on the prevention and control of non-communicable diseases<sup>43</sup>; which established the global goal "25 for 25", namely reducing 25% of premature deaths associated to non-transmittable diseases by 2025.

At a European Union (EU) level, in addition to the health global strategy and several initiatives oriented towards the prevention and control of chronic diseases and their main risk factors, the ongoing "Joint Action of the MMSS on Chronic Diseases and Healthy Ageing across the Life Cycle" is highlighted, where Spain is the coordinator leader<sup>44</sup>.

##### *Ageing*

Active and healthy ageing is another high priority topic in the political agenda. 2012 was the tenth anniversary of the adoption by the United Nations General Assembly of the International Plan for action on ageing in Madrid<sup>45</sup>, and of the regional implementation strategy (RIS) for Europe (UNECE 2002)<sup>46</sup>. Also in 2012, the WHO adopted the resolution WHA 65.3 on "strengthening non-communicable diseases policies to promote active ageing"<sup>47</sup>. Furthermore, we also draw attention to the 2013 Rio Declaration "Beyond Prevention and Treatment: Developing a culture of care in response to the longevity revolution"<sup>48</sup>.

The WHO European region has adopted in its 2012 regional committee the "Strategy and Action Plan for Healthy Ageing in Europe (2012-2020)"<sup>49</sup>, whose first priority action line "healthy ageing across the cycle of life", highlights promotion and prevention, and where intervention for the promotion of physical activity and prevention of falls are some of the priorities.

In the EU, in addition to the prioritisation given to promotion of active ageing across the course of life in the 2020 "Health Strategy", one of the pillars of the "European Innovation Partnership on Active and Healthy Ageing" (EIP on AHA) is for action in prevention, screening and early diagnosis of frailty and functional deficit, in addition to the pillar "age-friendly environments"<sup>50</sup>.

## Strategic and legislative framework in Spain

In relation to the framework for action in this document, in addition to the basic healthcare legislation it is important to mention the **Royal Decree Act 16/2012 for urgent measures to guarantee NHS sustainability**, which established the basic common care services portfolio of the National Health System. This portfolio determines homogeneous prevention health care activities for the whole territory.

Furthermore, the **Act 39/2006, of 14th December, on the Promotion of Personal Autonomy and Care for Dependent Persons**, in its article 21, establishes the legal grounds for the prevention of dependence. Preventing dependence is as important as tackling and addressing, if not more so. Whilst dependence in its early stage, when is still reversible, it is easier to address than when it is clearly established, as is reflected in the norms that have been developed through the Resolution of 23 April 2013<sup>51</sup> and 25 July 2013<sup>52</sup> of the State Secretariat for Social Services and Equality.

The promotion and prevention approach in the healthcare field and, specifically, for Primary Healthcare, is gathered in Annex II of the **Royal Decree 1030/2006, of 15th of September, which establishes the common services provided by the National Health System and the procedure for its updating**, recognising Primary Healthcare as a basic and initial level that guarantees overall and continuous care across the course of life. Among its activities are health promotion and disease prevention, aimed at the individual, the family and the community, in coordination with other levels and sectors involved, such as the social and educational sectors.

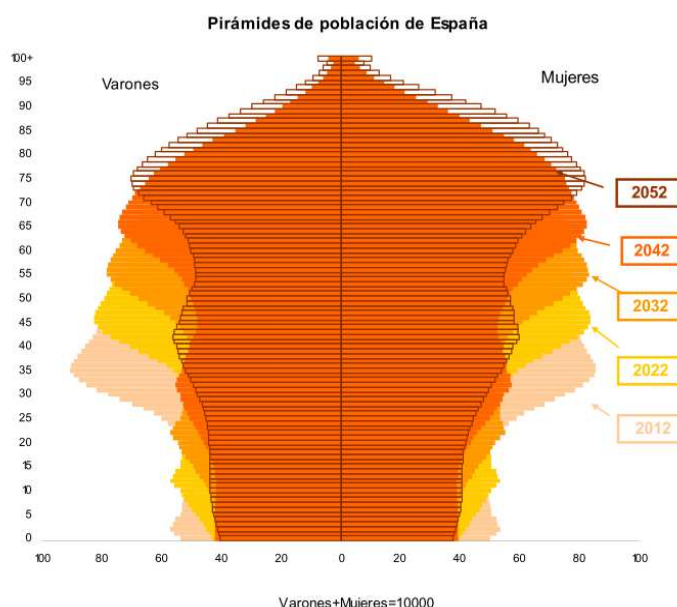
In 2007, within the **1<sup>st</sup> Conference on Prevention and Health Promotion in Clinical Practice in Spain: "Prevention of dependence in the elderly"**, a consensus document was produced on the prevention of dependence in the elderly and its recommendations have been a fundamental guide for producing this document. Among the recommendations oriented towards the prevention on the functional decline and dependence in Primary Healthcare, there were provisions for the implementation and extension of prevention and health promotion measures; the correct approach and management of geriatric syndromes, clinical pictures and medication and the detection and action on "the at risk and frail elderly". This last detection must be based on the screening of incipient functional limitation, by means of performance tests. It was established that, while the detection method was being improved, the recommendation was to do it based on risk factors (>80 years, hospitalisation, cognitive impairment, comorbidity, mobility impairment, poor social support, falls, polypharmacy). The BARBER survey was not recommended due to its structural and content deficiencies, and because there was no evidence of its ability to detect risk of adverse events, despite this, it was referred to extensively within the former Spanish National Institute of Health (INSALUD) and it is currently used in the AACC.

## The ageing population

Undoubtedly, one of the greatest achievements of our society is reflected in the continuous increase of the life expectancy of the population. Spain is one of the countries with the highest life expectancy, reaching, 82.1 years (85 years among women and 79.2 among men) in 2011, with individuals enjoying an average 20.5-year life expectancy at the age of 65 (22.4 among women and 18.5 among men). The population projections for the next few years indicate a continuous increase on these figures and a narrowing of the difference between both sexes <sup>1</sup>.

Since the last century, modern societies are facing two interrelated challenges: the demographic and the epidemiological transitions. This means a shift from communicable to non communicable diseases as the life expectancy rises in the population. This tendency is already global and is in a very advanced phase of evolution in our country, as the demographic data confirms, with a population pyramid practically inversed, and as the studies of burden disease demonstrate, showing a predominance of chronic diseases. The population projections for our country show a continuous process of ageing, fuelled by the decline in the birth rate and negative migration balances. Therefore, in 2052, 37% of the population will be older than 64 and, if the current rates persist, the dependence rate will be around 100% (that is to say, for each person in working age, there will be another potential dependent due to being aged under 16 or over 64). According to the projections, the population segment that will grow the most in the next years is that of individuals aged older than 80, which, in Spain, will go from 2.4 million in 2012 to 6.2 million in 2050. This phenomenon, called “ageing of ageing” is, in addition, mainly feminine, as women will comprise almost 60% of the total <sup>2</sup>.

Figure 5: Population pyramid in Spain. Projections 2012-2052



Source: Long term Population Projection. National Institute for Statistics (INE), 2012.

<sup>1</sup> *Movimiento natural de la población e indicadores demográficos básicos. INE 2012*

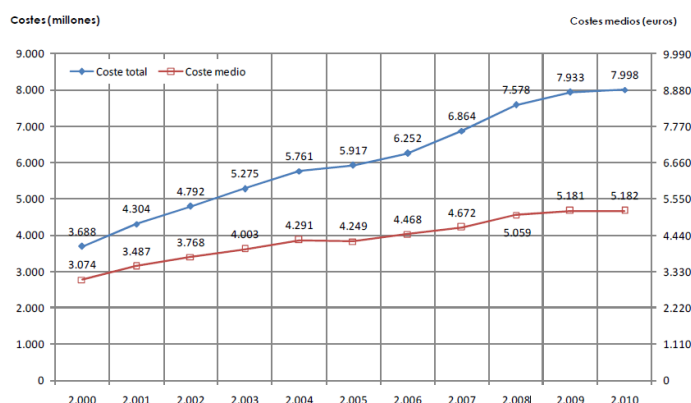
<sup>2</sup> *Proyecciones de población a largo plazo 2012-2052. INE 2012*

## Associated costs

Global ageing is an achievement that poses many challenges. It will cause important social and political changes and will place different economic and social demands at all levels and, especially, at the healthcare system. The Organisation for Economic Cooperation and Development (OECD) estimates an average growth of public spending related to ageing, in health care and long-term care, of 3.5 points of GDP for 2050<sup>53</sup>. At an EU level, growth in health care spending is estimated to be 1.5 points of GDP (1.2 for long-term care spending) for 2060<sup>54</sup>. According to the same estimate, in Spain, these figures will be 1.6 and 0.9 points over GDP, respectively. These projections estimate that the impact of ageing in public health care spending could be halved if the increase in healthy life expectancy was proportional to the growth in average life expectancy.

The largest share of the use of healthcare and social resources in an individual's life span is concentrated on the last phase. The elderly represent more than 40% of the hospital care demand in the NHS and the costs associated with their attention are constantly increasing (see Figure 6). The use of hospital care in the over-65 age group, for the year 2010, is double that of the general population and their average hospital stays exceed by almost 2 days those of the whole population being assisted<sup>55</sup>.

