



Co-funded by
the Health Programme
of the European Union

advantAGE
MANAGING FRAILTY

Updated state of the art report on the prevention and management of frailty

August 2019

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This report is part of Joint Action ‘724099 / ADVANTAGE’ which has received funding from the European Union’s Health Programme (2014-2020).

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ABBREVIATIONS

BMI = Body Mass Index

CD = Chronic diseases

CFS = Clinical Frailty Scale

CHS = Cardiovascular Health Study

CGA = Comprehensive Geriatric Assessment

COPD = Chronic Obstructive Pulmonary Disease

EC = European Commission

eFI = Electronic Frailty Index

EFS = Edmonton Frail Scale

EIPAHA = European Innovation Partnership on Active and Healthy Ageing

EU = European Union

FRAIL = Fatigue, Resistance, Ambulation, Illness, Loss of Weight

ICTs = Information and Communication Technologies

JA = Joint Action

MNA = Mini Nutritional Assessment

MS = Member State

SHARE = Survey of Health, Ageing and Retirement in Europe

SOF = Study of Osteoporotic Fractures

SoAR = State of the Art report

SPPB = Short Physical Performance Battery

WHO = World Health Organization

WP = Work package

EXECUTIVE SUMMARY

Demographic ageing is one of the most serious challenges that Europe is currently facing. Older people are at greatest risk of becoming frail and developing disability. However, since frailty is not an inevitable consequence of ageing, it can be prevented and treated to foster a longer and healthier life.

There are several initiatives taken forward by the European institutions to address these challenges, but frailty is not yet at the top of the public health agenda. There is an urgent need to develop evidence-based support to make frailty a public health priority.

The concern for this situation motivated the European Commission, the Parliament and many of the Member States (MSs) to co-fund, by the Third European Health Programme of the European Union (EU) 2014-2020, the first Joint Action (JA) on the prevention of frailty, ADVANTAGE, which brings together 33 partners from 22 MSs for three years.

The first practical step towards this aim was the preparation of the document *State of the Art on Frailty Report* to support an overview of evidence of what works and what does not work on frailty prevention and management. Evidence on frailty was researched and discussed by the professionals involved in the ADVANTAGE JA and crystallized to have a common conceptual framework for further work and to base the recommendations for action for health and social care policies on this area. ADVANTAGE JA partners summarized and analyzed the evidence obtained from four sources of information: peer-reviewed articles, grey documents, good practices identified at European level and EU funded projects. The main results were presented as answers to key questions that stakeholders might ask when trying to understand how to best address frailty.

The State of the Art on Frailty Report was first published at the end of 2017. Now some eighteen months on, the document has been updated to reflect new evidence produced since 2017.

The key messages reflected in this updated version of the State of the Art document are grounded in scientific knowledge, are assertive and avoid controversial statements whenever further research is needed or results are unclear. Furthermore, they acknowledge the heterogeneity of the MSs health and social care systems and diverse societies in a scenario of demographic change and economic constraints across the EU. For further information on these issues specific reports are available at the JA website www.advantageja.eu

Overall these messages intend to be an instrument of added value to advocate for policy driven decisions on frailty prevention and management in the JA participating MSs and subsequently towards a disability free older population in Europe.

INTRODUCTION

Ageing population in Europe and the importance of frailty

Demographic ageing is one of the most serious challenges that Europe is facing (European Commission 2012). The percentage of citizens aged over 65 years is predicted to rise from 18% to 28% by 2060; the percentage of over 80s will increase from 5% to 12% during the same time period. Life expectancy at the age of 65 years, and even at 80 years, has increased and is expected to continue increasing beyond 2020 (European Union, 2017).

Older people are at greatest risk of becoming frail and developing disability. These demographic trends suggest that there will be an increase in age-related disability and dependence, which will ultimately impact not only on the wellbeing of the individuals affected but also on the sustainability of healthcare systems (European Commission, 2015).

As a consequence, the models of care should take into account the need to approach older people not just in terms of addressing diseases but also in terms of care and support to prevent functional decline, frailty and disability (Murray et al., 2013).

Despite ongoing controversy over an agreed definition of frailty, it is widely accepted that it is a geriatric syndrome characterized by a diminished physiological reserve of multiple organs, which means increased vulnerability of older people to adverse outcomes such as disability, institutionalization, hospitalization and death (Gill, 2006; Kan et al., 2008; Rodriguez-Mañas et al., 2012).

Frailty is very common with a global weighted prevalence of approximately 11% in people older than 65 years living in the community (Collard et al., 2012).

Frailty has a clear impact on the costs of health services. Recent studies carried out in Germany, France and Spain have determined its costs in older people both in the community and in hospitals. The incremental annual costs range from 1,500 to 5,000 €/person depending upon the level of frailty and the setting of care (community or hospital) (Bock et al., 2016; García-Nogueras et al., 2016; Sirven et al., 2016).

However, since frailty is not an inevitable consequence of ageing, it may be prevented and treated to foster a longer and healthier life. The identification of conditions preceding the development of disability is an essential requisite to effectively prevent it. Among them the most important risk factor is frailty (Gill et al., 2011).

An EU approach to address frailty

The above-mentioned reasons make frailty an important topic for public health at European level.

In this regard, several institutions, such as the European Commission (EC) and the World Health Organization (WHO), are advancing strategies and actions to create awareness about the need to support and care for older people and to build consensus across all sectors of society regarding both the philosophy of care and on how this will be delivered in the most cost-efficient way.

- The European Innovation Partnership on Active and Healthy Ageing (EIPAHA) was launched in 2012 as an EC response to meet Europe's demographic challenges. Tackling frailty and disability and promoting integrated care are among its priorities. Action Groups on those topics have since contributed significantly to policy debate at the European Union (EU) and to shape new models for screening, treatment and monitoring as well as sharing good practices (European Commission, 2012).
- In the 2014 joint report on adequate social protection for long-term care needs in an ageing society, the Social Protection Committee and the EC agreed that national policy makers should move to an increasingly proactive policy approach, seeking both to prevent the loss of autonomy and thus reduce care demand, and to boost efficient, cost-effective care provision (European Union, 2014).
- The WHO is taking the lead in advocating for a comprehensive public health action on population ageing focusing on supporting action around the new concept of functional ability (WHO, 2015).

Despite these initiatives, frailty is not yet at the top of the public health agenda. There is an urgent need to develop evidence-based support to make frailty a public health priority.

The concern for this situation motivated the EC, the Parliament and many of the Member States (MSs) to co-fund, by the Third European Health Programme of the European Union 2014-2020, the first Joint Action (JA) on the prevention and management of frailty: ADVANTAGE.

The work that ADVANTAGE JA is implementing is particularly relevant in Europe at present as it addresses the demographic change and the associated increasing demands for social and health care from the burden of chronic diseases, frailty, disability and older age, which are a central priority for the EU and its MSs.

Bringing together 33 partners from 22 MSs for three years, this JA involves a wide range of countries and regions with very different health systems, diverse health and social policies and different cultural, social and economic backgrounds. This scenario represents a formidable challenge but also a great opportunity for concerted action resulting in fostering effective and successful policies in frailty prevention and management in the participating MSs.

ADVANTAGE JA focuses on three lines of action:

1. Building a common understanding on the concept and operative definition of frailty versus chronic diseases (CD) interventions.
2. Developing methodology and tools for assessment of people with frailty.
3. Preparing common health and social care guidelines or frameworks on frailty prevention and management to promote better health in older people and to reduce the growing burden of health care demands related to frailty, CD and disability.

