



## An Integrated Solution for Sustainable Care for Multimorbid Elderly Patients with Dementia



### WP8: Impact Promotion, Dissemination, Exploitation and Business Planning

#### D8.5: Reports on Dissemination and Communication Plan and Activities

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**Participant(s):** <sup>4</sup>WARWICK, <sup>1</sup>EXYS, <sup>2</sup>Fraunhofer, <sup>3</sup>SKB, <sup>5</sup>UHCW, <sup>6</sup>SESCAM, <sup>7</sup>UCLM, <sup>8</sup>CITST, <sup>9</sup>SRDC, <sup>10</sup>OCT

**Author(s):** <sup>4</sup>Sarah N. Lim Choi Keung, <sup>4</sup>Theodoros N. Arvanitis, <sup>4</sup>Omid Pournik, <sup>4</sup>Bilal Ahmad, <sup>1</sup>Aboubacar Mchangama, <sup>1</sup>Jaouhar Ayadi, <sup>2</sup>Yehya Mohamad, <sup>2</sup>Carlos Velasco, <sup>2</sup>Henrike Gappa, <sup>3</sup>Wolfgang Schmidt-Barzynski, <sup>3</sup>Antje Steinhoff, <sup>3</sup>Khoi Le, <sup>5</sup>Tim Robbins, <sup>6</sup>Pedro Abizanda Soler, <sup>7</sup>Ana Magdalena Vargas Martínez, <sup>7</sup>Luz María Peña Longobardo, <sup>8</sup>Oana Cramariuc, <sup>9</sup>Mert Gencturk, <sup>10</sup>Lionello Ferrazzini

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## Executive Summary

The present document aims at reporting on the dissemination and communication plan of the project and detailing the activities that have been conducted to achieve this in the first period of the project, as part of Task 8.3. D8.5 Release 1 is the first of three reports from the project, that reports on dissemination activities throughout the project, initially at Month 18.

In Section 2, we present the methodology for the dissemination strategy for the content, audience and levels. In recognition of the importance of the key stakeholders for the project, we are working closely with Task 8.1 and Task 8.2 for the identification of stakeholders and for the main messages in targeting these groups.

Section 3 describes the communication channels we use for the dissemination and also lists the publications and event participation and collaborations in this first reporting period of the project.

Finally, in Section 4, we outline the dissemination and communication plan for the next period in the project.

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# 1 Introduction

The objective of Task 8.3 is to communicate and raise awareness of the approaches and results of the CAREPATH project and also engage with relevant stakeholders in the areas of technical innovation and associated impacts on healthcare. In this first dissemination report, we specify the strategy that the project consortium will follow to ensure the effective and efficient dissemination of the project. We outline the stakeholder groups that are relevant to the project and the dissemination plan for these groups. We also report on the communication approaches used in the project and the dissemination activities that project partners have participated in. Dissemination and publication plans for the next period are also outlined. The dissemination and communication plan is a living document and updates will be reported in a further two releases of this deliverable at Months 36 and 48.

## 2 Dissemination Strategy

### 2.1 Objectives

The key objective of the CAREPATH dissemination strategy is to identify and organise the activities to be performed in order to promote the widest dissemination of knowledge from the project. It also aims at maximizing the impact and the market uptake to support the exploitation activities in Task 8.2. Specifically, the dissemination and communication plan sets the following objectives:

- To raise public awareness and ensure maximum visibility of the project key facts, outputs and findings among public at large;
- To support the presentation of project's main results in key stakeholders (e.g., market service providers, technology sector firms, civil rights movements organizations), EC and general media;
- To enhance the commercial potential of the results.

### 2.2 Methodology

#### 2.2.1 Goal determination, content and branding (what?)

Dissemination material will be produced to share CAREPATH results and experiences beyond the limits of the project's partnership into the maximum number of potential beneficiaries (e.g., home care providers, technology providers, healthcare provider organizations, patients) in the whole European region. To ensure real impact, CAREPATH dissemination content will be customized and aligned with different target audience classes and differs from: General public to Decision makers. For example, the language style used in the different products will vary, generally becoming more specialised at deeper levels utilizing technical language and terms. The objectives of this customized dissemination strategy will be:

1. **Creating Awareness.** First of all, we will develop content for those target audiences that do not require a detailed knowledge of the project, but it is helpful for them to be aware of the activities and outcomes. Creating such an awareness message of CAREPATH work will help to build a wide recognised identity and profile. We will create dissemination materials for general public that is easy to understand.
2. **Introduce CAREPATH Solution.** We will develop content for those audiences that need to be targeted directly because they can benefit from what CAREPATH project has to offer. Creating such content will help build a deeper understanding of the project's work.
3. **Engage Commitment and Action.** It is important to develop content for those audiences that are able to adopt or use any product/approach/output offered by CAREPATH project. Creating such content will help those people that are in a position to act in some way. Decision makers need information that relates to their policy makers (e.g., how and to what level do measure contribute to their policy goals).

#### 2.2.2 Targeted audiences' identification and profiling (who?)

The CAREPATH dissemination target groups include:

- **Policy makers** as drivers for the implementation of the recommendations and IT-supported Integrated Care models. The “policy drivers” include EU government, and more specifically national and regional health departments,
- **Public and private healthcare organisations, hospitals and health/care institutions, health insurers** that represent the demand for ICT-based integrated care solution,
- **Practitioner/prescribers**, which can influence the former for integrating ICT-based Integrated Care systems. Among these we will target practitioner organizations and associations,
- **ICT providers for the eHealth sector** that can potentially benefit and enhance the platform and can integrate easily in the proposed Integrated Care framework,
- **Academia and research**: health and social researchers,
- **Patients, informal caregivers and society** at large.

Dissemination activities will be performed by all project partners, but they will differ according to their nature. The CAREPATH technological partners will approach relevant stakeholders and their client networks, while the academic and research partners will focus on disseminating the project results towards research institutes and universities across the enlarged Europe.

### 2.2.3 Dissemination levels and phases (when?)

The dissemination activities will be carried out in three main phases, spanning throughout the project duration and extended beyond it, with an increasing level of intensity. They will start from the creation of general awareness and will conclude with attracting potential supporters and customers/users of the project results. As a result, indicative activities at different stages of the CAREPATH project cycle will include:

- **At the beginning of the project:** Our aim is creating general awareness and wide dissemination about the project objectives, idea and its approach at early stages of the project and getting early feedback from the community related with requirements and early design of the architecture. We have drafted the dissemination plan (D8.5) describing the expected impact and deliverables and elaborating of how and to whom the outcomes will be disseminated.
- **During the project:** Our aim for dissemination at this phase is proving our capabilities and attracting potential scientific community, open-source groups, users and potential customers. We will be updating the dissemination plan with recent information on the project and results; contacting relevant media at local or regional level; conducting regular activities such as information sessions, training, demonstrations, peer review journal and conference articles; assessing the impact on target groups; involving other stakeholders in view of transferring results to end users/ new areas/policies.
- **During the pilot phase and after the project:** Our aim is presenting results, proving the benefits, attracting potential investors and pave the way for commercialization. We will be continuing further dissemination; developing ideas for future cooperation; evaluating achievements and impact; contacting policy-makers; create market for the product.

## 2.3 Key Stakeholder Messages

The table below summarises the main messages we seek to convey to the stakeholder groups. Some stakeholder messages are the same but will be delivered in appropriate language and with an appropriate level of clinical or technical detail for each group.

**Table 1:** Key messages for target audience groups

Target Audience	Key Messages	Communication Channels
Policy makers	Results of the CAREPATH clinical investigation and health economic assessment. Sharing of research and best practice.	Website Multi-stakeholder events Meetings with decision makers, mainly at national level

Target Audience	Key Messages	Communication Channels
Public and private healthcare organisations, health insurers	<p>The growing challenge of multi-morbidity and burden of dementia across Europe and the need for more integrated personalized care. Implications on healthcare efficiency, outcomes and costs.</p> <p>Availability of CAREPATH solution for adoption by health systems</p>	<p>Website</p> <p>Multi-stakeholder events</p> <p>Dedicated meetings with decision makers</p>
Health and care professionals	<p>How aligned/holistic guidelines may alter first line treatment and care planning choices.</p> <p>The knowledge assets of CAREPATH.</p> <p>The integrated care support provided by the CAREPATH technical components.</p> <p>CAREPATH clinical investigation results.</p> <p>The demonstrated value to patients of the CAREPATH empowerment platform and home/health monitoring platform.</p>	<p>Website</p> <p>Multi-stakeholder events</p> <p>Clinical and healthcare related conferences</p>
Health ICT industry	<p><b>The growing scale of multi-morbidity and burden of dementia across Europe and the need for more integrated personalized care.</b></p> <p><b>The potential of this as a market driver for interoperability standards, computerized clinical guidelines and AI-based decision support adoption.</b></p> <p>Details of the CAREPATH technical components e.g. FHIR repository, semantic interoperability tools, care plan management tool, patient empowerment platform, home/health monitoring platform, advanced early warning decision tools, clinical decision support modules.</p> <p>Commercial relationships</p>	<p>Website</p> <p>Multi-stakeholder events</p>
Academia and research	<p>The importance of health data and medical knowledge integration</p> <p>CAREPATH approaches to semantic interoperability</p> <p>CAREPATH implementations of data standards and security standards</p> <p>Details of the CAREPATH technical components e.g. FHIR repository, semantic interoperability tools, care plan management tool, patient empowerment platform, home/health monitoring platform, advanced early warning decision tools, clinical decision support modules.</p> <p>Relevant and novel areas of research in data analytics and AI.</p>	<p>Website</p> <p>Multi-stakeholder events</p> <p>Health informatics, data science, AI academic conferences and journals</p>
Patients, informal caregivers and society	<p>Explanation of what multi-morbidity is, and how it relates to mild cognitive impairment and dementia.</p> <p>Challenges in care coordination faced by health systems.</p>	<p>Website</p> <p>Multi-stakeholder events</p> <p>Targeting of patient organisations and groups for diseases commonly</p>



Target Audience	Key Messages	Communication Channels
	<p>Benefit of harmonising clinical guidelines across diseases.</p> <p>Importance of engagement in care planning.</p> <p>Value of health monitoring, prevention and quality of life.</p> <p>CAREPATH solution and results of the clinical intervention.</p>	<p>associated with multi-morbidity and dementia</p>

### 3 Communication Channels

CAREPATH considers a wide set of outreach means expanding traditional means with interactive and on-line based ones. The communication channels are selected to convey the key messages and key outcomes of the project to the stakeholders.

#### 3.1 Visual Identity

The project's visual identity has been used since the beginning of the project (WP1) and is used through the various communication channels and products. It includes:

- Project logo
- Partner logos
- Templates for minutes and reports
- Template for PowerPoint presentations
- Template for WP deliverables

#### 3.2 Project Website

The CAREPATH website (<https://www.carepath.care/>) is considered the hub for the project dissemination. It is the first point of contact with the project for a wide audience and includes full details of the project objectives, challenges, and the expected outcome of the project.

It also provides highlights of the internal as well as related external activities. Among these activities are, monthly blogs, newsletters, events that a member of the project consortium might have attended. Newsletters are prepared and published to the project and subscribers to keep them updated on the project activities, as well as news and activities in the relevant research areas. Newsletters are also available via the project website. So far, we have published two newsletters.

