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eCare Draft Use Cases

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Procurers

Supporting organisations

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1. Introduction

eCare aims to deliver disruptive digital solutions for the prevention and comprehensive management of frailty to encourage independent living, wellbeing and to relieve health and care services budget pressure, throughout the implementation of a Pre-Commercial Procurement scheme. Solutions should improve outcomes for frailty in old adults entailing the physical and the psychosocial factors. The target groups are the pre-frail/frail old adults with emphasis on those that feel lonely and/or isolated.

Key characteristics of the expected solutions

The eCare solutions should enable:

- **Frailty and pre-frailty detection**.
  - Providing reliable, efficient, holistic and responsive technology solutions for frailty detection, to prevent disability, avoiding adverse health events and hospital admissions.
- **Capacity/autonomy to manage critical events and emergencies**.
  - Alerting in order to prevent and better manage critical events, such as falls or acute episodes, to accelerate the emergency handling response while promoting older adults' sense of safeness at home despite functional limitations due to Health conditions.
- **Psychological and emotional support**.
  - Moving towards holistic solutions to address frailty prevention, from physical condition to psychosocial risk factors, namely loneliness and isolation. Mitigating psychological and emotional distress, thus avoiding social exclusion, supporting mental health and independent living, while promoting healthy lifestyles and safe habits.
- **Access to social and healthcare services**.
  - Establishment of monitoring and performance evaluation systems to improve the user experience, thus supporting the paradigm shift in the provision of health and care of frail older people towards a more appropriate goal-directed service.
- **Cognitive and functional decline support.**
  - Developing and implementing sustainable multimodal and multidimensional interventions for the prevention and comprehensive management of functional decline, frailty and isolation and/or the perception of loneliness and isolation, enabling a sense of safeness at home.
- **Clinical condition management.**
  - Conveying the shift to User-centered interventions tailored to the individual needs, through the adoption of integrated pathways of care that are more efficient (and sometimes less costly) to slow the impact of frailty (on cognition, mental health, autonomy, quality of

life) than an usual intervention program.

- **End-users education and empowerment.**
  - Enabling user empowerment to self-manage their condition by means of education and training, promoting a sense of secureness about dealing with their health status, which will improve the psychological side of their condition.
- **Social and healthcare systems integration**
  - Facilitating effective continuum care across a range of health and care service to build and communicate meaningful information across service boundaries in order to facilitate the staff organization and provision of service.
- **IT adoption**.
  - Ensuring engagement and technology acceptance by the target user for the solution to commercially succeed, namely older adults that might be pre-frail, feeling lonely and/or isolated, that usually have a a low level of proficiency on digital skills
- **Data management and interoperability**.
  - Enhancing interoperability, flexibility and scalability to overcome technology silos. Pursuing higher automation levels, exploiting data in an efficient and cost effective way

2. Draft Use Cases

PCP projects pose the challenge of finding a comprehensive approach on how to structure the vision of the Procurers in a way that will be understood by the suppliers. Thus, a complete set of use cases that defines all behavior required by the system, bounding its scope needs to be defined. The use cases aim to provide a clear response to the validated unmet needs of the Project.

As part of the Challenge Brief document that will support the call for tender, the Consortium must present the identified requirements, use cases and service process models. In order to ensure that the system is correctly designed and developed, the requirements must be captured from the user's point of view with a focus on the "what" and not the "how" so the use cases can clearly describe what steps will be taken by the user through the system to accomplish a particular goal that will address one or more of the identified unmet needs

In this sense, the eCARE solution presents itself as an user centric system that encompasses concomitantly **4 main drivers** – Frailty screening, related to UC1; Frailty management and prevention, related to UC4; Develop integrated

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pathways, related to UC2 and UC3; and Knowledge sharing related do UC5 – and **3 main building blocks** – one focused on the care assessment (UC1, UC2 and UC3); other on the care delivery (UC4, UC4.1, UC4.2, UC4.3, UC4.4 and UC5); and a last one on the providence of an effective integrated system (UC6, UC6.1 and UC0).

Knowing that use cases should start off simple and at the highest view possible, and only then can be refined and detailed further, the consortium defined the use case set list and organized in a sequential way the set of interactions in between the use cases

Table 1. eCare Use case set list and corresponding challenges

UC0	Registering users into eCare
UC1	Detecting frailty and pre-frailty in Older adults
UC2	Matching older adults' needs, preferences and limits with existing care pathways
UC3	Shared care planning
UC4	Comprehensive management of frailty
UC4.1	Providing psychological and emotional support
UC4.2	Managing functional decline
UC4.3	Managing critical events/emergencies
UC4.4	Supporting self-management
UC5	Increasing the skills of Older adults, their Caregivers and Care professionals
UC6	Enabling information exchange and improving communication
UC6.1	Integrating data and ensuring interoperability