Why an ADVANTAGE JA State of the Art report on frailty?

The final aim of this State of the Art report (SoAR) is to support an overview of evidence of what works on frailty prevention and management. This is the basis of the advice that the JA is giving to policy makers and stakeholders in general so that their own decisions may be informed by the evidence on frailty that has been researched and discussed by the professionals involved in the ADVANTAGE JA and crystallized in this report.

The need for research on known evidence and gaps about frailty was based on the following reasons:

1. The need for concerted action from the ADVANTAGE JA advised to share a common rationale despite the different professional backgrounds and country situations of the consortium.
2. The lack of international consensus on how to define and measure frailty, which poses challenges for prevention, clinical management and research activities.
3. The need to distinguish between frailty and CDs/ multimorbidity, two syndromes that overlap and are sometimes used interchangeably to describe vulnerable older adults.
4. Due to the lack of a common definition there is wide variation in the results of the studies on the prevalence of frailty, rendering unclear information on how common frailty is in different settings (community, primary care, hospitals, nursing homes) and whether its frequency varies across countries. Moreover, little is known about how many new cases can be expected in the future, and the proportion of individuals who will become frail or recover from the condition, including the precipitating factors for transitions from robust to different stages of frailty.
5. The plethora of tools that have been developed and are used to screen and diagnose frailty contributes to further complicate the comparison between prevention and management activities. There is a need to identify and select the most appropriate tools through the application of well-defined criteria.
6. Frailty can potentially be prevented and treated; particularly where appropriate interventions are implemented early. Therefore, it is necessary to update the

available evidence and knowledge on four specific areas that have proven so far to be either effective or promising in the prevention and clinical management of frailty: nutrition, physical activity and exercise, drugs, and information and communication technologies (ICTs).

7. Many screening tools for frailty have been recommended at population level, but the feasibility and potential benefits of systematic screening and monitoring programs are yet unclear.
8. Current health and social care models are not attuned to the challenges that an increasing presence of frailty among the individuals they attend bring. Rather than the presence or absence of disease, the most important consideration for older people is usually their level of function. Integrated care has emerged as an effective way to improve outcomes for people with chronic conditions and complex care and support needs; therefore, it could also benefit people who have frailty, although there is currently limited data from cost-effectiveness studies to support this hypothesis.
9. The need for competencies, which are not usually part of the curricula of health and social care professionals during their undergraduate and postgraduate training, to support reshaping of health and social care systems to address frailty.

How this document is organized

The SoAR points out the main facts and draws conclusions from the specific work packages (WPs) state of the art reports. For more detailed information, the interested reader should consult the specific WP SoARs available at the ADVANTAGE JA website: www.advantageja.eu

The SoAR is arranged in five sections: introduction, methods, results, key messages, and annexes. Results are presented as answers to key questions that stakeholders might ask when trying to understand how to best address frailty, such as: what is frailty?; why is it a public health problem?; what is the relationship with CDs?; how can frailty be prevented?; how can frailty be managed?

METHODS

Search strategy

The goal of the WP SoARs was to summarize and analyze the evidence obtained from four sources of information: Peer-reviewed articles, grey documents, good practices identified at European level and EU funded projects. The initial review was carried out from February to October 2017. Each WP focused on their respective area of knowledge as depicted in Table 1.

Table 1. Area of knowledge researched and analyzed by work packages

WP	Area of knowledge covered by each WP
WP4	Frailty definition. Relationship of frailty with chronic diseases and multi-morbidity. Individual screening and diagnosis.
WP5	Epidemiology. Population screening, monitoring and surveillance.
WP6	Prevention, clinical management and treatment (including nutrition, physical activity, drugs and ICTs).
WP7	Health and social care models for frailty management.
WP8	Education/training of the workforce. Research.

A homogenous search approach by all WP partners was ensured by agreeing types of articles, period of search, sources of information and inclusion-exclusion criteria.

Only original articles were considered. Letters to the editor, abstract publications, conference proceedings, non-systematic reviews and editorials were excluded. Languages allowed were English and from any of the ADVANTAGE JA MSs.

All WPs reviewed papers published from 2002 to 2017, the period that has witnessed a dramatic increase in publications dealing with the concept of frailty. Exceptions were reviews on the areas presented in Table 1 of “education/training of the workforce”, limited to the last 10 years, and “research”, limited to the last 2.5 years. Papers published before 2002 were included on a case-by-case basis if deemed relevant.

Sources of information for peer-reviewed articles were databases of references and abstracts on biomedical topics. All WPs searched articles in Medline via PubMed. All but one searched Embase. Other, less frequently used, databases were CINAHL, Cochrane databases, Up to date, OpenGrey, Scopus and the Web of Science.

Specific search terms for each WP queries can be found in their reports. Overall, the search terms *frailty* or *frail* were applied without prejudice as to the specific definition. A total of 17 areas of knowledge were considered for the search and included key issues related to frailty concept, epidemiology and its management.

In most of the WPs, pairs of reviewers independently assessed each of the studies for inclusion. A third reviewer settled disagreements. A total of 1,291,904 articles were identified by the search and information from 503 articles was extracted and subsequently analyzed (Annex 1).

The search for grey documents, good practices and initiatives supported by the EC included searching the websites of the EIPAHA and EU funded projects related to frailty, and reporting by ADVANTAGE JA partners (many of whom are also EIPAHA members) when aware of relevant unpublished evidence in their own countries.

Analysis of information

Each WP discussed their main findings within the group and subsequently developed their own topic-specific SoAR. Each report was critically reviewed by three out of the seven members of an expert panel and later discussed in a two-day session with the expert panel, the coordination team and the WP leaders and co-leaders (Expert Panel meeting, September 2017. Mao Spain).

Limitations of the common search strategy

Although the methodology for the review was rigorous, some limitations need to be considered:

- The open definition of the terms *frail* and *frailty* makes the comparison between different publications using the same terms for an array of clinical situations difficult.
- The search for grey literature was opportunistic; thus, some important documents may not have been identified.

2019 update

As new research on frailty continues to emerge, each WP has updated the SoAR in the light of new evidence published since the 2017 version of the SoAR.

A more detailed analysis of impact (effectiveness and/or costs) of integrated care for frailty was undertaken in 2018. A further systematic review and Delphi consensus were carried out to ascertain the components and effectiveness of intermediate care and transitional care interventions for older people.

For the update of the rest of the questions, the review was not systematic but based on the knowledge and expertise of the members of the JA.

RESULTS

1. What is the definition of frailty adopted by ADVANTAGE JA?

The concept of frailty is a recent one, dating from the last quarter of the 20th century. The definition of frailty is still under debate. ADVANTAGE JA partners have agreed that, irrespective of a given definition, the concept of frailty must refer to a condition with five core attributes:

1. Characteristics (multiple conditions, complexity, relationship to ageing, and a specific trajectory that may be reversible).
2. Pathogenesis (a multicausal process that includes the malfunction of several systems due to intrinsic and extrinsic factors that results in loss of reserve).
3. Triggers (stressors).
4. Vulnerability for adverse outcomes.
5. Phenomenon (characterized by its heterogeneity, fluctuating nature and difficulties in staging the progressive pathway). Frailty is viewed as progressive and potentially reversible condition characterized by a continuum of changes in intrinsic capacity. When describing frailty three different approaches have been raised: the clinical (a clinical state or geriatric syndrome), the functional (losses in human functioning, alterations in several domains of function and reduction of activities) and the multidimensional one (frailty covers different domains including the physical, cognitive and psychosocial domains).

