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advantAGE
MANAGING FRAILTY

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This European guideline on the management of frailty at the individual level provides a valuable insight into six fields of intervention: prevention, clinical management, nutrition, physical exercise, medicines, and information and communication technologies. This guideline will be informative for both clinical practice and public health interventions. There are four targeted audience groups: policy makers; health and social care professionals; formal and informal carers; and people with frailty (or risk of frailty). A robust, systematic methodological approach was used to develop the guidelines, which included evidence from a background systematic review, a survey of key members/expert panel members of the EU Advantage project, and recommendations for the key fields based on the WHO's GRADE system. All recommendations outlined in this guideline document were developed with the end-user in mind. An evidence-based clinical decision tree (algorithm) for frailty management is provided. This guidelines document also provides detailed information regarding the levels of development for frailty prevention and management by EU ADVANTAGE member states.

Dr Elsa Dent

One of the main objectives of the European project ADVANTAGE was to collect and critically review the existing literature on topics concerning the management of frailty at individual level. The authors decided to present the results in a systematic and transparent manner in order to support all who are dealing with the management of frailty at the individual level. They prepared a very useful guide for management of frailty at individual level, but not exclusively. The monograph is also very useful for those who are dealing with frailty at the population level, especially policy makers and health and social care professionals, since they are in a position to positively influence the living circumstances that enable prolonged independent living of people who have frailty already indicated or in those persons who are at increased risk of frailty. The guide is drawn up in a systematic and transparent manner that will greatly assist users in their work. Last but not least, it also provides a certain standard of working procedures, which is especially important in a new area where activities have just started.

We are aware of the fact that the proportion of the population exposed to the possibility of frailty is increasing rapidly, and therefore of the challenges that frailty poses to society and the individual. The guide supports a concerted and professionally based approach, thus contributing to more successful work in the field of frailty management at the individual level.

Prof Ivan Eržen

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The Editorial Team

The European Guide for Management of Frailty at Individual Level Including Recommendations and Roadmap was approved by the Steering Committee of Joint Action Advantage on 9 September 2019 (Toledo, Spain).

EXECUTIVE SUMMARY

Widespread evidence shows that frailty emergence or its onset can be delayed through intervention in the early stages. The present European Guide for Management of Frailty at Individual Level is of high importance, as it addresses the management of older adults with frailty or those at risk of developing it. The main objective of our work was to collect and critically review the existing literature on topics concerning the management of frailty at individual level. It has focused on six key fields of intervention that must be taken into consideration while tackling frailty: prevention, clinical management, nutrition, physical exercise, medicines, and information and communication technologies (ICTs).

Key findings

- The prevention of frailty should include both the promotion of healthy lifestyles among middle-aged and older people and service organisations, and an emphasis on enablement and maintaining independence.
- To tackle frailty, we should take steps to raise greater awareness of empowerment of older people who have a strong aversion to the term “frail”.
- Nutritional intervention is proposed widely to be an important component of frailty management, while inadequate nutritional intake is an important modifiable risk factor for frailty.
- Sedentary lifestyle is a risk factor for developing frailty. Exercise can improve physical performance and reduce physical frailty. Exercise in older people with frailty is effective and relatively safe, and may reverse frailty.
- Many tools are available to assess polypharmacy, but none address all aspects of appropriate polypharmacy. The various aspects to be considered include multimorbidity, safety, efficacy and acceptability of medicines, the patient’s wellbeing, social circumstances and outcomes. There is an urgent need for research on effective strategies for managing polypharmacy and for robust evaluation of both clinical benefits for patients and value for the system.
- ICT services have gained increasing attention for dealing with people with frailty due to the development of solutions for tele-monitoring (to monitor health status at distance) and tele-treatment (to work on the functional status). Results of these reviews suggest that the acceptance and employment of these new technologies remains problematic, especially for older people.

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METHODOLOGY OF THE EUROPEAN GUIDE

1 - INTRODUCTION

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, becoming as numerous as young people are now in 2016 (European Commission, 2015). These demographic trends suggest that there will be an increase in age-related disability and functional dependence, which will ultimately impact not only the wellbeing of the individuals affected (disability being a major factor determining quality of life), but also the sustainability of healthcare systems (Murray & Lopez, 2013). This implies that there is a need to re-shape healthcare systems in order to better address emerging public health challenges, particularly the needs of older people, independent of socioeconomic background. Consequently, the models of care should take into account the need to approach older people not just in terms of curing diseases, but also in terms of care and support to prevent functional decline, frailty and disability.

There are several definitions of frailty and the JA ADVANTAGE recognised the definition of the World Health Organisation (WHO, 2015) as being most representative.
"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).

The prevalence of frailty reported in multiple studies on community cohort samples globally ranges from 2% to 60%, contingent on factors such as the age of the population studied and the frailty assessment instrument or classification used. Nine out of every ten studies reviewed, reported prevalence rates below 30% and half reported rates above 11%. 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 far fewer studies from other settings. These studies indicate that frailty is more frequent (≥ 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 (Theou et al., 2018). Not all ADVANTAGE JA Members States (MS) 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 (Rodríguez-Laso et al., 2018).
The process of frailty can potentially be prevented and treated, particularly if interventions occur early. Therefore, it is important to know how to manage older adults with frailty or those at risk of developing it (Clegg et al., 2013).

ADVANTAGE is a Joint Action (JA), co-founded by the European Commission under the third EU Health Programme 2014-2020, with 22 MS and 35 organizations involved. Partners worked together to summarize the current state of the art of the different components of frailty and its management, both at a personal and population level, and to increase knowledge in the field of frailty to build a common understanding of frailty to be used by the MS. The final output of the project was intended to be the "Frailty prevention approach", a common European model to tackle frailty and indicate what should be prioritized in the upcoming years at European, national and regional level and on which to base a common management approach of older people who are frail or at risk of developing frailty in the European Union. The identification of the core components of frailty and its management should promote the needed changes in the organization and implementation of health and social systems.

ADVANTAGE JA addresses a) policy makers involved in planning and developing health and social care policies and strategies for older people, b) health and social care professionals c) formal and informal carers, who implement the necessary changes in everyday practice and d) people, those who are frail, those at risk of frailty, as well as the EU population at large (Advantage JA, 2017).

The present *European Guide for Management of Frailty at Individual Level* (referred to below as 'European Guide') summarises the work of work package 6 – "Management of frailty at individual Level". This guide focuses on six key fields of intervention that must be taken into consideration when managing frailty, namely: prevention, clinical management, nutrition, physical exercise, medicines, and information and communication technologies (ICTs).

2 - METHODS APPLIED IN THE DEVELOPMENT OF THE GUIDE

The recommendations from this European guide derive from different methodical approaches. The methodology used in the development of this guide is the following:

a) Evidence from a systematic literature review;
b) The current condition of the Member States as answered by key players in the Member State Survey;
c) A critical review by the expert panel;
d) Recommendations for key fields based on WHO's GRADE system.

Literature review

A narrative literature review was conducted according to Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA-P) 2015 guidelines (Moher et al., 2015), as it enables the obtaining of data from various sources, and ensures a holistic understanding of the research subject. The scientific literature reviews were performed analysing the following databases: PubMed, The Cochrane Library, Embase, UpToDate, Cumulative Index to Nursing and Allied Health Literature (CINAHL). The descriptive research methodology was used to review the peer-reviewed medical literature.

The criterion in selecting the literature was that articles were published in a time period of 15 years, from 2002 to 2017. Key words were selected from a proposed list of key words that was prepared by task leaders and the working group on six tasks: Prevention, Clinical management, Nutrition, Physical activity, Drugs and ICTs. Several combinations of selected search words in English and their synonyms were prepared and used with Boolean operators AND or OR, searching by title, key words and in abstract.

Articles regarding current policies and guidelines on six tasks which were published in peer-reviewed scientific journals, as well as in international documents, standards, guidelines, and research studies performed in the EU, were reviewed. Information from editorials, letters, interviews, posters and articles with no access to full text were not included in the review. Grey documents which were identified and proposed by task leaders were also reviewed and included in the review. Grey documents were identified through an opportunistic search, meaning a targeted or focused one, based on the information that each partner was able to find regarding their own country.

In total, for the task **Prevention**, 391,910 search results were identified and 31 articles/sources included in the analysis; for the task **Clinical management**, 67,432 search results were identified and 27 articles/sources included in the analysis; for the task **Nutrition**, 39,885 search results were identified and 28 articles/sources included in the analysis; for the task **Physical activity**, 620,043 search results were identified and 25 articles/sources included in the analysis; for the task **Drugs**, 28,796 search results were identified and 25 articles/sources

included in the analysis; for the task ICTs, 124,634 search results were identified and 33 articles/sources included in the analysis.

Good practices

The collection of good practices was opportunistic, rather than systematic. It was based on the former EU-funded programmes, European Innovation Partnership on Active and Healthy Ageing (EIP-AHA) and Joint Action on Chronic Diseases and Promoting Healthy Ageing Across the Life Cycle (JA CHRODIS), and key stakeholders and national policy documents known by partners. Task leaders, as experts in the field, sought partners' suggestions on good practice and submitted them to the WP Co-Leader. The Co-leader used the following exclusion criteria: lack of relevance or respect for ethical principles; absence of evaluation (the practice should have been evaluated at least from a process evaluation perspective); and inability to be transferred to other settings (including an insufficiently clear description of the practice).
The inclusion criteria used were: equity, sustainability, participation and inter-sectoral collaboration. Articles/sources were entered in an excel spreadsheet and validated by internal reviewers using a bespoke points-based scoring system developed by the WP Co-leader. Each subcategory of the proposed criteria (they may be found in the annex) was allocated equal weighting (i.e. one point) and summed up to create the Good Practices score.

Survey

A survey of MS was conducted in the Joint Action ADVANTAGE MS to access policies, strategies, programmes, guidelines and interventions regarding countries' specific frailty situations. A questionnaire was prepared by WP 6 work group and was test-piloted in Greece and Spain. The questionnaire was approved by the Joint action ADVANTAGE Steering Committee on 18 December 2017. The MS' survey was conducted from January to March 2018. Survey analysis was conducted by descriptive methodology and MS were classified into five different levels of implementation (Basic, Fair, Well developed, Advanced, Sustainable). The methodology for classification was adopted by the Joint action ADVANTAGE Steering Committee on 19 April 2018. Survey analysis was completed by the end of May 2018.

Expert opinions and discussions

Additional input to the European guide was received after the presentation of results to the panel of experts as part of JA ADVANTAGE implementation activities. Participants discussed the State of the Art Reports (SoAR) prepared by WP partners and peer reviewed by the expert panel and on ways of convincing policy makers to address frailty prevention and assessment. The objectives of the expert panel were to review the draft reports on state of the art on frailty in Europe, discuss how to convince policy makers of the need for disability prevention

by addressing frailty as its main risk factor and to identify key ideas for tackling frailty from an EU policy perspective.