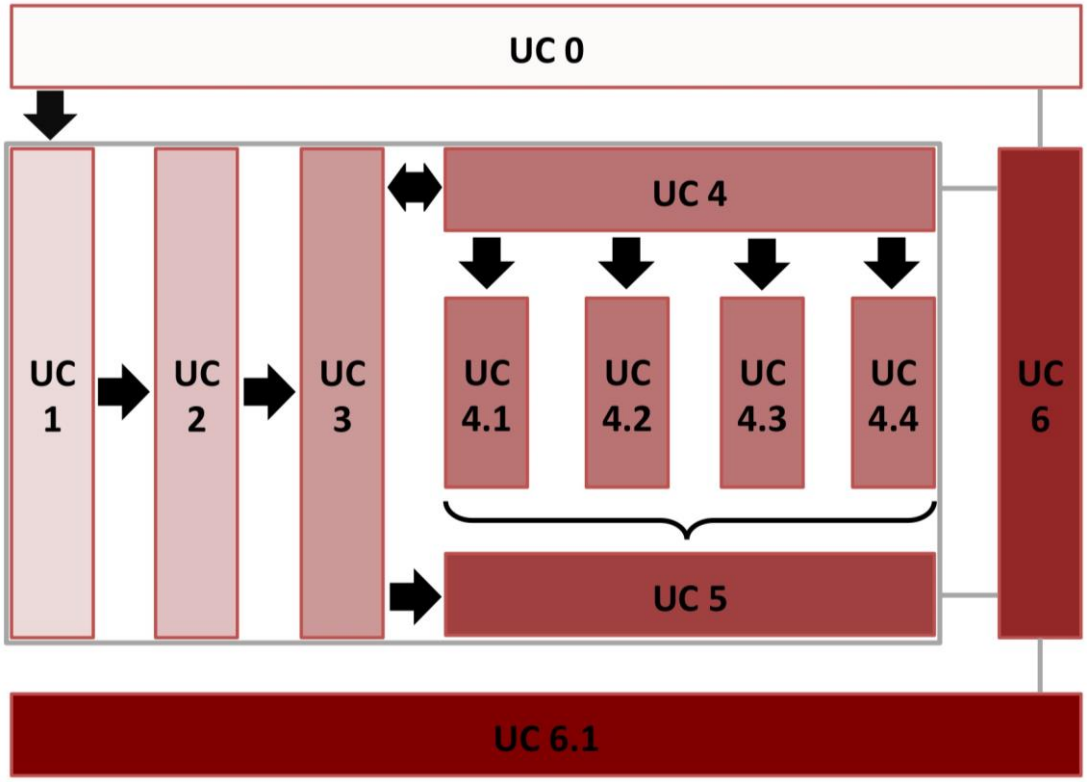

Fig.1 Set of interactions in between use cases in the eCare system

Following the perspective of the actor, it starts off with his/her registering into the system (UC0) ➔ passing through a frailty screening (UC1) ➔ and a matching of his/her needs, limits and preferences with existing procurers' care pathways (UC2) ➔ to develop a shared care plan (UC3) ➔ able to inform, both users and care professionals, what and how the comprehensive management interventions should be implemented (UC4 and their children) + what and how skill trainings should be developed (UC5)✓ The shared care plan (UC3) is continuously updated in accordance to older adults' physical and psychosocial status changes, as well as to any therapeutic prescribed by the Care Professionals, resulting from the comprehensive management (UC4) that comprises 4 typologies of intervention: psychological and emotional support (UC4.1)✓; functional decline management (UC4.2) ✓; critical events/ emergencies management (UC4.3) ✓; self-management support (UC4.4) ✓. Last, but not least, for the system to work properly it is necessary to enable an effective information exchange and to improve communication between actors (UC6)☑ supported by data integration and ensuring interoperability (UC6.1)☑.

To further develop the use cases, the consortium adopted the following use case template, here presented filled with an explanation of each of the use

case elements, as well as a typification of the actors.

Table 2. Use cases description template

ID	Each use case has an ID number to allow for easy referencing.
Title	Each use case should have a unique title suggesting its purpose. The name should express what happens when the use case is performed. Usually a combination of a verb and a noun is chosen which is occasionally extended by adjectives or adverbs
Summary	Gives an overview over the purpose of the use case and provides the ideal outcome (result) of the use case.
Actors	An actor specifies a role played by a user or any other system that interacts with the subject. It may represent roles played by human users, external hardware, or other subjects. The actors involved in the eCare solution are: - Older Adult (one over the age of 65 who is diagnosed with frailty or at risk) - Caregiver (or informal caregiver, is usually a relative without formal training who helps with the activities of daily living) - Formal Carer (one who is paid who paid to provide professional care to an individual or group of individuals) - Healthcare Professional (one who provides health care treatment and advice based on formal training and experience) - Social Worker (one who aim to improve people's lives by helping with social and interpersonal difficulties, based on formal training and experience) - Emergency Services (organization that respond to and deal with emergencies when they occur) - System Administrator (one who is responsible for the upkeep, configuration, and reliable operation of the ICT systems - System (ICT system is the set-up consisting of hardware, software, and data inputted by the users)
Parent	Use cases can have sub-use cases, in which case the former are "parents" of the latter.
Children	Use cases can have sub-use cases or "children", which are listed in this field.
Preconditions	In some cases, certain conditions and factors need to be

	present for the use case to be applied. They are described in this field.
Base flow	Describe the main aspects of the envisioned system, implying steps that the actors and the system go through to accomplish the goal of the use case.
Post conditions	Clearly describes the end state or outcome of the use case
Triggers	Describes the entry criteria for the use case. This becomes especially important in semi-automatic or automatic processes which apply to services.
Frequency	How often a use case is executed.
Exception paths	Particular exceptions of the standard case
Open issues/Notes	Free text to report issues and make comments is also available for each use case.

The procurers are carrying out Open Market Consultations (OMC) with interested suppliers, seeking to establish dialogue, collect feedback about the scope of the procurement and its feasibility of development within the project timeline.

The set of use cases presented below are therefore first drafts that will be informed by the feedback collected during the OMC events. A full list of OMC events can be found here.

Suppliers can also pose questions using the email hello@ecare-pcp.eu. Feedback can also be provided by filling in an online questionnaire depending the type of organization you are: supply-side questionnaire and demand-side questionnaire.