More details about the number of the website visitors are shown in the table below.

**Table 2:** Project website visitors

Year	Number of visitors	Expected visitors per year
2022	11264	2000
2021	9000	2000

#### 3.3 Social Media

The project has its profiles in Twitter (<https://twitter.com/CAREPATH2021>) and LinkedIn (<https://www.linkedin.com/in/carepath-project/>), these channels are used to connect the project with other

people outside of the consortium. The project posts its activities and other related topics in these two platforms. The tables below summarise the social media platform statistics.

**Table 3:** Social media connections

Platform	Number of connected profiles	Expected number of connected profiles throughout the project
LinkedIn	98	200
Twitter	29	1000

**Table 4:** Social media post impressions

Platform	Number of posts	Impressions
LinkedIn	15	286
Twitter	22	2468

The post impressions include activities that consortium members have participated, project monthly blogs and reposting of other posts that are related to the project activities.

### 3.4 Multimedia Production

The consortium will use online channels such as YouTube, to publish informative and demonstration videos of the CAREPATH solution.

### 3.5 Publications

This channel includes classical means of knowledge transfer such as articles in topic specific journals, brochures, publications in broadcast media and business papers focusing on the dissemination of the project results, mainly to experts and professionals. It will increase the level of information need and involvement and invite interactive participation of interested parties. It will guarantee high degree of knowledge promotion within targeted groups.

#### 3.5.1 International Conference on Informatics Revolution for Smarter Healthcare (IRSH'2021), 14-15 October 2021

At this virtual conference, Angelo Consoli (EXYS) and Tim Robbins (UHCW) gave a keynote on “Sustainable care for multimorbid elderly patients with mild cognitive impairment”.

*Abstract:*

Provision of effective health and social care for people with multi-morbidity represents one of the greatest emerging challenges for both healthcare and health-tech providers. Where dementia is present within the multi-morbid conditions, there are additional challenges related to cognitive decline. CAREPATH represents an ambitious EU funded Horizon 2020 project that proposes an ICT based solution for in the treatment and management of multimorbid patients with mild cognitive impairment or mild dementia. In this presentation, we consider the technical ICT based privacy, data compliance, data processing and security constraints relevant to multimorbidity care in the context of cognitive impairment alongside a consideration of how these interact with front-line clinical challenges.

#### 3.5.2 Joint International Conference on Digital Inclusion, Assistive Technology & Accessibility (ICCHP-AAATE 2022), Lecco, Italy, 11-15 July 2022

Henrike Gappa (Fraunhofer) presented WP2 work, to understand the user requirements of patients and their informal caregivers and was achieved in CAREPATH by interviews.

Gappa, H. et al. (2022). Making Person-Centred Health Care Beneficial for People with Mild Cognitive Impairment (MCI) or Mild Dementia – Results of Interviews with Patients and Their Informal Caregivers. In: Miesenberger, K., Kouroupetroglou, G., Mavrou, K., Manduchi, R., Covarrubias Rodriguez, M., Penáz, P. (eds) Computers Helping People with Special Needs. ICCHP-AAATE 2022. Lecture Notes in Computer Science, vol 13341. Springer, Cham. [https://doi.org/10.1007/978-3-031-08648-9\\_54](https://doi.org/10.1007/978-3-031-08648-9_54)

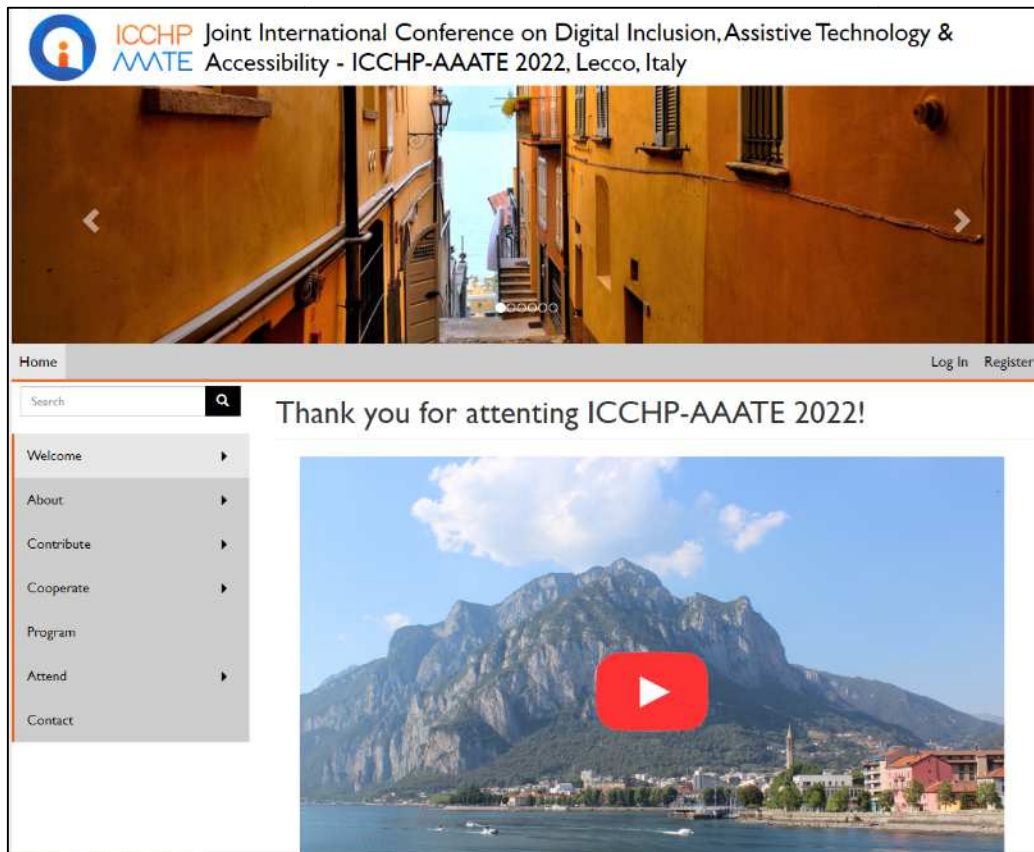


Figure 1: Screenshot of website: <https://www.icchp-aaate.org/>

### 3.5.3 20<sup>th</sup> International Conference on Informatics, Management and Technology in Healthcare (ICIMTH22), Athens, Greece, 1-3 July 2022

Omid Pournik (WARWICK) presented the project at this informatics conference in Greece.

Pournik, O., Ahmad, B., Lim Choi Keung, S. N., Khan, O., Despotou, G., Consoli, A., Ayadi, J., Gilardi, L., Laleci Erturkmen, G. B., Yuksel, M., Gencturk, M., Gappa, H., Breidenbach, M., Mohamad, Y., Velasco, C. A., Cramariuc, O., Ciobanu, C., Gómez Jiménez, E., Avendaño Céspedes, A., Alcantud Córcoles, R., ... Arvanitis, T. N. (2022). CAREPATH: Developing Digital Integrated Care Solutions for Multimorbid Patients with Dementia. *Studies in health technology and informatics*, 295, 487–490. <https://doi.org/10.3233/SHTI220771>

See Appendix 8.1 for the conference paper.

### 3.5.4 Software Development and Technologies for Enhancing Accessibility and Fighting Info-exclusion Conference (DSAI 2022), Lisboa, Portugal, 31 August 31 – 2 September 2022

Yehya Mohamad and Carlos Velasco (Fraunhofer) organized a special track at DSAI 2022 on Accessible, Smart, and Integrated Healthcare Systems for Elderly and Disabled People. The special track brought together contributions from international researchers and practitioners focusing on design, development,

testing and application of information technologies to healthcare sector, pervasive, mobile, and ubiquitous healthcare systems, pandemic research, accessibility, usability and user experience of medical apps & devices, human behaviour, integrated healthcare approaches, patient empowerment systems, eHealth data standards and interoperability (e.g. HL7/FHIR), medical device and clinical investigation regulatory frameworks, as well as privacy and security.

8 papers were presented, 6 of them from Horizon 2020 projects:

CAREPATH with 4 papers: <https://www.carepath.care/>

ESCAPE with 1 paper: <https://escape-project.org/>

ADLIFE with 1 paper: <https://adlifeproject.com/>



**Figure 2:** Screenshot of conference website: <http://dsai.ws/2022>

The 4 papers presented from CAREPATH:

- CAREPATH Protocol for Creating a Single, Holistic and Digitally Implementable Consensus Clinical Guideline for Multiple Multi-morbid Conditions, by Tim R. Robbins et al., presented by Tim Robbins (UHCW) on the work in WP6.
- CAREPATH methodology for development of computer interpretable, integrated clinical guidelines, by Omid Pournik et al., presented by Omid Pournik (WARWICK) on the work in WP3.
- Key scenarios, Use Cases & Architecture of an E-health Homecare Instance, by Yehya Mohamad et al., presented by Yehya Mohamad (Fraunhofer) on the work in WP2.

- The design of a mobile platform providing personalized assistance to older multimorbid patients with mild dementia or mild cognitive impairment (MCI), by Mert Gencturk et al., presented by Mert Gencturk (SRDC) on the work in WP4.

Refer to Appendix 8.2 for the conference materials. DSAI 2022 proceedings will be published in the ACM International Conference Proceedings Series (ISBN: 978-1-4503-9808-4).

### 3.5.5 18<sup>th</sup> International Congress of the European Geriatric Medicine Society, London, United Kingdom, 28-30 September 2022

Rubén Alcantud Córcoles (SESCAM) gave a presentation on the work in WP6 on "Clinical guidelines and best practices to improve the management of elderly patients with dementia and multimorbidity. A systematic review".



Figure 3: Screenshot of event website: <https://eugms2022.com/>



Figure 4: Rubén Alcantud Córcoles presenting at 2020 EuGMS

## 3.6 Events

Interactive dissemination offers a chance for personal interaction in academic, commercial and socio-economic conferences and workshops, EU organised events, trade fairs and exhibitions. It is intended for target groups with a high level of information need and involvement and provides information tailored to highly targeted audiences. It also includes possible interviews in radio or TV stations, as well as concertation activities with other European and/or International funded projects in the domain, which shall be established timely, to ensure a useful exchange and could take the form of a common workshop.

### 3.6.1 MEDICA 2022, medical trade fair, Düsseldorf, Germany, 14-17 November 2022

Yehya Mohamad (Fraunhofer) has participated in this event and has been talking about the CAREPATH project in his presentations.

More than 81,000 visitors from various sectors of the global healthcare industry came to Düsseldorf, Germany, to attend MEDICA 2022, the world's leading medical trade fair, and COMPAMED 2022, the international No. 1 for the medical technology supply sector.

