GATE KEEPER

Reference Use Cases

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INTRODUCTION
The Project AIM

GATEKEEPER is building a European- led decentralised digital ecosystem, aiming to enable **collaboration and provide mutually beneficial results to a multi-stakeholder ecosystem in Europe.**

The platform will provide **evidence in real life** (Pilot Sites), generate a set of first adopters (Open Calls) and develop a **sustainability activities** to maintain the project (Foundation). Altogether, **the project will empower the ageing citizens to keep themselves healthy** with respect to optimal functional ability over time.

GATEKEEPER will directly **contribute to the United Nations Sustainable Development Goal** which aims to “ensure healthy lives and promote well-being for all at all ages”.

MEDICAL USE CASES
Pilot Sites

GATEKEEPER will demonstrate its value by scaling up **innovative solutions that will involve 40,000 elderly citizens** in 8 regional communities, from **7 EU member states.**

GATEKEEPER Large Scale Pilots (SLP) are running in the Basque Country and Aragon **(Spain)**, Saxony **(Germany)**, Puglia **(Italy),** Milton Keynes **(United Kingdom),** Lodz **(Poland), Cyprus** and **Greece.**

- Lifestyle-related early detection and interventions
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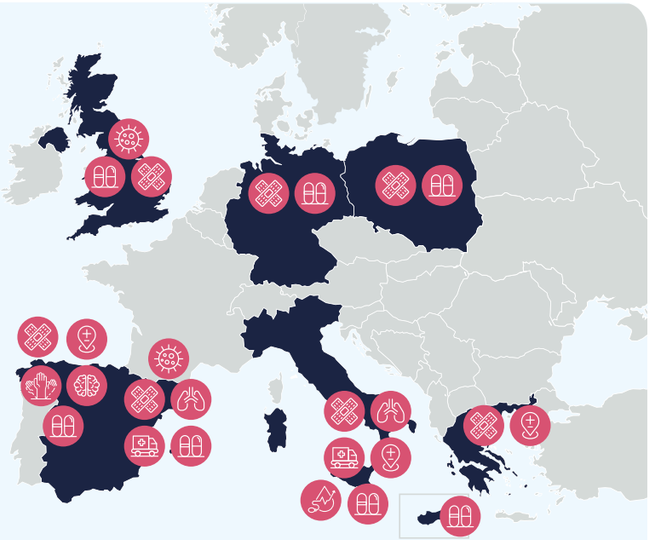


RUC 1

Lifestyle-related early detection and interventions

The main purpose of RUC1 is the promotion of healthy lifestyles among elderly people to prevent and/or delay the onset and/or worsening of chronic conditions. An example of a target for RUC1 according to the EIP on AHA blueprint “personas” can be found on this link1. RUC1 will be based on timely interventions provided by AI-based, digital coaches using Natural Language Processing techniques, structured conversations, and personalized feedback and education.

Big Data Analytics techniques will be exploited to address risk stratification and early detection, based on lifestyles analysis including: pattern recognition for the improvement of public health surveillance and for the early detection of cognitive decline and frailty; data mining for inductive reasoning and exploratory data analysis; and, Cluster Analysis for identifying high-risk groups among elder citizens.

link1: https://ec.europa.eu/eip/ageing/library/blueprint-personas-randolph-retired-generally-well

RUC 2

COPD exacerbations management

RUC2 proposes novel integrated care management for patients with Chronic obstructive pulmonary disease (COPD), aiming at an early detection of the appearance of exacerbations, avoidance of transitions to higher complexity strata, and preservation of functional status. At its core, machine learning methods based on Dynamic Bayesian Networks, suitable for modelling knowledge and handling time series data, will be added to the Ecosystem Transaction Space to implement systems that predict exacerbations and avoid hospitalizations.

These systems will be built on top of advanced wearable monitoring KETs, available in the GK Things Catalogue, that combine, in a single wearable garment piece, time series data for blood pressure, pulse oximetry, electrocardiogram (ECG), respiration, skin temperature and/or activity.