From the many different frailty definitions used in the publications and projects reviewed, only the 2015 WHO definition fully incorporates the first four attributes that are uncontroversial. Thus, ADVANTAGE JA has decided to adopt this definition:

“Frailty is a progressive age-related decline in physiological systems that results in decreased reserves of intrinsic capacity, which confers extreme vulnerability to stressors and increases the risk of a range of adverse health outcomes.” (WHO, 2015).

2. What is the relationship between frailty and multi-morbidity?

Multimorbidity, disability and frailty are often used interchangeably to identify vulnerable older adults. However, they are distinct clinical entities that are causally related, often associated and may overlap. Frailty is now considered to be a distinct dimension, aside from comorbidity and functional dependency, and is a pre-disability stage (Kan et al., 2008).

The creation of a frailty scale, based on disease count, has been proposed (Gilbert et al., 2018), but frailty and multimorbidity, despite a substantial overlap, are two distinct conditions (Hanlon et al., 2018; Vetrano et al., 2018). There is a need to distinguish

between them because frailty is more strongly predictive of adverse outcomes compared to multimorbidity. Compared to disease states, function has a greater impact on quality of life than disease. Furthermore, the best predictor of function is frailty. For these reasons, assessment of frailty is necessary to assess the most care demanding population in need of comprehensive interventions. In this context, the NICE guidelines on multimorbidity (Farmer et al., 2016) suggest applying a personalized and integrated care approach aimed at improving quality of life only when multimorbidity and frailty coexist.

Frailty focuses on specific areas for which a general treatment approach can be developed, whereas multi-morbidity moves the focus to the management of each condition separately, although both require multidimensional assessment and management (Morley et al., 2013).

As frailty shares the key features of the common long-term conditions (Harrison et al., 2015), chronic care strategies to provide accessible information, advice, education and support for self-management to promote participation, independence and wellbeing in later life should be adopted. Support for the caregiver to remain well and continue in their caring role should be also provided.

3. How common is frailty in the ADVANTAGE JA Member States?

The prevalence of frailty reported in multiple studies on community cohort samples ranges from 2% to 60%, contingent on factors such as the age of the population studied, and the frailty assessment instrument or classification used. Most of the community-based studies reviewed, reported prevalence rates below 30%, with a median of 10.8%. The ADVANTAGE meta-analysis of European community-based studies confirmed an estimated prevalence of 12% (O’Caoimh et al., 2018a). This is consistent with the global weighted prevalence of 11% reported in a recent systematic review of community-dwellers over 65 years old (Collard et al., 2012).

There are much fewer studies from other settings. They indicate that frailty is more frequent ($\geq 30\%$) in primary care and outpatient settings, reaching more than 50% of inpatients in hospital wards and over 60% of residents in long-term care facilities. The pooled estimate resulting from the ADVANTAGE meta-analysis is four times higher in non-community settings (45%) than in community dwellers (O’Caoimh et al, 2018a).

Not all ADVANTAGE JA MSs are equally represented in these frailty prevalence studies. Most of the studies reviewed were conducted in just five countries (France, Germany, Italy, the Netherlands and Spain), while another five (Bulgaria, Croatia, Cyprus, Lithuania and Malta), to the best of our knowledge, do not have any published information available.

4. How many new cases should we expect in the future?

As frailty is highly associated with age, we should expect an increase in the absolute number of new cases (incidence) of frailty as the European population gets older. Despite the dynamic nature of frailty, there is a remarkable paucity of longitudinal data about frailty development and progression over time.

The few incidence studies retrieved through the ADVANTAGE systematic review of literature (Galluzzo et al., 2018) show a considerable heterogeneity of findings due to considerable differences in age, sample size and follow-up length. In the European studies (3 out of 6), the proportion of new cases of frailty ranges from 3.9% of older adults aged over 65 years in Germany to 7.5% of those aged over 60 in Spain. Published data show a substantial lack of analysis of the basic socio-economic characteristics potentially influencing the development of new cases of frailty. The adoption of incidence proportions, rather than person-time rates, is a further obstacle to the comparability of results because highly influenced by the duration of follow-up.

A study in Italy investigating factors associated with frailty transitions and mortality found the following risk factors for becoming frail: older age, female gender, obesity, cardiovascular disease, diabetes, osteoarthritis, low vitamin D, hyperuricemia, smoking, loss of vision, reduced independence in activities of daily living, cognitive impairment; and poor physical performance (Trevisan et al., 2017). Diabetes was also associated with an increased risk of frailty in a study carried out in Spain (Garcia-Esquinas et al., 2015).

5. Can a frail person improve his/her situation (become less frail) spontaneously?

Frailty is a potentially reversible condition that can regress spontaneously to a robust (non-frail) state, especially in its early stages, although little is known about how frequently this can happen without intervention.

Few studies examining frailty trajectories or transitions over time are available from EU ADVANTAGE JA MSs (O’Caoimh et al., 2018b). Findings on frailty transitions appear roughly similar in two European cohorts both reporting frailty transitions in terms of the proportion of participants with at least one change in discrete frailty states over time (non-frail, pre-frail, frail and back). The reported proportion is 32.6% in the Italian study Pro.V.A vs. 34.3% in the Dutch PERSSILAA, however the follow-up duration varies markedly ranging from 4.4 to 2 years, respectively, thus limiting comparability of findings.

In a study conducted in the Netherlands within the FP7-funded PERSSILAA project, in a sample of 169 participants 25% of frail participants transitioned back to pre-frail, while 25% of pre-frail participants transitioned to robust after two years follow-up. Other studies in the USA have reported similar transitions from frailty to pre-frailty (23%) but smaller ones from pre-frailty to robustness (11.9%) (Gill, 2006).

Being overweight, having a low-moderate alcohol consumption, a higher educational level and living alone appear to be associated with improvements in frailty status, while some chronic conditions like diabetes or chronic obstructive pulmonary disease (COPD) are associated with a poor evolution (Trevisan et al., 2017; Pollack et al., 2017), although this has to be confirmed with other studies.

Physical activity and physical exercise have a role in reversing frailty status: moderate physical activity reduced frailty progression in some age groups (particularly those aged over 65 years) and vigorous activity significantly reduced the trajectory towards frailty. However, mild physical activity was insufficient to slow progression (Rogers et al., 2017).

6. How can frailty be screened in clinical practice?

An international consensus group stated there is sufficient evidence to recommend that all persons older than 70 years should be screened for frailty by health care providers (Morley et al., 2013). The Ministry of Health of Spain (2014) also recommends as a national strategy the opportunistic screening for frailty in patients aged over 70 years attending primary health care centers and active search for frailty in patients with CD.

ADVANTAGE JA supports the recommendation of opportunistic screening of individuals aged over 70 years receiving health care at any level of the system.

In order to screen for frailty, many instruments have been proposed and are used in clinical practice and public health level frailty detection programs.

Frailty screening instruments used in clinical practice must be sensitive, so as to detect most patients needing special attention, and specific, so as to avoid providing unneeded interventions to robust patients falsely classified as frail. Available instruments tend to have high sensitivity but limited specificity. Frailty screening instruments must also have good positive and negative predictive values, which are influenced by the prevalence of frailty. These will be the instruments most useful at population level.

ADVANTAGE JA proposes the use of screening tools that fulfill four characteristics:

- Quick to administer (taking no more than 10 minutes to complete).
- Do not require special equipment.
- Have been validated.
- Are meant for screening (see Annex 2).