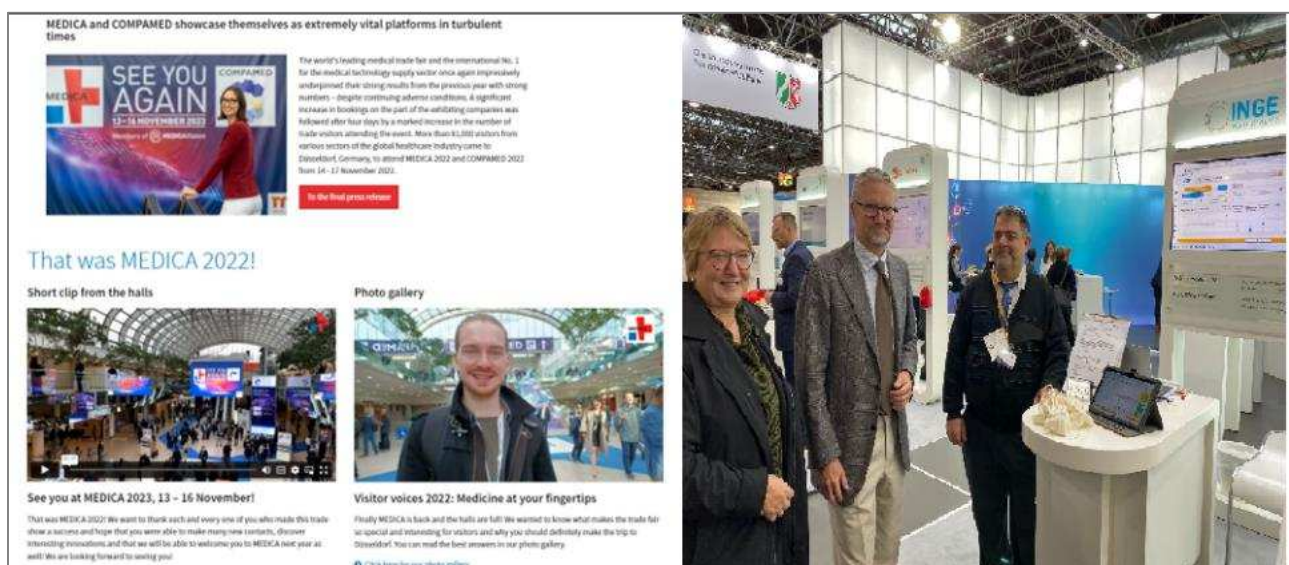


Figure 5: Screenshot of event website: <https://www.medica-tradefair.com/> (left); Yehya Mohammad (right in photo) at the event (right)

### 3.6.2 Quality circle, GP Initiative meeting, Bielefeld, Germany, 16 November 2022

Wolfgang Schmidt-Barzynski (SKB) presented the CAREPATH project to a group of about a dozen General Practitioners in the region of Bielefeld, Germany, at their quality circle meeting. This introduction to the project has provided key information about the project and study for the involvement of these healthcare professionals and support in recruiting patients to the study.

## 3.7 Collaborations and Networks

### 3.7.1 Related projects

Projects related to CAREPATH are continuously being identified to raise awareness within the project of innovations and shared lessons; and to increase potential collaborations.

As described in Section 3.5.4, a joint workshop was organized and featured three EU projects, relating to integrated care. Besides CAREPATH, the other two projects are ADLIFE and ESCAPE.

## Relevant projects

[ESCAPE: Evaluation of a patient-centred biopsychosocial blended collaborative care pathway for the treatment of multi-morbid elderly patients](#) (H2020-SC1-BHC-2018-2020)

[GERONTE: Streamlined Geriatric and Oncological evaluation based on IC Technology for holistic patient-oriented healthcare management for older multimorbid patients](#) (H2020-SC1-BHC-2018-2020)

[ADLIFE: Integrated Personalized Care for Patients with Advanced Chronic Diseases to Improve Health and Quality of Life](#) (H2020-SC1-DTH-2019)

[OPEN DEI: Aligning Reference Architectures, Open Platforms and Large-Scale Pilots in Digitising European Industry](#) (H2020-DT-2018-2)

**INTEGRATE4CARE:** Digital integrated health and social care with IT-supported home care counseling visits as specified in §37.3 SGB XI - funded by the European Union from the European Regional Development Fund (EFRE) and the State of Rhineland-Westphalia (NRW), Germany (grant agreement number EFRE-0801905).

### 3.7.2 Standardisation

CAREPATH seeks to raise awareness and contribute to relevant standardization work from its project results. CAREPATH is involved in ISO standardisation, by having some project members on the British Standards Institution (BSI Group) IST/35 - Health informatics Committee and promoting knowhow in the development of specific standards in the domain of health informatics. Through BSI/IST/35, there is association and routes to the International Organization for Standardization (ISO) and in particular to the ISO/TC 215/Health Informatics Committee. Some of the work can provide input to the following working groups: ISO/TC 215/WG 01 "Architecture, Frameworks and Models", ISO/TC 215/WG 02 "Systems and Device Interoperability" and ISO/TC 215/WG 04 "Security, Safety and Privacy".

To ensure the sustainability and impact of research, CAREPATH partner Fraunhofer is involved since 15 years in different Working Groups of the World Wide Web Consortium (W3C). The World Wide Web Consortium (W3C) is an international community where Member organizations, a full-time staff, and the public work together to develop Web standards. Led by Web inventor Tim Berners-Lee, W3C's mission is to lead the Web to its full potential. Fraunhofer participation also ensures that its teams are up-to-date with the leading-edge developments of the web and is able to influence new directions of the web in collaboration with leading industrial partners.

Additionally, CAREPATH, through its members, is involved in a CEN Workshop Agreement (CWA 17933) entitled "Digital health innovations — Good practice guide for obtaining user consent for personal health information". The CWA will define a guideline for obtaining the most suitable consent for the use of digital health innovations. The guideline will describe which aspects should be considered when asking for consent. It will also cover the usability of a consent form especially regarding the patient-friendly presentation of informed consent choices. Another aspect of this CWA will focus on how to handle the subject's access requests or withdrawal during a pilot evaluation. The planned CWA (to be completed in 2023) is intended to be used as a guideline for Horizon Europe research and innovation projects and other market participants when consent is needed for the use of digital health innovations.

## 4 Dissemination and Communication Plan

In the next period of the project, the following dissemination and communication activities are being planned.

### 4.1 Publication Plan

Several manuscripts are currently in progress for publication in journals:

- i. An Integrated Solution for Sustainable Care for Multimorbid Elderly Patients with Mild Cognitive Impairment or Mild Dementia (CAREPATH): A Study Protocol for a clinical investigation. Angelo Consoli et al. (under review)
- ii. Introducing CAREPATH project: Roadmap for an Integrated and Sustainable Care system for Elderly Patients with mild Dementia or mild cognitive impairment (MCI) (draft white paper)
- iii. Economic evaluations of healthcare interventions for the management of elderly multimorbid patients with dementia: a review (draft paper)

## 4.2 Dissemination Plan

In the next period, the following dissemination activities will be organized:

- Pilot site partners will be planning public information events in order to recruit patient and general physician participants to take part in the Clinical Investigation.
- Continue to publish regular blog posts and newsletters.
- Produce videos and demonstrations of the CAREPATH solution.

The following conferences/events are being targeted for future dissemination activities by the project:

- Medical Informatics Europe 2023, <https://www.mie2023.org/>
- 21<sup>st</sup> International Conference on Informatics, Management, and Technology in Healthcare 2023, <https://www.icimth.com/>
- DMEA 2023 25 to 27 April in the Berlin exhibition halls - Connecting Digital Health - DMEA is one of Europe's most important digital health conference and trade fair. Once a year, experts from the digital health industry meet for three days in Berlin. In addition to a comprehensive market overview, DMEA offers all stakeholders a wide range of opportunities for intensive exchange, targeted networking, and effective customer acquisition, <https://www.dmea.de/en/>



## 5 Conclusions

In this deliverable, we have outlined the project dissemination strategy for communicating the project's results and progress. We have identified the key stakeholders and started to develop the key messages for each group and the communication channels to use.

In the first period, the project members have participated in a number of conferences, workshops, exhibitions and meetings to raise awareness of the project and to communicate the results so far. The project has also identified related projects for collaborations in similar topic areas, and has contributed to standardization work.

Finally, we describe the dissemination plan for the next period with targeted events and publications in the pipeline.

## 6 Appendix – Sample presentation slides and papers

## 6.1 ICIMTH2022 paper

# CAREPATH: developing digital integrated care solutions for multimorbid patients with dementia

Omid POURNIK<sup>a</sup>, Bilal AHMAD<sup>a</sup>, Sarah N. LIM CHOI KEUNG<sup>a</sup>, Omar KHAN<sup>a</sup>, George DESPOTOU<sup>a</sup>, Angelo CONSOLI<sup>b</sup>, Jaouhar AYADI<sup>b</sup>, Luca GILARDI<sup>b</sup>, Gokce Banu LALECI ERTURKMEN<sup>c</sup>, Mustafa YUKSEL<sup>c</sup>, Mert GENCTURK<sup>c</sup>, Henrike GAPPA<sup>d</sup>, Martin BREIDENBACH<sup>d</sup>, Yehya MOHAMAD<sup>d</sup>, Carlos A. VELASCO<sup>d</sup>, Oana CRAMAIUC<sup>e</sup>, Cristiana CIOBANU<sup>e</sup>, Elena GÓMEZ JIMÉNEZ<sup>f</sup>, Almudena AVENDAÑO CÉSPEDES<sup>f,g</sup>, Rubén ALCANTUD CÓRCOLES<sup>f</sup>, Elisa Belén CORTÉS ZAMORA<sup>f,g</sup>, Pedro ABIZANDA<sup>f,h</sup>, Antje STEINHOFF<sup>i</sup>, Wolfgang SCHMIDT-BARZYNSKI<sup>i</sup>, Timothy ROBBINS<sup>j</sup>, Ioannis KYROU<sup>j</sup>, Harpal RANDEVA<sup>j</sup>, Lionello FERRAZZINI<sup>k</sup>, Theodoros N. ARVANITIS<sup>a,j,1</sup>

<sup>a</sup>*Institute of Digital Healthcare, WMG, University of Warwick, Coventry, UK*

<sup>b</sup>*Eclxys S.A.G.L, Switzerland*

<sup>c</sup>*Software Research Development and Consultancy Cooperation, Ankara, Turkey*

<sup>d</sup>*Fraunhofer Institute for Applied Information Technology FIT, Germany*

<sup>e</sup>*Centrul IT pentru Stiinta si Tehnologie, Romania*

<sup>f</sup>*Complejo Hospitalario Universitario de Albacete, Servicio de Salud de Castilla-La Mancha (SESCAM), Albacete, Spain*

<sup>g</sup>*CIBERFES, Instituto de Salud Carlos III, Madrid, Spain*

<sup>h</sup>*Facultad de Medicina de Albacete, Universidad de Castilla-La Mancha, Spain*

<sup>i</sup>*Universitätsklinikum OWL, Klinikum Bielefeld, Germany*

<sup>j</sup>*University Hospitals Coventry and Warwickshire NHS Trust, Coventry, UK*

<sup>k</sup>*Octylum, Switzerland*

**Abstract.** CAREPATH project is focusing on providing an integrated solution for sustainable care for multimorbid elderly patients with dementia or mild cognitive impairment. The project has a digitally enhanced integrated patient-centered care approach clinical decision and associated intelligent tools with the aim to increase patients' independence, quality of life and intrinsic capacity. In this paper, the conceptual aspects of the CAREPATH project, in terms of technical and clinical requirements and considerations, are presented.