Figure 6: Evolution of full costs and mean costs. Patients aged 65 and older. NHS Hospitals 2000-2010 (BMDS. Health Information Institute. MSSSI).



## Health state among the elderly

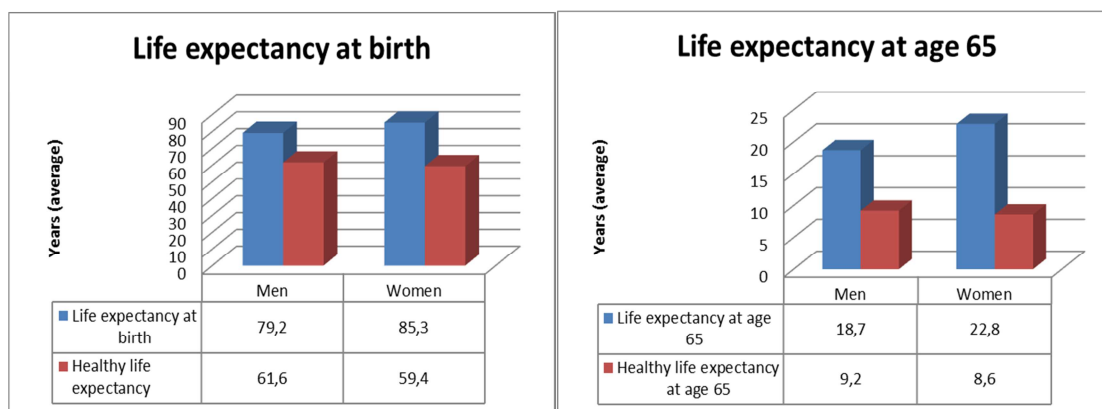
The increase in life expectancy in the population is not always linked to good quality of life. According to the latest available data, healthy life expectancy in Spain corresponds to 61.6 years for men and 59.4 years for women, figures that, at age 65, are estimated to be 9.2 and 8.63 years, respectively<sup>56</sup>. For the same year, 2011, the European Office for Statistics (Eurostat) estimates figures of 65.3 years in men and 65.8 years in women when born, while life expectancy in good health at the age of 65 corresponds to 9.7 years and 9.2 years, respectively<sup>57</sup>.

In the last Spanish National Health Survey 2011 (ENSE), 79.4% of men and 76.4% of women referred to their health status as good or very good, figures that in those aged over 65 decrease to 45% and 38%, respectively, which demonstrates a clear difference according to sex.

Furthermore, there is a strong social gradient in respect to perceived health, with a percentage of the population that refers to their own health as good or very good that

variates between 86.5% in the most favoured social classes (class I) <sup>3</sup>, to 68.5% in the - least favoured class (class VI), according to ENSE 2011. -

Figure 7: Life expectancy (global and in good health), Spain 2011. Men and women (Spanish National - Health Survey 2011, MSSI and Vital Statistics, INE). -



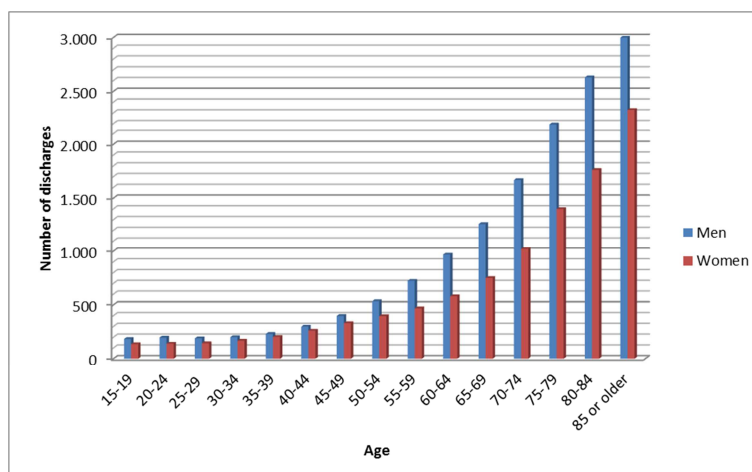
## Burden of disease

At age 50 onwards, the prevalence of many risk factors and chronic disorders accelerates and, consequently, so does comorbidity.<sup>58</sup>

The burden of disease in the elderly is characterised by chronic diseases that are going to determine, together with the process of ageing, the progressive functional impairment, the frailty and the disability. Moreover, diseases of the circulatory system, neoplasias and respiratory diseases are among the first causes of mortality, coinciding with the general population, even if their rates are higher<sup>59</sup>. The morbidity pattern assisted in hospital care also shows how the prevalence of chronic diseases increases with ageing (see Figure 8).

<sup>3</sup> Social classes based on the person's occupation. Taken from the INE. extracted from the report: "Measuring social class in Health Sciences" From the Spanish Society of Epidemiology. Classes vary from I to VI, I being the most favoured class and VI, the least favored one.

Figure 8: Discharges following selected chronic disorders (cases/100.000 inhabitants). BMDS 2011.

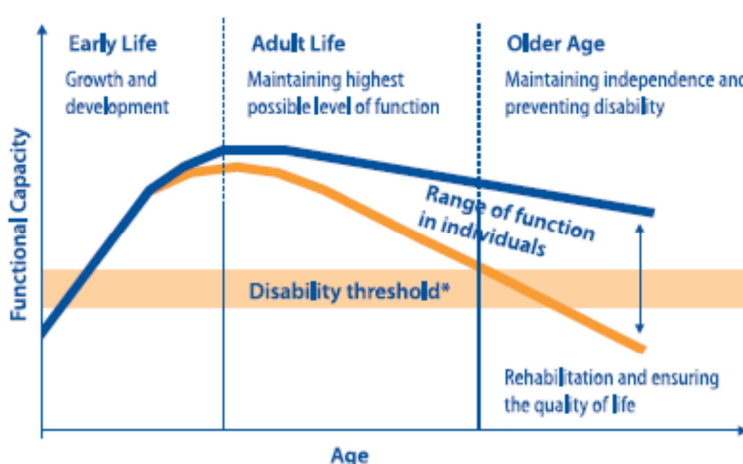


Later in life, the morbidity pattern gets modified and diseases or health problems that cause dependence become more important, such as cardiovascular diseases (heart failure and coronary artery disease), diabetes mellitus, COLD, neurological diseases (especially the stroke-dementia binomial), osteoarthritis and sensory impairment affecting vision and hearing.<sup>60</sup>

The real challenge is to maintain autonomy and independence as people age. Disability is an increasing global problem and risk increases with age. According to data from our country, the population aged over 64 have a rate of disability of 302.6/1000 inhabitants, 348.9/1000 inhabitants in women and 240.7/1000 inhabitants in men, with a public spending estimated in 2011 as being 8,000 million euros (0.74% of GDP).<sup>61</sup>

The dependence is the result of combining physiological changes associated with age, chronic diseases and intercurrent acute processes, all of which is influenced by the psycho-social environment of the individual<sup>60</sup>. The aim of the actions for primary, secondary and tertiary prevention will be to maintain a functional capacity as people age that prevents them exceeding the threshold of disability (see figure 9).

Figure 9: Maintenance of functional capacity during the life course



Source: Kalache y Kickbusch, 1997

In our country, figures reflecting disability for the basic activities of daily life (BADL) varies between 15% and 25% in individuals aged over 65. When they refer to people aged over 75, these figures reach 25% and 35% with a clear difference between sexes: three out of every four dependent people are women. In the ENSE 2011, 11.5% of men and 16% of women aged over 65 have serious limitations for the daily activities, figures that rose to 22.5% and 30.7%, respectively, in those aged over 85.

In addition to this gender difference, there is an evident social gradient regarding the prevalence of situations of dependence within this population. For example, when measured according to social status, figures in the last ENSE show a progressive increase in the percentage of dependent individuals aged over 65 as we go further down the social-economic level. The range varies between 32.45%, in the most favoured social class (class I) and 56.3% in the most disadvantaged class (class VI).

## *Annex 2. Justification of the proposal*

### **Frailty screening**

The first step to prevent the functional decline of elderly in the community is to identify the population group that could benefit most from an intervention aimed at delaying or reversing disability and dependence. This is the frail elderly group.