These four characteristics are met by the following instruments: Clinical Frailty Scale (CFS); Edmonton Frail Scale (EFS); Fatigue, Resistance, Ambulation Illness, Loss of Weight Index (FRAIL Index); Inter-Frail; Prisma-7; Sherbrooke Postal Questionnaire; Short Physical Performance Battery (SPPB) or Study of Osteoporotic Fractures Index (SOF). All of these instruments appear in a recent review of tools for frailty assessment (Dent et al., 2016).

In addition, the use of electronic Frailty Indexes (eFI) built based on variables included in the patient's electronic care health records, represents a quick, simple and validated methodology to screen for frailty in primary care. Such a methodology has been tested in the UK, Australia and US (Ambagtsheer et al., 2019; Boyd et al., 2019; Pajewski et al., 2019; Stow et al., 2018).

Although gait speed is not a scale, it has been shown to be a good predictor of frailty and other significant adverse events. It is also one of the screening tools recommended in the Frailty Strategy of the Ministry of Health of Spain (2014). For these reasons, ADVANTAGE JA adds it to the list of recommended tools. In addition, there are other tools, as the SUNFRAIL tool (D 6.2: Sunfrail Tools for the Identification of Frailty and Multimorbidity, available at www.sunfrail.eu), developed under the umbrella of European projects that are in the process of validation.

In the absence of a “gold standard”, the instrument to screen and diagnose frailty should be chosen according to the characteristics of the population being studied, the aims of the assessment and the assessment context (Cesari et al., 2016).

7. How can frailty be diagnosed?

Frailty status in older adults without disability should be determined using a validated scale (Annex 3). ADVANTAGE JA proposes as frailty diagnostic instruments the Frailty Index of accumulative deficits, the Frailty Phenotype of the Cardiovascular Health Study (CHS), or the Frailty Trait Scale. The first and last instruments allow tracking of the evolution of frailty status. These scales appear in a recent review of tools for the assessment of frailty (Dent et al., 2016).

These three diagnostic tools do not assess all the dimensions of individual needs that must be considered. These dimensions are best assessed through the process of Comprehensive Geriatric Assessment (CGA), which has become the internationally established method to assess and manage older people in clinical practice.

As the aim of diagnosing frailty is to prevent functional decline and disability, assessing frailty status is a controversial issue in patients with established disability and a low Barthel Index.

Frailty is viewed as continuum of changes in intrinsic capacity, where early intervention is more likely to reverse frailty or delay progression to frailty (Rodriguez-Mañas et al., 2017).

8. How can frailty be managed?

It is important to encourage a healthy life-style from midlife, which will include interventions such as stopping smoking and reducing alcohol consumption, increasing physical activity, and improving the diet to achieve and maintain a healthy weight, to improve health status in general and to reduce the risk of becoming frail in later life (National Institute for Health and Care Excellence, 2015; Graciani et al., 2016).

There is weak evidence supporting that the Mediterranean diet is useful to prevent frailty (Goisser et al., 2016; León-Muñoz et al., 2014).

No other results of preventive interventions were found in our literature research. Nevertheless, there is observational evidence that societal factors, such as education level (Mello et al. 2014; Young et al., 2016), income (Guessous et al., 2014; Mello et al., 2014) and marital status (Young et al., 2016) may be shaping the development of frailty.

A recent meta-analysis has confirmed that exercise and nutrition are effective interventions to reduce frailty (Puts et al., 2017). Although some drugs have shown some potential benefits, up to now no drug treatment has been approved for frailty.

Today, the gold standard for management of frailty is the CGA and its associated interventions (Morley et al., 2013). CGA is a multidimensional, interdisciplinary assessment process to determine the medical, psychological, social and functional capabilities of a frail older person and to develop a co-ordinated and integrated plan for treatment and long-term follow up (Rubenstein et al., 1991). CGA allows structuring of the specific actions needed to be adopted by different professionals according to the range of problems identified with the individual and his/her caregiver.

Figure 1 presents an algorithm for the prevention and management of frailty and Box 1 details the elements of a comprehensive clinical management of frailty.

8.1 How useful is physical activity and exercise for the management of frailty?

In order to reduce frailty it is necessary to act on one of its main risk factors: inactivity. Research shows that sedentary behaviour is independently and positively associated with frailty (Coqueiro et al., 2017). Interventions that have focused on physical activity have demonstrated its effectiveness in delaying and even reversing symptoms of both frailty and disability.

A systematic review provides evidence on the positive effects of multicomponent exercise programs on the functional ability and the overall health of frail people. The most frequently used program consists of endurance, flexibility, balance, and resistance training performed with low to moderate intensity, in 30 to 45 minutes sessions, three times a week. Exercise seems to be more effective in earlier stages of frailty than on its later stages.

Several clinical trials (Cadore et al., 2013; Pahor et al., 2014), show that frailty and frailty related syndromes (falls, sarcopenia) respond positively to structured exercise programs of strength training, consisting on low (30% of maximum intensity) to medium (60-70% of maximum intensity) exercise load. The duration of the trials was extremely variable, from eight weeks minimum to a year and a half maximum, but even the shortest trial duration produced an increase in strength.

There is also evidence that physical exercise is more useful if combined with a nutritional programme (Theou et al., 2011).

8.2 What should be done about nutrition for the treatment of frailty?

There is sufficient evidence that nutrition and frailty status are related; thus nutritional status should be assessed in frail patients using a validated tool such as the Mini Nutritional Assessment (MNA) (Guigoz, 2006).

Evidence suggests that BMI 25-29 offers the best outcomes for older people in terms of mortality and overall health. When weight loss is of benefit, BMI greater than 30 kg/m² and age between 65 to 80 years, a moderate weight loss of 8-10% of body weight over six months always combined with exercise (resistive training to maintain muscle mass) is advised. For over 80 years of age, or elders with a serious health condition, there is no conclusive evidence for the benefit of weight reduction, so only advice on healthy diet and, if possible, exercise to maintain muscle mass can be offered (Porter Starr et al., 2015).

Older adults with BMI < 23 Kg/m² are advised to adopt a diet of high energy and nutrient density and participate in exercise (resistance) training in order to achieve a gradual increase in body mass, especially muscle mass (Porter Starr et al., 2015).

Protein intake of 1.5 g per kilogram of weight per day has the most beneficial effects in regard to preventing sarcopenia and frailty compared with protein intakes of 0.8 and 1.2 g per kilogram of weight per day in prefrail or frail elderly subjects at risk of malnutrition (Yongsoon et al., 2018).