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UC0 – Registering users into eCare

ID	UC0
Title	**Registering users into eCare**
Summary	The eCARE solution shall be able to differentiate user types and include new users in the system – older adults, their caregivers, formal carers, healthcare professionals and social workers Each Procurer will have an overall administrator who can create new healthcare professional and/or social worker profiles. Healthcare professional and/or social worker register new older adult and their caregiver into eCARE. The system shall re-use existing information (e.g. EHR) as much as possible and local authentication techniques and/or biometric signature so these will be used throughout the eCARE service, including access to the Shared Care Plan. The eCARE solution should be user friendly and provide accessibility options like screen reading capacity or screen magnification tool available as a part of interface and voice control.
Actors	Older Adult; Caregiver; Formal Carer; Healthcare Professional; Social Worker; System Administrator; System
Parent	-
Children	-
Preconditions	The eCARE solution developer provides an administrator role for each local Procurer. The administrator can register new users.
Base flow	**1. Register healthcare professionals and/or social workers** Administrators can generate and reset credentials for

	healthcare professionals and social workers. They can select from a list of healthcare professionals and social workers that work at the care facility, which will be possible because eCare must be developed in a way to be interoperable with the local systems. The generated credentials are based on the existing local authorization mechanisms (e.g. existing username, email, ID) and/or by biometric signature, so it can be used later for local authentication. The user will be prompted to change the password when logging in for the first time. The administrator can view, edit and remove healthcare professionals and/or social workers from the eCare service. **2. Register older adults** Typically done when the older adult's needs are assessed by either healthcare professional or a social worker during a visit. The healthcare professional or the social worker chooses from a list of his/her managed cases, possible because the eCare solution must be developed in a way to be interoperable with the local systems. The credentials are generated using existing information such as the older adults' email address or their biometric signature, so it can be used later for local authentication. In addition, the older adult may wish that his/her caregiver is registered, in which case another set of credentials are generated by the care professional. Caregivers' access to the system is equivalent to the role of observers – they cannot, for example, adjust the different goals for the older adult but they have access to information (e.g. latest physiological parameter readings) that helps them to assist the older adult as best as possible, providing guidance and support. **3. Register formal carers, new healthcare professionals and/or social workers** Healthcare professionals and/or social workers can also register formal carers and other healthcare professionals and/or social workers (e.g. Specialist, Nurse, Psychologist, Dietician, Physiotherapist; Occupational therapist) to take part in the older adult's shared care plan. The healthcare professionals and/or social workers can select from a list of formal carers, healthcare professionals and social workers that work in the care facility.
Post conditions	Upon registering, users have immediate access to the eCare service process model.

Triggers	Healthcare professional or social worker has been selected to participate in eCare. Older adult has been selected to participate in eCare. (Optional) Older adult has requested that their caregiver(s) is/are provided access to eCare (Optional) Healthcare professional or social worker provides access to eCare to older adult's formal carers or other healthcare professionals or social workers
Frequency	Every time a new older adult, caregiver, formal carer, healthcare professional or social worker needs to be registered into eCare system.
Exception paths	Older adult decide to withdraw from the eCare trial
Open issues/Notes	The ethical and legal implications to ensure safety measures of the processes and systems to be implemented. The solution should comply with the dispositions of the GDPR: 1. Authentication and authorization; 2. Pseudonymization and Encryption; 3. Backups and Business Continuity; 4. Infrastructure security (physical protection); 5. Applications security. Older adults and their caregivers should receive basic training once registered into the eCare service considering both health literacy and digital literacy, with respect to their needs, limits and preferences.

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UC1 – Detecting frailty and pre-frailty in Older adults

ID	UC1
Title	**Detecting frailty and pre-frailty in older adults**
Summary	The eCare solution shall be leveraged by an online system that provide an algorithmic module that embed available existing data (EHR) and data from other sources (e.g.weather), screening older adults and identifying those who might have frailty or pre-frailty. Predictors of frailty and pre-frailty are from both physical and psychosocial spheres (parameters are yet to be decided. The identified older adults will be flagged, and a report provided to the healthcare professional and social worker in charge of their care in order to refine the shared care plan. Being an online solution, the assessment can be done either at the older adult's home, at a care center or at a nursing home.
Actors	Older Adult; Healthcare Professional; Social Worker; System
Parent	-
Children	-
Preconditions	Improved understanding of the factors affecting frailty and the feelings of loneliness and isolation, and how they do correlate (e.g.: gender dimension, social context, etc.) in order to choose or develop a frailty algorithm that takes both physical and psychosocial measures to identify frailty and pre-frailty stages.
Base flow	**1. Older adults' physical and psychosocial data feeding** eCare system should allow for an automatic and semi-automatic data input, collecting data relevant to the older adults' risk of developing frailty. This includes: - EHRs and other databases; -Questionnaires, based on knowledge/international guidelines and validated instruments; - Data from wearable devices and Medical Devices that detect specific parameters (to be defined)- Data from sensors (e.g. eWare) and/or robots installed at home. **2. Identifying older adults with frailty or pre-frailty** The older adults' inputted data is reviewed by the system thorough a risk stratification algorithm allowing the identification of those with frailty or pre-frailty. Innovative systems should be implemented, for example that use

	predictive methods based on artificial intelligence, monitoring trends in the parameters. **3. Communicating results to healthcare professionals and/or social workers in charge of the older adults' care.** The system provides a report on older adults' assessed risk within the profile of the Care professional assigned to the case that will be available through the shared care plan. The EHR should provide an alert, flagging the older person as fragile.
Post conditions	Healthcare professionals and social workers are alerted of identified frail and pre-frail older adults and can refine their shared care plan to better manage frailty and encourage independent living
Triggers	After every physical and/or psychosocial user data update, the system automatically runs a screening in order to detect any change in the frailty risk assessment.
Frequency	Access should be continuous. A systematic routine screening should be promoted
Exception paths	-
Open issues/Notes	Since there are several frailty algorithms, the parameters to be used by the eCare system are still to be decided. Although, one a possible solution may be to enable the selection of one specific algorithms from a list of preloaded algorithms. The developed solution should improve utilization of care and health outcomes collecting data for research using a standard and reusable format in the case of a data set (Pre-defined standard data model). eCare system should provide evidence of cost effectiveness and demonstrative how technology positively impact on frailty prevention, simultaneously relieving health and care services budget.