3 - RESULTS

3.1 MANAGEMENT OF FRAILTY AT INDIVIDUAL LEVEL

In the field of management of frailty at individual level, ADVANTAGE JA has a) reviewed and collected existing literature on six topics that contribute to management of frailty at individual level (Prevention, Clinical management, Nutrition, Physical exercise, Drugs and ICTs; b) identified examples of good practices on these topics in the management of frailty; c) collected specific frailty situations data from MS regarding policies, strategies, programmes, guidelines and interventions; and d) taken into account expert opinions and discussions. The European guide summarises results and emphasises the interventions which are beneficial to the prevention and management of frailty.

3.1.1 Prevention

The prevention of frailty should address all people that are frail, in early stages of frailty and also robust, and it should be delivered in a holistic approach. For older people and informal caregivers, information about accessing preventive strategies and frailty services are received in the context of:

– Beliefs that many elements of frailty are an inevitable or unavoidable part of ageing, but that losing your independence is not;
– A mixed awareness amongst these audiences of the risks of frailty;
– A mixed awareness of the range of available preventive strategies and frailty services;
– The attitudinal barriers that older people have to engage with strategies and services (BritainThinks, 2015).

Non-specialist healthcare providers and caregivers were attuned to the fact that having an independent lifestyle is the biggest motivator for older people in terms of taking action to safeguard their health and wellbeing. Moreover, non-specialist healthcare professionals and informal caregivers tended to feel strongly that it was their role to support older people in this goal as far as possible. Informal caregivers were highly conscious of barriers to accessing support among their older relatives, and several reported 'taking matters into their own hands' to overcome them (BritainThinks, 2015). Caregivers often play a significant role in coordinating and managing care for their family members and in facilitating informational continuity (Bunn et al., 2015).

Young et al. (2016) concluded based on their study that frailty prevention and management call for a multifaceted approach that includes addressing deleterious environmental factors, some of which, like childhood or socioeconomic status, may act across the life course.
Frailty is viewed as a continuum, preceded by a pre-frail state, where early intervention may delay progression to frailty. Health promotion activities, such as reducing smoking and alcohol consumption, increasing physical activity, and improving diet to achieve and maintain a healthy weight, improve health and reduce the risk of frailty in later life (Mohandas et al., 2011).

The results of several studies provide strong evidence that a supervised physical therapy or occupational therapy rehabilitation programme that targets underlying physical impairments can lead to improvements in physical function and a reduction in adverse outcomes such as frailty among the elderly. Targeted interventions could have a significant impact on preventing the progression of frailty and the negative consequences of frailty. For effective design and evaluation of interventions tailored to address frailty, priority must be placed on achieving a consistent definition of frailty (Mohandas et al., 2011).

3.1.2 Clinical assessment

There are dozens of tools designated to assess frailty, ranging from simple to multicomponent tools (Fried et al., 2001; Clegg et al., 2013; Dent et al., 2016). Furthermore, the gold standard for diagnosing and planning the treatment of frailty status is the comprehensive geriatric assessment (CGA) (Dent et al., 2016). Comprehensive geriatric assessment is an effective way to decrease frailty status, especially when performed in geriatric wards (Veninšek & Gabrovec, 2018).

We recommend that all persons older than 70 years attending health care services should be screened for frailty. Therefore, we propose a range of instruments to pick, firstly in a screening phase and secondly in a diagnostic one. According to the criteria (faster to administrate, do not require special equipment and are validated and used for screening) we recommend use of one of the most relevant: Study of Osteoporotic Fractures (SOF) Index, Edmonton Frailty Scale, FRAIL (Fatigue, Resistance, Ambulance, Illness, Loss of Weight) Index, Clinical Frailty Scale, Prisma-7, Sherbrooke Postal Questionnaire, Inter-Frail, the Frailty Phenotype, Short Physical Performance Battery (SPPB) or gait speed. When screening is positive, we recommend performing a comprehensive geriatric assessment (CGA) to have a global assessment of persons and to diagnose frailty by the use of validated scales derived from the CGA. The most used and validated scale for the diagnostic of frailty is Frailty Phenotype (White et al., 2012).

3.1.3 Nutrition

Malnutrition remains one of the most serious health problems for older people worldwide (Dent et al., 2019). Malnutrition or being at risk of malnutrition increases the risk of frailty and its consequences (Clegg et al., 2013; Goisser et al., 2016). Prevalence of malnutrition depends on the setting and criteria used and ranges from 2- 60% (Guigoz, 2006; Elmadfa et al., 2008; Kaiser et al., 2010). One of the main variable risk factors for the development of frailty can be unsuitable nourishment and there is evidence that nutrition and frailty status are related. Successful comprehensive management of frailty requires balanced, healthy nutrition at all ages, preferably in combination with physical activity (Gabrovec et al., 2018).
The Mini Nutritional Assessment (MNA) is a well validated and the most common tool with acceptable sensitivity/specificity to be used for screening and assessment of malnutrition and risk of malnutrition (Guigoz, 2006).
Even without malnutrition, older people are prone to lose lean body mass and develop frailty because of decreased physical activity (Elmadfa et al., 2008) and age associated sarcopenia. A Mediterranean diet is associated with lower risk of frailty in both frail and pre-frail patients (Goisser et al., 2016).
Evidence suggests that a BMI of 25-29.9 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/m^2 and age between 65 to 80 years, a moderate weight loss of 8-10% of body weight over 6 months always combined with exercise (resistance training to maintain muscle mass) is advised. For those over 80 years of age, or old people 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/m^2 are advised to emphasize 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).

Older people with higher protein intake lose lean body mass slower, lose less when losing weight and increase muscle mass more if they increase weight (Houston et al., 2008).
Protein intake of 1.5 g per kilogramme 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 in early stages of frailty or older people with frailty subject to the risk of malnutrition (Park et al., 2018).
Supplementation of vitamin D might have a positive effect on muscle strength and physical frailty in adults over 65 years of age and vitamin D deficient subjects (Beaudart et al., 2014; Bruyère et al., 2017).

Older patients with frailty 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 of vitamin D (Bruyère et al., 2017).

3.1.4 Physical activity

Sedentary individuals had significantly increased odds of developing frailty compared with the exercise active group. Furthermore, an important part of the management of frailty at individual level is physical exercise. Physical activity and exercise in older people with frailty are effective and relatively safe and may reverse frailty (Strojnik & Gabrovec, 2019). 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 (El-Khoury et al., 2013).
Falls in adults over 65 years of age are frequent and cause many injuries (Rubenstein & Josephson, 2002) leading to impaired mobility and loss of physical fitness. Exercise programmes are effective in reducing falls and fall-related injuries in healthy older persons (Gillespie et al., 2012; El-Khoury et al., 2013). Improving balance and reducing falls risk is even more important for older persons with frailty that are already at increased risk of falls and injuries.

Different training interventions have been shown to increase strength in healthy older adults as well as in frail individuals. Supervised centre-based interventions seem to be more effective than home ones to improve strength in older persons with frailty (Fairhall et al., 2014; Pahor et al., 2014).

A systematic review provides evidence of the positive effects of multicomponent exercise programmes on functional ability and the overall health of people with frailty. The most frequently used programme consists of endurance, flexibility, balance and resistance training performed with low to moderate intensity, in 30- to 45-minute sessions, three times a week. Exercise seems to be more effective in earlier stages of frailty than in its later stages (Cadore et al., 2013).

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 programmes of strength training, consisting of a low to medium exercise load (from 30% -low- to 60-70% -medium- of maximum intensity). 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).

3.1.5 Drugs

Older people often have concurrent multiple chronic and acute diseases, which increase in prevalence with ageing, and the treatment of these diseases usually requires multiple drugs (Palmer et al., 2016). The expression 'polypharmacy' indicates concurrent use of multiple medication items by one individual (Duerden et al., 2013). It has been estimated that more than 50% of persons aged 65 years or older receive five or more drugs concomitantly (Marengoni et al., 2011; Palmer et al., 2016). Applying single disease guidelines often increases the treatment burden for older people and may increase risk of drug-drug and drug-disease interactions, poor adherence to treatment and increased risk of adverse drug reactions. These contribute to hospitalizations and high unnecessary costs of medical care (Marengoni et al., 2014).

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). Some authors suggested that high-risk prescribing may have directly aggravated the clinical features of frailty. A reduction in inappropriate medicines can clearly decrease costs and medication side effects in populations with frailty (Morley et al., 2013). There are useful tools to manage inappropriate prescribing and reduce polypharmacy in patients with frailty, for example the Beers, STOPP/START and Laroche criteria (Kelaiditi, 2016).