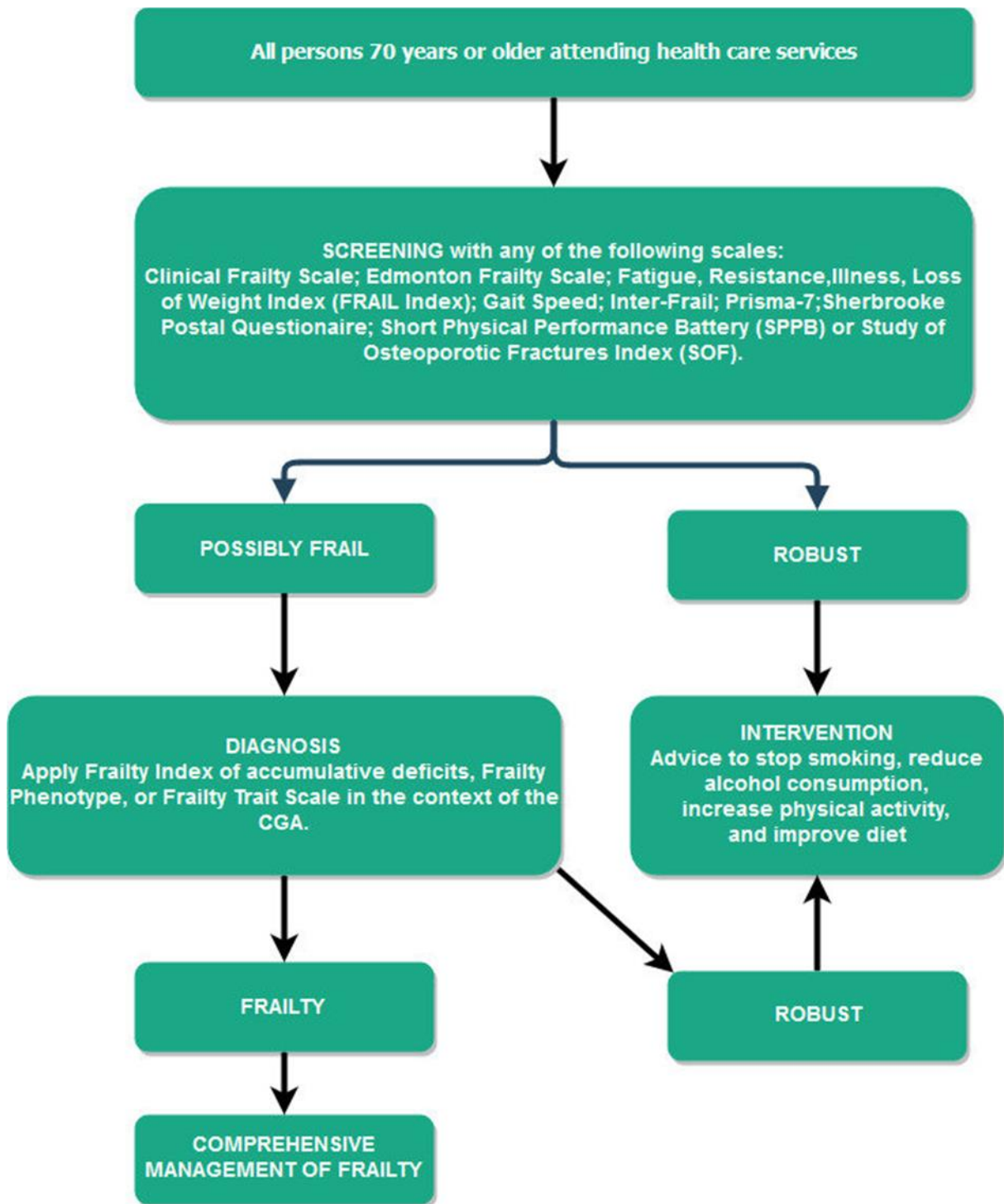
Frail older patients who are at high risk of falls or fracture and with a 25-OH vitamin D level < 30 ng/ml should receive doses of 20 to 25 µg/day (800 a 1000 IU/day) of vitamin D (Bruyère et al., 2017).

8.3 What is the relationship between polypharmacy and frailty?

Frailty increases the risk of side effects from drug treatments.

Polypharmacy is associated with frailty (Lorenzo-López et al. 2018; Veronese et al., 2017) and increased rates of mortality, disability, hospitalization, and emergency department visits in frail older adults. Polypharmacy (especially when more than 10 drugs are taken) should be monitored in these patient subgroups to optimize health outcomes (Bonaga et al., 2018).

Figure 1. Algorithm for the management of frailty at individual level



Box 1: Comprehensive clinical management of frailty

- Comprehensive Geriatric Assessment (CGA) to develop a personalised care plan and carry out a personalized multi-dimensional intervention.
- Take into account the frailty stage to tailor the correct treatment of concomitant diseases.
- Provide structured multicomponent exercise programs (consisting of endurance, flexibility, balance, and resistance training) performed with low to moderate intensity, in 30 to 45 minute sessions, three times a week. Followed or substituted by exercise programs of strength training: minimum of 8 weeks and medium to high exercise load (from 8 to 12 repetitions, from 30% - 60-70% of maximum intensity).
- Assess and optimize nutrition (Mini Nutritional Assessment).
- Apply tools to minimise risk from inappropriate drugs and polypharmacy (Beers criteria, STOPP/START or Laroche criteria).
- When weight loss is of benefit, in BMI $\geq 30 \text{ kg/m}^2$, and age 65 to 80 years, advise a moderate weight loss of 8-10% of body weight over 6 months always combined with exercise (resistive training to maintain muscle mass).
- Considerer Vitamin D supplementation for frail older patients who are at high risk of falls or fracture and with a 25-OH vitamin D level $< 30 \text{ ng/ml}$ with doses of 20 to 25 $\mu\text{g/day}$ (800 a 1000 IU/day).
- ICT solutions should also be considered and advised to enable self-management and promote independence.

Besides the number of drugs, prescribing medicines which are either inappropriate or no longer indicated increases adverse drug reactions, drug interactions, hospitalisations and costs of care, and may exacerbate frailty (Gnjidic et al., 2012). Hence, reduction in inappropriate medicines can clearly decrease costs and medication side effects in frail populations (Morley et al., 2013).

There are useful tools to manage inappropriate prescribing and reduce polypharmacy in patients who have frailty. The most widely used include the Beers, STOPP-START and Laroche criteria (Kaufmann et al., 2014).

8.4 Are ICTs useful in the management of frailty?

A wide range of technological solutions have been developed to enable older people to remain independent at home, support caregivers, facilitate remote monitoring and self-management, provide decision support, and improve information sharing and coordination of services. Examples include the CareWell, SmartCare and FACET European projects.

There is evidence that shows there are substantial potential benefits from the use of ICTs in older people especially for aspects of smart home technologies and monitoring of chronic conditions. In addition, Scotland has developed a strategy in this setting, and telecare has been shown to delay entry to long term care (The Deloitte Centre for Health Solutions, 2015). Although ICTs have been shown to be beneficial in the provision of care for older people with disabilities, up to now it is not quite clear if these benefits expand to individuals who have frailty.

The most effective Telehealth intervention is automated vital signs monitoring in order to reduce health service use, according to a systematic review of home telehealth and telecare for frail older people and patients with chronic conditions (Barlow et al., 2007). However, there is still limited evidence on the cost-effectiveness of these interventions and on the effects of home safety and security alert systems at scale. Furthermore, results of this review suggest that the acceptance and deployment of these new technologies remains problematic, especially for frail older people.

9. Do we need programs to screen for frailty at population level?

Screening for frailty in older populations would provide the opportunity to intervene at earlier stages when treatments are more likely to reverse or at least delay the progression of the condition. Nevertheless, to date there is little empirical evidence on the feasibility, acceptability and effectiveness of population screening programmes in EU countries (Rodríguez-Laso et al., 2018).

General practitioners have been identified as the preferred healthcare professional to identify physical health problems and risks (Lette et al., 2015) and therefore seem very appropriate to screen and monitor for frailty at population level.

There are both ongoing and completed EU funded projects and initiatives showing the feasibility and acceptance of screening approaches for frailty in primary care or the community in ADVANTAGE JA MSs. They are based on a two-step approach, consisting of the use of a short screening instrument to identify individuals who may have frailty followed by a more comprehensive evaluation to confirm the diagnosis. Different approaches to the first step have been tried, including the use of questionnaires, an Electronic Frailty Index (eFI) to be used with the patient's primary care records, or scales

administered by healthcare professionals or even the individual him/herself. The second step is always a more structured assessment using validated diagnostic tools.