RUC 3

Diabetes, predictive modelling of glycaemic status

Diabetes is the leading cause of blindness, end-stage renal failure, non-traumatic limb amputations, and cardiovascular morbidity and mortality. This use case aims to establish patterns that detect related and preventable factors of alterations in metabolic control. In this way it is intended to establish measures related to lifestyles and medication control, trying to perform tertiary prevention (decrease in comorbidity, exacerbations and decompensations). Short-term prediction of glycaemic dynamics is essential to improve Diabetes self-management. A personalized, adaptive, real-time data driven computational solution based on data federation in the Healthcare Space, identifying the different modes of the underlying glucose metabolism will be provided, ultimately contributing to the prevention of hypoglycaemic events. A set of monitoring devices will collect clinical data at home such as bio- and physiological signals (i.e. blood glucose concentration data or continuous glucose monitoring data, galvanic skin response, heart rate variability) combining them with adaptive machine-learning regression models to trigger promptly alarms and signs, allowing for early interventions.

RUC 4

Parkinson's disease treatment decision support system

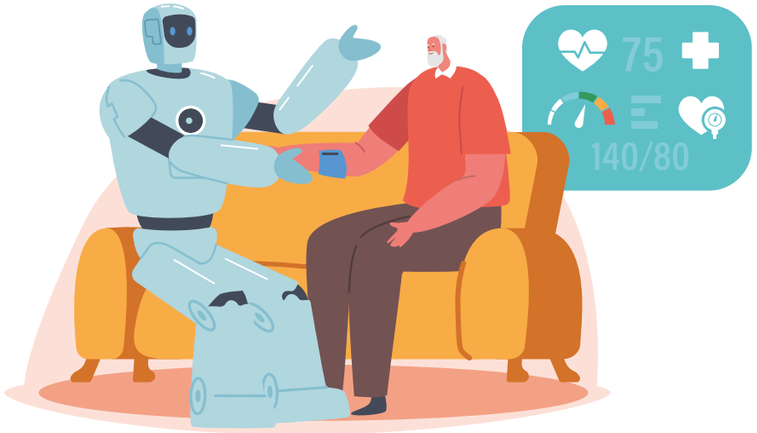
So far, RUC4 will only be conducted in the Basque country and will target Parkinson's disease (PD) patients with early motor complications of the disease, commonly motor complications related to PD treatment such as unpredictable motor fluctuations, and dyskinesia. Through the collection of intense monitoring data, a Medication change model, which was developed in collaboration with medical experts, using a qualitative multi-criteria method, will identify situations in which the disease has progressed to the point which requires a change of medical therapy and then suggests what kind of changes should be made.

GK KETs such as wearable sensors to continuously or periodically measure motor symptoms (depending on disease severity) and digital applications, that can be used to detect non-motor symptoms could be used to record data into the patient's EHR, accessible in the GK Healthcare Space. The model will alert clinicians that the patient's current treatment plan is not optimal any more, and will derive suggestions on how to improve it.

RUC 5

Predicting readmissions and decompensations in Heart Failure

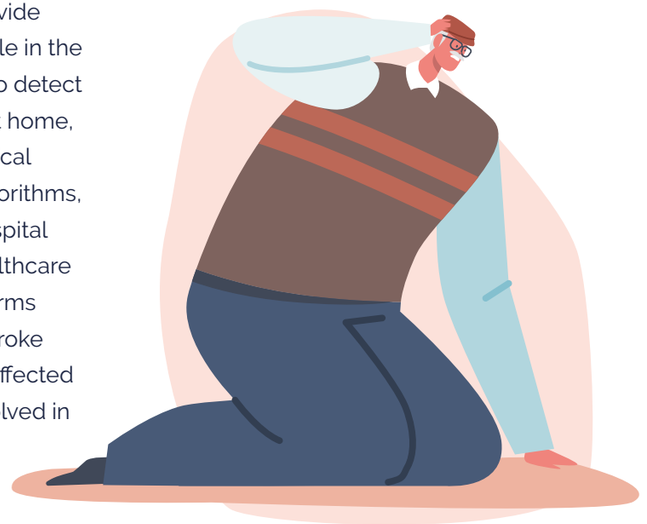
RUC5 proposes novel integrated care management for patients with acute Heart Failure (HF), aiming at an early detection of the appearance of decompensations, avoidance of transitions to higher complexity strata, and preservation of functional status. Telemonitoring services and machine learning with Dynamic Bayes Networks will be harnessed to implement an advanced model for predicting HF decompensations, taking comorbidities into account. Building on the experience of the Multisensor Monitoring in Congestive Heart Failure (MUSIC) Trial, GK Healthcare Space apps allow to explore which other longitudinal data (measured by GK Consumer Space "things", e.g. bio-impedance, heart rate, respiratory rate and volume, physical activity duration and intensity, body posture, gathered with a wearable platform as the one depicted in (10)) can be used for predicting decompensations.