3.1.6 Information and Communication Technology (ICT)

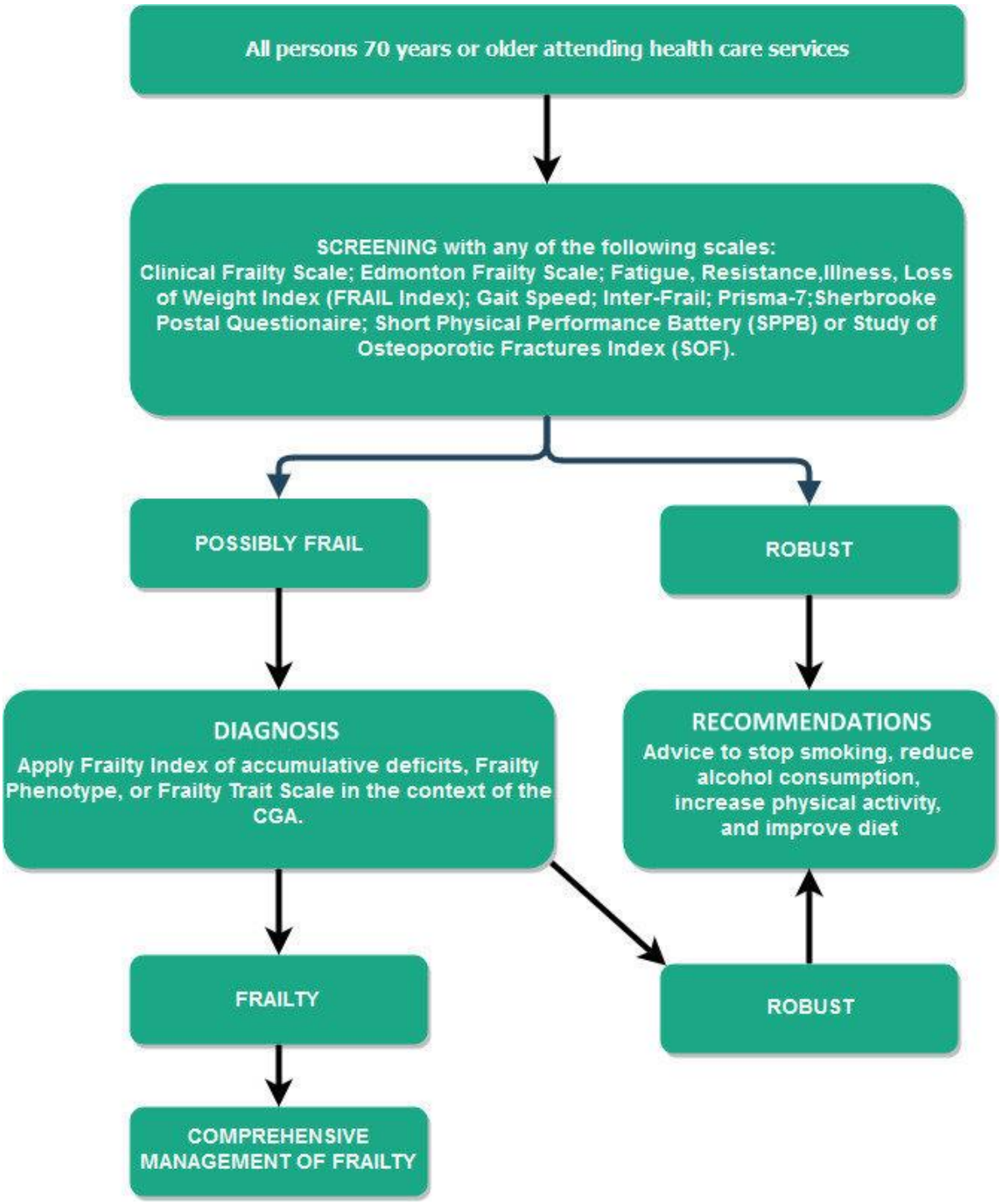
ICTs are of potential interest to support the challenges of older persons with frailty and can play an important role in enabling older people to remain independent at home, support caregivers, facilitate remote monitoring and self-management, provide decision support, and improve information sharing and coordination of services. In addition to the general benefits of ICTs, they may also improve quality of life and general wellbeing, promote social interaction and communication, physical activity and exercise, nutrition, and support other activities of daily life (Morley et al., 2013). Evidence indicates that ICT may play an important role in supporting complex care of older people with frailty in terms of screening, assessment, monitoring and follow-up (Kelaiditi, 2016). ICT supporting physical activity such as personalized exercise has been shown to have an effect on the progression of frailty (Aguirre & Villareal, 2015; de Labra et al., 2015). Smart home technologies and other supportive ICTs seem to be an important factor in reducing the level of frailty among elderly people and have potential benefits regarding their ageing at home. They mainly include assistive technologies (for disabilities, home care etc.) and monitoring of different data and activities (e.g., fall detection, kinematics, position, physiological data, etc.). Despite the range of all the potential benefits from the use of ICTs for older persons with frailty, the acceptance and deployment of ICTs remain problematic, especially for older people with frailty.

3.2 COMPREHENSIVE MANAGEMENT OF FRAILTY AT INDIVIDUAL LEVEL

Most countries in Europe and around the world are faced with the serious challenge of demographic ageing of their populations. Although we live longer, there is no evidence we live longer in good health (Gabrovec & Eržen, 2016).

Most older people are faced with a decline of psychophysical abilities. Frailty and disability are commonplace and this presents a multidimensional health and social challenge in the EU, connected with physical, cognitive and functional decline for ageing populations. The prevalence of frailty and disability is increasing and progressively associated with age, and it is also a main factor of increasing health expense in elderly populations. As the process which leads to frailty and disability can be slowed down or even completely reversed, it is appropriate for early interventions in multiple fields such as prevention, clinical management, physical exercise, nutrition, drugs and ICTs to be implemented.

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



Box 1: Comprehensive management of frailty

- Comprehensive Geriatric Assessment (CGA) to develop a personalised care plan and carry out personalized multi-dimensional interventions.
- Take into account the frailty stage to tailor the correct treatment of concomitant diseases.
- Provide structured multicomponent exercise programmes (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 programmes 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 ≥ 30 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 (resistance training to maintain muscle mass).
- Considerer Vitamin D supplementation for older patients with frailty who are at high risk of falls or fracture and with a 25-OH vitamin D level < 30 ng/ml, who should receive doses of 20 to 25 µg/day of vitamin D.
- ICT solutions should also be considered and advised to enable self-management and promote independence.

3.3 RECOMMENDATIONS AND ROADMAPS FOR MANAGEMENT OF FRAILTY AT INDIVIDUAL LEVEL

3.3.1 Recommendations

Aim: The Joint Actions purpose is to change the policies in the EU in order to establish the best management in Europe for older people with frailty, and of course to reduce the burden of disability that frailty brings in the people affected. The way to achieve this main goal is by proposing strategies towards a disability-free Europe, where frailty is the cause. Issuing recommendations for the implementation of the best evidence is one of the key milestones in the process. The recommendations are the basis of an effective and sound policy for the management of any condition that includes frailty.

Method: In order to issue sound recommendations a process of evaluation of the body of evidence was of great importance. The recommendations must have two major characteristics – first they must incorporate the best evidence and second they must be clear for the policy makers and stakeholders. In the process of developing the recommendation in the field of preventing and managing frailty at individual level we have applied the two previous points The recommendations are based on a systematic literature review that is the basis of the State of the Art Report and the critical review of the expert panel. For the purpose of evidence we used the the WHO GRADE system evaluation (WHO) to address the strength of the evidence (see table 1 below). In the context of recommendation development, the quality of the evidence indicates a confidence that the estimate of the effect could support a decision, and the strength of recommendation indicates the extent to which we can be confident that adherence to the recommendation will do more good than harm (Atkins et al., 2004). For each key question a systematic literature review was conducted, in PICO format, and there was a summary of findings for each outcome (see text above). For interventional studies the starting point was always the study design, rating the RCT as the best evidence, observational studies as low and the rest as very low. We have increased or decreased the grading based on study limitations, inconsistencies, lack of precision and bias. We are aware that this is not always feasible in the real clinical setting of an RCT, so some of the evidence can be deducted from observation of other types of studies with good quality characteristics and large numbers of participants. In this analysis the limitation in study design and execution was also considered. The quality rating applies to the body of evidence for each key question and not to individual studies. Based on the GRADE system the quality of the evidence for the proposed recommendations is described in Table 1.

Table 1: Quality of evidence in GRADE

Quality level	Definition
High	We are very confident that the true effect lies close to that of the estimate of the effect
Moderate	We are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low	Our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect
Very low	We have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect

GRADE= Grading of Recommendations Assessment, Development and Evaluation

It should be stressed that a recommendation does not mean that all patients should be treated in the same way, or that they should not be involved in the decision, it is simply to facilitate an appropriate decision. It is simply to provide the best evidence for clinicians and healthcare providers to make decisions in everyday practice.

3.3.1.1 Prevention of frailty

Recommendation	Quality of evidence (GRADE)	Strength of recommendation
Healthy lifestyle from middle age, which will include interventions such as smoking cessation, reduction of alcohol consumption, increasing physical activity, and healthy diet to maintain an appropriate body weight	High	Strong
Mediterranean Diet	Low	Conditional

Rationale: The prevention of frailty has several operational problems involved in creating a recommendation. The first is the same definition of frailty, which is not universally accepted, and there are variations between studies, although the core component of frailty per se "the

loss of intrinsic capacity that creates an increased vulnerability to stressors" is incorporated into almost every definition. In this analysis we did not include or exclude studies based on a particular definition. The second problem was the same term prevention, which is broad and has many components, e.g. primary, secondary and tertiary prevention, physical or psychological and societal. Under the term prevention we have only included primary prevention because secondary prevention is discussed in the management of frailty. Also, we have focused mainly on physical frailty as a prevention strategy because of the Joint action main objectives.

The systematic analysis of Vermeulen et al. (2011), with the intent to explore physical frailty indicators in community-dwelling older adults, included 28 longitudinal cohort studies. These types of study are of very low evidence, but the large number suggests some evidence should be taken into account although further studies are needed. In this study slow gait speed and low physical activity/exercise seem to be the most powerful indicators, whereas weight loss, lower extremity function, balance and muscle strength were less important.
The systematic review by de Carvalho Mello et al. (2014) of 35 cross-sectional studies found that the main factors associated with frailty were female gender, black race/colour, education, income, cardiovascular disease, number of co-morbidities, functional incapacity, poor self-rated health depressive symptoms, cognitive function, BMI, smoking and alcohol use. Again, a very low level of evidence.

In the Young et al. (2016) study a structural equation model to study the contribution of genetic and environmental factors to frailty in many volunteer adult twins, education, marital status and health behaviours were strongly associated with frailty. The type of study has good evidence, but still more data is needed to create a confident recommendation.
In the Guessous et al. (2014) frailty indicators among middle-aged people and older, age hypertension, current smoking negatively associated with male gender, BMI waist to hip ratio and serum total cholesterol, along with lower household income, were indicators of frailty.

There are various interventions in the field of prevention, but the evidence to make a recommendation of any particular one is not high. The best evidence is in the general idea of mid-life interventions through healthy lifestyle adaptation (BritainThinks, 2015).

3.3.1.2 Clinical Management

Recommendation	Quality of evidence (GRADE)	Strength of recommendation
Use of Comprehensive Geriatric Assessment to address frailty	High	Strong

Rationale: The same methodological problems in analyzing the literature that we have encountered in prevention are true also for clinical management. The definitions among trials are different, and the diagnostic or early detection tool may also vary. In our analysis we did not exclude any publication based on the definition or diagnostic tool used, due to the fact that no gold standard is available. By keeping these limitations in mind we have concluded that there are two frailty models, i.e. the phenotype model (Fried et al., 2001) and the Cumulative Deficit Model (Frailty Index) (Clegg et al., 2013), and many tools that screen, assess or diagnose frailty in older adults but there are no conclusive data for the adoption of one in particular. Dent et al. (2016) after conducting a literature review to assess the definition and measurement of frailty concluded that Frailty Phenotype and Frailty Index are the most robust tools for clinical use today, yet we need more evidence in order to issue a strong recommendation for the use of one of them.