UC2 – Matching older adults' needs, preferences and limits with existing care pathways

ID	UC2
Title	**Matching older adults' needs, preferences and limits with existing care pathways**
Summary	This use case is characterized by being a bridge between UC1 and UC3. In order to develop a personalized shared care plan, an assessment of the needs, preferences and limits of the older adult should be done. The eCare solution should allow to collect this information, as well as identify older adults' knowledge, attitude and capability towards topics such as healthy habits (nutrition and physical activity), socialization, and the ones addressed in UC5, namely on ICT usage, acts of care and soft skills. By taking a standardized survey/interview older adults provide one piece of the necessary info to enable a match with existing care pathways at procurers' site.
Actors	Older adult; Healthcare Professional; Social worker; Caregiver; System
Parent	-
Children	-
Preconditions	The standardized survey/interview needs to be developed.
Base flow	**1. Comprehensive profile building** A standardized survey/interview to be addressed by Care professionals to older adults and their caregivers (optional) should allow to capture their: - Health needs, preferences and limits; - Psychosocial needs, preferences and limits; - Habits, knowledge, attitude and capability. **2. Matching existing care pathways with older adult's profile** The captured information will enable UC3, UC4, UC5 by identifying the services and its personalization that can be delivered in a holistic, anticipative and based-on-function type of care to the older adult in order to best serve its needs, preferences and limits. The information is conveyed in the shared care plan dashboard (UC3)

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Post conditions	A comprehensive understanding of the older adult needs, preferences and limits is collected enabling a more personalized share care planning
Triggers	Care professional walks older adult through the survey/interview.
Frequency	This use case is executed whenever an older adult is detected as frail. It can be repeated periodically.
Exception paths	If older adult does not want to provide such information, the shared care plan will not be as personalized as it could.
Open issues/Notes	The ethical and legal implications. The solution should comply with the dispositions of the GDPR.

UC3 – Shared care planning

ID	UC3
Title	**Shared care planning**
Summary	A shared care plan is a user-centered health record designed to facilitate communication among members of the care team, including the older adults and providers. In integrated care settings, it is vital that all members of the care team have access to the same information and can build upon the shared care plan. In this sense, the Shared Care Plan represents a structured way by which the Care professionals and the older adult can co-organize in a negotiation basis a plan for the management of frailty. The Shared Care Plan is built upon All necessary parameters that make the Shared Care Plan a comprehensive document are available in the plan itself, while some come from local systems (EHR, PHR, other), others are recorded by using other innovative functionalities of the eCare solution (UC1 and UC2). The shared care plan provides the older adult, their caregiver and the Care professionals a common guidance on how to comprehensively manage frailty (UC4). A Care professional, most often the older adult's physician (GPs and/or specialist) will act as administrator of the care plan and permits access to other stakeholders, under express consent. The Shared Care Plan allows to set up and track goals, schedule events, manage alerts and notifications, medication and dosage, as well as view, generate and export reports, including one adapted to older adults with a user-friendly design to be printable and easily understandable. The Information is displayed in two different views – the older adults' and the Care professionals', and each user can be assigned with different permissions such as observer or co-creator of the care plan. All necessary parameters that make the Shared Care Plan a comprehensive document are available in the plan itself, while some come from local systems (EHR, PHR, other), others are recorded by using other innovative functionalities of the eCare solution (UC1 and UC2). The access is done through authorization mechanisms and/or by biometric signature.

Actors	Older Adult; Caregiver; Formal Carer; Healthcare Professional; Social Worker; System
Parent	-
Children	-
Preconditions	Procurers' existing IT systems, both in terms of functionalities and design of Electronic Records
Base flow	The Shared Care Plan has one view for the older adult and caregivers and another for Care Professionals. The system shall have one Shared Care Plan manager with full access and authorization to the system. The manager grants access to other Care Professionals, providing different levels of access; the manager level, authorization to modify the care plan, and read-only. A both-ways option of integration of the system with the EHRs is needed, to feed Shared Care Plan and the Shared Care Plan can be stored in and be accessed from the EHR (UC6). Changes to the Shared Care Plan should generate an automatic notification to the users. The shared Care Plan will allow to: 1. **Set up and track goals/targets** Goals/targets will be typically set when the care professional and older adult are together, being the different targets based on the discussions by selecting a target category (e.g. physical activity targets, nutrition targets, blood glucose targets, weight and other physiological parameter targets, emotional regulation targets, socialization targets). Adjustments in the targets are performed by the Care professionals, ensuring that they reflect the older adult's current health status. Both older adult and Care professional can view whether the older adult is on track, being also actively informed about whether or not targets are met using positive messages (e.g. instead of saying "You are not on target", a notification can say "If you walk for another 12 minutes today, you will be on target" or "have you talked to a friend/relative on the phone today?"). Alerts can be used for more critical targets and deviations from them, such as dangerous blood sugar levels. 2. **Upload vital signs readings and other relevant data,**

via Bluetooth or manually

The eCare system should allow users to upload data derived from self-assessment, will it be automatically (e.g. wearables) or through manual input:

- Vital signs;
- Physical activity;
- Food and Nutrition;
- Psychological state of mind;
- Therapy adherence;
- Socialization (e.g.walking with people, going to sewing class, painting workshop, dancing, shopping, volunteering, talking on the phone, etc.).