In Spain, the Ministry of Health, in agreement with all regional ministries and professional associations, developed in 2014 a common protocol to screen for frailty in primary care. Furthermore, the region of Andalusia has implemented a programme to screen and manage/monitor frailty at population-level, on-going since 2008. In the United Kingdom, the routine use of an eFI in primary care has been promoted since 2017. None of these strategies have been evaluated yet.

Challenges in the uptake of screening programs remain, with concerns raised about inconsistencies in the definition of frailty; difficulty in eliciting psychosocial issues through questionnaires compared to home visits; overlapping of preventive initiatives between services; the weak evidence-base of many initiatives; ill-defined target groups and limited consideration of how to follow-up the detected problems.

There is a need to pilot throughout Europe regional screening programmes in primary care using a two-step strategy and to evaluate the existing programmes in countries like Spain and the United Kingdom, to build the evidence base for future routine screening programs.

10. Is there a need to monitor frailty in Europe?

As frailty is highly prevalent in Europe and is very much associated with disability, monitoring its evolution seems a reasonable way to proceed.

Longitudinal studies across Europe (Survey of Health, Ageing and Retirement in Europe-SHARE) and in specific countries (Germany, Italy, Spain) and the recent inclusion of an assessment of frailty into the English National Health Service primary care contracts show that identifying and monitoring frailty is feasible and useful to provide information on its prevalence, incidence and outcomes. This may help health and care providers calibrate the extent to which appropriate interventions are provided and to assess their impact over time.

Despite this, no country in Europe has adopted a systematic process for the surveillance or monitoring of this condition (Rodríguez-Laso Á et al., 2018). Cross-national experiences like the [SHARE project](#) can serve as basis to establish these programmes. Furthermore, monitoring would be much easier if the next review of the International Classification of Diseases includes a specific code for frailty.

11. What components should health and care systems adopt to manage frailty?

A systematic review of 18 comprehensive integrated care programmes for people with multimorbidity or frailty (Hopman et al., 2016) reported improved health-related quality of life, function, and satisfaction with care but no reduction in health services utilisation or costs. Seven of nine studies of integrated primary care for frail older people evidenced reduced hospital and/or long-term care utilisation (Béland et al., 2011). The key components of these models of care are similar to the elements of the Multimorbidity Care Model developed by the JA on Chronic Diseases and Promoting Healthy Ageing across the Life Cycle (CHRODIS) (Navickas et al., 2016). They are also consistent with the Integrated Care for Older People (ICOPE) Guidelines on community-level interventions to manage declines in intrinsic capacity (WHO, 2017).

This evidence helps to frame frailty as a chronic condition/syndrome requiring education and support for self-management for older patients and their caregivers, as for chronic conditions (Harrison et al., 2015).

A systematic review of 46 studies of 29 different interventions in differing populations of community dwelling older people reported limited evidence for cost-effectiveness of preventive integrated care (Looman et al., 2018). However integrated care for frailty requires effective chronic care plus enablement and rehabilitation to optimise function, particularly at times of a deterioration in health, or when moving between home, hospital or care home.

The key components of an effective model of care for frailty (Hendry et al., 2018) are:

- The establishment of a single-entry point in the community – generally in Primary Care - for comprehensive assessment and individualised care plans (for both older people and their caregivers).
- The use of simple frailty specific screening tools in all care settings.
- Focusing on case management.
- The coordination of home support and community services by a continuous partnership between the case manager, primary care team and the full range of care providers.
- Tailoring multiple interventions (physical, cognitive, social and functional) delivered by an interdisciplinary team, both in hospitals and community, to achieve the outcomes that are important to the individual, increase independence and reduce the risk of adverse events.
- The effective management of transitions between care teams and settings.
- Using electronic information tools and technology enabled care solutions.

- The adoption of clear policies and procedures for service eligibility and care processes.

All providers should be supported to make the required changes in the way care is delivered and to ensure there is a greater focus on outcomes such as care experience, quality of life and ability to participate in society.

Evidence for effectiveness of integrated care must consider the whole system impact, and not just the costs and benefits for health services. The inclusion of data from different care providers and different care settings is critical to understanding cost-effectiveness of integrated care interventions across the whole system. (Everink et al., 2018).

Evaluation of such complex interventions is challenging, and evaluation studies are rarely conducted over a long enough period to observe optimal impact. Compared to studies of integrated interventions at specific points in the care pathway, there is a relative lack of studies at organisational and system level (Briggs et al., 2018).

12. What is the role of intermediate care and transitional care within an integrated model of care?

A systematic review and Delphi consensus studied the components and effectiveness of 133 studies of intermediate care and transitional care interventions for older people (report available at the ADVANTAGE JA website: www.advantageja.eu).

Intermediate care and transitional care are a broad range of time limited services, from crisis response to support for several weeks or months, that aim to ensure continuity and quality of care and promote recovery at the interface between hospital and home, care home, primary care and community services. These services may particularly benefit persons who have complex support needs or circumstances, are vulnerable to a decline in health status or functional ability, or are at increased risk of (re)admissions to hospital or long-term care.

Intermediate care, at home or in intermediate care beds, aims to enable recovery, restore independence and confidence, or prevent a decline in functional ability at times of change in health.

Transitional care services are a subset of intermediate care designed to enable safe, coordinated and timely transfers between care settings.

Intermediate care is best delivered by an interdisciplinary team within an integrated health and social care system that links different providers and levels of care in a collaborative network of care and support that includes partners from community and voluntary sectors. A single point of contact helps to optimise service access, communication and coordination of care.

Health and care workforce should adopt relational approaches, creative solutions and simple technologies that enable and support patients, their families and caregivers to be fully involved in care planning, goal setting and monitoring from early stages. The nature, duration and intensity of the multi-dimensional interventions should be tailored to the needs of the individual, in collaboration with their family and caregivers, and may involve a case management approach for the duration of the episode.

There is clear and growing evidence that many examples of transitional care and intermediate care are effective and can make an important contribution to many positive outcomes for older adults and for healthcare systems. To be effective, services should have sufficient capacity and responsiveness, appropriate expertise, clear governance arrangements, and opportunities for education and training to support team members to work collaboratively and to continually improve service quality and outcomes for people and care systems.

There is strong evidence that intermediate care services can improve functional outcomes and reduce adverse events, including preventable early readmissions (Cunliffe et al., 2004; Caplan et al., 2006; Mas et al., 2018) and premature admission to long term care (Goodwin et al., 2018). There is more evidence for intermediate care delivered at home (Shepperd et al., 2016; Mas et al., 2017) than for bed-based interventions (Herfjord et al., 2014; Young et al., 2010; Garasen et al., 2008).

Intermediate care is a moderate cost, low volume intervention that has high impact in both short and medium term, particularly if delivered at home with an interdisciplinary team to enable independence and reduce harm.

Although transitional care is a relatively low cost and potentially high volume intervention that can reduce preventable early readmissions for older adults, the impact of transitional care on outcomes such as functional ability, independence and health and social care costs is not clear (Coleman et al., 2006; Courtney et al., 2009).