Interventions were based on physical activity, exercise, nutrition, supplementation and management of polypharmacy, all of which will be analysed in subsequent chapters. Types of interventions vary and the same is true for results, but from various RCTs the common point is that as a general idea frailty has to be addressed and there are transitions between the different frailty states (Gill et al., 2004; Theou et al., 2011; Chan et al., 2012; Beaudart et al., 2014; Cesari et al., 2015; Ng et al., 2015; Behm et al., 2016; Bruyère et al., 2017).
The use of CGA is the gold standard in frailty management in all settings, but seems to be even more effective when performed in a Geriatric Ward. It can be adapted to fit the particular clinical condition and patient, but the core idea of a multidimensional approach tailored to the specific needs of the particular patient is the basis with the best evidence (Ellis et al., 2011; Clegg et al., 2013).

3.3.1.3 Nutrition

Recommendations	Quality of evidence (GRADE)	Strength of recommendation
Consumption of at least 1-1,2gr/kg/d of protein; older people and those with acute or chronic illness 1,2-1,5 gr/kg/d	High	Strong
Assessment with a validated tool such as MNA	High	Strong
Vitamin D supplementation to the desired 30 mg/ml	High	Strong
Reduce excess weight if advised (200-500Kcal/d) with moderate weight loss (0.5-1 kg/w) and	Moderate	Conditional

normal protein intake (1g/kg/d) plus exercise. Consider Mediterranean diet		

Rationale: Dietary consumption of at least 1 gr of protein per kg per day for older people is important to maintain health and avoid malnutrition. The type of protein is not yet clear, nor is the choice between essential and non-essential amino acids. As such further research is needed to create recommendations about the specific protein intake. There is some evidence to support βHMB, arginine and lysine as well as whey protein but further research is needed (Bauer et al., 2013; Goisser, 2016).

There is good evidence to propose the MNA (Mini Nutritional Assessment) as an assessment instrument for nutrition in this age group. There are moderate to good psychometric values in a large sample of old people and the ability to screen malnutrition before severe clinical outcomes (Guigoz et al., 2006).

There is strong evidence to support vitamin D supplementation at a level of 30 ng/dl not as a direct measure against frailty, but as an essential component in order to maintain muscle mass in the elderly (Beaudart et al., 2014). There is only one study that demonstrated the effect of vitamin D in the frailty trajectory in men but this is an observational study (Shardell et al., 2009).

There is not enough evidence to suggest whether there is an optimal range of BMI in older adults, there is some evidence that a BMI of 25-29.9 has the best outcomes in terms of mortality and overall health. When there are metabolic conditions or other (BPCO, cardiological problems, disability etc.) and weight loss is of benefit, in BMI *≥30* kg/m^2, and age 65 to 80 years, we advise a moderate weight loss of 8-10% of body weight over 6 months, always combined with exercise (resistance training to maintain muscle mass) (Winter et al., 2014; Porter Starr et al., 2015).

For those over 80 years of age, or older people with a serious health condition or who are frail, we have no conclusive evidence of the benefit of weight reduction, so we can only advise a healthy diet and if possible, exercise to maintain muscle mass.
Older adults with a BMI of <23 kg/m^2 are advised to emphasize 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 (Winter et al., 2014; Porter Starr et al., 2015).

Nutritional interventions may have the potential to address nutritional deficiencies in older people with frailty, but we need more quality evidence to support this.

3.3.1.4 Physical Activity

Recommendation	Quality of Evidence (GRADE)	Level of Recommendation
Reduce inactivity and sedentary lifestyle	High	Strong
Multicomponent exercise programmes	high	Strong
Fall prevention programmes	High	Strong
Low to medium intensity	moderate	conditional
Combine exercise with dietary modification	Moderate	Conditional

Rationale: The creation of recommendations on physical exercise has more than one methodological problem, the one being the definition of frailty, which is variable between studies even though the core components of frailty are present in the various definitions. The second major limitation is that physical activity and exercise are not the same; also the interventions had differences in settings, type of instructor and duration of the intervention. Keeping in mind the limitations when comparing different studies, there are some key recommendations that can be deduced and these can help with frailty management.

Sedentary lifestyle is *per se* a risk factor both for the development of frailty as well as for its management. There is not enough evidence for the maximum time of sedentary behaviour that brings with it a risk of developing frailty, but there is some evidence that 7-9 h per day of sedentary behaviour are closely linked to the development of frailty (da Silva et al., 2017). For frail and pre-frail older people, multicomponent exercise seems to be more effective (King et al., 2002; Faber et al., 2006; Ginè-Garriga, 2010; Cadore et al., 2013; Kim et al., 2015; Ng et al., 2015). In multicomponent exercise we include endurance, strength, flexibility and balance exercises. There is no clear evidence about the setting, or the minimum duration of an intervention programme. As for the intensity, there is some evidence that the exercise load must be adapted to the individual capacities, so as a general idea for older people with frailty we advise low to medium intensity and gradually increase this, and for pre-frail people moderate to high and gradually increase this. Safety is another concern when older people are offered exercise programmes, especially when they are not supervised.

Also, there is moderate evidence that exercise and nutrition should combine to have better results, but evidence of multidimensional programmes that combine exercise with nutritional supplementation or cognitive interventions show some evidence in the literature.

3.3.1.5 Drugs

Recommendations	Quality of evidence (GRADE)	Level of Recommendation
Reduce polypharmacy of more than 10 drugs	High	Strong
Reduce inappropriate prescriptions	High	Strong

Rationale: The problem of polypharmacy and inappropriate prescriptions in older people with frailty is of major importance. Although neither of these cause frailty, they are linked to increased adverse drugs reaction and increased health care costs (Jano & Aparasu, 2007). There is no gold standard tool to use in order to avoid inappropriate prescribing, and familiarity with the assessment tool as well as the cultural environment can lead to the use of one of the following: Beers Criteria, Laroche criteria and STOPP/START criteria (Jano & Aparasu, 2007; Gallagher et al., 2008; Hamilton et al., 2011; Kaufmann et al., 2014). There are studies comparing Beers and START/STOPP criteria but the quality of the evidence is not high enough to suggest one versus the other (Gallagher et al., 2008; Frankenthal et al., 2014). A two-round Delphi survey developed the European Union (EU) (7)-PIM list as a screening tool for Potentially Inappropriate Medications (PIM), and the same methodology for the PRISCUS list for Germany (Holt et al., 2010; Renom-Guiteras et al., 2015), but more data is needed for both these lists. There is also some evidence that the CGA (Sergi et al., 2011) could be a useful tool to manage polypharmacy and tailored therapy for elderly patients.

In conclusion, polypharmacy and inadequate prescriptions are important topics in the management of frailty but there is not much evidence to suggest the use of one specific tool versus clinically relevant endpoints. Multimorbidity and complexity in the clinical management of older people with frailty demand that clinicians manage this vulnerable population with a more holistic approach.

3.3.1.6 ICTs

Recommendation	Quality of evidence (GRADE)	Level of Recommendation
Use ICTs to monitor vital signs	Low	Conditional

Rationale: There is data that ICTs improve the quality of life of older people (Vollenbroek-Hutten et al., 2017) and they can favour better clinical outcomes. Based on a systematic literature review (Barlow et al., 2007), the best data are for interventions that monitor vital

signs at home and delay the entry into long-term care, but evidence is limited, lacking the cost-effectiveness of these interventions and also the level of acceptance in the older population with frailty. There are some positive data on the perception of fall prevention technologies for promoting healthy ageing, the reduction of social isolation, smart home technology and home care support (Tomita et al., 2010; Hawley-Hague et al., 2014; Chen & Schulz, 2016).

As an overall idea ICTs should be used in the management of older people with frailty, but still we need further research to create specific recommendations.

3.3.2 Roadmap for frailty prevention and management in the EU

Aim: A roadmap in policy by definition is a strategic plan to achieve a goal and includes the major steps for doing so. Issuing a roadmap for the prevention and management of frailty at individual level is an important step towards application of the best evidence. We are aware of the differences of the healthcare systems in the EU and also of the different levels of implementation of policies for older people with frailty in the MS, yet the harmonization of policy initiatives is possible on an EU level, which makes this roadmap very useful.

Method: Based on the SoArt Report a survey of the MS was conducted in order to map the current situation in every member state in the field of prevention and management of frailty. The survey covered the entire spectrum of the Joint Action areas through 24 questions. From these a part was dedicated to prevention and management of frailty at individual level. To answer the survey, each MS selected a group of key informants among health strategic planners, health managers and representatives of the social services, research and education sectors. The survey was carried out during the first trimester of 2018. Answers from each MS were merged in a 'background frailty situation report' that also included information from regions in the case of de-centralised countries.

The study of the background frailty situation reports made clear that the classification of the MS should be organized in five very general levels that were discussed by the JA WP leaders and co-leaders and the coordination team. Subsequently, the following categories were agreed:

Table 2: Levels of classification of Member States

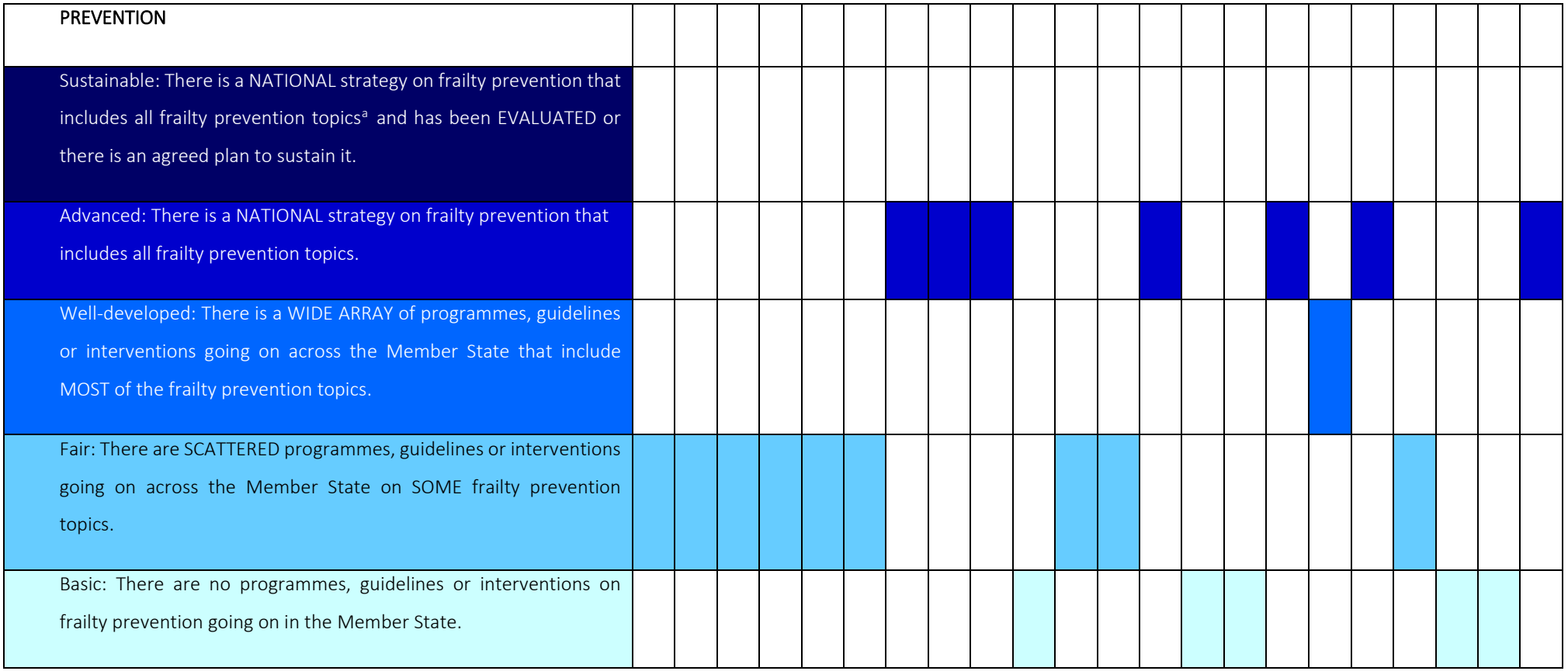
Sustainable: There is an evaluated national strategy or there is an agreed plan to sustain it.
Advanced: There is a national strategy on that item.
Well-developed: Relevant interventions/programmes are being carried out in many parts of the MS.
Fair: Something is being done in some places in the MS.
Basic: Nothing is going on in the MS in relation to that item.