RUC 6

Primary and secondary stroke prevention

RUC6 will be conducted in the Basque Country and Hong Kong pilots, targeting patients who have suffered a stroke or with risk factors of suffer a stroke. The aim will be to carry out empowerment programs in early detection of symptoms and lifestyles that would allow for a reduction of the risk of a first episode of stroke or reinfarction and the early detection of initial signs of a (re) infarction. In this sense, GK could provide image recognition algorithms available in the Ecosystem Transaction Space, able to detect stroke signs from images recorded at home, for example on the basis of pathological facial weakness detection. These algorithms, coupled with smart-home/smart-hospital interactions supported in the GK Healthcare Space, will activate early warning alarms which effectively target secondary stroke prevention, particularly for subjects affected by recurrent strokes. GK "Things" involved in this scenario could include image detection technologies (e.g. camera in smartphone) and/or real-time location systems. Primary prevention can be addressed through AI-based smart assistants, like Samsung Bixby, aimed at coaching patients on stroke-related healthy habits, similarly to RUC1.



RUC 7

Multi-chronic elderly patient management including polymedication

RUC7 proposes the implementation of novel Chronic Care Models (CCM) for multi-morbid subjects, or the enhancement of already existing CCM, using the possibilities of the different GK Spaces. An example of a target for RUC7 according to the EIP on AHA blueprint “personas” can be found on this link2. Several sensing technologies, available in the GK Things Catalogue, can be leveraged and integrated in an unobtrusive mobile data collection platform (e.g. based on smartphones, smart-trackers, smart-textiles, etc.), able to monitor the multiple parameters required in CCM for multi-morbid subjects. Through the GK Healthcare Space, data can be shared with clinical professionals in charge of managing the CCMs, in order to adjust individual care plans accordingly. Through the GK Ecosystem Transaction Space, robotics KETs (from very simple pill dispensers to more complex social robots) can be integrated with digital coaching systems to assist polymedicated patients (e.g. in particular for patients which are concurrently affected by cognitive impairments).

link2: https://ec.europa.eu/eip/ageing/library/blueprint-personas-randolph-retired-generally-well

RUC 8

eHealth solutions for the management of High Blood Pressure

RUC8 proposes novel integrated care management for patients with High Blood Pressure (HBP), aiming for the monitoring of blood pressure and early detection of health complications (e.g., heart problems and stroke). Telemonitoring services of different intensities will be harnessed to implement a periodic or continuous monitoring. The intensity of telemonitoring will range from high-intensity monitoring devices in the GK Consumer Space “things” like Biobeat’s wrist-monitor, which includes measurement of other vitals that are important for the close follow-up of HBP patients, to low-intensity health-promotion apps employing Optical Character Recognition (OCR) technology to capture blood pressure data with family-based management features.

RUC 9

eHealth solutions for the management of COVID-19

The onset of the COVID-19 pandemic has triggered a need for integrated management tools capable of working on a remote basis, thus limiting the physical contact among different actors. In this scenario, the different GK Spaces can provide the technological basis to cover the necessities of COVID-19 patients, citizens in lock-down, and health and social organizations dealing with the pandemic. At the healthcare level, several sensing technologies, available in the GK Things Catalogue, can be leveraged and integrated in an unobtrusive mobile data collection platform (e.g. based on smartphones, smart-trackers, etc.), able to monitor key parameters in COVID-19 (e.g. heart rate, respiratory rate, and blood oxygen saturation). At the social care level, GK can provide technological solutions dealing with the complexities of social isolation thus supporting population's self-monitoring at individual and community scale, in synergy with the existing community/social area services.

Join the GATEKEEPER community!

www.gatekeeper-project.eu

coordinator@gatekeeper-project.eu

@GATEKEEPER_EU

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