13. Is the health and social care workforce ready to meet the challenges of frailty?

Scientific literature searches updated to 2019 showed that literature and documentation regarding health and social care professionals' education concerning the concepts of frailty and multimorbidity is still very poor. Specifically, the concept of frailty is commonly intended as referring to an "acquired pathological status" very "institution/hospital/residential"-oriented, whereas community dwelling citizens older than 65 years are apparently not specifically or only partially the final target of academic programs. This reflects the fact that prevention of a frailty status in the citizens has not been considered as a priority by official academic programs so far. Delivery of integrated healthcare, which is pivotal for frailty management, is also neglected in these programs.

To address this gap, professionals need to be trained in three broad areas of competencies: geriatrics, interprofessional practice and inter-organizational collaboration (Sunfrail, 2018), something that has also been pinpointed by SAPEA (Science Advice for Policy by European Academies) in its report “Transforming the Future for Ageing” launched in May 2019. In this recent document, one chapter is dedicated to the needs of developing a skilled workforce to tackle the complex care needs of an ageing European society. The most urgent need is to effect a major change in the perception of ageing and care for older patients in all health care professional schools (medical, nursing, dentistry, pharmacy, physiotherapy and social work, amongst others) (SAPEA, 2019).

The EU funded SUNFRAIL project has recently reported sustainable positive outcomes from implementing a community-based training program to prevent frailty that was easy to access for all citizens. The two days course on detection, prevention, and management of frailty and multi-morbidity is based upon the SUNFRAIL tool. The course was organized for a multi-professional audience with the use of “concept mapping” (Sunfrail, 2018).

There are also current initiatives on continuous health professional education at national level. One example is Spain, where the Ministry of Health put in place in 2015 a 30 hours online programme on the detection and management of frailty and falls in older people, which has trained so far 2,698 health care professionals. Another example is Ireland, where the Health Service Executive and the Royal College of Physicians have launched a National Frailty Education Programme based on “train the trainers” of health professionals with the support of e-learning materials in 2017. France includes several in-person training initiatives on this topic under the umbrella of a national education strategy. All these experiences are promising and, after their evaluation, may be seen as a hallmark for future recommendations within participating MSs.

To address the needs of educational content design outlined above, the team of ADVANTAGE JA, together with all partners from the 22 countries involved into the JA, has developed a commonly agreed multi-professional capability framework. This framework consists of knowledge, skills and attitudes for frailty prevention and management that should be addressed by all professionals involved in the care pathway across Europe. Besides the capabilities to correctly identify, screen, assess for and manage frailty, broadly based organizational and strategic approaches are required. They refer to the establishment of multidisciplinary teams, integrated and coordinated care, the use of ICT-tools and person-centred approaches.

Education and training should ideally be organized within a continuous and integrated process, supported by national and regional strategies and accompanied by evaluation and quality control mechanisms. Other main features highlighted are concept mapping of the existing views on frailty held by the participants, work on a bio-psycho-social model, enhancing the reversibility of frailty, helping professionals to recognize frailty in the final “beneficiaries” and addressing it by using the resources available in the existing

public services. Moreover, training of community actors is fundamental to detect frailty in its early stages, also for those that do not reach professionals or services (ADVANTAGE JA, 2018).

14. What are the future areas of research on frailty?

Continuing research is needed not only to better understand the nature of frailty but also to improve screening and diagnostic tools and test the effectiveness of interventions. Main areas identified are:

- In basic research, the most relevant issues are the identification of subtle systemic dysfunctions prone to develop frailty and the definition of patterns of risk combining different –omics (Erusalimsky et al., 2016; Lin et al., 2017). A crucial issue is factors related with the progressive loss of muscle mass and strength (Calvani et al., 2018), including the heart muscle (Bellumkonda et al., 2017).
- In the field of epidemiology, European studies on frailty prevalence, incidence and trajectories (including their precipitating factors) should be developed with a sound common methodological approach.
- More research is needed on the impact on frailty of the quality of outdoor and indoor air (García-Esquinas et al., 2017), especially the one produced by climate-control equipment for nursing homes (Bentayeb et al., 2015).
- Concerning assessment and treatment, knowing which screening and diagnostic scales best suit different settings is warranted. A better characterization of early stages of the frailty continuum (pre-frailty; Sezgin et al., 2019) and the development of tools to screen and diagnose it is needed. More clinical trials should be conducted to determine if the Mediterranean diet, loss of weight, vitamin D and proteins supplementation, withdrawal of psychoactive drugs, control of polypharmacy and use of scales such as MNA, STOPP-START, BEERS and Laroche, are effective for the prevention or treatment of frailty. Assessment of more specific outcomes should be explored in these trials.
- Acceptance and use by older people of ICTs to manage frailty should be further investigated.
- In relation to frailty management by care systems, further research is required to identify the most effective combinations of community health and social care interventions for frailty and to understand the stages in which people benefit most from these approaches. There is a requirement for well-designed trials of CGA for within intermediate care services and a need for more research on the implementation of integrated care for frailty across the whole system.
- More local, national and European projects for education/training of the workforce need to be funded.

KEY MESSAGES

ADVANTAGE JA key messages, reflected in this updated SoAR, are grounded in scientific knowledge, are assertive and avoid controversial statements whenever further research is needed or results are unclear. This is because overall, they are intended to be an instrument of added value to support policy driven decisions on frailty prevention and management in the JA participating MSs.

1. Frailty is a geriatric syndrome characterized by a progressive age-related decline in physiological systems that results in decreased functional reserves and a low intrinsic capacity, which confers extreme vulnerability to stressors and increases the risk of a range of adverse health outcomes (WHO definition which ADVANTAGE JA supports).
2. Multi-morbidity, disability and frailty are distinct clinical entities that are causally related, often associated and may overlap. All three occur frequently and have important clinical consequences. What really affects quality of life is function and not disease, and the best predictor of function is frailty.
3. Frailty is very common, although the prevalence reported varies considerably contingent on factors such as the definition used, the age of the population studied, and the frailty assessment instrument/classification used. An overall frailty prevalence of about 18% in the total population over 65 years old (12% in community-dwellers and 45% in hospital/institution settings) seems a reasonable estimate of the current situation in the EU.
4. As frailty is highly prevalent in Europe and is very much associated with disability, monitoring its evolution seems a reasonable way to proceed.
5. Frailty is a potentially reversible condition and may also revert spontaneously to a robust (non-frail) state, especially in its early stages.
6. Frailty is not an inevitable consequence of ageing, it may be prevented and treated to foster a longer and healthier life. In addition, it has a clear negative impact on the costs of health services. Despite that, frailty is not yet at the top of the public health agenda.
7. To prevent disability in older age and support healthy ageing in the JA participating MSs, the first step is to identify the population group at the highest risk and that could benefit most from an intervention aimed at delaying or reversing disability and dependence. These are the individuals with frailty.