Bearing in mind that no final method has been determined for carrying out the frailty screening, the possibilities to develop this screening in Primary Healthcare are:<sup>7, 62, 63, 64, 65</sup>

1. - According to the initial definition and conceptualisation of the term, **the physical criteria or Fried phenotype**<sup>66</sup> or ulterior variations (such as the version of 5 items of the SHARE-SHARE Fit<sup>67</sup>), is based on objective clinical criteria (weight loss, weakness, low energy, slow walking speed, physical inactivity). Even if it was a selection method followed in studies of our field, doubts remain about its suitability (it requires specific equipment) and its appropriateness to be transferred to common practice. The FRAIL questionnaire<sup>68, 69</sup> has the advantage of not requiring dynamometer; it evaluates exhaustion, resistance, ambulation and weight loss, each of these items is worth one point and, as with Fried criteria, patients are considered frail when they accumulate 3-5 points.
2. - **Risk factors or indicators** (such as old age –generally >80 years–, recent or multiple hospitalisations, deficient social and family relations, comorbidity, polypharmacy, physical inactivity, falls, nutritional alterations, ...) <sup>70</sup> are useful for identifying possible frail patients but, "per se" they can not be used to categorise them. Nonetheless, some **multi-dimensional indexes** have been developed based on the accumulation of morbidity items, disability and mental and social factors, such as the Rockwood frailty index or the SHARE-Fix (wide version and based on the CGA). In Primary Healthcare they are scarcely feasible due to the length of time they require and due to the low integration they have had in our healthcare environment.
3. - The relationship between frailty and recent and emerging functional impairment, makes the assessment of the **Instrumental Activities of the Daily Living (IADL)** a potential method to select frail elderly individuals, especially when this situation is monitored to observe their changes. The Lawton and Brody scale is widely used in our environment.
4. - **Performance tests** that assess gait and mobility. There is an increasing tendency to assess the functional capacity through objective "performance tests", which are based on short and simple tests to assess gait, balance and mobility. These tests have the advantage of being more valid and reproducible and at the same time, being less influenced by the cognitive status, language and cultural level <sup>71, 72</sup>. The most employed and validated performance tests in our environment are gait speed, Timed Up and Go Test (TUG), and the Short Physical Performance Battery (SPPB), which are explained in Annex 4. Its good match with other methods, its simplicity and feasibility to be used in the first

level of health care, make the performance tests, probably, the best method to detect frailty in Primary Healthcare nowadays.

On the other hand, CGA is probably the most comprehensive way to evaluate patients with frailty. It allows assessing multiple components affecting the evolution of frailty and, consequently, to draw a plan of care tailored to the individual needs of each patient. Obviously, its extension and scarce standardisation do not make it an appropriate screening test. Nonetheless, patients selected through the aforementioned tests would benefit from a management based on this comprehensive assessment as a second step.

## Assessment for risk of falls

The assessment for risk of falls is presented in the Primary Healthcare programmes of the AACC. This information was not collected in a homogeneous way throughout the programmes, in some AACC programmes ask about the patient's history of falls or assess the risk of falls, without mentioning any specific scale for risk assessment; in others, the assessment of risk of falls is carried out using a specific scale (Downton scale)<sup>73</sup>. There is not homogeneity regarding the professional that performs this assessment, sometimes it is the general practitioner and in another cases, it is the nurse. Regarding the target population for the intervention, age range varies between aged 65 and 75 years old depending on the AACC.

Both NICE guidelines for prevention of falls<sup>98</sup> and the British and American Geriatrics associations<sup>99</sup> recommend an annual screening in people aged 65 and older that evaluates background for a history of falls and gait and balance disorders.

The *Cochrane* review<sup>74</sup> on commuty-based interventions to prevent injuries related to falls among the elderly also concludes that this approach is effective and can be part of public health practice. *Up-to-date*<sup>75</sup> recommends the evaluation of risk for falls among the elderly.

In our region, different publications have reviewed and found evidence of the effectiveness of a multifactorial intervention for the reduction of falls among the elderly and/or their consequences<sup>76,77</sup>. The majority of these studies have been developed among people aged over 70. On the other hand, other studies have been undertaken where the multifactor interventions have not been effective<sup>78</sup>. A possible explanation for this difference in results could be the age gap of the target population as, in some of the studies, the target population was based on people aged 80 and older.

Regarding cost-effectiveness, conclusive information has not been found about cost-effectiveness of this intervention in regards to the framework of the NHS.

Interventions of multiple components are effective to reduce the number of individuals that fall and the rate of falls. There are several approaches related to carrying out this intervention:

- The NICE guidelines for the prevention of falls<sup>98</sup> recommends a multifactor evaluation for all those individuals identified as at risk for falls and afterwards, an individualised intervention for the identified risk factors.

- A recent systematic review<sup>79</sup> has concluded that multicomponent interventions aimed at the selected target population, without dealing with individual evaluation for risk of falls, are effective in the reduction of the number of individuals that fall and also the rate of falls, and they may require less use of resources as they do not imply the need for individual multifactor evaluation.

The intervention that is being proposed here is based on this second approach, an assessment of the risk of falls and a proposal for multicomponent intervention based on three of the components that have been proved effective.

- **Screening questions**<sup>98, 99</sup>:
  - Have you suffered a fall in the last year that required healthcare assistance?
  - Have you suffered two or more falls in the same year?
  - Do you have any significant gait disturbance? (in the event that the performance screening test shows evidence of frailty, a positive response will be assumed).

- **Performance tests**

There is evidence for the effectiveness of the Timed Up and Go Test (TUG), gait speed and the SPPB battery, to determine the risk for falls (see Annex 4).

## **Intervention for preventing functional impairment**

The main interventions that have proved effective to prevent and even to reverse the state of frailty are physical exercise, multidimensional geriatric assessment followed by the intervention for the main geriatric syndromes, emphasising nutritional state, hydration and appropriate adjustments to medication<sup>80</sup>. Interventions aimed at fostering physical activity among the elderly have shown to be effective regarding mobility and functionality<sup>81</sup>. Evidence is inconclusive for other interventions, such as nutritional or pharmacological ones<sup>19</sup>.

The programmes that include exercises for developing aerobic endurance, flexibility, balance, strength and muscle power are the most effective interventions for the improvement of the overall physical condition and the health status among frail, elderly individuals and also for delaying disability<sup>82,83</sup>. A recent systematic review indicates that the best strategies to improve frailty and falls are the intervention of multicomponent exercises, where strength, endurance and balance are worked on<sup>84</sup>. A Cochrane review studying the effect of Progressive Resistance Strength Training (PRT)<sup>85</sup> provides evidence that PRT is an effective intervention to improve physical functionality and delay disability. Therefore, it seems that structured multicomponent programmes (in particular, the training of strength of lower limb muscles, with an average duration of 5-6 month, at an intensity of two-three group sessions per week) are the ones that offer the most benefit<sup>86,87,88</sup>. The improvements on functional status are more evident when the intervention addresses more than one component of the physical condition (strength, endurance and balance) compared to only one type of physical exercise. It is known that strength programmes are recommended to improve neuromuscular function and that the main benefit of aerobic endurance programmes is the improvement of the cardiovascular capacity. At the same time, balance is improved by training exercise in tandem position, changes of direction, walking on

heels, unipedal stance, Tai Chi, etc. Hence, it is reasonable to suggest that different stimuli applied at the same programme can trigger greater functional benefit than if applied individually. Furthermore, these types of programmes can be applied with more emphasis, depending on the specific goal (i.e. strength in elderly individuals with sarcopenia, or training of balance and Tai Chi in elderly with repetitive falls)<sup>89,90</sup>. Similarly, the results of the programme "Lifestyle Interventions and Independence for Elders" (LIFE), recently published<sup>91</sup>, confirm that in a group of vulnerable elderly, (SPPB less than 10) a programme of multicomponent physical exercise intervention (aerobic exercise, resistance and flexibility) , based on moderate intensity and over a long period (2.6 years) reduces physical disability (mobility).

Moreover, benefits from group based physical activity will extend beyond frailty and physical functionality. These benefits include the prevention of falls and cognitive impairment, as well as improvement of emotional wellbeing among this population<sup>92, 93</sup>.

On the other hand, the **multidimensional assessment** (Comprehensive Geriatric Assessment -CGA) is a useful instrument in assessing frail elderly individuals<sup>13, 94</sup>. It allows the structuring of the specific actions needed to be adopted according to the problems detected. Among them, special emphasis should be placed on physical activity, nutrition, geriatric syndromes, polypharmacy, etc. In this population, it is important to take the correct approach towards specific clinical pictures and chronic diseases (depression, diabetes, osteoporosis, osteoarthritis, cardiovascular events and their prevention, etc.); syndromes of special prevalence in frail elderly (delirium, incontinence, cognitive impairment, instability and falls, malnutrition), as well as towards other factors that are related to the causes of frailty and dependence.

Periodical review of regular medication and avoiding polypharmacy as much as possible are both very important measures. It should be consider the indication of drugs advisable for their clinical conditions (STOPP START criteria)<sup>95</sup>.

Among the frail elderly, interventions aimed at maintaining an appropriate nutritional status are more controversial than those related to exercise<sup>96</sup>. Apparently, a higher protein intake is an independent factor that protects from frailty<sup>97</sup>. Regarding the use of hormonal supplements or products, more studies are needed in order to determine their effectiveness in the treatment of these patients<sup>92</sup>.

# Interventions for the prevention of falls

## Components of the intervention

Both the NICE guidelines on the prevention of falls<sup>98</sup> and the British and American Geriatric Associations<sup>99</sup> include physical exercise, the review of medication and intervention on the home risks as components of an intervention to prevent falls.