3. **Schedule and update events**

The Care professional and the older adult will be able to set up different events for the foreseeable future (e.g. they plan together until their next meeting, which itself is planned and put into the schedule). Each event entry has a minimum of required information: name of event, due date and time, occurrence (one-time vs. recurring) and frequency (e.g. every three months), notification target (e.g. just for the older adult, for Care professional, or for both), event reminders (e.g. sending an alert 1, 3 days before event, 30 minutes before event, etc.), notes related to the event. The Older adult can enter own events (e.g. related to the UC4). Events can be updated, new times set, notes added, etc. Certain changes (such as changing the schedule of the next visit) can be valid only if both Older adult and the Care professional first approve them and this approval mechanism should be supported by the system.

4. **Manage alerts, notifications and recommendations**
Alerts can be issued to the older adult and/or the care professionals when there are deviations from pre-set information (e.g. agreed targets, monitored parameters). The system can send urgent alerts to the Care professional (e.g. when a measured parameter is out of the accepted range the physician has defined), the caregiver (if applicable), or even to a nearby Emergency Centre. These critical episodes will be automatically registered in the Shared Care Plan.
The older adult receives personalized notifications on how to best manage his/her health and recommendations, advices or tips (e.g. today is market day). He/she can also define personal reminders, such as family birthdays and other socialization related events. This information is accessible through the virtual carer (UC4.1).
5 **Manage medication and dosage**
The Shared Care Plan shall allow the recording of the prescribed medication and for the older adult to communicate the actual medication intake actively or passively by simply confirming that the medication was taken. Subsequently, the Care professional can adjust the medication prescribed, and add new or remove old medication. For each medication the Medication name and Dosage (amount and frequency) is recorded after verifying possible drugs interaction.
6. **View, generate and export/print reports**
The system is expected to be able to produce a standardized output in form of a report, that help Care professionals to adjust the therapy and to support his/her decision making. Suitable reports for older adults should also be available, using user-friendly design and understandable language and graphics. Past reports will be available for comparison of older adult's data related to the eCare services as part of a dashboard. There should be different export options available (minimum: PDF, HTML), as well as a possibility to print the results.
7. **Send/receive messages and information material**
The eCare users will have access to a dedicated channel to exchange information, and communicate regularly**.** The idea is that a question, which requires no more than 30 seconds to be answered, can be more effectively answered using a messaging system rather than clinical visit. The UC5 will also take advantage of this functionality.

Post conditions	The built Shared Care Plan will guide both the comprehensive frailty management and point out the skills to be developed by the Older adult and their caregiver.
Triggers	Whenever an older adult is identified as either frail or pre-frail, the process of creating a shared care plan is triggered and the healthcare professionals and/or social workers assigned to the case is alerted so Shared care plan is to be filled out by them (preferably with the older adult).
Frequency	The Shared Care Plan is continuously accessible and is updated frequently in accordance to older adults' physical and psychosocial status changes, as well as to any therapeutic prescribed by the Care Professionals
Exception paths	-
Open issues/Notes	The Shared Care Plan must have tracking of changes.

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UC4 – Comprehensive management of frailty

ID	UC4
Title	**Comprehensive management of frailty**
Summary	Since frailty does not necessarily represent a point of no return, early intervention is necessary to prevent disability, avoiding adverse health events and hospital admissions. In terms of frailty comprehensive management integrated care technologies offer the greatest opportunity for preserving function in late aging in both physical and mental spheres. The eCare solution should encourage healthy aging, thorough the delivery of the sustainable multimodal interventions outlined in the Shared care plan (UC3). These interventions should be mainly proactive and not reactive as the shared care plan acts as a strategic framework ensuring that an integrated and person-centric intervention is delivered in a way capable of empowering older adults and promotion of independent living. In order to optimize resources, systems and societal costs associated with ageing, the eCare solution should include 4 interlinked modules: 1. Psychological and Emotional Support (UC4.1) 2. Functional decline management (UC4.2) 3. Critical events management (UC4.3) 4. Self-management support (UC4.4) The effective implementation of this actions that focus on behavior change correlate highly with the Increasing of skills of Older Adults, their Caregivers and Care Professionals (UC5) that focus on information provision.
Actors	Older adult; Healthcare Professional; Social worker; Formal Carer; Caregiver; System
Parent	-
Children	UC4.1 ; UC4.2 ; UC4.3 ; UC4.4
Preconditions	The shared care plan must already have been developed
Base flow	This use case aims to optimize the frailty and loneliness management in the health and social systems of the eCare procurers by 1) shortening the time of finding the optimal treatment and by 2) increasing adherence to therapeutics. eCare will approach older adults not just in terms of their frailty but also in terms of physical, cognitive and

	psychosocial care and support to prevent functional decline and disability. In integrated care settings, it is vital that all members of the care team have access to the same information and can build upon the shared care plan. Team members must act in coordination toward a common goal to provide quality integrated care. In this sense, the project key components to address frailty are those that define also integrated care. The eCare solution should allow the care professionals to monitor entries periodically or view summary reports (UC3) adjusting the multidimensional goal-directed interventions and providing feedback to the older adult automatically or during visits.
Post conditions	The Care is delivered in a more efficient and comprehensive way
Triggers	The Care professionals and the Older adult initiate the actions outlined in the shared care plan.
Frequency	Continuous
Exception paths	-
Open issues/Notes	-

UC4.1 – Providing psychological and emotional support

ID	UC4.1
Title	**Providing Psychological and Emotional Support**
Summary	According to Jazaieri et al (2014) *Emotion regulation strategies are an effective way to change emotions, feelings, desires, beliefs, and practices of the individual and giving order and meaning to daily life*. The eCare solution should provide a mobile context-aware system that predicts the user mood, cognitive and motivational state in order to deliver personalized emotional and psychological support at specific moments of the day. This is especially important because all stakeholders identified psychological distress (phobias;anxiety;depression;sleep disorders) and emotional distress (Fear of being a burden; fear of Cognitive and functional decline; fear and shame of being identified as frail and lonely; difficulties in accepting and coping with frailty's condition; low self-esteem) as key determinants of older adults' condition.