Each WP decided on what items of the SoAR recommendations pertaining to their area of expertise should have been reported in each MS's 'background frailty situation report' to allocate it a given level. Depending on the WP, a first critical appraisal of the survey results was initially performed either by the WP leader and co-leaders or the task-leaders, with subsequent consultation with the other group in all cases; discrepancies were discussed and resolved through consensus.

Tables that show the areas covered in the MS survey, the five levels of classification for each of them, their description and the MS that comply with each level were created. Based on this analysis and the previous recommendations we have created a roadmap on frailty prevention and management in the EU for each of the above-mentioned categories.

Roadmaps

Table 3: Levels of development of activities for the prevention of frailty by Member State



[a] Smoking cessation, reducing alcohol consumption, increasing physical activity and improving diet to achieve and maintain a healthy weight - such as Mediterranean diet.

In the field of prevention there are only three countries that have a national strategy that complies with the recommendation – Spain, Finland and Italy. Yet there is no evaluation of the effects of the strategy. The next step will be using an indicator to evaluate the efficacy of the strategy implemented.

For the rest of the countries the goal is adoption of the recommendation of frailty prevention through programmes that start in mid-life and have all of the following components: smoking cessation, reduction of alcohol consumption, increase of physical activity and improved diet to achieve and maintain a healthy weight.

A proposed indicator from the JA is the creation of National Guidelines to prevent frailty. As the Mediterranean diet is a weak recommendation, it is the responsibility of each MS to include it (or not).

Table 4: Levels of development of activities for the clinical management of frailty by Member State

CLINICAL MANAGEMENT	AT	BE	BG	CY	DE	EL	ES	FI	FR	HR	HU	IE	IT	LT	MT	NL	NO	PL	PT	RO	SI	UK
Sustainable: There is a NATIONAL strategy for the management of older people with frailty based on the CGA and ALL specific interventions related to frailty[b] that apply in primary/ community care and in hospitals that has been EVALUATED or there is an agreed plan to sustain it.																						
Advanced: There is a NATIONAL strategy for the management of older people with frailty based on the CGA and ALL specific interventions related to frailty that apply in primary care, community care and in hospitals.																						
Well-developed: There is a WIDE ARRAY of programmes, guidelines or interventions going on across the Member State for the management of older people with frailty based on the CGA and MOST specific interventions related to frailty.																						
Fair: There are SCATTERED programmes, guidelines or interventions going on across the Member State for the management of older people with frailty based on the CGA and SOME specific interventions related to frailty.																						
Basic: There are no programmes, guidelines or interventions going on in the Member State for the management of older people with frailty based on the CGA and specific interventions related to frailty.																						

[b] Physical activity, nutrition and reduction of polypharmacy.

In the field of clinical management three countries have a sustainable approach – Belgium, Italy and the UK. All of them have integrated into their healthcare systems from primary care to the specialized geriatric ward programmes, guidelines and interventions based on the CGA, and they have an evaluation process.

Ireland and France also have National Strategies for the clinical management of older persons with frailty based on the CGA, with no evaluation or sustainability agreement.

Spain has a wide array of action based on the CGA but nothing on a national level.

The rest of the countries have little to nothing in the clinical management and the incorporation of the CGA into the management of frailty.

Since the use of the CGA is a strong recommendation with a high level of evidence, the MS's are encouraged to create strategies for the implementation of the CGA in order to address the clinical needs of older people with frailty in all care settings.

A possible indicator could be the same use of the CGA at PC/Hospitals and long-term care facilities.

Table 5: Levels of development of activities for nutrition related to frailty by Member State

NUTRITION	AT	BE	BG	CY	DE	EL	ES	FI	FR	HR	HU	IE	IT	LT	MT	NL	NO	PL	PT	RO	SI	UK
Sustainable: There is a NATIONAL strategy on nutrition of older people with frailty that includes ALL the interventions recommended in the ADVANTAGE JA State of the Art Report[d] that has been EVALUATED or there is an agreed plan to sustain it.																						
Advanced: There is a NATIONAL strategy on nutrition of older people with frailty that includes ALL the interventions mentioned above.																						
Well-developed: There is a WIDE ARRAY of programmes, guidelines or interventions going on across the Member State on nutrition of older people with frailty that include MOST of the interventions mentioned above.																						
Fair: There are SCATTERED programmes, guidelines or interventions going on across the Member State on nutrition of older people with frailty that include SOME of the interventions mentioned above.																						
Basic: There are no programmes, guidelines or interventions on nutrition of older people with frailty going on in the Member State.																						

[d] Administration of the Mini Nutritional Assessment, assuring adequate protein intake, achieving moderate weight loss in those who are obese, and supplementation of vitamin D in those who are at high risk of falls or fracture and have a lower vitamin D level.

In nutrition we have three strong recommendations with a high level of evidence for the older adult with frailty; assessment with a validated tool for malnutrition such as MNA, consumption of 1-1.2 g/kg/d, and vitamin D3 levels at 30 ng/dl. The reduction of body weight is also advised but the proposed way to achieve it is a conditional recommendation, like the implementation of the Mediterranean diet.

In the present situation only Greece, Finland and France have national strategies with all the above interventions, but none of them has an evaluation plan.

In France, Spain, Ireland, Poland, Germany, Italy, Holland and the UK there are initiatives and programmes but not national strategies.

The remaining MS have little to nothing. Due to the importance of nutrition for the elderly they are encouraged to create and implement national guidelines with the above-mentioned recommendations.

An indicator is the production of guidelines on a national level.

Table 6: Levels of development of activities for physical exercise related to frailty by Member State

PHYSICAL EXERCISE	AT	BE	BG	CY	DE	EL	ES	FI	FR	HR	HU	IE	IT	LT	MT	NL	NO	PL	PT	RO	SI	UK
Sustainable: There is a NATIONAL strategy on physical exercise for older people with frailty that includes structured multicomponent exercise (SME) or exercise strength training (EST) that has been EVALUATED or there is an agreed plan to sustain it.																						
Advanced: There is a NATIONAL strategy on physical exercise for older people with frailty that includes SME or EST.																						
Well-developed: There is a WIDE ARRAY of programmes, guidelines or interventions going on across the Member State on physical exercise for older people with frailty that includes SME or EST.																						
Fair: There are SCATTERED programmes, guidelines or interventions going on across the Member State on physical exercise for older people with frailty.																						
Basic: There are no programmes, guidelines or interventions on physical exercise for older people with frailty going on in the Member State.																						

Only Finland and France have a national strategy on exercise for older people. Spain, Ireland and the UK have a wide array of programmes but there is no national strategy to implement them.

Since this is a strong recommendation, the MS are highly advised not only to create a national strategy on physical activity but also to incorporate the key components of a multicomponent exercise programme.

A possible indicator could be the development of such programmes in the MS.

Table 7: Levels of development of activities for drugs related to frailty by Member State

DRUGS	AT	BE	BG	CY	DE	EL	ES	FI	FR	HR	HU	IE	IT	LT	MT	NL	NO	PL	PT	RO	SI	UK
Sustainable: There is a NATIONAL strategy to promote appropriate prescribing, manage polypharmacy AND optimise adherence in older people with frailty that has been EVALUATED or there is an agreed plan to sustain it.																						
Advanced: There is a NATIONAL strategy to promote appropriate prescribing, manage polypharmacy AND optimise adherence in older people with frailty.																						
Well-developed: There is a WIDE ARRAY of programmes, guidelines or interventions going on across the Member State to promote appropriate prescribing, manage polypharmacy AND optimise adherence in older people with frailty.																						
Fair: There are SCATTERED programmes, guidelines or interventions going on across the Member State to promote appropriate prescribing, manage polypharmacy OR optimise adherence in older people with frailty.																						
Basic: There are no programmes, guidelines or interventions to promote appropriate prescribing, manage polypharmacy OR optimise adherence in older people with frailty going on in the Member State.																						

In Belgium, Finland, France and the UK there is a national strategy to reduce both inappropriate prescription and polypharmacy.

In Germany, Greece, Spain, Ireland Italy, Malta, Portugal and Slovenia there is a wide array of programmes, guidelines and interventions but not on a national level.

Since there is a strong recommendation for the reduction of polypharmacy and inappropriate prescription, the MS are encouraged to address the issue with national strategies.

The indicator could be the existence of those strategies and the implementation of electronic health records

Table 8: Levels of development of activities for information and communication technologies (ICT's) related to frailty by Member State

INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs)	INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs)	AT	BE	BG	CY	BE	BG	CY	DE	EL	ES	FI	FR	HR	HU	IE	IT	LT	MT	NL	NO	PL	PT	RO	SI	UK
Sustainable: There is a NATIONAL strategy to promote adoption of specific ICTs/Apps/Tools to prevent or manage frailty that has been EVALUATED or there is an agreed plan to sustain it.	Sustainable: There is a NATIONAL strategy to promote adoption of specific ICTs/Apps/Tools to prevent or manage frailty that has been EVALUATED or there is an agreed plan to sustain it.																									
Advanced: There is a national strategy to promote adoption of specific ICTs/Apps/Tools to prevent or manage frailty.	Advanced: There is a national strategy to promote adoption of specific ICTs/Apps/Tools to prevent or manage frailty.																									
Well-developed: ICTs/Apps/Tools to prevent or manage frailty are WIDELY used across the Member State.	Well-developed: ICTs/Apps/Tools to prevent or manage frailty are WIDELY used across the Member State.																									
Fair: ICTs/Apps/Tools to prevent or manage frailty are SOMETIMES used across the Member State.	Fair: ICTs/Apps/Tools to prevent or manage frailty are SOMETIMES used across the Member State.																									
Basic: No specific ICTs/Apps/Tools are used to prevent or manage frailty.	Basic: No specific ICTs/Apps/Tools are used to prevent or manage frailty.																									