**Keywords.** Clinical Decision Support System, Multimorbidity, Dementia

## 1. Introduction

In the last decade, development of Clinical Decision Support Systems (CDSSs) has become popular in the health informatics domain[1]. Implementation of CDSS in daily

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<sup>1</sup> Corresponding Author, Theodoros N. Arvanitis, International Digital Laboratory, Warwick Manufacturing Group, University of Warwick, Coventry, UK, E-mail: T.Arvanitis@warwick.ac.uk

medical practices is believed to improve healthcare providers' performance on clinical decision-making, quality of care and patient safety, although there has been disadvantages and limitations in their clinical implications[1]. Meanwhile, healthcare providers face challenges in conciliating recommended tasks and activities of different guidelines in multimorbid patients[2]. The heterogeneity of patients accompanied by the complex nature of their health condition makes the existing guidelines, with disease-oriented approaches incapable of providing the same level of improved patient outcomes in this group of patients[3]. This has highlighted the importance of patient-specific recommendations for multimorbid patients, which are frequently provided through computer-interpretable guidelines (CIGs)[5].

Such co-existence of multimorbid conditions can be very well demonstrated in diagnosis and management of dementia, where most guidelines have focused on managing dementia as a single disease[5]. The existing guidelines have been developed to provide the necessary advice on supporting people with dementia and their caregivers in health and social care, without holistic consideration of their implications on other morbidities and intrinsic capacity of the patient. At the level of "best practice", we are facing increased challenges and difficulties in the use of good clinical guidelines due to the co-existence of dementia with other morbidities[6]. These challenges can include but are not limited to polypharmacy, adverse drug reactions, and frequent non-adherence to treatments[3].

In Europe, the single-disease oriented health system and ageing population, which increases the risk of multimorbidity[7], has affected healthcare costs and efficacy and the sustainability of health systems[8]. When dementia is present, the situation becomes even more complicated[6]. The CAREPATH project is a research project within Horizon 2020 that focuses on the enhancement of healthcare interventions for the management of elderly multimorbid patients suffering from dementia. It aims at developing ICT solutions with integrated patient-centered approaches to care for patients with multimorbidity to increase their independence, quality of life and intrinsic capacity (9). In this paper, we are discussing the conceptual aspects of the CAREPATH project in terms of technical and clinical requirements and considerations.

## 2. The Holistic CAREPATH Solution

CAREPATH will provide a holistic environment that efficiently addresses multimorbidity and dementia challenge in the elderly population, by delivering three complementary components: (A) A *Home and Health Monitoring* platform implemented at the patients' homes integrated with *Advanced Early Warning Smart Decision Tools*, providing environment aware services with natural and comfortable interfaces for older adults for continuously collecting real time data for early detection of onset and changes in functioning, autonomy, underlying cognitive and physiological functions and to derive dementia profiles and intrinsic capacity of these patients, (B) A *Patient Empowerment Platform* providing personalized assistance to the patients, guidance and reminders about care plan goals and activities, present educational materials for reinforcing treatment adherence; collect feedback from the patients and their informal caregivers via PROMs for carrying out geriatric assessments and (C) An *Adaptive Integrated Care Platform* to be used by health professionals, enabling implementation of adaptive care plans for managing multimorbidity based on evidence from clinical guidelines, but prioritizing and reconciling them with the help of clinical

decision support systems, processing patient's most recent context from the home monitoring environment and Electronic Health Records for calculating risk scores for comorbidities and monitor disease progression and intervention effects and tackling polypharmacy management.

### 3. Steps for developing integrated patient-centered solutions

*Team building:* It is of crucial importance to identify and build partnerships with all stakeholders in the CDSS domain. For the CAREPATH project, a consortium is composed of ten organizations (universities, clinical organizations, and SMEs) from six countries (Germany, Romania, Spain, Switzerland, Turkey and UK). The team members have expertise in clinical, technical, health economic and ethical aspects relevant to the project. The clinical investigations will be carried out in Germany, Romania, Spain and UK, four countries with diverse health and social care systems.

*Clinical Aspects:* The clinical teams are expected to provide patient-centered best practice guidelines based on existing evidence, reviews, legislations, and expert consensus. They should also develop or approve the polypharmacy management services to be implemented in the CDSS. Clinical teams will also support collecting the user requirements and determine characteristics of various target users, as well as instrument specifications in the clinical setting. The clinical teams are also expected to provide a variety of probable scenarios and use cases to be tested during the integrated care plan development and pilot phase.

*Technical Aspects:* The main task expected from the technical team is to design and introduce a generic reusable architecture. This holistic, cross-sectoral and interdisciplinary patient-centered care model of personalized care services is built on existing prototypes of IONIS, C3-Cloud and imergo®-ICP (10). The system is intended to provide patients, healthcare providers and caregivers with smart early warning CDS services and home and health monitoring capability. There will be critical security and privacy issues to be dealt with during this process to help patients and caregivers better manage health related conditions. Finally, the integrated care solution would be presented in accordance with present standards such as HL7/FHIR, using comprehensive, multilingual clinical healthcare terminologies e.g., SNOMED. The functions will be performed by means of APIs for exchanging electronic health record based on CDS Hooks specification for describing the RESTful APIs and interactions to integrate Clinical Decision Support (CDS) between CDS Clients and CDS Services.

*Economic and Ethical Aspects:* A Health economic study and analysis is an important part of this project. The acceptability and sustainability of the project is partially determined by the success of adjustments made based on the findings of the health economic studies. The project endures important ethical considerations. An ethical team is required to participate in all phases of the development process to ensure all requirements are met.

### 4. Concluding Remarks

The health and social needs of ageing populations are often complex and ongoing, spanning a range of areas of functioning and fluctuating over time. Traditional care models for people in later life are frequently fragmented and inefficient[11]. Even in

countries with reasonably well-developed health and social care provision, treatment of dementia patients with multimorbidity is generally provided without careful monitoring of the current intrinsic capacity and dementia profile of the patient. There is a need to employ fundamental changes to the focus of clinical care for older people from treating specific symptoms in a disjointed fashion to adapting holistic approaches according to older people's physical and mental capacities. CAREPATH will follow an integrated patient-centered approach, in order to develop a flexible and modular system that will provide a viable solution for improving the management of multimorbid elderly patients with dementia and possibly improving intrinsic capacity, by delivering a system of care adapted to their needs.

**Acknowledgements.** The work presented in this paper have been supported the European Union's Horizon 2020 research and innovation programme, under grant agreement No 945169, CAREPATH Project.

## References

1. Muhiyaddin R, Abd-Alrazaq AA, Househ M, Alam T, Shah Z. The impact of clinical decision support systems (CDSS) on physicians: a scoping review. *The Importance of Health Informatics in Public Health during a Pandemic*. 2020:470-3.
2. Bilici E, Keung SNLC, Despotou G, Arvanitis TN. Computer-interpretable Guidelines driven Clinical Decision Support Systems: An Approach to the Treatment Personalisation Routes of Patients with Multi-Diseases. WIN; 2017.
3. Muth C, Blom J, Smith S, Johnell K, Gonzalez-Gonzalez A, Nguyen T, et al. Evidence supporting the best clinical management of patients with multimorbidity and polypharmacy: a systematic guideline review and expert consensus. *Wiley Online Library*; 2019. p. 272-88.
4. Artola G, Torres J, Larburu N, Alvarez R, Muro N, editors. Development and Usability Assessment of a Semantically Validated Guideline-Based Patient-Oriented Gestational Diabetes Mobile App. *International Joint Conference on Knowledge Discovery, Knowledge Engineering, and Knowledge Management*; 2019: Springer.
5. Bjerre LM, Farrell B, Hogel M, Graham L, Lemay G, McCarthy L, et al. Deprescribing antipsychotics for behavioural and psychological symptoms of dementia and insomnia: evidence-based clinical practice guideline. *Canadian Family Physician*. 2018;64(1):17-27.
6. Kaczynski A, Michalowsky B, Eichler T, Thyrian JR, Wucherer D, Zwingmann I, et al. Comorbidity in dementia diseases and associated health care resources utilization and cost. *Journal of Alzheimer's Disease*. 2019;68(2):635-46.
7. Ofori-Asenso R, Chin KL, Curtis AJ, Zomer E, Zoungas S, Liew D. Recent patterns of multimorbidity among older adults in high-income countries. *Population health management*. 2019;22(2):127-37.
8. Brockmüller J, Stingl JC. Multimorbidity, polypharmacy and pharmacogenomics in old age. *Future Medicine*; 2017. p. 515-7.
9. Belloni G, Cesari M. Frailty and intrinsic capacity: two distinct but related constructs. *Frontiers in medicine*. 2019;6:133.
10. Velasco CA, Mohamad Y, Ackermann P, editors. Architecture of a web of things ehealth framework for the support of users with chronic diseases. *Proceedings of the 7th International Conference on Software Development and Technologies for Enhancing Accessibility and Fighting Info-Exclusion*; 2016.
11. de Carvalho IA, Martin FC, Cesari M, Summi Y, Thiyagarajan JA, Beard J. Operationalising the concept of intrinsic capacity in clinical settings. *Background paper for the WHO Working Group on Metrics and Research Standards for Healthy Ageing*. 2017.

## 6.2 DSAI22 conference materials

### 6.2.1 Y. Mohamad et al. Key scenarios, Use Cases & Architecture of an E-health Homecare Instance

Presentation slides:



SOFTWARE DEVELOPMENT AND TECHNOLOGIES FOR ENHANCING ACCESSIBILITY AND FIGHTING INFO-EXCLUSION AUGUST 31 - SEPTEMBER 2, 2022 - NOVA-IMS, LISBOA, PORTUGAL

## Key scenarios, Use Cases & Architecture of an E-health Homecare Instance



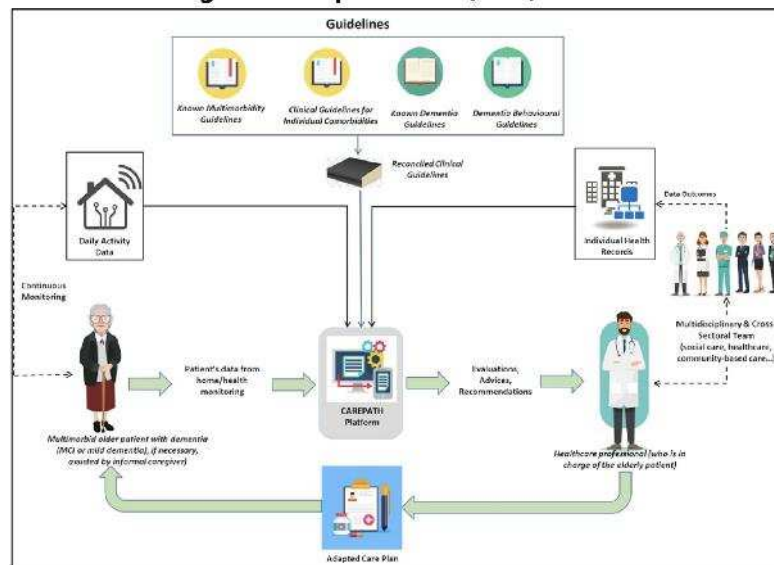
Yehya Mohamad, Henrike Gappa et. Al.  
Fraunhofer Institute for Applied Information Technology FIT  
Digital Health Department