### 1. Physical exercise

Exercise has a positive effect on falls, even in relation to the most serious falls<sup>100</sup>. Interventions of multiple component exercises are effective in reducing the rate and risk of falls. There is evidence for the effectiveness of three different approaches to programmes of physical activity aimed at reducing the rate and risk of falls: group exercises of multiple components (including endurance, balance and strength exercises), Tai Chi as group exercise and multiple component exercises prescribed individually, carried out in the home<sup>101</sup>.

These strength-training programmes among the elderly are in themselves a preventive and effective way to delay loss of strength, loss of muscle mass and a decrease in functional capacity and frailty. The practice of physical exercise is the most effective intervention in delaying disability and the adverse events that are normally associated with frailty syndrome. Training strength and multicomponent programmes, in particular, reveal an increasing number of successful results in this population group and their effects are more effective in reducing other aspects of the syndrome such as falls and cognitive impairment<sup>102, 103</sup>.

### 2. Medication review:

Use of medication is one of the factors that contribute to risk of falls. It is one of the most easily modifiable aspects<sup>75</sup>.

Polypharmacy (consumption of five or more drugs) is an important risk factor for falls. The proportion of older people with polypharmacy in our environment is around 35%-50%.<sup>104, 105</sup>

The level of inappropriate prescribing (IP) is also high, at around 50% according to several studies, with benzodiazepines being the most common drug implied in IP<sup>106, 107, 108</sup>.

The chronic use of benzodiazepines among the elderly has been related to poorer outcomes in cognitive assessment scales, alteration of several sensory-motor functions and, secondarily, posture instability related to falls and fractures<sup>109</sup>.

The reduction to less than 4 drugs decreases falls even though the evaluation and withdrawal of drugs on its own is not associated with a lesser risk of falls if it is not linked to other interventions<sup>110</sup>.

The strongest evidence regarding medication review interventions refers to the reduction and withdrawal of psychoactive drugs [B]. For other medications, there is less evidence [C]<sup>99</sup>.

Among the tools for the detection of inappropriate prescriptions is the STOPP/START criteria. This is the most commonly used.

The STOPP criteria brings together 65 indicators for potentially inappropriate prescriptions. These indicators include interactions, both drug-drug and drug-clinical situation, therapeutic duplicity and drugs that rise the risk of cognitive impairment and falls in the elderly.

The START criteria has 22 evidence based indicators that detect the omission of drug prescriptions, which could benefit elder patients. In a study developed in Spain, 54% of IP was found according to the STOPP criteria and prescription omissions according to the START criteria were detected in 48% of cases<sup>111</sup>.

Among the STOPP criteria, there is a specific section of those drugs related to the risk of falls: section H on Drugs that negatively affect those individuals likely to fall (one or more falls in the last three months). The groups of drugs included in this category are<sup>112,113</sup>.

1. Benzodiazepines (sedatives, can reduce sensorium, deteriorate balance). Especially long-acting benzodiazepines or with a long-acting metabolite (bromazepam, clobazam, chlordiazepoxide, diazepam, flurazepam, flunitrazepam, dipotassium clorazepate, ketazolam, nitrazepam).
2. Neuroleptics -  
They can cause confusion, hypotension, extra-pyramidal side effects, falls. -
3. First generation antihistamines (chlorpheniramine, diphenhydramine, - hydroxyzine, promethazine, etc.) -  
They have sedative effects, can reduce sensory perception and deteriorate - balance, raising the risk of falls. -
4. Vasodilators that are known to be a possible cause for hypotension in those - with persistent posture hypotension, i.e. a recurring drop higher than 20mmHg of - systolic pressure (risk of fainting, falls). -
5. Long-term use of opiates in those with recurrent falls (risk of somnolence, - drowsiness, posture hypertension, vertigo). -

### 3. **Home risks**

More than 50% and up to 75% of falls happen at home. It is also here where the frailest individuals tend to fall<sup>75</sup>.

Several studies have proved the effectiveness of interventions for modifying home risks for the prevention of falls<sup>75</sup>, especially in patients at high risk who have suffered falls and those with visual impairment<sup>114, 115</sup>.

### *Annex 3. Assessment scales for ADL*

#### **Assessment scales for Activities of Daily Living (ADL)**

The scales for functional/disability assessment most commonly used in our environment are those surveys assessing activities of the daily living (ADL), which are normally divided into two groups. Basic (BADL) (bathing, showering, dressing, eating, continence, mobility, etc.) and Instrumental (IADL) (more complex functions such as preparation and intake of medication, going outside the home, doing household tasks, taking care of the household economy, travelling in public transport, using the phone, social relations, etc.). While the first group is necessary to keep the autonomy in the home (self-care activities), the second group allows people to adapt to their environment and maintain independence not only at home but also in the community (relation activities). The last one need more functional ability to being carried out and are the first ones to deteriorate<sup>116</sup>.

For **basic activities** of daily living (BADL), the most common scale is the Barthel<sup>117</sup> scale, which has shown its utility in our environment<sup>118, 119</sup> (see table below).

Its results, when assessing the degree of dependence for the BADL, are established, according to Shah et al.<sup>120</sup>, in the following way:

- Independence 100,
- Slight dependence (91-99),
- Moderate dependence (61-90),
- Severe dependence (21-60),
- Total dependence (< 21).

Other authors place the limit of slight dependence at 90 to prevent an overestimate that can cause the existence of incontinence, while others assess moderate dependence if  $\leq 60$  points.

Regarding the **instrumental activities** of daily living (IADL), the Lawton scale<sup>121</sup> is one of the most renowned measuring instruments and one of the most commonly used (see table bellow). It has a good interobserver reliability coefficient but also has some drawbacks<sup>122</sup>. Its translation to Spanish was published in 1993<sup>123</sup> and was validated in our environment<sup>124</sup>. Its main limitation is the influence of cultural and gender aspects, as well as the environment, on the variables that it studies, so it is necessary to adapt them to the cultural level of the individual<sup>125</sup>. It assesses three functions that for many years have traditionally been assigned to women where older men commonly score lower: preparing food, taking care of the household and doing the laundry. Due to this, a variant of the scale is usually employed where these three functions are not assessed in men.

Its results, when assessing the degree of dependence for the IADL, are established in the following way:

- Among women (8 functions): Total dependence 0-1, severe dependence 2-3, moderate dependence 4-5, slight dependence 6-7, autonomous 8.
- Among men (5 functions): Total dependence 0, severe dependence 1, moderate dependence 2-3, slight dependence 4, autonomous 5.

## Barthel Index -

	Score
<b>Feeding</b>	
Independent.....	10
Needs help cutting meat or bread, spreading butter, etc.....	5
Dependent.....	0
<b>Bathing</b>	
Independent: capable of washing the whole body using the shower or a bathtub.....	5
Dependent.....	0
<b>Dressing</b>	
Independent: able to put on and remove all clothing without any help.....	10
He/she needs help but is able to accomplish at least half of the task alone within reasonable time.....	5
Dependent.....	0
<b>Grooming</b>	
Independent: Can wash face and hands, comb hair, apply make-up, shave, etc. without assistance.....	5
Dependent.....	0
<b>Bowels control</b> (assessment based on the previous week)	
Able to control bowels and had no accidents.....	10
Occasional accidents: one faecal incontinence episode, needs help in using suppository or taking an enema....	5
Faecal incontinence.....	0
<b>Bladder control</b> (assessment based on the previous week)	
Able to control bladder and had no accidents.....	10
Occasional accidents: maximum of one episode of incontinence in 24 hours; needs help in dealing with the catheter and other devices to collect urine.....	5
Incontinent.....	0
<b>Toilet use</b>	
Independent: uses the toilet, bedpan or urinals with no help and keeps clean.....	10
They need some help to put clothes on or remove them but keeps clean on his or her own.....	5
Dependent.....	0
<b>Transfers (sofa/bed)</b>	
Independent.....	15
Minimum physical help or verbal supervision needed.....	10
Needs a great deal of help (trained person) but is able to stay seated with no help.....	5
Dependent: needs a hoist or help from two people; is not able to stay seated.....	10
<b>Ambulation</b>	
Independent: able to walk 50 metres on his/her own, he/she may need help from a walking stick, crutches or zimmer frame; if he/she uses a prosthesis, he/she is able to put it on and off.....	15
Needs physical help or supervision to walk 50 metres.....	10
Independent on wheelchair with no help or supervision.....	5
Dependent.....	0
<b>Climbing stairs</b>	
Independent to go up and down stairs without help or supervision.....	10
Needs physical help from another person or supervision.....	5
Dependent.....	0