There is no MS with a national strategy in ICTS.

Finland, France, Italy and the UK have some initiatives in the implementation of ICTs.

In the literature review there is only a recommendation for the implementation of ICTs in monitoring vital signs.

4 – LITERATURE

Advantage JA. About us - Advantage JA. (2017). Retrieved from: http://www.advantageja.eu/

Aguirre, L.E. & Villareal, D.T. (2015). Physical exercise as therapy for frailty. *Nestle Nutrition Institute Workshop Series*, 83, 83–92. doi: 10.1159/000382065

Atkins, D., Best, D., Briss, P.A., Eccles, M., Falck-Ytter, Y., Flottorp, S., et al. (2004). Grading quality of evidence and strength of recommendations. *The British Medical Journal*, 328(7454), 1490. doi: 10.1136/bmj.328.7454.1490

Barlow, J., Singh, D., Bayer, S. & Curry, R. (2007). A systematic review of the benefits of home telecare for frail elderly people and those with long-term conditions. *Journal of Telemedicine and Telecare*, 13(4), 172–179. doi: 10.1258/135763307780908058

Bauer, J., Biolo, G., Cederholm, T., Cesari, M., Cruz-Jentoft, A. J., Morley, J. E., et al. (2013). Evidence-based recommendations for optimal dietary protein intake in older people: a position paper from the PROT-AGE Study Group. *Journal of the American Medical Directors Association*, 14(8), 542–559. doi: 10.1016/j.jamda.2013.05.021

Beaudart, C., Buckinx, F., Rabenda, V., Gillain, S., Cavalier, E., Slomian, J., et al. (2014). The Effects of Vitamin D on Skeletal Muscle Strength, Muscle Mass, and Muscle Power: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *The Journal of Clinical Endocrinology & Metabolism*, 99(11), 4336–4345. doi: 10.1210/jc.2014-1742

Behm, L., Eklund, K., Wilhelmson, K., Zidén, L., Gustafsson, S., Falk, K., et al. (2016). Health Promotion Can Postpone Frailty: Results from the RCT Elderly Persons in the Risk Zone. *Public Health Nursing (Boston, Mass.)*, 33(4), 303–315. doi: 10.1111/phn.12240

BritainThinks. (2015). Frailty: Language and Perceptions. Retrieved from: https://www.ageuk.org.uk/documents/en-gb/for-professionals/policy/health-and-wellbeing/report_bgs_frailty_language_and_perceptions.pdf?dtrk=true

Bruyère, O., Cavalier, E., Buckinx, F. & Reginster, J.Y. (2017). Relevance of vitamin D in the pathogenesis and therapy of frailty. *Current Opinion in Clinical Nutrition and Metabolic care,* 20(1), 26–29. doi: 10.1097/MCO.0000000000000334

Bunn, D., Jimoh, F., Wilsher, S.H. & Hooper, L. (2015). Increasing Fluid Intake and Reducing Dehydration Risk in Older People Living in Long-Term Care: A Systematic Review. *Journal of the American Medical Directors Association*, 16(2), 101–113. doi: 10.1016/j.jamda.2014.10.016

Cadore, E.L., Rodríguez-Mañas, L., Sinclair, A. & Izquierdo, M. (2013). Effects of different exercise interventions on risk of falls, gait ability, and balance in physically frail older adults: A systematic review. *Rejuvenation Research*, 16(2), 105-114. doi: 10.1089/rej.2012.1397

Cesari, M., Vellas, B., Hsu, F.C., Newman, A.B., Doss, H., King, A.C., et al. (2015). A physical activity intervention to treat the frailty syndrome in older persons-results from the LIFE-P study. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, 70(2), 216–222. doi: 10.1093/gerona/glu099

Chan, D.C., Tsou, H.H., Yang, R.S., Tsauo, J.Y., Chen, C.Y., Hsiung, C.A., et al. (2012). A pilot randomized controlled trial to improve geriatric frailty. *BMC Geriatrics,* 12, 58. doi:

10.1186/1471-2318-12-58
Chen, Y.R. & Schulz, P.J. (2016). The Effect of Information Communication Technology Interventions on Reducing Social Isolation in the Elderly: A Systematic Review. *Journal of Medical Internet Research*, 18(1), e18. doi: 10.2196/jmir.4596
Clegg, A., Young, J., Iliffe, S., Rikkert, M.O. & Rockwood, K. (2013). Frailty in elderly people. *The Lancet*, 381(9868), 752–762. doi: 10.1016/S0140-6736(12)62167-9
Collard, R.M., Boter, H., Schoevers, R.A. & Oude Voshaar, R.C. (2012). Prevalence of Frailty in Community-Dwelling Older Persons: A Systematic Review. *Journal of the American Geriatrics Society*, 60(8), 1487–1492. doi: 10.1111/j.1532-5415.2012.04054.x
da Silva Coqueiro, R., de Queiroz, B.M., Oliveira, D.S., das Merces, M.C., Oliveira Carneiro, J.A., Pereira, R., et al. (2017). Cross-sectional relationships between sedentary behavior and frailty in older adults. *The Journal of Sports Medicine and Physical Fitness*, 57(6), 825-830. doi: 10.23736/S0022-4707.16.06289-7

de Carvalho Mello, A., Engstrom, E.M. & Alves, L.C. (2014). Health-related and socio-demographic factors associated with frailty in the elderly: a systematic literature review. *Cadernos de Saúde Pública*, 30(6), 1143-1168. doi: 10.1590/0102-311X00148213
de Labra, C., Guimaraes-Pinheiro, C., Maseda, A., Lorenzo, T. & Millán-Calenti, J.C. (2015). Effects of physical exercise interventions in frail older adults: a systematic review of randomized controlled trials. *BMC Geriatrics*, 15, 154. doi: 10.1186/s12877-015-0155-4
Dent, E., Hoogendijk, E.O., Visvanathan, R. & Wright, O.R.L. (2019). Malnutrition Screening and Assessment in Hospitalised Older People: a Review. *The Journal of Nutrition, Health & Aging*, 23(5), 431-441. doi: 10.1007/s12603-019-1176-z
Dent, E., Kowal, P. & Hoogendijk, E.O. (2016). Frailty measurement in research and clinical practice: A review. *European Journal of Internal Medicine*, 31, 3–10. doi: 10.1016/j.ejim.2016.03.007
Duerden, M., Avery, T. & Payne, R. (2013). Polypharmacy and medicines optimisation: Making it safe and sound. London: The King's Fund. Retreived from: https://www.kingsfund.org.uk/sites/default/files/field/field_publication_file/polypharmacy-and-medicines-optimisation-kingsfund-nov13.pdf
El-Khoury, F., Cassou, B., Charles, M.A. & Dargent-Molina, P. (2013). The effect of fall prevention exercise programmes on fall induced injuries in community dwelling older adults: systematic review and meta-analysis of randomised controlled trials. *The British Medical Journal*, 347, f6234. doi: 10.1136/bmj.f6234
Ellis, G., Whitehead, M.A., Robinson, D., O'Neill, D. & Langhorne, P. (2011). Comprehensive geriatric assessment for older adults admitted to hospital: meta-analysis of randomised controlled trials. *The British Medical Journal*, 343, d6553. doi: 10.1136/bmj.d6553
Elmadfa, I. & Meyer, A.L. (2008). Body Composition, Changing Physiological Functions and Nutrient Requirements of the Elderly. *Annals of Nutrition and Metabolism*, 52(1), 2–5. doi: 10.1159/000115339
European Commission. (2015). The 2015 Ageing Report:Economic and budgetary projections

for the 28 EU Member States (2013-2060). Luxembourg: Publications Office of the European Union. Retrieved from: http://ec.europa.eu/economy_finance/publications/european_economy/2015/pdf/ee3_en.pdf

Faber, M.J., Bosscher, R.J., Chin A Paw, M.J. & van Wieringen, P.C. (2006). Effects of exercise programs on falls and mobility in frail and pre-frail older adults: A multicenter randomized controlled trial. *Archives of Physical Medicine and Rehabilitation*, 87(7), 885–896. doi: 10.1016/j.apmr.2006.04.005

Fairhall, N., Sherrington, C., Lord, S.R., Kurrle, S.E., Langron, C., Lockwood, K., et al. (2014). Effect of a multifactorial, interdisciplinary intervention on risk factors for falls and fall rate in frail older people: a randomised controlled trial. *Age Ageing*, 43(5), 616–622. doi: 10.1093/ageing/aft204

Frankenthal, D., Lerman, Y., Kalendaryev, E. & Lerman, Y. (2014). Intervention with the screening tool of older persons potentially inappropriate prescriptions/screening tool to alert doctors to right treatment criteria in elderly residents of a chronic geriatric facility: a randomized clinical trial. *Journal of the American Geriatrics Society*, 62(9), 1658–1665. doi: 10.1111/jgs.12993

Fried, L.P., Tangen, C.M., Walston, J., Newman, A.B., Hirsch, C., Gottdiener, J., et al. (2001). Frailty in older adults: evidence for a phenotype. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, 56(3), M146-156. doi: 10.1093/gerona/56.3.m146

Gabrovec, B. & Eržen, I. (2016). Svetovno poročilo o staranju in zdravju. *Isis: Glasilo Zdravniške zbornice,* 25(2), 52-53. ISSN: 1318-0193

Gabrovec, B., Veninšek, G., López Samaniego, L., Carriazo, A.M., Antoniadou, E. & Jelenc, M. (2018). The role of nutrition in ageing: a narrative review from the perspective of the European joint action on frailty - ADVANTAGE JA. *European Journal of Internal Medicine,* 54, e8-e14. doi: 10.1016/j.ejim.2018.07.021

Gallagher, P., Ryan, C., Byrne, S., Kennedy, J. & O'Mahony, D. (2008). STOPP (Screening Tool of Older Person's Prescriptions) and START (Screening Tool to Alert doctors to Right Treatment). Consensus validation. *International Journal of Clinical Pharmacology and Therapeutics*, 46(2), 72–83. doi: 10.5414/cpp46072

Gill, T.M., Baker, D.I., Gottschalk, M., Peduzzi, P.N., Allore, H. & Van Ness, P.H. (2004). A prehabilitation program for the prevention of functional decline: effect on higher-level physical function. *Archives of Physical Medicine and Rehabilitation*, 85(7), 1043–1049. doi: 10.1016/j.apmr.2003.10.021

Gillespie, L.D., Robertson, M.C., Gillespie, W.J., Sherrington, C., Gates, S., Clemson, L.M., et al. (2012). Interventions for preventing falls in older people living in the community. *The Cochrane Database of Systematic Reviews*, 9, CD007146. doi: 10.1002/14651858.CD007146.pub3

Giné-Garriga, M., Guerra, M., Pagès, E., Manini, T.M., Jiménez, R. & Unnithan, V.B. (2010). The effect of functional circuit training on physical frailty in frail older adults: a randomized controlled trial. *Journal of Aging and Physical Activity*, 18(4), 401–424.