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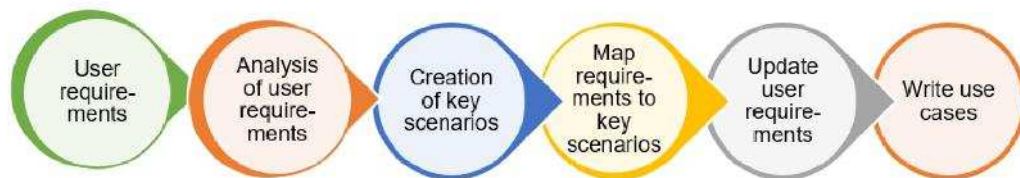
## CAREPATH

Goal: improve the treatment and quality of life of multimorbid older patients with Mild Cognitive Impairment (MCI) or mild dementia





## 2 SCENARIOS AND USE CASES FOR INTEGRATED CARE



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### Participating clinicians

- 4 pilot sites in
  - Rumania,
  - Spain,
  - UK and
  - Germany



Romania



Spain



England



Germany

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## Key Scenario Template

Subject	Action
Scenario	Provide a short description of the use scenario, so workflow and context-of-use become alive for all partners
User roles involved	GP <input type="checkbox"/> Geriatrician <input type="checkbox"/> Nurse <input type="checkbox"/> PT/OT <input type="checkbox"/> Dietician <input type="checkbox"/> Social worker <input type="checkbox"/> Patient <input type="checkbox"/> Informal caregiver <input type="checkbox"/> Other (specify) <input type="checkbox"/> .....
User tasks	List user tasks depicting the workflow
Design in- /output of CAREPATH services	Describe here whatever is important to mention in regard to how a CAREPATH service should be presented to users enabling them to fulfil their tasks. For example, if input is required from a user, how shall the system be designed to collect this input. If the system provides output such as an early warning or analysis of a patient's health measurements, how shall this information be presented to the user.

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## Example of a filled key scenario template I

### Action: early warnings (health professional view)

- **Scenario:** Carmen is a 71-year-old patient with obesity (BMI >30), diabetes, hypertension, sarcopenia, frailty and mild cognitive impairment. She has been included in the CAREPATH program for a few weeks. The H/HMP has been recording data correctly.
- Several Early Warnings have been triggered in the last 24 hours:
  - - Risk of insomnia, and other sleep/circadian rhythms disturbances
  - - Risk of hyper/hypoglycemia
- In addition, the H/HMP has recorded a fever of 38°C; in addition to changes in the movement pattern with nocturnal wandering, which has also been reflected in the sleep recording.
- The comments of his informal caregiver are also noted, who refers to an episode of disorientation at home.
- In the last two days Carmen has reported a "bad mood".

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## Example of a filled key scenario template II

User roles involved	GP x Specialist x Nurse x PT/OT/Sport <input type="checkbox"/> Dietist Social worker <input type="checkbox"/> Patient x Informal caregiver x Other (specify) <input type="checkbox"/>		
User tasks	List of user tasks, depicting the workflow		
	Health professional	Patient	Informal caregiver
	• View eMH	• Comments	• Comments
	• AICP/EW	PEP	PEP
Design of services	in-/output	Based on these data Peter reviews all the records and decides to order a urine and blood test to rule out urine infection or other organic condition that could be altering Carmen. Carmen and her informal caregiver are alerted to the need for these tests. Information on alerting conditions is presented to health professional Out-of expected range results are highlighted	

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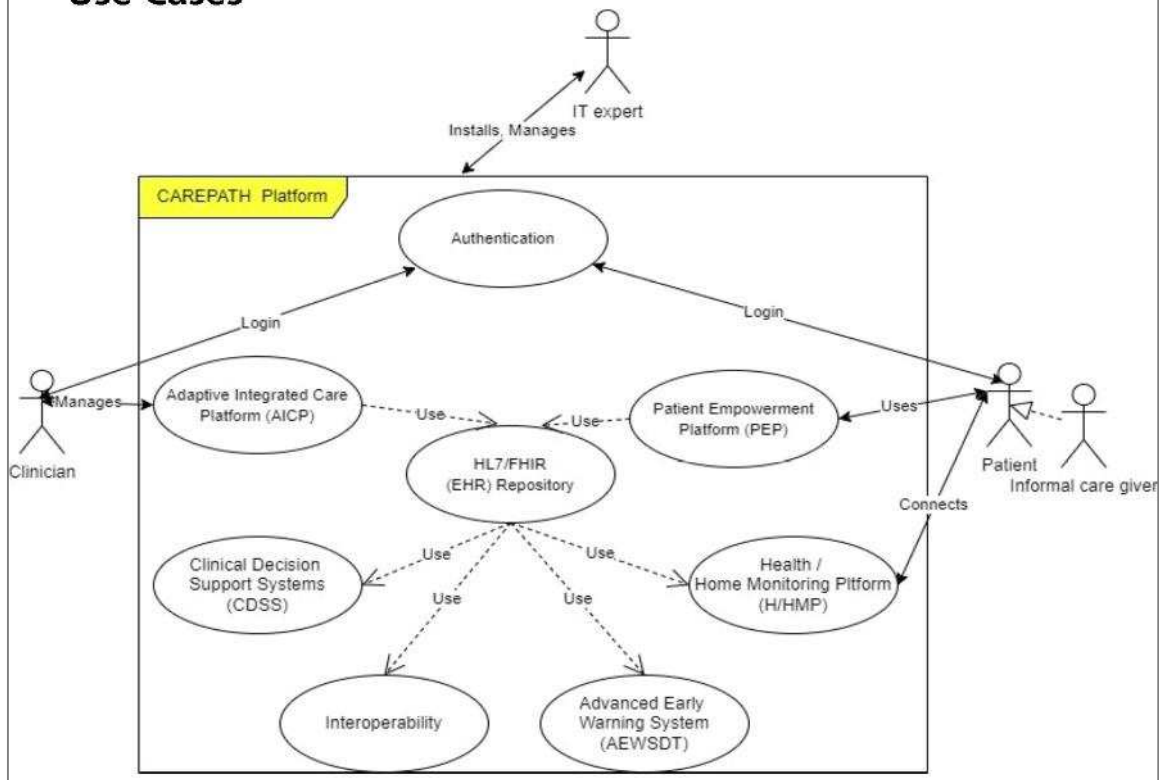
## Example of a filled key scenario template III

Related user requirements	<ul style="list-style-type: none"> <li>• CARE-21 Health professionals shall be pointed specifically to alerting risks of their patients (early warnings) and corrupted/lost data from H/HMP</li> <li>• CARE-31 All results from patient's health data collected on H/HMP and PEP are presented to health professionals</li> <li>• CARE-32 Health professionals need to be supported in analysis and interpretation of results from patient's health data collected on H/HMP and PEP</li> </ul>
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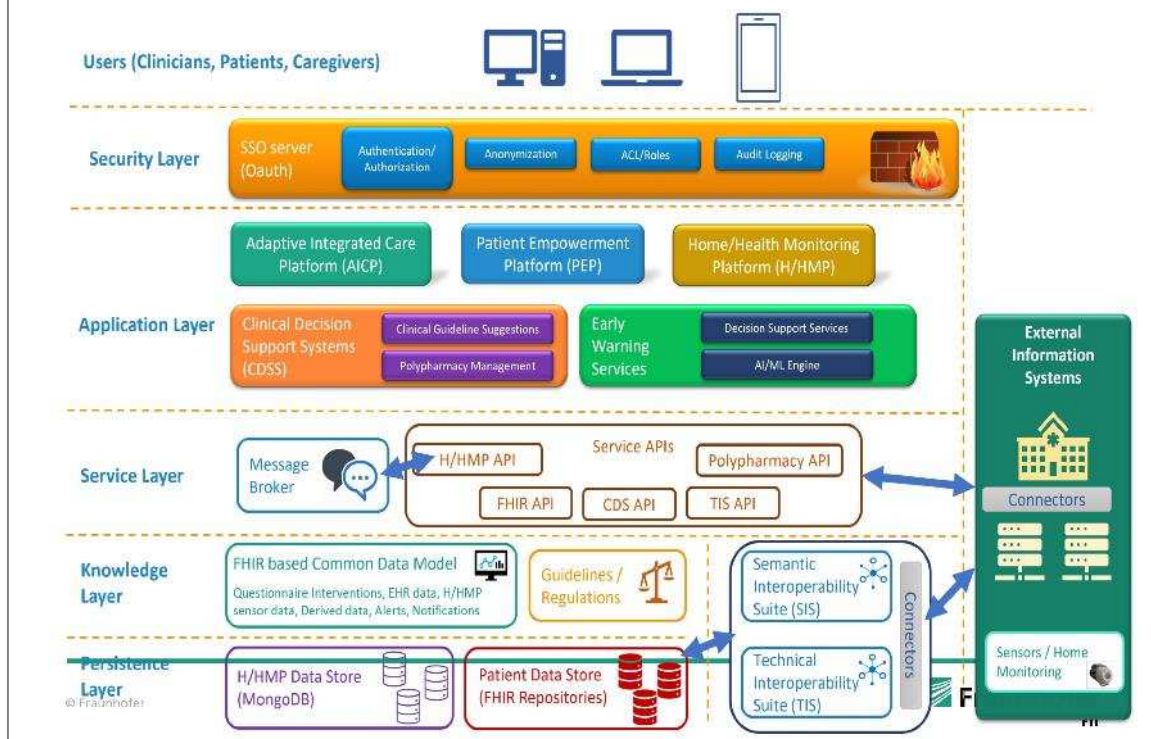
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## Use Cases



## CAREPATH Architecture



## Lessons Learned

	Key scenarios and use cases are essential to	Create common understanding Refine user requirements
	Iterative process	User Involvement
	Layered architecture	Illustrative Easy
	Software Development process	Acceleration Flexibility Modularisation

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■ Thank you for your attention!

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### 6.2.2 O. Pournik et al. CAREPATH methodology for development of computer interpretable, integrated clinical guidelines



## CAREPATH methodology for development of computer interpretable, integrated clinical guidelines

Software Development and Technologies for Enhancing Accessibility and Fighting Info-exclusion (DSAI 2022)  
August 31 - September 2, 2022 - NOVA-IMS, Lisbon, Portugal

1<sup>st</sup> Sep 2022

D4: Accessible, Smart, and Integrated Healthcare Systems for Elderly and Disabled People

Presenter:

Dr. Omid Pournik (MD, MPH, MSc. MIT, MBA, PhD)  
Institute of Digital Healthcare, University of Warwick (WMG), UK



## Consortium Contributors

OMID POURNIK\*, BILAL AHMAD, GEORGE DESPOTOU, SARAH N. LIM CHOI KEUNG

Institute of Digital Healthcare, WMG, University of Warwick, Coventry, UK

YEHYA MOHAMAD, HENRIKE GAPPA

Fraunhofer Institute for Applied Information Technology (FIT), Sankt Augustin, Germany

GOKCE B. LALECI ERTURKMEN, MUSTAFA YUKSEL, MERT GENCTURK

SRDC Software Research Development & Consultancy Corp, Ankara, Turkey

WOLFGANG SCHMIDT-BARZYNSKI, ANTJE STEINHOFF, EZGI KABA, KHOI LE

University Hospital OWL, Bielefeld, Germany

TIMOTHY ROBBINS, IOANNIS KYROU, HARPAL RANDEVA

Digital and Data Driven Research Unit, University Hospitals Coventry & Warwickshire NHS Trust, Coventry, UK.