## Lawton-Brody Index -

	Score
<b>Ability to Use Telephone</b>	
Operates telephone on own initiative.....	1 -
Dials a few numbers he/she knows well.....	1 -
Answers telephone, but does not dial.....	1 -
Does not use telephone at all.....	0 -
<b>Shopping</b>	
Takes care of all shopping needs independently.....	1 -
Shops independently for small purchases.....	0 -
Needs to be accompanied on any shopping trip.....	0 -
Completely unable to shop .....	0 -
<b>Food Preparation</b>	
Plans, prepares, and serves adequate meals independently.....	1 -
Prepares adequate meals if supplied with ingredients.....	0 -
Heats and serves prepared meals or prepares meals but does not maintain adequate diet.....	0 -
Needs to have meals prepared and served.....	0 -
<b>Housekeeping</b>	
Maintains house alone with occasional assistance (heavy work).....	1 -
Performs light daily tasks such as dishwashing, bed making.....	1 -
Performs light daily tasks, but cannot maintain acceptable level of cleanliness.....	1 -
Needs help with all home maintenance tasks.....	1 -
Does not participate in any housekeeping tasks.....	0 -
<b>Laundry</b>	
Does personal laundry completely .....	1 -
Launders small items.....	1 -
All laundry must be done by others .....	0 -
<b>Mode of Transportation</b>	
Travels independently on public transportation or drives own car.....	1 -
Arranges own travel via taxi, but does not otherwise use public transportation .....	1 -
Travels on public transportation when assisted or accompanied by another.....	1 -
Travel limited to taxi or automobile with assistance of another.....	0 -
Does not travel at all.....	0 -
<b>Responsibility for Own Medications</b>	
Is responsible for taking medication in correct dosages at correct time.....	1 -
Takes responsibility if medication is prepared in advance in separate dosages.....	0 -
Is not capable of dispensing own medication .....	0 -
<b>Ability to Handle Finances</b>	
Manages financial matters independently .....	1 -
Manages day-to-day purchases, but needs help with banking or major purchases .....	1 -
Incapable of handling money .....	0 -

## Annex 4. Performance tests

The fundamental clinical usefulness of the measures based on the implementation is the detection of individuals who are at risk of functional decline. The most validated and employed tests in our environment are the following:

**Short Physical Performance Battery (SPPB)**, increasingly used and validated in our environment for Primary Healthcare, is relatively easy to apply. Among the tests introduced here, this is the only one specifically designed to predict disabilities<sup>126</sup> and it has proved the capacity to predict adverse events, dependence, institutionalisation and mortality<sup>127,128,129</sup>. In addition to predicting institutionalisation and death, back in the 90's it was already proved that SPPB was a tool that allowed for monitoring of the evolution of the individual over time (changes of 1 point are clinically significant) and it could significantly predict the development of dependence, both regarding daily activities and mobility in four years' time<sup>130</sup>. This predictive ability was proved in different populations, always adjusted by age, sex and comorbidity<sup>131</sup>. The SPPB is one of the most validated and reliable tests for detecting frailty and for predicting disability<sup>132</sup>. It has been recommended as an objective tool for measuring mobility limitations<sup>133, 134</sup>. In a significant sample of non-dependent individuals aged 74 and older, who attended the PHC, 30.5% (36.6% women; 21% men) presented functional limitation according to this test.

The **Timed Up and Go Test (TUG)**, was specifically designed to quantify mobility<sup>135</sup> and has proved its predictive value for the deterioration of health status and activities of daily living, as well as falls, similar to walk gait speed. The evidence for being a predictive tool of incident disability is more limited<sup>136</sup>. Failing this test seems to be the best predictor for the short-term (one year) and, therefore, it seems useful to link consequent interventions; on the other hand, scarce physical activity and exercise are more useful for long-term predictions (three years)<sup>137</sup>. It has been used and validated in our environment<sup>138, 139</sup>. It has also been validated to assess the risk of falls and it has recently been validated as a diagnostic tool for frailty<sup>140</sup>.

**Walk gait speed** is the most frequent objective test for evaluating functional limitations in the bibliography. In longitudinal studies, it has proved the capacity to predict adverse events such as hospitalisation, frailty, falls, dependence and mortality<sup>141, 142, 143</sup>; in addition, it is one of the components of Fried's phenotype for frailty<sup>144</sup>. In a Spanish cohort of individuals aged 70 and older, percentile50 is 0.91 m/sec for men and 0.67 for women, while percentile25 is 0.69 m/s and 0.43 m/s respectively<sup>145</sup>. In the Toledo Study for Healthy Ageing, specifically designed for studying frailty, 20 percentile (employed in the Cardiovascular Health Study to determine the cut-off point for the item "walk gait speed" within the frailty criteria) was introduced, adjusted by sex and size, between 0.37 and 0.5 m/sec<sup>146, 67</sup>. A recent Spanish study found that the cut-off point bearing the best value to predict frailty was between 0.8 and 0.9 m/sec., finally proposing the figure 0.8 m/sec. due to its widespread use. The most employed tests are those calculating the speed in distances of 2.4 metres, 4 metres or 6 metres at a normal walk gait speed. The test duration ranges from 2 and 3 minutes. These tests deliver a very good performance in regards to predictive validity and in test-retest reliability (with a coefficient between 0.8 and 0.9). Nevertheless, interpretability, ceiling and floor effects and responsiveness are the

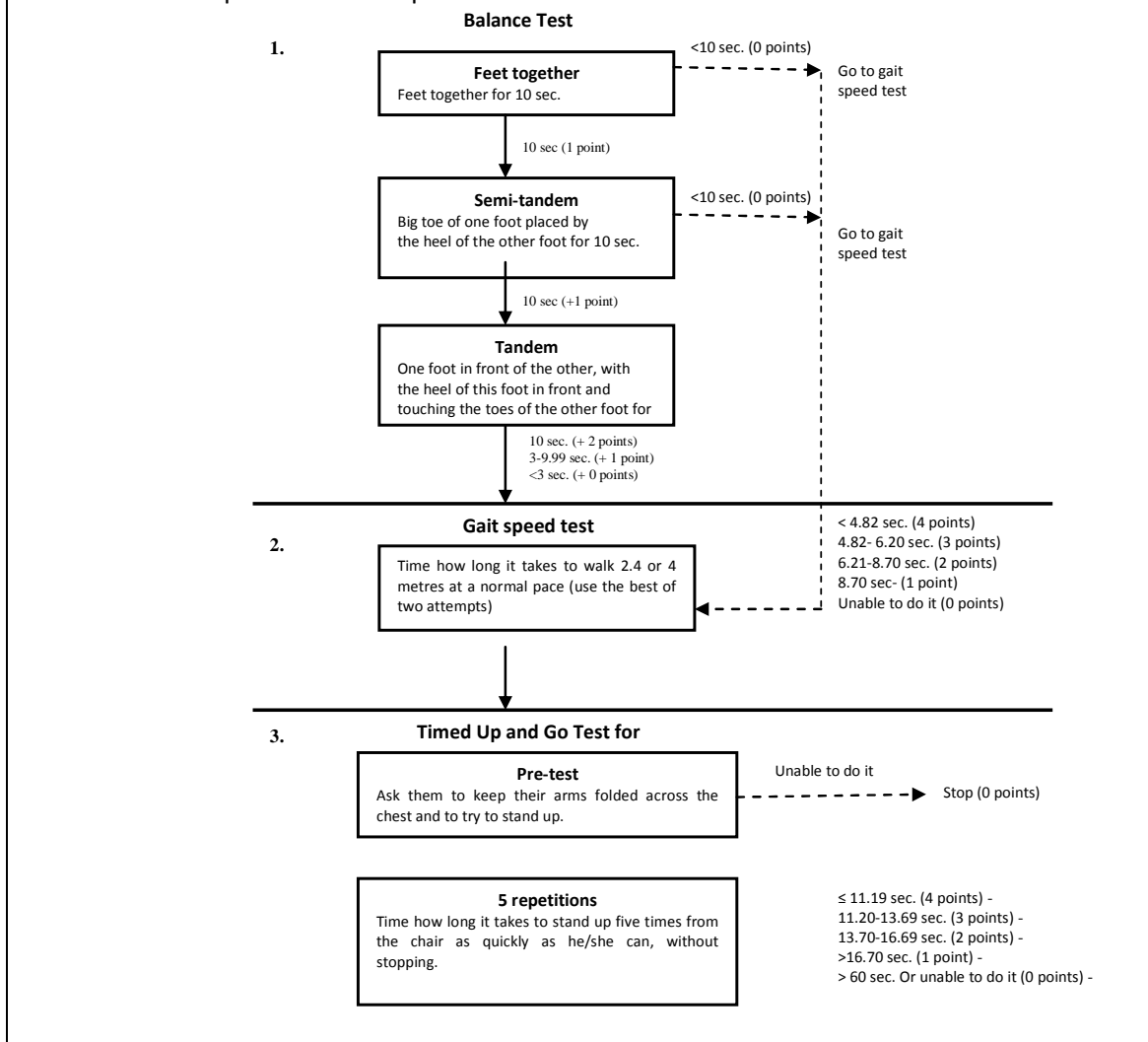
attributes which are supported by less evidence. The professional performing the test must have some minimum training in advance. It is a test with a high acceptance among professionals and patients which is easy to implement<sup>147</sup>. It is, therefore, an easy to carry out measure that could also be used as a predictor for incident disability; however, in cohort studies it has shown less predictive capacity than SPPB<sup>148</sup>.

The reasons above justify the choice of the SPPB test for screening frailty, and also encouraging alternatives such as TUG and gait speed.