Gnjidic, D., Hilmer, S.N., Blyth, F.M., Naganathan, V., Cumming, R.G., Handelsman, D.J., et al. (2012). High-Risk Prescribing and Incidence of Frailty Among Older Community-Dwelling Men. *Clinical Pharmacology and Therapeutics*, 91(3), 521–528. doi: 10.1038/clpt.2011.258

Goisser, S., Guyonnet, S. & Volkert, D. (2016). The Role of Nutrition in Frailty: An Overview. *The Journal of Frailty & Aging*, *5*(2), 74–77. doi: 10.14283/jfa.2016.87

Guessous, I., Luthi, J.C., Bowling, C.B., Theler, J., Paccaud, F., Gaspoz, J.M., et al. (2014). Prevalence of Frailty Indicators and Association with Socioeconomic Status in Middle-Aged and Older Adults in a Swiss Region with Universal Health Insurance Coverage: A Population-Based Cross-Sectional Study. *Journal of Aging Research*, 2014, 198603. doi: 10.1155/2014/198603

Guigoz, Y. (2006). The Mini Nutritional Assessment (MNA) review of the literature--What does it tell us? *The Journal of Nutrition, Health & Aging*, 10(6), 466-485; discussion 485-487.

Hamilton, H., Gallagher, P., Ryan, C., Byrne, S. & O'Mahony, D. (2011). Potentially inappropriate medications defined by STOPP criteria and the risk of adverse drug events in older hospitalized patients. *Archives of Internal Medicine*, 171(11), 1013–1019. doi: 10.1001/archinternmed.2011.215

Hawley-Hague, H., Boulton, E., Hall, A., Pfeiffer, K. & Todd, C. (2014). Older adults' perceptions of technologies aimed at falls prevention, detection or monitoring: a systematic review. *International Journal of Medical Informatics*, 83(6), 416–426. doi: 10.1016/j.ijmedinf.2014.03.002

Holt, S., Schmiedl, S. & Thürmann, P.A. (2010). Potentially Inappropriate Medications in the Elderly: The PRISCUS List. *Deutsches Ärzteblatt International*, 107(31–32), 543–551. doi: 10.3238/arztebl.2010.0543

Houston, D.K., Nicklas, B.J., Ding, J., Harris, T.B., Tylavsky, F.A., Newman, A.B, et al. (2008). Dietary protein intake is associated with lean mass change in older, community-dwelling adults: the Health, Aging, and Body Composition (Health ABC) Study. *The American Journal of Clinical Nutrition*, 87(1), 150–155. doi: 10.1093/ajcn/87.1.150

Jano, E. & Aparasu, R.R. (2007). Healthcare outcomes associated with beers' criteria: a systematic review. *The Annals of Pharmacotherapy*, 41(3), 438–447. doi: 10.1345/aph.1H473

Kaiser, M.J., Bauer, J.M., Rämsch, C., Uter, W., Guigoz, Y., Cederholm, T., et al. (2010). Frequency of Malnutrition in Older Adults: A Multinational Perspective Using the Mini Nutritional Assessment. *Journal of the American Geriatrics Society*, 58(9), 1734–1738. doi: 10.1111/j.1532-5415.2010.03016.x

Kaufmann, C.P., Tremp, R., Hersberger, K.E. & Lampert, M.L. (2014). Inappropriate prescribing: a systematic overview of published assessment tools. *European Journal of Clinical Pharmacology*, 70(1), 1–11. doi: 10.1007/s00228-013-1575-8

Kelaiditi, E. (2016). Frailty and Novel Technologies - A Step Ahead. In: B. Vellas, M. Cesari & J.

Li (Eds.), White Book on Frailty, ebook, 140–142. Retrieved from: http://www.garn-network.org/documents/whitebookonfrailty-usversion.pdf

Kim, H., Suzuki, T., Kim, M., Kojima, N., Ota, N., Shimotoyodome, A., et al. (2015). Effects of exercise and milk fat globule membrane (MFGM) supplementation on body composition, physical function, and hematological parameters in community-dwelling frail Japanese women: a randomized double blind, placebo-controlled, follow-up trial. *PloS One*, 10(2), e0116256. doi: 10.1371/journal.pone.0116256

King, M.B., Whipple, R.H., Gruman, C.A., Judge, J.O., Schmidt, J.A. & Wolfson, L.I. (2002). The Performance Enhancement Project: improving physical performance in older persons. *Archives of Physical Medicine and Rehabilitation*, 83(8), 1060–1069. doi: 10.1053/apmr.2002.33653

Marengoni, A., Angleman, S., Melis, R., Mangialasche, F., Karp, A., Garmen, A., et al. (2011). Aging with multimorbidity: A systematic review of the literature. *Ageing Research Reviews*, 10(4), 430–439. doi: 10.1016/j.arr.2011.03.003

Marengoni, A., Pasina, L., Concoreggi, C., Martini, G., Brognoli, F., Nobili, A., et al. (2014). Understanding adverse drug reactions in older adults through drug–drug interactions. *The European Journal of Internal Medicine*, 25(9), 843–846. doi: 10.1016/j.ejim.2014.10.001

Mohandas, A., Reifsnyder, J., Jacobs, M. & Fox, T. (2011). Current and Future Directions in Frailty Research. *Population Health Management*, 14(6), 277–283. doi: 10.1089/pop.2010.0066

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., et al. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews*, 4, 1. doi: 10.1186/2046-4053-4-1

Morley, J.E., Vellas, B., van Kan, G.A., Anker, S.D., Bauer, J.M., Bernabei, R., et al. (2013). Frailty consensus: a call to action. *The Journal of the American Medical Directors Association*, 14(6), 392–397. doi: 10.1016/j.jamda.2013.03.022

Murray, C.J.L. & Lopez, A.D. (2013). Measuring the Global Burden of Disease. *The New England Journal of Medicine*, 369(5), 448–457. doi: 10.1056/NEJMra1201534

Ng, T.P., Feng, L., Nyunt, M.S.Z., Feng, L., Niti, M., Tan, B.Y., et al. (2015). Nutritional, Physical, Cognitive, and Combination Interventions and Frailty Reversal Among Older Adults: A Randomized Controlled Trial. *The American Journal of Medicine*, 128(11), 1225–1236.e1. doi: 10.1016/j.amjmed.2015.06.017

Pahor, M., Guralnik, J.M., Ambrosius, W.T., Blair, S., Bonds, D.E., Church, T.S., et al. (2014). Effect of structured physical activity on prevention of major mobility disability in older adults: the LIFE study randomized clinical trial. *The Journal of the American Medical Association*, 311(23), 2387-2396. doi: 10.1001/jama.2014.5616

Palmer, K., Marengoni, A., Russo, P., Mammarella, F. & Onder, G. (2016). Frailty and Drug Use. *The Journal of Frailty & Aging,* 5(2), 100–103. doi: 10.14283/jfa.2016.84

Park, Y., Choi, J.E. & Hwang, H.S. (2018). Protein supplementation improves muscle mass and physical performance in undernourished prefrail and frail elderly subjects: a randomized, double-blind, placebo-controlled trial. *The American Journal of Clinical Nutrition*, 108(5),

1026-1033. doi: 10.1093/ajcn/nqy214.

Porter Starr, K.N. & Bales, C.W. (2015). Excessive Body Weight in Older Adults. *Clinics in Geriatric Medicine*, 31(3), 311–326. doi: 10.1016/j.cger.2015.04.001

Renom-Guiteras, A., Meyer, G. & Thürmann, P.A. (2015). The EU(7)-PIM list: a list of potentially inappropriate medications for older people consented by experts from seven European countries. *European Journal of Clinical Pharmacology*, 71(7), 861–875. doi: 10.1007/s00228-015-1860-9

Rodríguez-Laso, A., Caballero Mora, M.A., García Sánchez, I., Rodríguez Mañas, L., Bernabei, R., Gabrovec, B., et al. (2018). State of the art report on the prevention and management of frailty. Retrieved from: http://advantageja.eu/images/SoAR-AdvantageJA_Fulltext.pdf

Rubenstein, L.Z. & Josephson, K.R. (2002). The epidemiology of falls and syncope. *Clinics in Geriatric Medicine*, 18(2), 141–158. doi: 10.1016/S0749-0690(02)00002-2

Sergi, G., De Rui, M., Sarti, S. & Manzato, E. (2011). Polypharmacy in the elderly: can comprehensive geriatric assessment reduce inappropriate medication use? *Drugs & Aging*, 28(7), 509–518. doi: 10.2165/11592010-000000000-00000

Shardell, M., Hicks, G.E., Miller, R.R., Kritchevsky, S., Andersen, D., Bandinelli, S., et al. (2009). Association of low vitamin D levels with the frailty syndrome in men and women. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, 64(1), 69–75. doi: 10.1093/gerona/gln007

Strojnik, V. & Gabrovec, B. (2019). Management of frailty at individual level: narrative review of physical activity from the European perspective of joint action on frailty - JA ADVANTAGE = Management krhkosti na ravni posameznika: pregled literature iz evropske perspektive projekta skupnega ukrepanja ADVANTAGE. *Zdravstveno varstvo: Slovenian Journal of Public Health*, 58(2), 84-90. doi: 10.2478/sjph-2019-0011

Theou, O., Stathokostas, L., Roland, K.P., Jakobi, J.M., Patterson, C., Vandervoort, A.A., et al. (2011). The Effectiveness of Exercise Interventions for the Management of Frailty: A Systematic Review. *Journal of Aging Research*, 2011, 569194. doi: 10.4061/2011/569194

Theou, O., Squires, E., Mallery, K., Lee, J.S., Fay, S., Goldstein, J., et al. (2018). What do we know about frailty in the acute care setting? A scoping review. *BMC Geriatrics,* 18(1), 139. doi: 10.1186/s12877-018-0823-2

Tomita, M.R., Russ, L.S., Sridhar, R. & Naughton M., B.J. (2010). Smart Home with Healthcare Technologies for Community-Dwelling Older Adults. In M.A. Al-Qutayri, Smart Home Systems. doi: 10.5772/8411

Veninšek, G. & Gabrovec, B. (2018). Management of frailty at individual level - clinical management: systematic literature review = Menedžment krhkosti na ravni posameznika - klinični menedžment: sistematični pregled literature. *Zdravstveno varstvo: Slovenian Journal of Public Health*, 57(2), 106-115. doi: 10.2478/sjph-2018-0014

Vermeulen, J., Neyens, J.C., van Rossum, E., Spreeuwenberg, M.D. & de Witte, L.P. (2011). Predicting ADL disability in community-dwelling elderly people using physical frailty indicators: a systematic review. *BMC Geriatrics*, 11, 33. doi: 10.1186/1471-2318-11-33

Vollenbroek-Hutten, M., Jansen-Kosterink, S., Tabak, M., Feletti, L.C., Zia, G., N'dja, A., et al.