PEDRO ABIZANDA, ELENA GÓMEZ JIMÉNEZ, ALMUDENA AVENDAÑO CÉSPEDES, RUBÉN ALCANTUD CÓRCOLES

Complejo Hospitalario Universitario de Albacete, Albacete, Spain, CIBERFES, Instituto de Salud Carlos III, Madrid, Spain, Facultad de Medicina de Albacete, Universidad de Castilla-La Mancha, Spain

JAOUHAR AYADI

Eclexys Sagl, Riva San Vitale, Switzerland

THEODOROS N. ARVANITIS

Institute of Digital Healthcare, WMG, University of Warwick, Coventry, UK

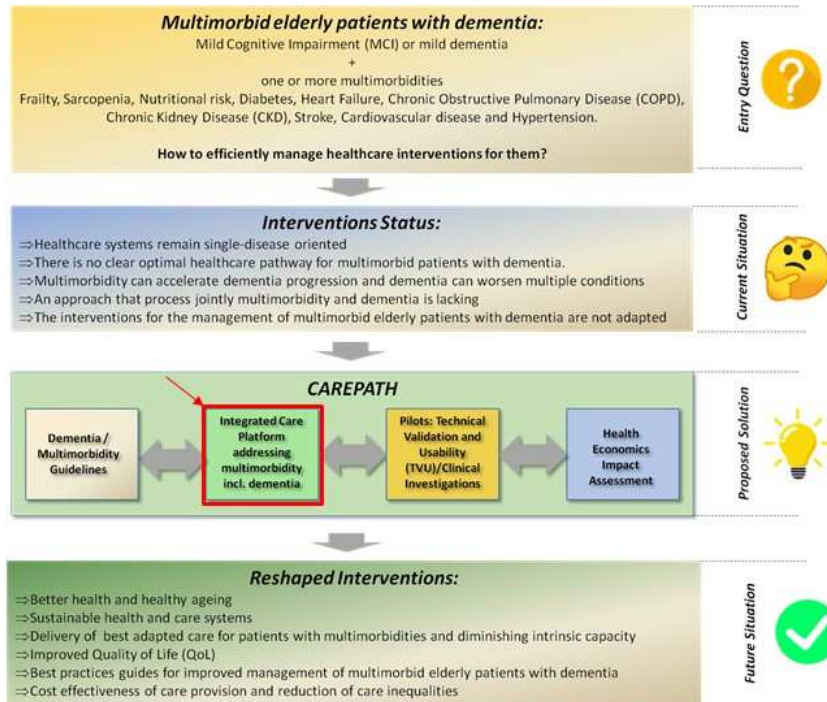
Digital and Data Driven Research Unit, University Hospitals Coventry & Warwickshire NHS Trust, Coventry, UK



# CAREPATH

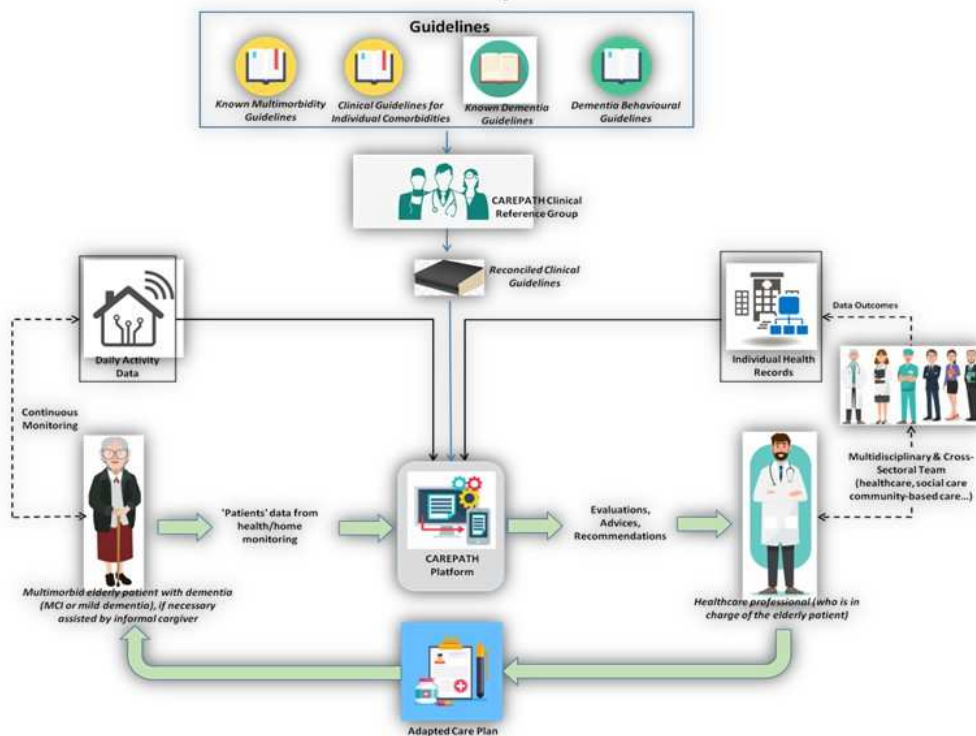
## Question to Solution

How it is situated in the healthcare interventions for the management of elderly multimorbid patients with dementia



# CAREPATH

## Intended Ecosystem



## The process of translating CPGs into CDSSs



Disease-based Guidelines



Reconciled Clinical Guideline

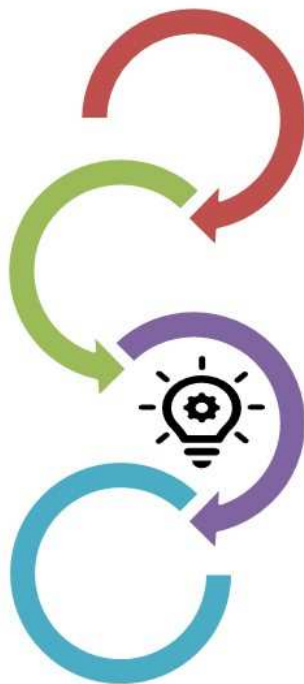


Computer Interpretable Guideline



Clinical Decision Support Module

## The process of translating CPGs into CDSSs



Disease-based Guidelines



Reconciled Clinical Guideline



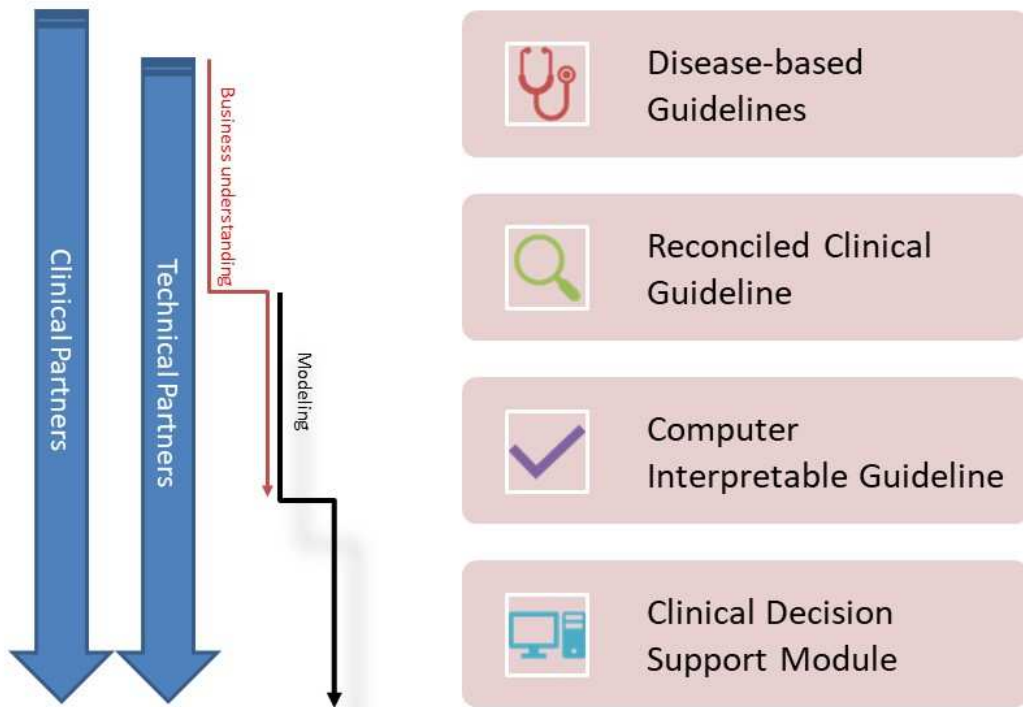
Computer Interpretable Guideline



Clinical Decision Support Module



## The process of translating CPGs into CDSSs



## Patient-centered computer interpretable guideline (CIG) modelling phases

Conceptual modelling phase

Interpretable modelling phase

Localization phase

# Conceptual modelling phase

## Sarcopenia Guideline

### Screening

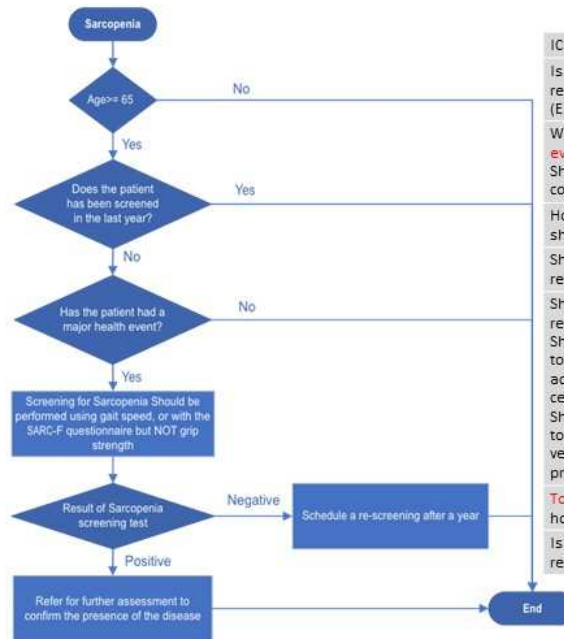
Older adults aged 65 years and over should be screened for sarcopenia annually, or after the occurrence of major health events. Screening for sarcopenia can be performed using gait speed, or with the SARC-F questionnaire. Individuals screened as positive for sarcopenia should be referred for further assessment to confirm the presence of the disease.

### Diagnosis and Measurement

Walking speed should be used to determine low levels of muscle strength and physical performance respectively when diagnosing sarcopenia. Measurement of sarcopenia can be by gait speed and SARC-F questionnaire but NOT grip strength.