**Short Physical Performance Battery (SPPB or Guralnik Test battery)**

It involves the implementation of three tests: Balance (in three positions: feet together, semi-tandem and tandem), gait speed (on 2.4 or 4 metres) and chair stand five times. It is very important to respect the sequence of the tests because, if it started with tests that require standing, it can be tiresome for the patient and he or she may show a false low performance in other sub-tests. The average time for implementation ranges from 6 to 10 minutes. Normative values for the Spanish population have been established in several studies, such as population cohort studies<sup>149, 150</sup> and in Primary Healthcare<sup>151</sup>. The total punctuation of SPPB is the sum of the three sub-test and ranges from 0 (the worst) and 12; changes of 1 point have a clinical meaning<sup>152, 153</sup>. Scores below 10 indicate frailty and a high risk of disabilities and falls<sup>154</sup>.

A flow-chart and protocol test implementation is featured below.



Implementation flow-chart for SPPB battery. Source: Rodríguez Mañas L, et al. An evaluation of the effectiveness of a multi-modal intervention in frail and pre-frail older people with type 2 diabetes – the MID-frail study: study protocol for a randomised controlled trial. *Trials* 2014; 15:34.

## PROTOCOL

### BALANCE TESTING

**Instructions:** Start to balance in semi-tandem (big toe of one foot placed by the heel of the other foot). Individuals who can not maintain this position must try balancing with their feet together. Those who are able must try the tandem position, skipping the feet together position.

a. Semi-tandem balance: I want you to stand with the side of the heel of one foot touching the big toe of the other foot, for about ten seconds. You can place whatever foot you prefer in front.

- He/she stands 10 sec.
- He/she stands less than 10 sec. (mark the number of seconds.....) 1
- He/she is not able to do it 0

b. Balance with feet together: I want you to stand with your feet together for about 10 seconds. You can use your arms, bend your knees, move your body to maintain your balance but try not to move your feet. Keep this position until I tell you.

- He/she stands 10 sec.
- He/she stands less than 10 sec. (mark the number of seconds.....) 1
- He/she is not able to do it 0

c. Tandem balance: Now I want you to maintain your balance with one foot in front of the other, with the heel of one foot in front and touching the toes of the other foot for ten seconds. You may put either foot in front, whichever is more comfortable for you. Please watch whilst I demonstrate. -

(Stand next to the participant to help him or her into this position. Allow the participant to hold onto your arms to get balance. - Begin timing when the participant is standing with balance and with tandem feet.) -

- He/she stands 10 sec.
- He/she stands less than 10 sec. (mark the number of seconds.....) 1
- He/she is not able to do it 0

#### Score:

- **Unable to stand with feet together, or between 0-9 secs.** 0
- **Standing with feet together for between 10 sec. and <10 sec. semi-tandem** 1
- **Semi-tandem 10 sec. and tandem between 0 and 2 sec.** 2
- **Semi-tandem 10 sec. and tandem between 3 and 9 sec.** 3
- **Tandem 10 sec.** 4

### AMBULATION 2.44 or 4.00 metres

**Instructions:** You need to walk at your usual pace until the end of the corridor. Walk all the way past the final mark before you stop. You may use a walking stick or any help you use when walking on the street. I will walk with you. Are you ready?

**Score:** Begin timing when the participant starts to walk and stop timing when his/her last foot has overtaken the mark indicating the distance to walk.

Distance 2.44 metres	Distance 4 metres	m/s	Score
• <b>Unable to do it</b>	<b>Unable to do it</b>		<b>0</b>
• <b>&gt; 5.7 sec</b>	<b>&gt; 8.7 sec</b>	<b>&lt; 0.43 m/sec</b>	<b>1</b>
• <b>4.1 – 6.5 sec</b>	<b>6.21 – 8.70 sec</b>	<b>0.44-0.60 m/sec</b>	<b>2</b>
• <b>3.2 – 4.0 sec</b>	<b>4.82 – 6.20 sec</b>	<b>0.61-0.77 m/sec</b>	<b>3</b>
• <b>&gt; 3.1 sec</b>	<b>&gt; 4.82 sec</b>	<b>&lt; 0.78 m/sec</b>	<b>4</b>

### REPEATED CHAIR STANDS

**Instructions:** Do you think it is safe for you to try to get up from a chair 5 times without using your arms? Please, stand up and sit down as fast as you can 5 times without stopping. Keep your arms folded across your chest the whole time. I will be timing how long it takes you with a stopwatch. Are you ready? Start.

**Score:** Start timing as soon as the individual starts the first stand-up. Count out loud the number of sits the participant has performed. Stop the stopwatch when they are fully standing for the final time. Stop the stopwatch if the participant starts to use their arms, or after one minute if they have not completed the test, or if you are concerned about the safety of the participant.

- **Unable to perform the test** 0
- **≥ 16.7 sec** 1
- **Between 16.6 and 13.7 sec** 2
- **Between 13.6 and 11.2 sec** 3
- **≥ 11.1 sec** 4

### **Timed Up and Go Test (TUG) -**

The TUG<sup>155</sup> test involves timing how long it takes the individual to get up from a chair with an armrest, walk 3 metres, turn around and go back to the chair and sit down; the test has to be performed once for training purposes and two more times being timed. The time needed to perform the test is 1-2 minutes. Usually, it is considered correct if the person takes 10 seconds or less, when it takes 20 seconds or more, the elderly individual is considered to be at high risk of falls<sup>156, 157</sup> and this is the threshold to detect frailty.

### **Gait speed -**

You need to ask the individual to walk a 2.4; 4; 5; 6 or 10 metre distance at his or her usual pace, although for its use in Primary Healthcare, it can be adapted to a distance of 3 or 4 metres<sup>158, 159</sup>. The cut-off points most commonly used to determine the risk threshold are normally between 1 and 0.8 m/sec., this last cut-off figure being the most common in different studies and consensus recommendations<sup>160</sup>. The test duration ranges from 2 and 3 minutes. In the event of speed on 4 metres, there are interpretative data indicating the less significant change at the figure of 0.05 m/s, and as substantial change, 0.1 m/s<sup>161</sup>. This test on 4 metres is the best validated in the bibliography.

## Annex 5. Frailty scales

### Scales for assessing frailty by author

#### SHARE-FI INSTRUMENT:

It is the Frailty Instrument for Primary Care in the Survey of Health, Ageing and Retirement in Europe (SHARE-FI). SHARE-FI is based on a modification of the original criteria of Fried and Walston<sup>16</sup>, applied to a representative sample of citizens from 12 European countries (Austria, Germany, Sweden, the Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, Belgium and Israel), aged 50 and over and not institutionalised. SHARE-FI is provided in the format of two frailty calculators (one for each sex), which are available on the web site belonging to the BMC Geriatrics Journal (<http://www.biomedcentral.com/1471-2318/10/57>). The Spanish translation of those calculators is available at <http://sites.google.com/a/tcd.ie/sharefrailty-instrument-calculators/>. Its validation in Spain was published in 2011<sup>162</sup>.

The modification of Fried criteria is the following:

- Feeling of exhaustion: Defined as a positive answer to the question: "In the last month, have you had too little energy to do the things you wanted to do?"
- Loss of appetite: "Diminution in desire for food" during the last month or, if there is no answer to this question, to have been eating "less than usual".
- Handgrip strength: It was measured in kg using Smedley dynamometer (S Dynamometer, TTM, Tokyo, 100 kg), in accordance with the measurement protocol published by Mohd Hairi et al. Two consecutive measurements were taken in each hand and the biggest of the four was selected.
- Functional difficulties: The criteria was considered if there was a positive answer to the question: "due to physical or health problems, is it difficult for you to walk 100 metres or to climb a flight of stairs without resting (excluding difficulties that are believed to last less than three months)?"
- Physical activity: The question was: "How often do you engage in activities that require a low or moderate level of energy, such as gardening, cleaning the car or going for a walk?". Answers were classified according to the following order: 1) More than once a week; 2) Once a week; 3) Between one and three times a month and 4) hardly ever or never.

#### FRAIL scale:

The FRAIL questionnaire<sup>163, 164</sup> is a validated scale and one of easiest to use. It has 5 simple questions, each of them related to a field (Fatigue, Resistance, Ambulation, Co-morbidity, and Loss of weight), and each of them is worth a point. As with Fried criteria, patients are classified as frail when they sum up 3-5 points.

Questionnaire:

- Fatigue: "How often have you felt tired during the past four weeks?" 1= The whole time, 2= Most of the time, 3= Some times, 4= Rarely, 5= Never. Answers "1" or "2" are classified as 1 and the rest, as 0. Basal prevalence = 20.1%.
- Resistance: "Do you have any difficulty climbing 10 steps without resting on your own, without any help?" "1 = Yes, 0 = No." Basal prevalence = 25.5 %.

- Ambulation: Do you have any difficulties walking a few hundred metres on your own, without any help? “1 = Yes, 0 = No.” Basal prevalence = 27.7 %.
- Co-morbidity: For 11 diseases, the following questions are asked: “Were you ever told by a doctor that you have [the disease]?” “1 = Yes, 0 = No.” The total number of diseases (0-11) are re-codified as 0-4 = 0 points, and 5-11 = 1 point. The diseases are: Hypertension, diabetes, cancer (excluding skin cancer of minor importance), chronic lung disease, heart attack, congestive heart failure, angina pectoris, asthma, arthritis, stroke and kidney disease. Basal prevalence = 2.1 %.
- Weight loss: “How much do you weigh with your clothes on but without shoes? [current weight]” and “One year ago, in (MONTH, YEAR), how much did you weigh without shoes and with your clothes on? [Weight one year ago]”. The weight change percentage is calculated in the following way:  $[\text{weight one year ago} - \text{current weight}] / \text{weight one year ago} * 100$ . Change percentage > 5 (which stands for 5% of weight loss) is punctuated as 1 and <5% as 0. Reference prevalence = 21.0%.