(2017). Possibilities of ICT-supported services in the clinical management of older adults. *Aging Clinical and Experimental Research*, 29(1), 49–57. doi: 10.1007/s40520-016-0711-6

White, J.V., Guenter, P., Jensen, G., Malone, A., Schofield, M., Academy Malnutrition Work Group, et al. (2012). Consensus Statement: Academy of Nutrition and Dietetics and American Society for Parenteral and Enteral Nutrition. *The Journal of Parenteral and Enteral Nutrition*, 36(3), 275–283. doi: 10.1177/0148607112440285

Winter, J.E., MacInnis, R.J., Wattanapenpaiboon, N. & Nowson, C.A. (2014). BMI and all-cause mortality in older adults: a meta-analysis, *The American Journal of Clinical Nutrition,* 99(4), 875-890. doi: 10.3945/ajcn.113.068122

World Health Organization. (2015). World report on ageing and health. Luxembourg. Retrieved from: http://apps.who.int/iris/bitstream/10665/186463/1/9789240694811_eng.pdf?ua=1

Young, A.C.M., Glaser, K., Spector, T.D. & Steves, C.J. (2016). The Identification of Hereditary and Environmental Determinants of Frailty in a Cohort of UK Twins. *Twin Research and Human Genetics*, 19(6), 600–609. doi: 10.1017/thg.2016.72

5 - LIST OF ABBREVIATIONS

BMI = Body Mass Index

CFS = Clinical Frailty Scale

CGA = Comprehensive Geriatric Assessment

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, Ambulance, Illness, Loss of Weight

GRADE= Grading of Recommendations Assessment, Development and Evaluation

ICTs = Information and Communication Technologies

JA = Joint Action

MNA = Mini Nutritional Assessment

MS = Member State

SoAR = State of the Art Report

WHO = World Health Organization

WP = Work package

6 - ANNEXES

Annex 1: Words used in literature review search

Prevention: Functional decline OR Frailty OR Frail OR Vulnerable OR disability OR Elderly OR Aged OR Older OR adult OR Older person OR Older adult function OR Geriatric OR Prevention OR Health promotion OR Geriatric programmes OR screening tools OR family carer's OR risks OR social determinants OR strategies.

Clinical management: Comprehensive Geriatric Assessment OR Frail OR Disability OR Frailty treatment OR Frail older adult OR Frailty screening OR Frailty management OR Frailty intervention therapy OR Functional decline OR Frail older person OR Geriatric vulnerable OR Elderly vulnerable OR Frailty scale.

Nutrition: Geriatric nutritional OR Elderly protein deficiency OR Frailty energy intake OR Frailty D vitamin OR Osteoporosis nutrition OR Frail nutrition OR Frail vulnerable nutrition OR Functional decline protein deficiency OR Older person sarcopenia OR Frail D vitamin OR Aged dietary supplements OR Cognitive decline OR Calcium nutrition OR Calcium older adult OR Geriatric nutrition OR Disability nutrition.

Physical activity: Frail muscle strength OR Frailty activity OR Elderly exercise OR Older adult functional ability OR Aged functional decline OR Older person mobility OR Geriatric disability OR Inactivity vulnerable elderly OR Physical activity aged function OR Training aged OR Functional outcomes geriatric OR Physical interventions vulnerable OR Sports older person OR Patterns of activity older adult OR Leisure activity elderly.

Drugs/medicines: Multimedication OR Multimedication frail OR Poly medicine OR Polymedicine older person OR Polypharmacy OR Polypharmacy geriatric OR Polypragmasy aged OR Polytherapy elderly OR Multiple medication disability OR Polypragmasy OR Polytherapy OR Multiple medication frail OR Polypragmasy function OR Multimedication vulnerable OR Polypharmacy functional decline.

ICTs: Elderly mobile health OR Geriatric mobile health OR Frailty ICT OR Vulnerable App OR Disability App OR Information and communication technology frail OR ICT elderly OR Mobile health aged OR E health elderly OR Older adult tele care OR Screening application OR Support ICT OR ICT lder person OR Treatment monitor frailty OR Frail ICT OR tele care function.

Annex 2. Number of papers reviewed

Areas of knowledge reviewed	Papers identified	Papers analysed
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
Total	1.291.904	503

ICTs: Information and communication technologies

Annex 3: Inclusion criteria used in good practices selection (score)

A. RELEVANCE

1. Political/strategic context of the practice or intervention clearly explained and considered (i.e. WHO targets on Non-Communicable Diseases).
2. Description of the practice: A priority public health area or a strategy at Local/Regional level or National level or European level.
3. Description of the practice: put in place to support the implementation of legislation.

B. INTERVENTION CHARACTERISTICS

1. Target population is clearly described.
2. Detailed description methodology provided. SMART (Specific, Measurable, Assignable, Realistic, Time-related) objectives defined and actions to reach them are clearly specified and easily measurable.
3. Indicators to measure the planned objectives are clearly described.
4. Contribution of target population, carers and health professionals (and other stakeholders as applicable) was appropriately planned, supported and resourced.
5. Practice includes an adequate estimate of human resources, material and budget requirements in clear relation to committed tasks.
6. Information on the optimization of resources for achieving the objectives and a model of efficiency is included.
7. Evaluation process was designed and developed including elements of effectiveness and/or efficiency and/or equity including information affecting the different stakeholders involved.
8. Documentation (guidelines, protocols, etc.) supporting the practice including the bibliography is presented properly, referenced throughout the text and easily available for relevant stakeholders (e.g. health professionals) and the target population.

C. EVIDENCE AND THEORY BASED

1. Intervention is built on a well-founded programme theory and is evidence-based.
2. Effective elements (or techniques or principles) in the approach are stated and justified.

D. ETHICAL ASPECTS

1. Practice is respectful of the basic bioethical principles of Autonomy, Non-maleficence, Beneficence and Justice.
2. Expected benefits supersede the potential harms.
3. Intervention was implemented equitably - proportional to target group needs.
4. Individuals' rights (for example, data protection) have been protected according to national and European legislation.

5. Conflicts of interest (including potential ones) are clearly stated, including measures taken.
6. Practice does not advertise a specific product, device or relate to any commercial initiative.

E. EFFECTIVENESS AND EFFICIENCY

Process evaluation

1. Practice has been evaluated (internally or externally) taking into account social and economic aspects from both the target population and the perspectives of all other stakeholders concerned (e.g. formal or informal caregivers, health professionals, teachers).
2. Evaluation outcomes (eg clinical, health, economics) and objectives were linked to the stated goals.
3. A study has been performed (based on needs and challenges) between the initial and final situation. The purpose of this study would be to determine if the practice was implemented equitably (i.e. proportional to the identified needs).
4. Practice has been implemented in an effective and efficient way.

Outcome evaluation

5. The potential impact on the target population is assessed as positive. All improvements in comparison to the starting point, for example the baseline concerning e.g. structure, process and outcomes in different areas, are documented and presented.
6. Practice has been evaluated from an economic point of view.
7. Evaluation outcomes demonstrate beneficial impact.
8. Evaluation results are trustworthy.

F. EQUITY

1. Relevant dimensions of equity are adequately and actively considered throughout the process of implementing the practice (e.g. age, gender, socioeconomic status, ethnicity, rural-urban area, vulnerable groups).
2. Practice makes recommendations or guidelines to reduce identified health inequalities.

G. TRANSFERABILITY

1. Practice uses instruments (e.g. a manual with a detailed activity description) that allow for repetition/transfer.
2. Description of the practice includes all organizational elements, and identifies the limits and the necessary actions that were taken to overcome legal, managerial, financial or skill-related barriers.
3. Description includes all contextual elements of the beneficiaries (e.g. patients, general population) and the actions that were taken to overcome personal and environmental barriers.

4. Communication strategy and a plan to disseminate the results have been developed and implemented.
5. Practice has already been successfully transferred / repeated.
6. Practice shows adaptability to different needs encountered during its implementation.

H. SUSTAINABILITY

1. Practice has institutional support, an organizational and technological structure and stable human resources.
2. Practice presents a justifying economic report, which also discloses the sources of financing.
3. Continuation of the practice has been ensured through institutional anchoring and/or ownership by the relevant stakeholders or communities in the medium and long term in the planning of the practice.
4. Practice provides training of staff in terms of knowledge, techniques and approaches in order to sustain it.
5. A sustainability strategy has been developed that considers a range of contextual factors (e.g. health and social policies, innovation, cultural trends and general economy, epidemiological trends).

I. PARTICIPATION

1. The structure, organization and content (also evaluation outcomes and monitoring) of the practice was defined and established together with the target population and families or caregivers and all stakeholders involved.
2. Mechanisms have been established and well described facilitating participation of several agents involved in different stages of the intervention as well as their specific role.
3. Elements are included to promote empowerment of the target population (e.g. strengthen their health literacy, ensuring the right skills, knowledge and behaviour including for stress management and self-care).

J. INTERSECTORAL COORDINATION (Collaboration)

1. Practice has been carried out jointly by several sectors.
2. A multidisciplinary approach is supported by the appropriate stakeholders (e.g. professional associations, public institutions from education, employment, ICT, etc).
3. It promotes the continuity of care through coordination between social and health services (if applicable).

   Practice creates ownership among the target population and several stakeholders considering multidisciplinary, multi-/inter-sectoral partnerships and alliances (if applicable).

Annex 4: Glossary

Assessment: the action of making a 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.

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

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: 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.