Actors	Older adult; Healthcare Professional; Social worker; Formal Carer; Caregiver; System
Parent	UC4
Children	-
Preconditions	The shared care plan must already have been developed
Base flow	**1. Assess and predict older adult's mood, cognitive and motivational state** A virtual carer should engage with older adult in such a way that they will provide a daily self-report predicting emotional/psychological status. This assessment will encompass the acknowledgement of sleep quality, stress and significant life events that could be risk factors, physical activity and quality of social interactions. The data is then analyzed through machine learning techniques and/or AI algorithms in order to provide older adults with tailored support leveraged by a better understanding of unique factors and behaviours associated with cognitive decline, loneliness, social isolation, resilience decrease, and behavioural symptoms like agitation. These algorithms complement the detection, classifying, and prediction of early pathological cognitive decline in older adults require the use of novel inputs like wearables, mobile devices and sensor signals. The trends and other critical information are recorded into the shared care plan (UC3) in order to increasing personalize self-management support (UC4.4) and training (UC5) as well as to alert (UC4.3) in case of a serious deviation from pre-set information (e.g. agreed targets, monitored parameters).

	2. Provide Support Ongoing emotional/psychological care - Since frailty is simultaneously one of the causes and effects of emotional and psychological distress, support must not be limited to people with "diagnosable/classifiable" psychological disorders. Effective frailty management is largely dependent on how people care for themselves (UC4.4), therefore ongoing emotional/psychological care provided by the same virtual carer that does the emotional/psychological assessment can improve not only psychosocial outcomes but also physical outcomes. This virtual carer will act as a companion, providing for example: - The news of the day; - "knowledge pills" as way of learning new thing; - Book reading or audio books listening; - Family events remembering; - The local cultural agenda; - Talking about daily tasks; - Discussions about topics of interest; - Engaging contents (e.g. community feedback from UC4.4); - Music therapy; -Biofeedback therapy with relaxation exercises like deep breathing; progressive muscle relaxation; guided imagery; mindfulness meditation; - Overnight tools to aid sleep or to beat insomnia. Psychological first aid is about comforting someone who is in distress and helping them feel safe and calm. It provides basic emotional support and helps people to address immediate basic needs and find information, services and psychosocial support. In case of a critical event (UC4.3) care professionals are alerted in order to address a fast response to the older adult avoiding therefore future complications resulting of emotional or psychological distress from that same critical event. This support is provided either in person or by phone/video-call that is triggered by the virtual carer.
Post conditions	The older adult has received emotional/psychological support
Triggers	The Care professionals and the Older adult initiate the actions outlined in the shared care plan.
Frequency	Continuous access, offered according to the user's needs.
Exception	Older adult does not want to take advantage of the module

paths	
Open issues/Notes	-

UC4.2 – Managing functional decline

ID	UC4.2
Title	**Managing functional decline**
Summary	An active social life can slow health decline and improve physical and mental fitness, even if social ludic activities are not considered to be formal exercise. To promote social or psychological wellbeing in older adults with frailty or pre-frailty, the eCare solution should encourage users to participate in social ludic activities, improving their physical and mental condition at the same time that loneliness and isolation and/or the perception of loneliness and isolation is tackled. This use case aim to deliver a serious game based therapeutic anchored on the experiences of sharing, giving and receiving.
Actors	Older adult; Healthcare Professional; Social worker; Formal Carer; Caregiver; System
Parent	UC4
Children	-
Preconditions	The shared care plan must already have been developed.
Base flow	Serious games are games that go beyond the merely playful to achieve a particular purpose, which may have to do with education, therapeutics, etc. Serious Games promote rule-based activities that involve challenges and active participation to reach goals, provide feedback on progress made towards the goals that in this case are related to sharing, giving and receiving. If possible, this solution should be able to provide intuitive user experiences supported by wearable Human-Computer Interaction that are able to recognise cognitive impairment and trigger a referral for a formal assessment. These games for functional health could be leverage on Virtual Reality or Augmented Reality and the manipulation of physical objects. In order to obtain a serious game played by its end users, it is recommended to find a point where the intrinsic and

	extrinsic motivation of the players can converge, i.e. where the players can enjoy a future desirable outcome (e.g. better mobility) made virtually present in the game. Second, to avoid the development of a game which does not fulfill its objectives developers should consider the four pillars of learning: 1) Attention - promoting strategies that help to select relevant information (modeling/examples, modality/use of the audio channel for verbal explanations to guide visual search, feedback, integration of relevant information in virtual tools); 2) Active learning - promoting interactivity rather than convey the learning content via text or audio explanation; 3) Feedback - promoting the use of feedback which deals with the task completed, not with the self-esteem; 4) Consolidation - promoting the repetition of interactions with important learning content inside the game. The role of Care professionals is essential in prescribing and promoting the system in a suitable way, considering dosing intensity of training and the balance between practicing tasks using gaming systems and practicing functional tasks outside the simulated environment. Selection and progression of training should allow transfer of training from the simulated environment to the real-life environment.
Post conditions	The older adult has engaged in physical and cognitive stimulation exercises and activities.
Triggers	The Care professionals and the Older adult initiate the actions outlined in the shared care plan.
Frequency	Continuous
Exception paths	Older adult does not want or is unable of taking advantage of the module
Open issues/Notes	-