## Annex 6. Basic recommendations for a multicomponent physical activity programme.

Basic recommendations are presented below in order to develop a multi-component physical activity programme aimed at the frail elderly, based on the works of the research team lead by Mikel Izquierdo<sup>165, 166</sup>.

Multi-component training programmes include: Exercises of aerobic resistance, muscle strength, walking and balance as well as flexibility.

Guideline table for a multi-component physical activity programme aimed at the frail elderly<sup>167,168</sup>:

BENEFITS	EXERCISE TYPE	PRESCRIPTION
Improvement of cardiovascular resistance	Walking Pedalling	-60-80% of HF <sub>max</sub> (40-60% of VO <sub>2</sub> max) -5-30 min/session -3 days/week
Increase of muscle mass and strength	Free weights Variable-resistance machines	-3 series of 8 to 12 repetitions, starting with a walk or an exercise that allows us to make 20-30 RM until you progressively reach a maximum of 3 series of 4-6 repetitions with a weight that allows us to make 15 RM. -6-8 exercises of the largest muscle groups. -In order to optimise functional capacity, strength exercise must be specific to the most used muscle groups and include exercises that simulate everyday activities (i.e. sitting and getting up from a chair). -3 days/week
Potency and functional capacity	Include exercises of everyday life (standing and sitting, going up/down stairs) Include potency exercises (at high speed with mild/moderate weights)	-Potency can be improved by training using 60% of 1RM and with the maximum speed for this resistance (i.e. as fast as possible), that will be between 33% and 60% of maximum speed without resistance.
Flexibility	Stretching Yoga/Pilates	-10-15 min -2-3 days/week
Balance	It must include exercises in tandem and semi-tandem positions, multidirectional movements with extra weights (2-4 kg), heel-toe walking, climbing stairs with help, body weight transfer (from one leg to the other) and modified Tai Chi exercises	-In all sessions

HF max: Maximum Heart Frequency; RM: Repetition maximum, VO 2 max: maximal oxygen uptake.

General guidelines for a multi-component physical activity programme:

- Multi-component programmes must include gradual increases in volume, intensity and complexity in exercises of cardiovascular resistance, muscle strength and balance.
- Training muscle strength one day a week and cardiovascular resistance one day a week is an excellent stimulus to improve strength, potency and cardiovascular resistance in the frail elderly that start a programme of exercises.
- In programmes combining strength and cardiovascular resistance, strength training must be done before cardiovascular resistance training, as higher neuromuscular and cardiovascular gains are observed in this order of training.
- Physical exercise programmes, especially all those aimed at developing muscle strength and using weights, must be supervised by professionals with specific knowledge and training. Other programmes, such as, for example, walking, which increase the amount of physical activity per week, are very beneficial and significantly contribute to improved health.
- An initial low volume of training can facilitate adherence to the programme among people with a low level of physical activity and no previous systematic practice of exercise.

**Strength and muscle potency training<sup>169,167</sup> :**

In strength training, 4-6 exercises in machines of varying resistance may be employed as well as exercises with/without material (weighted ankles, elastic bands, the weight of one's body).

In order to optimise functional capacity, strength exercises must be specific for the most used muscle groups and must include exercises simulating everyday activities (for example, sitting down and getting up from a chair). Flexor and extensor muscles of the ankle and knees, and hip abductors are especially important for functional movement and for walking. Muscles involved in ankle dorsiflexion and plantarflexor muscles, are particularly important for recovering balance.

This type of training can be performed ranging from:

- 2-to-3 times per week.
- It is recommended to undertake between 1 and 3 series of 8 to 12 repetitions, starting with a weight that allows us to make 20-30 maximum repetitions, until progressively making between 1 and 3 series of 4-6 repetitions with a weight that allows us to make 15 maximum repetitions.

It is recommended: To perform cycles of 10-14 weeks, progressively increasing the intensity of the exercise; to employ the whole range of motion; to keep a correct respiration technique, during exercises; to expel air from the mouth or the nose avoiding holding your breath (Valsalva manoeuvre)<sup>167</sup>.

The training based on muscle potency (high speeds) could be more beneficial in terms of functional improvements rather than resistance programmes (low speeds)<sup>170,169</sup>.

### **Aerobic Resistance Training:**

Aerobic Resistance Training could have, depending on the functional capacity of the patient, different sections:

- Walking in different directions and at a different pace.
- Walking on a treadmill,
- Climbing steps, going up stairs
- Static cycling

The 6-minute walking distance test is a tool that is easy to implement in order to monitor aerobic resistance. Monitor every 8 to 10 weeks.

If the individual can walk for one hour, the 6-minute walking test could be employed measuring the cardiac rate that the individual reaches in the last two minutes of the walk. From this cardiac rate, intensity could be calculated observing 85%-100% of this value; 2 to 3 times per week. It could start with a walk of 5-10 minutes during the first weeks and progress up to 15-30 minutes.

If the individual can walk for between 30 minute and one hour, the 6-minute walking test could be employed measuring the cardiac rate that the individual reaches in the last two minutes of the walk. From this cardiac rate, intensity could be calculated set at 60%-85% of this value; 2 to 3 times per week. It could start with 5-10 minutes during the first weeks and progress up to 15-30 minutes.

If the person can walk no more than 4-5 minutes, an exercise could be done at the beginning of the session, lasting half of the time that the person is able to walk (2 minutes). The session will last half of the time he or she could endure until becoming too tired to continue. This 2-minute exercise could be divided in working periods of 15" with 15" of rest until completing 2 minutes. It could be done twice a day. It could start with 2 minutes, twice a day during the first weeks and then progressing to 5 minutes, twice a day.

### **If the person cannot get up from a chair:**

- The first thing to do will be to start with a strength programme.
- Once the person is able to get up from a chair, he/she would start with 5" gait and 10" rest until completing 1-2 minutes depending on how the person copes with the exercise. It could be performed twice a day.

### **Monitoring symptoms of physical exercise intolerance:**

- Borg Rating of Perceived Exertion is a good alternative method to prescribe the intensity of the exercise (12-14/6-20)
- Significant increase in shortness of breath
- Chest pain
- Oppression or palpitations
- Dizziness or fainting
- Talk test: the intensity must never be so vigorous as to make talking difficult. The individual should be able to have a conversation comfortably during physical exercise.

*To train muscle strength 1 day a week and 1 day per week aerobic resistance is an excellent stimulus to improve strength and muscle potency and cardiovascular resistance.*

### **Balance and gait training**

Balance and gait training will include exercises ranging from sitting and standing positions, such as:

- Moving heels up and down.
- Standing on one foot, in tandem or semi-tandem position.
- And with exercises in motion, heel-toe walking, climbing stairs with help, body weight transfer (from one leg to the other), multi-directional movements with extra weight (2-4 kg) and modified Tai Chi exercises.

These exercises can be performed on a daily basis, in 2 or 3 series of 8-10 repetitions.

It will be important to combine the balance programme with strength and resistance training as it has demonstrated greater improvement in functional capacity. A key element for the maintenance of independence in the Basic Activities of the Daily Living (BADL) among the elderly.

The progression of the exercises will include:

- The modification of the position of the arms, for example, leaning the arms on a table, hands on the hips, crossed arms, etc.
- Doing the exercises on different surfaces, for example, a chair, on unstable surfaces, giant balls.
- Modification of visual perception, doing the exercise with closed/open eyes.
- Complex multi-tasks such as, i.e., balance exercises while leaning on a ball.

The usual gait speed test (5min.) can be a useful tool to monitor this ability. Another tool with a higher degree of complexity can be the gait test with a double task, for example, walking and talking, counting, etc.

### **Flexibility training**

Flexibility training must include exercises for the largest muscle groups and it could include activities such as:

- Stretching
- Yoga
- Pilates -

This type of training can be performed ranging from: -

- 2 to 3 times per week.
- It could start with 10-12 minutes during the first weeks, gradually progressing.
- Repeat each exercise 3-5 times in every session.
- Stay in the position for 10-30 seconds.
- Make movements slowly; never brusquely.
- Training can never cause pain but some discomfort.

These activities are designed to increase the range of movement in joints, increase muscle length, muscle relaxation and general body flexibility. They must be performed after the resistance and strength exercises, when the muscles are warm.