8. It is recommended to screen opportunistically for frailty in populations aged over 70 years, giving the possibility of designing and implementing preventive, population-based interventions targeting identified risk factors.
9. General practitioners have been identified as the preferred healthcare professional to identify physical health problems and risks and as such to potentially screen and monitor for frailty at population level.
10. Many instruments have been proposed and are used to identify (screen and diagnose) frail individuals in clinical practice and for public health level frailty detection programs. From all tools available, ADVANTAGE JA proposes those that fulfill certain characteristics. For screening: Clinical Frailty Scale; Edmonton Frailty Scale; Fatigue, Resistance, Illness, Loss of Weight Index (FRAIL Index); Gait Speed; Inter-Frail; Prisma-7; Sherbrooke Postal Questionnaire; Short Physical Performance Battery (SPPB) and Study of Osteoporotic Fractures Index (SOF). For diagnosis: Frailty Index of accumulative deficits, Frailty Phenotype and Frailty Trait Scale.
11. Individual interventions, either in the community or in every setting of care, often share a three-step structure: 1) frailty screening to identify frail older persons, 2) use of diagnostic tools to diagnose frailty, and 3) a CGA to assess individual needs and develop multidimensional interventions to match these needs in the frame of individual care plans.
12. Early stages of frailty are the most appropriate target for intervention because they are more likely to be reversible.
13. The specific components of frailty interventions (both for prevention and treatment) include adequate physical activity and exercise, adequate nutrition, healthy lifestyles and review and optimization of drugs.
14. Models of care should take into account the need to approach older people not just in terms of their diseases but also in terms of physical, cognitive and psychosocial care and support to prevent functional decline, frailty and disability. Key components to address frailty are those that define also integrated care. A coordinated system able to provide the most effective care in the different settings (community, primary care, hospitals and residential or nursing homes) needs to be provided.
15. Health and social care professionals across settings and countries need to be trained to address future needs related to ageing, frailty and disability.

16. Further research is needed not only to better understand the nature of frailty, but also to improve screening and diagnostic tools and test the effectiveness of interventions. In this regard, ADVANTAGE JA has identified a number of areas that will benefit from EU research funding.

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Annex 1. Papers in the areas reviewed for the ADVANTAGE JA State of the Art report

Areas of knowledge reviewed	Papers identified	Papers analysed
Definition	494	74
Relation with chronic diseases	2,282	25
Prevalence and incidence	2,948	63
Individual screening and diagnosis	6,611	52
Prevention	391,910	31
Clinical management	67,462	27
Nutrition	39,885	28
Physical activity	620,043	25
Drugs	28,796	25
ICTs	124,634	33
Population screening	1,186	3
Surveillance	751	0
Monitoring	451	0
Trajectories and transitions	862	3
Integrated care models	1,065	43
Intermediate/transitional care	1,984	133
Education/Training	1,914	0
Research	610	71
Total	1,293,888	636

ICTs: Information and communication technologies.

Annex 2. Validated tools for the screening of frailty recommended by
ADVANTAGE JA

Tool name	Original reference	Tool description	Time needed to perform	Number of items	Special equipment needed
Clinical Frailty Scale	Roockwood et al. Can Med Assoc J 2005	Single descriptor of a person's state of frailty (fitness)	5 min	NA	No
Edmonton Frail Scale	Rolfson et al, Age Ageing. 2006	Timed up and Go Test, Clock draw test, 7 Questions exploring frailty domains	<5 min	9	No
Fatigue, Resistance, Ambulation, Illness, Loss of weight (FRAIL Index)	Morley et al. J Am Med Dir Assoc. 2008	5 items: fatigue, resistance, ambulation, illnesses, loss of weight	< 10 min	5	No
Inter-Frail	Bari et al. J Am Geriatr Soc 2014	1 disability and 10 frailty items (yes-or-no questions)	10 min	11	No
Prisma-7	Raiche et al. Arch Gerontol Geriatr 2007	Self-reported. 7 questions on demographics and performance	5 min	7	No
Sherbrooke Postal Questionnaire	Hebert et al. Age Ageing 1996	Self-reported questionnaire. 6 items: living alone, polypharmacy, mobility, eyesight, hearing, memory.	< 5 min	6	No
Short Physical Performance Battery (SPPB)	Guralnik et al. J Gerontol 1994	3 dimensions: balance, gait and weakness.	<10 min	12	No
Study of Osteoporotic Fractures Index (SOF)	Ensrud et al. Arch Intern Med. 2008	3 items: weight loss, reduced energy level and inability to rise from a chair.	< 5 min	3	No

Electronic Frailty Index	Clegg et al. Age Ageing. 2016	Calculated based on presence or absence of individual deficits, reported in the Electronic Health Records	0 min (derived from Electronic Health Records)	Variable (around 30)	No
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Annex 3. Tools for the diagnosis of frailty recommended by ADVANTAGE JA

Tool	Original reference	Tool description	Time	Number of items	Special equipment needed
Frailty Index of accumulative deficits	Mitnitsky et al. Sci World J. 2001	Number of health deficits present / Number of health deficits measured	20-30 min	>30	No
Frailty phenotype	Fried et al. Gerontol A Biol Sci Med Sci 2001	5 items: weight loss, low physical activity, exhaustion, slowness, weakness	< 10 min	5	Yes (dynamometer)
Frailty Trait Scale (FTS)	García-García et al. J Am Med Dir Assoc. 2014	Seven dimensions: energy balance and nutrition, activity, nervous system, vascular system, weakness, endurance, slowness	20 min	12	Yes (albumin, dynamometer)

Annex 4: Glossary

Active ageing: the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age.

Assessment: the action of making judgement about something. It refers in this context to screening and diagnosis of frailty.

Comprehensive geriatric assessment: a multidimensional assessment of an older person that includes medical, physical, cognitive, social and spiritual components; may also include the use of standardized assessment instruments and an interdisciplinary team to support the process.

Chronic condition: a disease, disorder, injury or trauma that is persistent or has long-lasting effects.

Disability: any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner, or within the range, considered to be normal for a human being. The term disability reflects the consequences of impairment in terms of functional performance and activity by the individual.

Drug: a chemical substance used as a medicine.

Functional ability: the ability to perform activities of daily living, including bathing, dressing, and other independent living skills, such as shopping and housework. Many functional assessment tools are available to quantify functional ability.

Frailty: is a geriatric syndrome which can be regarded as a progressive age-related deterioration in physiological systems that results in extreme vulnerability to stressors and increases the risk of a range of adverse outcomes including care dependence and death.

Geriatric syndrome: the multifaceted dynamics between underlying physiological change, chronic disease, and multi morbidity can also result in health states in older age that are not captured at all by traditional disease classifications and that are therefore often missing in disease-based assessments of health. These are commonly known as geriatric syndromes, although there is still some debate as to what disorders these include.

Good practice: is a practice that has been proven to work well and produce good results, and is therefore recommended as a model. It is a successful experience, which has been tested and validated, in the broad sense, which has been repeated and deserves to be shared so that a greater number of people can adopt it.

Intrinsic capacity: the composite of all the physical and mental (including psychosocial) capacities that an individual can draw on at any point in time.

Long term care: the activities undertaken by others to ensure that people with a significant ongoing loss of intrinsic capacity can maintain a level of functional ability consistent with their basic rights, fundamental freedoms and human dignity.

Management: to bring about or succeed in accomplishing, sometimes despite difficulty or hardship. In this context it refers to treatment and prevention of frailty.

Multi-morbidity: the co-occurrence of two or more chronic medical disorders in one person at the same time. It can lead to interactions between disorders; between one disorder and treatment recommendations for another; and between drugs prescribed for different disorders. As a result, the effect of multi-morbidity on functioning, quality of life, and mortality risk might be much greater than the individual effects that might be expected from these disorders.

Older person: a person whose age has passed the median life expectancy at birth.

Prevalence: it is an epidemiological measure of the proportion of cases of a disease that are present in a particular population at a given time, whereas incidence refers to the number of new cases that develop in a given period of time in a defined population. Incidence can also be expressed as the proportion of a population that develops the disease in a given period of time.

Polypharmacy: the simultaneous administration of multiple drugs (medication) to the same patient.

Work package: is a building block of the work breakdown structure that allows the JA management to define the steps necessary for completion of the work. Breaking it down into WP allows multiple teams to work simultaneously or sequentially on different components of the JA.

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