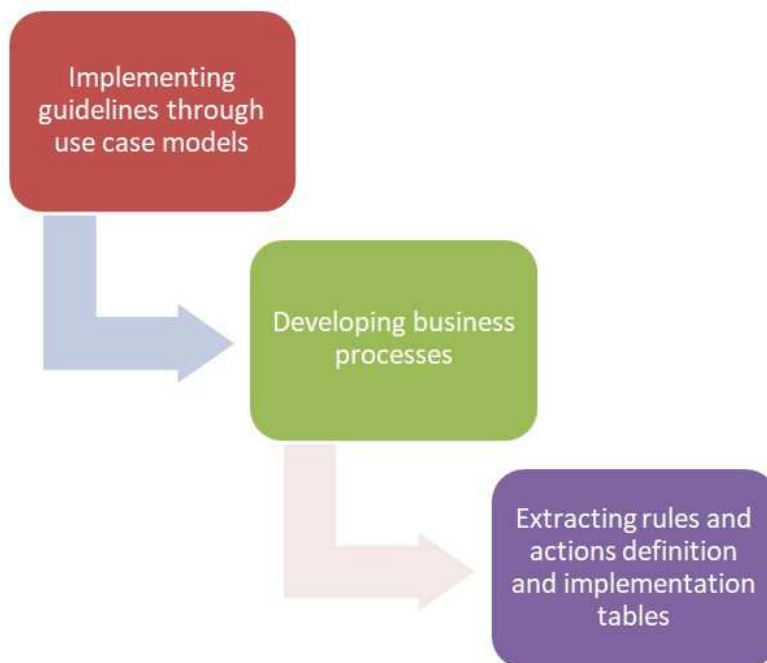
### Management

In patients with sarcopenia, prescription of resistance-based training may be effective to improve lean mass, strength, and physical function. We recommend clinicians consider protein supplementation/a protein-rich diet for older adults with sarcopenia. Clinicians may also consider discussing with patients the importance of adequate calorie and protein intake. Nutritional (protein) intervention should be combined with a physical activity intervention, and/or resistance-based training.



ICD-10 Code for Sarcopenia?
Is there any way to find the history and result of previous screening on EHR (Electronic Health Records)?
What is the definition of major health events? Is there any way to find it on EHR? Should clinician record or approve this condition in any visit?
How and where the result of screening should be recorded?
Should we provide any explanation or reference on how to do this?
Should we provide any explanation or reference on how to do this?
Should we provide it as a self-reporting form to patient or caregiver? (if yes, provide accepted version of questionnaire and its certified procedure)
Should we provide it as a medical calculator to clinician? (if yes, provide accepted version of questionnaire and its certified procedure)
To whom patient should be referred and how?
Is it necessary to receive and record the result of assessment?

# Interpretable modelling phase STEPS



## Interpretable modelling phase (1<sup>st</sup> Step)

- Implementing guidelines through use case models
  - Triggers: Any new condition or input can result in a series of suggestions based on the integrated guideline which can include medications, further evaluations, lifestyle modifications and patient education among the others
  - Actors:
    - Human users (e.g., clinicians, patients, informal caregivers)
    - Data sources or software (such as Electronic Health Record, Clinical Assessments)
    - Systems and services: including Polypharmacy management service, Patient Empowerment Platform
    - Devices and sensors: like Home monitoring sensors and other similar services
  - Scenarios: Interaction between the main or secondary actors and the CDS system. It is described by a set of scenarios to meet a fundamental goal in the system.

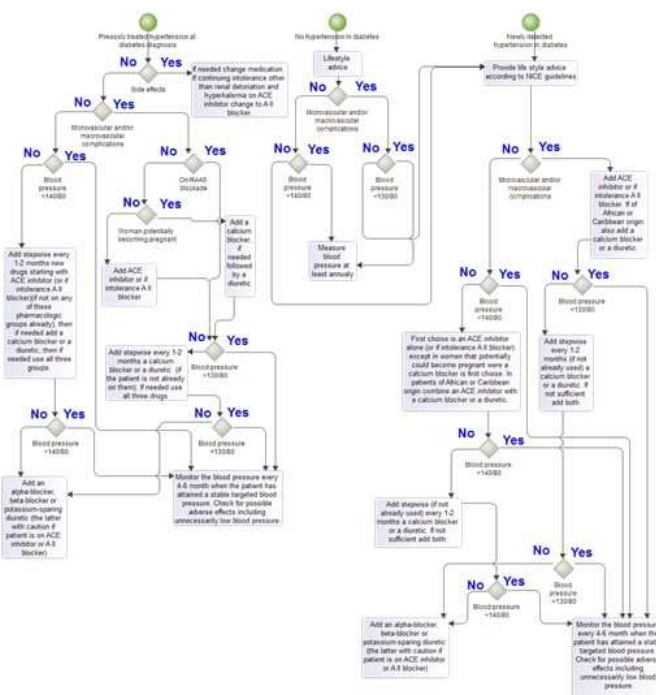
## Interpretable modelling phase (2<sup>nd</sup> Step)

- Developing business processes
  - Using business processes in combination with guideline flowcharts to extract
    - These may include but are not limited to
      - Decision tree pathway identification
      - The trigger event in any decision node
      - Switching and changing in states and actors and the expected results or targeted objectives.
      - The input
      - The output parameters to be conceptualized based on the CDS Hooks specification.

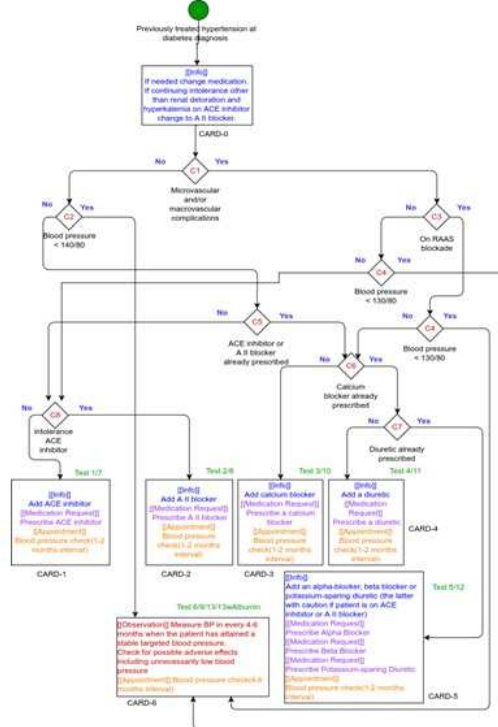
# Interpretable modelling phase (3<sup>rd</sup> Step)

- Extracting rules and actions definition and implementation tables
  - Using business processes in combination with guideline flowcharts to extract
    - These may include but are not limited to
      - Decision tree pathway identification
      - The trigger event in any decision node
      - Switching and changing in states and actors and the expected results or targeted objectives.
      - The input
      - The output parameters to be conceptualized based on the CDS Hooks specification.

# Diabetes - Blood Pressure Management



# Part of the BP management flowchart



# Blood pressure management module condition table



Condition No	Condition Clause
C1	If one of the following conditions exists: ICD[E11.2A, E11.2B, E11.4B, E11.4C, E11.4D, G63.2] OR If albumin secretion in urine is $\geq 30$ mg/l OR $\geq 20$ $\mu$ g/min OR $\geq 30$ mg/24h (depending how it is presented)
C2	If systolic blood pressure (LOINC[8480-6]) < 140 and diastolic blood pressure (LOINC[8462-4]) < 80 (Both from 55284-4)
C3	If medication ATC[C09] exists
C4	If systolic blood pressure (LOINC[8480-6]) < 130 and diastolic blood pressure (LOINC[8462-4]) < 80 (Both from 55284-4)
C5	If medication ATC[C09AA or C09CA] exists
C6	If medication ATC[C08] exists
C7	If medication ATC[C03] exists
C8	If condition ICD[T46.4X5A] or allergy ATC[C09AA] exists
C9	If observation LOINC[64234-8] (current smoker) has 373066001(yes)
C10	If observation LOINC[74013-4] (alcoholic drinks per day) > 0

## Localization phase



- At this phase models are ready to be implemented and customized based on the clinicians' opinion for different settings.
- This should be done in collaboration with the technical team and with considering legislative and ethical issues.
- When adaptation is completed, the pilot implementation can begin, and the system will be tested by simulated scenarios and data.
- Localization consists of
  - adaptation of inputs and outputs of CDS module and contents in accordance with the language, cultural and other specifications of the intended target settings.



an integrated patient-centered ICT-based solution,  
for improving the management of  
multimorbid elderly patients with dementia.

**Thank you for your attention**  
**Any questions?**

## 6.2.3 M. Gencturk et al. The design of a mobile platform providing personalized assistance to older multimorbid patients with mild dementia or mild cognitive impairment (MCI)







### The design of a mobile platform providing personalized assistance to older multimorbid patients with mild dementia or mild cognitive impairment (MCI)


**DSAI 2022 Conference**  
1<sup>st</sup> September 2022



**Mert Gencturk**, Gokce B. Laleci Erturkmen, Henrike Gappa, Wolfgang Schmidt-Barzynski, Antje Steinhoff, Pedro Abizanda, Timothy Robbins, Omid Pournik, Bilal Ahmad, Harpal Randeva, Oana Cramariuc, Theodoros N. Arvanitis, Jaouhar Ayadi, Yehya Mohamad, Mustafa Yuksel









MERT GENCTURK received the **B.S. and M.S.** degrees in **computer engineering** from Middle East Technical University, Turkey in 2012 and 2015, respectively.

**Ph.D. candidate** in computer engineering at the same university.

Working as a **technical manager and researcher** at SRDC Corp located in Ankara, Turkey.

Research interests include machine learning, federated learning, interoperability, and their application in the healthcare domain.