UC4.3 – Managing critical events/emergencies

ID	UC4.3
Title	**Managing critical events/emergencies**

Summary	Through the use of digital devices, the eCare solution should be able to provide two types of alerts in order to prevent and better manage critical events. It should be able to measure user's progresses as well as classify his/her behavior in order to identify possible alerts to be communicated, as well as be capable of providing automatic and semi-automatic alerts in case of falls or acute episodes to accelerate the emergency handling response. The solution should allow older adults to feel more secure at home despite functional limitations due to Health conditions.
Actors	Older adult; Healthcare Professional; Formal Carer; Caregiver; Emergency services; System
Parent	UC4
Children	-
Preconditions	The information based on latest data needs to be available.
Base flow	**1. Preventive alerts** A digital device should allow an in advance home security check to reduce possible fall risks (home safety intervention). Alerts should also be issued to the older adult and his/her caregiver or formal carer (if applicable) when there are deviations from pre-set information, e.g. agreed targets, monitored parameters to better support self-management (UC.4.4). The Care professionals only receive critical alerts when there are deviations from pre-set information (e.g. agreed targets, monitored parameters) defined in the shared care plan (UC3). These critical episodes will be automatically registered in the Shared Care Plan. **2. Emergency alerts** In the case of an emergency (e.g. a fall), the system prompts to send an urgent alert to the caregiver (if applicable) and informs a nearby emergency centre, so that they can intervene. The episode is then noted on the Shared Care Plan (UC3) so psychological first aid can be triggered (UC4.1). The automatic report could be done with the support of a user-friendly IT emergency wearable device that can perform the following functions: • Continuously measure the user's vital parameters (UC.4.4); • Support emergency self-management by giving step-by-step instruction to be carried out at home or outside it in

	case of emergency/extraordinary situation; • Voice connecting the user to the caregiver/emergency services.
Post conditions	Alert is emitted
Triggers	A critical event occurs
Frequency	The system is continuously available, being triggered according to user's needs and/or will.
Exception paths	-
Open issues/Notes	-

UC4.4 – Supporting self-management

ID	UC4.4
Title	**Supporting self-management**
Summary	Self-management, which is also referred to as "self-control" or "self-regulation," is the ability to regulate one's emotions, thoughts, and behaviors effectively in different situations. Empowerment-based support tools aims to promote users engagement in behaviors that positively impact their health, improving health-related outcomes and decreasing the cost of care. Novel digital solutions with a self-management approach can improve the efficiency and effectiveness of the care delivery services. This use case should use nudging techniques in an ethical way, and take advantage of community feedback to engage user in Self-management in a way capable of: - Increasing adherence to therapies and prescriptions - Improving nutritional intake - Improving physical activity levels
Actors	Older adult; Healthcare Professional; Social worker; Formal Carer; Caregiver; System
Parent	UC4
Children	-
Preconditions	The shared care plan must already have been developed

Base flow	This part of the solution focuses on empowering the older adult to adhere to the treatment plan defined in the Share Care Plan (UC3). **1. Importing captured behaviors** This use case will take advantage of the information the older adult communicated to the system in UC2.1 (e.g. the challenges he/she encounters regarding food, exercise, medication intake and socialization.) **2. Nudging behaviors** Based on the imported data the system provides nudging notifications in an engaging and ethical way (e.g. showing a bottle of water with hour marks, to promote water intake) to supporting comorbidities self-management. After concluding the task the user can share their accomplishment in the system either actively or passively (e.g. the system asks whether the medication has been taken as prescribed, and the older adults can simply confirm or click to adjust the entry) Other forms of share can be used (e.g. photographing the meal). **3. Community feedback and support** The eCare solution shall allow users to mark other community members as friends. All users will have possibilities to communicate with other community members asynchronously (via chat, comments on accomplished results). The virtual carer (UC4.1) will engage with users in order to facilitate the interaction with the community, promoting emotional and psychological wellbeing by providing clear and simple information on the services available in the area, possible therapeutic paths and support during de-hospitalization. In order to improve the interaction is important that the care professional provide positive feedback to the older adult and keep track on the goals/targets.
Post conditions	Older adult develops healthier habits
Triggers	The Older adult initiate the actions outlined in the shared care plan.

Frequency	Continuous
Exception paths	Older adult is unable to take advantage of the module
Open issues/Notes	-

UC5 – Increasing the skills of Older adults, their Caregivers and Care professionals

ID	UC5
Title	**Increasing the skills of Older Adults, their Caregivers and Care Professionals**
Summary	eCare system encompasses a capacity building programme so that users can enroll in specific training modules according to their needs and will. This programme is focused on three great themes - soft skills; IT usage and acts of care - delivered in different approaches according to the users profile (Older Adults, their Caregivers and Care Professionals). The eCare solution should collect and use certain users characteristics related to the knowledge to suggest specific modules according to the users profile, working on a fast learning curve enhanced by gamification techniques to promote engagement. Education may improve older adults' knowledge on frailty leading to a more positive and active role in the management of their health.
Actors	Older adult; Healthcare Professional; Social worker; Formal Carer; Caregiver; System
Parent	-
Children	-
Preconditions	Content availability and accessibility
Base flow	**1. Capturing users' knowledge, and learning preferences** The users' level of knowledge and learning preferences should be determined via a standardized set of questions, according to users profile, that need to be developed as part of this use case (e.g. resilience building to avoid burnout) **2. Training content** The training content is selected by the users' from a list of available modules divided in three main topics: 1) Soft Skills - Training emotion regulation strategies;