When practising any kind of exercise, these general recommendations must be taken into account:

- Breathing technique: Inhale before the movement, exhale during the movement and inhale at the end of it.
- Rest: 2 minutes of rest between all exercises.
- Use of weights: Consider the risks of using additional weights regarding potential adverse effects (injuries, cardiovascular events, incompleteness of the exercise).
- Disease: If a disease discontinues the exercise programme, you need to consult - with your doctor before re-starting. -

#### Absolute and relative contraindications to participate in the strength training

Absolute contraindications:

- Severe heart valve diseases
- Congestive heart failure
- Unstable angina
- Recent myocardial infarction
- Recent pulmonary or systemic embolism
- Uncontrolled cardiac arrhythmias
- Acute infectious disease
- Uncontrolled hypertension (>180/>110 mm Hg)
- Active or recent myocarditis, pericarditis, endocarditis
- Aortic dissection
- Malignant ventricular arrhythmias (ventricular tachycardia ; multifocal - ventricular arrhythmias...) -
- Uncontrolled diabetes

Relative contraindications (consult your doctor):

- Unstable angina pectoris, recent atrial fibrillation
- Uncontrolled hypertension (>160/100 mm Hg)
- Low functional capacity (<4 METS)
- Musculoskeletal limitations
- People wearing pacemakers or defibrillators.
- Thrombophlebitis

## Annex 7. Guidelines for the management of geriatric symptoms

Example guidelines for the clinical management of common patterns for geriatric conditions related to frailty, based on the publication of Fairhall et al<sup>171</sup>, translated and adapted with the permission of the author by Martín Lesende et al<sup>172</sup>.

Pattern-situation	Screening and assessment	Intervention
<b>Unstable health conditions</b>	Medical assessment	Medical management may include geriatrician review or other specialised resources that are available (according to specific referral criteria), medication review, intervention to increase compliance, referral for follow-up of medical conditions; for example memory clinic, continence clinic.
<b>Poor nutrition</b>	Screening (i.e. Mini Nutritional Assessment-MNA; IMC<23)	It may include: Education regarding foods rich in energy and protein, nutrition advice about general healthy eating and the benefits of regular exercise to improve health and overall wellbeing, and nutrition support.  The NICE clinical guideline 'Nutrition Support in Adults' provides high quality evidence for oral nutrition support in adults with malnutrition (Chapter 8 in particular). <a href="http://guidance.nice.org.uk/CG32">http://guidance.nice.org.uk/CG32</a>
<b>Psychological factors</b>	Geriatric Depression Scale (GDF), short form.	The "Victorian Government Health Information toolkit for depression" tool <a href="http://www.health.vic.gov.au/older/toolkit/06Cognition/03Depression/index.htm">http://www.health.vic.gov.au/older/toolkit/06Cognition/03Depression/index.htm</a> . Frail, older depressed patients are particularly susceptible to the side effects of antidepressant medication*. Antidepressant medication should therefore not be used as front line therapy. Antidepressant medication is effective in the treatment of older people*. The NICE clinical guideline "Occupational therapy interventions and physical activity interventions to promote the mental wellbeing of older people in primary care and residential care", <a href="http://guidance.nice.org.uk/PH16">http://guidance.nice.org.uk/PH16</a>
<b>Impaired cognition</b>	Mini Mental Status Examination (MMSE)*, Cognitive Mini-Exam of Lobo, informant questionnaire*	The NICE clinical guideline, 'Dementia: Supporting people with dementia and their carers in health and social care', <a href="http://guidance.nice.org.uk/CG42">http://guidance.nice.org.uk/CG42</a>
<b>Impaired vision/hearing</b>	Brief clinical assessment 'Newspaper reading test and the whispered voice test'	Referral for specialist medical assessment, according to the referral criteria established in each area.  Facilitate liaison with local/national foundations dealing with blindness and low vision, for aids and advice.  Facilitate self-management of aids for vision/hearing
<b>Decreased mobility</b>	Risk of falls: Physiological Profile Assessment*	Strategies to facilitate behaviour change to enhance participation in intervention programmes are outlined in the NICE Guidance "The most appropriate means of generic and specific interventions to support attitude and behaviour change at population and community levels", <a href="http://www.nice.org.uk/PH6">http://www.nice.org.uk/PH6</a> .*.  We also encourage the implementation of the Recommendations on physical activity for health from the Australian guide <a href="http://www.health.gov.au/internet/main/publishing.nsf/Content/phd-physical-rec-older-guidelines">http://www.health.gov.au/internet/main/publishing.nsf/Content/phd-physical-rec-older-guidelines</a> *
<b>Lack of participation in life roles</b>	Clinical assessment	Barriers to participation should be assessed. Randomised controlled trials have demonstrated increased participation with intervention, targeting risk factors, such as modification of the home environment* and specific

		<p>training on community interactions*.</p> <p>Setting individualised goals and tailoring interventions to meet these goals may also be effective. Enlist the help of significant others/carers to encourage goal attainment.</p>
<p><b>Problems with services or support systems</b></p>	<p>Clinical assessment</p>	<p>There should be early and ongoing engagement with support and education of formal and informal carers*. Caregivers and family should be taught about frailty, interventions to optimise function, and be involved in the planning and development of management plans.</p> <p>Provision and co-ordination of services, with preference given to care packages, followed by single services, followed by a residential aged care facility.</p> <p>Some tips for cares can be found in the NICE clinical guideline, 'Dementia: Supporting people with dementia and their carers in health and social care', <a href="http://guidance.nice.org.uk/CG42">http://guidance.nice.org.uk/CG42</a>. Section 1.11.</p>

*\*For further information, please consult the original article.*

## *Annex 8. Check List for risks in the home*

Example of a check list tackling the main risks of falls in the home and recommendations to solve the identified problems. (Adapted from V. Rodríguez Navarro, 2012<sup>173</sup>).

### **1. Floors**

Check the state of the floor in all rooms.

1.1. When you walk through a room, do you have to walk around furniture that makes it difficult to walk?

- No.
- Yes. Change the furniture so that you do not find obstacles in your way.

1.2. Do you have carpets on the floor?

- No.
- Yes. Remove the carpets and doormats or fix the carpets to the floor with a non-slip surface and avoid worn-out, slippery doormats or deep-pile carpets.

1.3. Are there newspapers, magazines, books, shoes, boxes, blankets, towels or other objects on the floor?

- No.
- Yes. Pick up the things that are on the floor. Always keep the floor free from objects.

1.4. Do you have to walk on, or around cables (for example, lamps and telephone cables or extension cords)?

- No.
- Yes. Roll the cables securely or fasten them with tape next to the wall, so as not to trip over obstacles.

1.5. Is the floor excessively polished or slippery?

- No.
- Yes. It is recommend to use non-slippery polishers or avoid using any at all.

### **2. Lighting**

Check lighting inside the home.

2.1. Is there enough lighting in the whole house, both during the day and the night?

- Yes.
- No. It is important to make use of natural light. Keep good electric lighting and avoid too direct or dazzling lights.

2.2. Are there accessible switches in all the rooms of the house?

- Yes.
- No. It is advisable to place switches at the entrance of the rooms and in places you can reach with your hands.

### **3. Kitchen**

Check the kitchen and the area where you eat.

3.1. Are all the things that you commonly use on high shelves?

- No.
  - Yes. Place the objects on the lower shelves. Keep the things you commonly use on the lower shelves (at roughly waist height).
- 3.2. Does the floor around the sink usually get wet when washing the dishes?
- No.
  - Yes. Dry the floor well after washing the dishes.

#### **4. Bedrooms**

Check all the bedrooms.

4.1. Is it difficult to reach the light switch next to the bed?

- No.
- Yes. Place a lamp next to the bed where you can easily reach to avoid standing up in the dark.

4.2. Do you have basic elements, such as a glass of water, glasses, walking stick, chamber pot, within hand reach from the bed?

- Yes.
- No. Place whatever you need during nighttime within your hands reach from the bed.

#### **5. Corridors**

Check corridors from the bedroom to the bathroom.

5.1. Is the corridor that goes from the bedroom to the bathroom dark?

- No.
- Yes. Place a light for night time so that you can always see where you are walking if you need to go to the bathroom.

5.2. Are the rest of the corridors in the house dark?

- There are no more corridors.
- No.
- Yes. Turn on the light so that you can see where you are walking when going through the corridors. Insert a light in the corridor if you do not have one.

#### **6. Bathroom**

Check all your bathrooms.

6.1. Is the floor of the bathtub or shower slippery?

- No.
- Yes. Place an anti-slip mat on the floor of the bathtub or shower.

6.2. Do you have an appropriate handle to get in and out of the bathtub or shower or when you get up from the toilet or bidet?

- Yes.
- No. Install handles in the bathtub or shower and next to the toilet and bidet. Neither towel rails nor water taps must be used as handles.

#### **7. Shoes and clothing**

7.1. Do you use closed footwear that correctly suits your feet and have a non-slip sole?

Yes.

No. Avoid using flip-flops and walking barefoot. It is advisable to use closed slippers that hold your ankle and with non-slip rubber sole.

7.2. At home, do you use trousers, pyjamas or long dresses that may drag on the floor?

No.

Yes. Be careful with long clothes that may drag along the ground because you may step on them. It is advisable to use clothing that does not drag on the floor.

#### **8. *Pets***

8.1. At home, do you have free-roaming pets such as dogs, cats, etc.?

No.

Yes. Make sure they are not roaming around you when you are walking around the house.

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