- A spin-off company of the Middle East Technical University, Software Research and Development Center (METU-SRDC) (Founded in 1991)
- **eHealth, Security, Factories of Future**
- SRDC has been involved in 33 EU Projects since 1998
- In 9 of these, SRDC has acted as coordinator
- In H2020, SRDC has been involved in 11 Projects
- **SRDC is the most successful SME in Turkey** in FP6, FP7, H2020



## Outline

- Problem
- CAREPATH project
- Methodology
- Design considerations
- Design of CAREPATH Patient Empowerment Platform (PEP)
- Conclusion

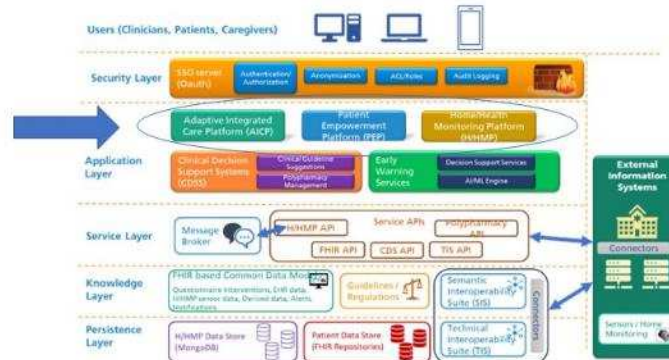
## Problem

- Management of multimorbidity is complex
- The situation becomes more complex, when multimorbidity is associated with dementia.
  - Multimorbidity can affect their dementia, impacting on its clinical course
  - Dementia can impact management of their multiple conditions, by hindering their effective management



## CAREPATH project

- Enhancement of healthcare interventions for the management of conditions of older multimorbid patients suffering from mild dementia or MCI through several platforms



## CAREPATH Patient Empowerment Platform (PEP)

- Provides personalized assistance and guidance to patients
- Sends reminders about care plan goals and activities
- Collects feedbacks from the patients via Patient Reported Outcome Measures (PROMs)
- In this work:
  - Human-centered design process of the CAREPATH PEP
  - Design challenges, iterative mock-ups
  - Target user group: Older multimorbid patients with mild dementia or MCI

## Methodology

- Collected user requirements through interviews
  - 16 patients over 65 years of age, living with mild dementia or MCI and with at least one chronic condition
  - 16 informal caregivers
  - 16 healthcare professionals
- Key scenarios & literature survey
- Identified main components and designed mock-ups
  - Daily tasks, Medications, Diet, Exercises, Appointments, Custom Tasks, Surveys, Symptoms & Events

## Design considerations

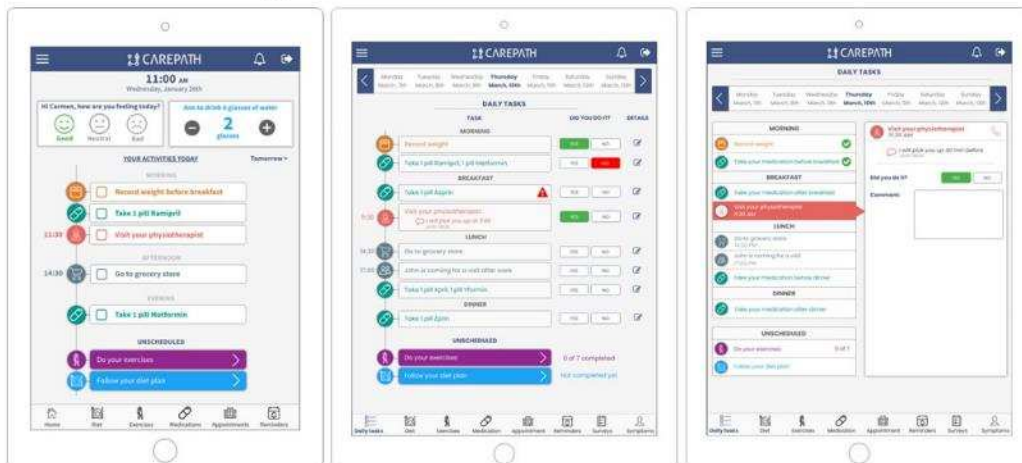
- Designed the app only for tablets
  - Reduces the cognitive load as it eliminates the use of an external keyboard or mouse
  - Larger screen, larger texts
    - Default font size 18pt as recommended by the Web Accessibility Initiative (WAI) of the World Wide Web Consortium (W3C) in the Web Content Accessibility Guidelines (WCAG) 2.1
- Built each screen in the same format
  - Consistency across the app is beneficial in improving patients' cognitive function in daily use
  - Minimizes the amount of information patients need to remember and learn, thereby avoiding disorientation and anxiety

## Design considerations

- Easy and clear language
  - Simple, direct and precise texts in order not to cause confusion
  - Avoided complex expressions and abbreviations
- Avoided using scrolling feature as much as possible
  - Dementia can cause motor impairment
  - People with reduced motor skills often have trouble using scrolling, resulting in disorientation

## Design of CAREPATH PEP – Daily tasks

- The first three designs:

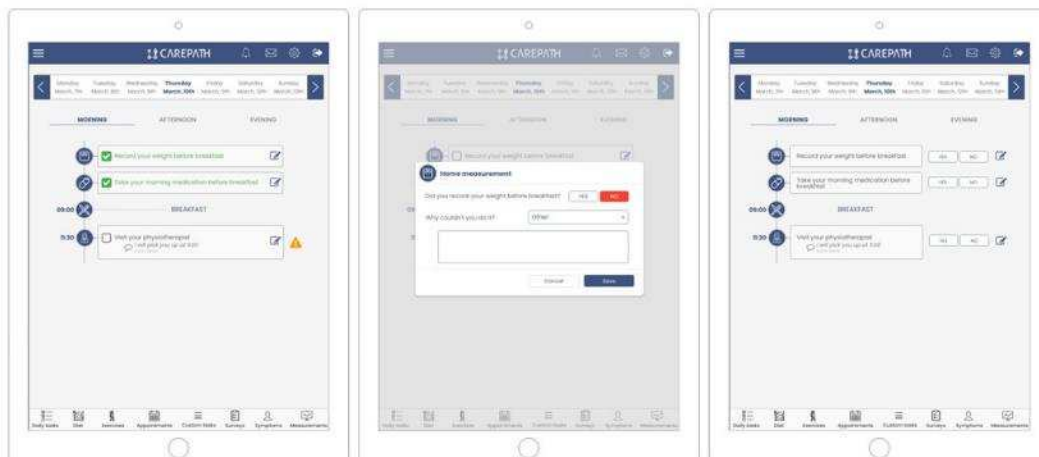


## Design of CAREPATH PEP – Daily tasks

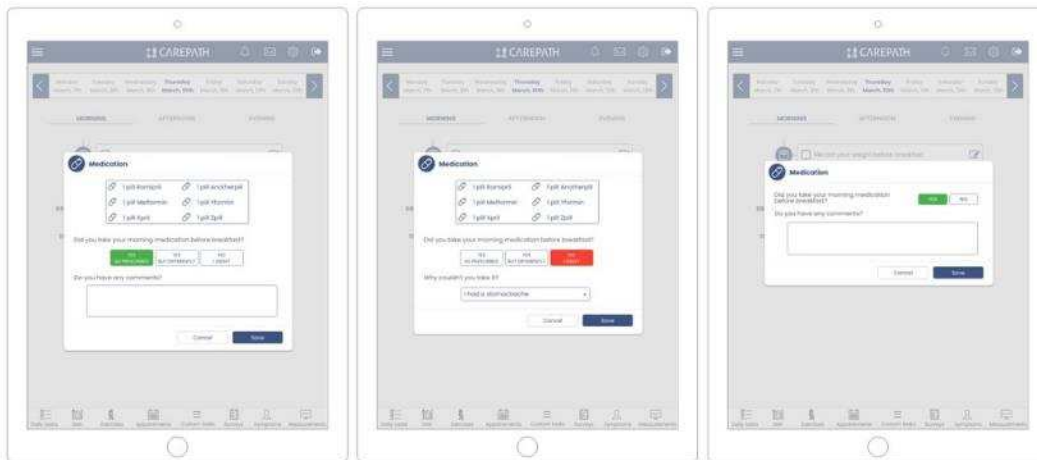
- Feedbacks retrieved:
  - Patients found the screen **very complex**. It was very tiring and incomprehensible to have too many items on the screen.
  - Patients found the **use of different colors confusing**. The purpose was to evoke patients of the task at a glance, but it did not create the desired impact when there are too many colors on a single screen.
  - Both the **design with checkbox** and **design with Yes/No buttons** were **appreciated**.

## Design of CAREPATH PEP – Daily tasks

- The final design:



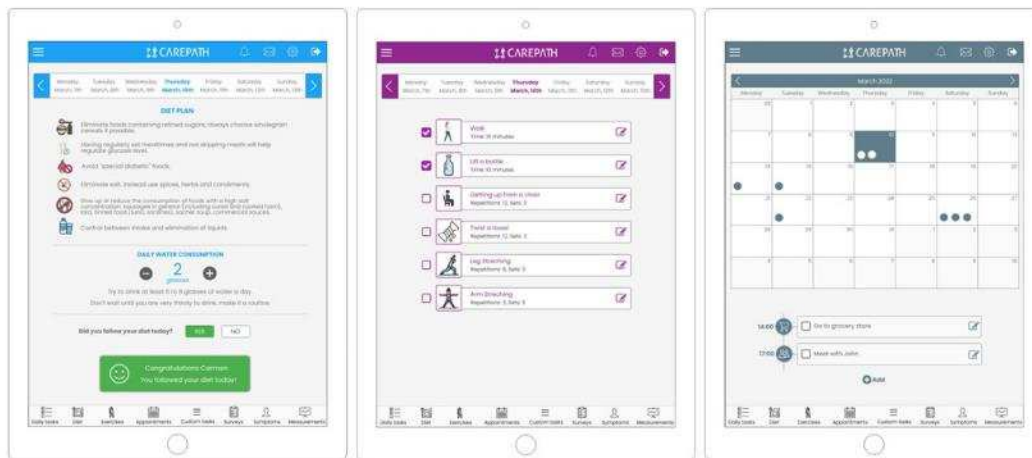
## Design of CAREPATH PEP – Medications



## Design of CAREPATH PEP – Push notifications

- One of the key components of CAREPATH PEP as they remind patients doing a task on time.
- How to clearly present a reminder message to patient is important.
- Send push notifications in **question-form** rather than **order-form**.
  - “Take your medication” -> NO
    - Patient could take the same medication again without remembering that he took it before.
  - “Have you taken your medication?” -> YES
    - Force the patient to remember and reduce the risk of taking the same medication twice.

## Design of CAREPATH PEP – Diet, Exercise, Calendar



## Conclusion and Future Work

- The application has been developed to run on Android tablets.
- A technical validation and usability study will be performed with 16 patients with mild dementia or MCI.
- Then, the application will be used by 208 patients and their informal caregivers in a clinical investigation study that will be conducted in four European countries
  - Spain, Romania, Germany, and the United Kingdom for two years within the scope of the CAREPATH project

Thank you...

[mert@srdc.com.tr](mailto:mert@srdc.com.tr)

[www.srdc.com.tr](http://www.srdc.com.tr)

 <https://www.linkedin.com/in/mertgencturk/>

<https://www.carepath.care/>

 <https://www.linkedin.com/in/carepath-project/>

 <https://twitter.com/CAREPATH2021>

## 7 Review status

Deliverable leader:	Sarah N. Lim Choi Keung (WARWICK)
Contributors:	Sarah N. Lim Choi Keung, Theodoros N. Arvanitis, Omid Pournik, Bilal Ahmad, Aboubacar Mchangama, Jaouhar Ayadi, Yehya Mohamad, Wolfgang Schmidt-Barzynski, Antje Steinhoff, Khoi Le, Mert Gencturk, Lionello Ferrazzini
Reviewers:	Oana Cramariuc (CITST) Luz Maria Longobardo (UCLM)
Approved by:	Theodoros N. Arvanitis (WARWICK)



## 8 Document History

Date	Changes	Version	Authors
24.11.2022	Initial draft of the deliverable	1v1	Sarah Lim Choi Keung
12.12.2022	Updated draft with inputs from partners	1v2	Sarah Lim Choi Keung, Aboubacar Mchangama, Antje Steinhoff
20.12.2022	Updated draft with further inputs from partners	1v3	Sarah Lim Choi Keung, Theo Arvanitis
23.12.2022	Updated draft with inputs from partners and reviewers	1v4	Sarah Lim Choi Keung, Yehya Mohamad, Oana Cramariuc, Luz Maria Longobardo, Ana Magdalena Vargas Martinez

- End of document -