	Effective communication and active listening; Empathy, negotiation and conflict resolution; Resilience and self-motivation; Loss&Grief; etc. 2) IT usage - Training on new technologies usage in order to leverage the potential of the eCare system it-self, as well as to empower Older adults and Care professionals. 3) Acts of Care - Training self-care; health promotion; care techniques; etc. The modules should have a high degree of ICT and multi-media (tutorials, videos, interviews, games, etc.) use and interaction, with a special attention to include demonstrations (e.g. how to use medical devices). The different modules are dynamic and content is suggested depending on the user's knowledge and capabilities, as well as their accomplishments during the training. Moreover, the system should provide continuous positive feedback to the users and tracks their goals in the shared care plan. The content is to be provided by the eCare suppliers, based on users' unmet needs identified by the procurers. The contents should be translated into the procurers' language.
Post conditions	Older Adults, their Caregivers and Care Professionals have developed their skills. The results (modules completed) are automatically recorded in order to provide even more personalization, and for older adults the accomplishment is marked in the shared care plan.
Triggers	Older Adults, their Caregivers or Care Professionals decide to engage in a specific training module.
Frequency	The contents are continuously available and can be accessed multiple times according to user's needs and will.
Exception paths	The possibility of Older Adults, their Caregivers or Care Professionals not want to be engaged in any training module.
Open issues/Notes	A user community can be developed so that users registered in the eCare solution (including its caregivers) can have access to a dedicated online community that offers the environment necessary to exchange information, identify and engage with peers, and communicate regularly.

UC6. – Enabling information exchange and improving communication

ID	UC6
Title	**Enabling information exchange and Improving communication**
Summary	The eCare system should be able to provide systematic access to social and medical services, and improving communication in between systems at local/regional and national level, enabling the different actors in the eCare environment to be able to exchange information. The eCare system should pay a special attention to accessibility in order to untie the knot of complexity and/or bureaucracy of the assessment processes, making the articulation/ cooperation between healthcare professionals and social workers more efficient by preventing the overlapping of interventions/prescriptions. The eCare solution must thereby use data aggregation and provide the resources for data exploitation to make care system more efficient and cost effective through the delivery of comprehensive decision support to Care professionals.
Actors	Older adult; Healthcare Professional; Social worker; System
Parent	-
Children	UC6.1
Preconditions	Procurers' existing IT systems, both in terms of functionalities and design of Electronic Records
Base flow	A dashboard should be implemented to simplify the access as a screen that displays individual's aggregated data and allows monitoring his/her progress on the most important clinical and social parameters in real time. In particular the dashboard should make available the following aggregated data: - Agile Reporting of group of users by imputed variables; - Statistical analysis and graphical reporting of users; - Shared care plans; - Critical alerts. The dashboard should also be able to ensure integration and

	provide a single access to social and healthcare services, as well as to ensure real time connection between users and carers and report any problems that must be managed and routed to the appropriate professional. Through the use of artificial intelligence, the solution must be able to provide support for Care professionals' decisions (UC3), based on users' clinical and laboratory results, data derived from self-assessment (wearables and self-report), accomplished activities, etc. The delivery of information will improve with time as regards to what information is desired by providing a feedback loop.
Post conditions	The information based on latest data is available.
Triggers	The Care professional access the dashboard.
Frequency	Information is continuously accessible.
Exception paths	Network access is interrupted.
Open issues/Notes	The ethical and legal implications. The solution should comply with the dispositions of the GDPR.

UC6.1 – Integrating data and ensuring interoperability

ID	UC6.1
Title	**Integrating data and ensuring interoperability**
Summary	A key requirement for the eCare solution is that is supported by a platform that integrates data and ensures interoperability with existing systems and with other devices that are necessary in order to capture certain clinical parameters. The selection of parameters depends on the characteristics of the proposed solution and the data it requires for its algorithms. The system should be able to integrate/refer to other databases where the older adult is enrolled at the hospital/center premises (e.g. existing EHR, administrative databases, order entries of the hospital). EHR systems, clinical decision support systems and analytic tools need to compute on coherent psychosocial and health data in order to support a more efficient and cost-effective care system.
Actors	Older adult; Healthcare Professional; Social worker; System
Parent	UC6

Children	-
Preconditions	Procurers' existing IT systems, both in terms of functionalities and design of Electronic Records
Base flow	1. The eCare solution will have to make use of different data, as all the data is not available in one place. Therefore integrating data from different sources and using it innovatively in order to deliver personalized support is seen as a key factor for a good solution. There should be a strategy of clearly define what data is necessary for the solution to work, where this data will come from (collected autonomously by the user or from a determined system), and how to ensure interoperability in order to integrate and use the data. Data may come from: - The existing systems of the procurers, that can provide basic or detailed patient data (age, weight, height, BP, lab results, etc.); - devices such as smartphones, wearables; -the older adults themselves, by providing information to the system, such as the tests in UC1 and UC2; - the Care professionals (e.g. prescribed medication); - non clinic data sources (e.g. cultural agenda, weather, local news, from an Open Data Portal, such as Santander Datos abiertos) - other databases or platform present at the premises 2. Automatic data upload will be the preferred choice for any data that the older adult has to handle (e.g. Blood Pressure). Depending on the proposed solution, developers will have to define a profile through an analysis of the existing laws, rules, work processes, and actors involved in the use of the systems in relation with the data they need to ensure that it is included in the system. 3. There should be a focus on the operability of the solution and its universal access for all parties involved in the project,

	therefore the platform should incorporate the use of open data formats for exchange and processing of data with particular attention paid to formats such as CSV, JSON, XML, etc. It must also be possible for the data (in standard formats) to be consumed by other internal applications from the procurers, with the required security. For this purpose, the necessary APIs (Application Programming Interfaces) must be developed.
Post conditions	All data required for the envisaged eCare system to run is available.
Triggers	-
Frequency	Integration of new data is a continuous process.
Exception paths	-
Open issues/Notes	The ethical and legal implications. The solution should comply with the dispositions of the GDPR. Data should be available through bulk downloads in open data formats.