Oscar Zanutto, Sara Ceron & Hein Raat (Eds.)

The ValueCare experience:

Creating value for older people with chronic conditions in Europe with a transition towards outcome-based integrated care supported by technology

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The ValueCare experience

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Edited by: Oscar Zanutto, Sara Ceron, Hein Raat

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Preface

By Javaria Mona Khalid
Chair, ValueCare Advisory Board

Over the years, the healthcare landscape has undergone significant changes. Life expectancy has risen, populations have aged, and medical advancements have surged at an unprecedented pace. These developments have placed immense pressure on health systems and governments around the world to find ways to reduce healthcare costs while simultaneously improving outcomes for increasingly ageing populations. Addressing this issue is a formidable endeavour.

The challenge becomes more acute when considering the sharp rise in healthcare costs associated with ageing. Expenses escalate notably for individuals aged 65 and older, and projections indicate that by 2050, there will be 1.5 billion people in this age group, double the number from 2022 (United Nations, 2019). This demographic shift necessitates a strategic overhaul of how healthcare is funded and delivered; a sustainable path must include a transition from the traditional volume-based approach to healthcare. It is also clear that this transition must be centred in a model that prioritises patient outcomes.

The genesis of this movement can be tracked to Michael Porter's strategy to fix healthcare. As detailed in his seminal work 'Redefining Health Care', this shift moves away from volume-based models and emphasises the importance of efficient delivery of health outcomes that truly matter to patients, known as value-based healthcare (VBHC). At the forefront of this is the International Consortium for Health Outcomes Measurement (ICHOM) which is defining standardised outcome sets for various health conditions. By incorporating the insights of leading physicians, measurement experts, and patients themselves, ICHOM has developed comprehensive frameworks that guide healthcare providers in delivering care that aligns with patients' values and preferences. The culmination of these efforts is evident in the ValueCare project, an ambitious initiative aimed at implementing VBHC principles across multiple European pilot sites.

The ValueCare project exemplifies how the principles of VBHC can be operationalised in real-world settings. It underscores the need to adapt care to the unique needs of each patient, ensuring that interventions are both effective and important from the patient's viewpoint. Central to the ValueCare project is the concept of shared decision-making (SDM). SDM represents a paradigm shift in the patient-provider relationship, fostering a collaborative environment where patients are actively involved in their care decisions. This approach not only enhances patient satisfaction but also improves health outcomes by aligning care with what patients value most. The project's implementation of SDM across its pilot sites has been a testament to the power of this approach, demonstrating significant improvements in patient engagement and overall care quality.

This book aims to guide healthcare managers and practitioners by providing practical insights and strategies to implement VBHC. By sharing real-world examples and lessons from the ValueCare project, this book demonstrates how VBHC can be effectively integrated into existing systems. It serves as both a roadmap and an inspiration for those committed to transforming healthcare delivery.

Each chapter of this book offers a detailed exploration of the various components that constitute the ValueCare project. From the development of tailored outcome measurement sets to the deployment of digital tools for seamless care coordination, the book provides a comprehensive overview of how VBHC can be effectively implemented. It also addresses the challenges encountered along the way, offering valuable insights into the practicalities of transforming healthcare delivery.

The chapters that follow are an illustration of the collaborative spirit that underpins the ValueCare project. They reflect the dedication and ingenuity of countless healthcare professionals, researchers, and patients who have contributed to this initiative. Their collective efforts have not only advanced the field of VBHC but have also set a new standard for patient-centred care.

The ValueCare project's success is not merely measured by the improvements in patient health outcomes but also by its impact and learnings for healthcare systems as a whole. By emphasising prevention and proactive management of health risks, the project aims to reduce the burden on healthcare resources while enhancing the quality of care. This dual focus on patient outcomes and system efficiency represents a sustainable model for the future of healthcare.

As you embark on this journey through the pages of this book, I invite you to reflect on the profound impact that VBHC can have on the lives of patients and the functioning of healthcare systems. The lessons gleaned from the ValueCare project are not just theoretical constructs; they are practical strategies that can be applied to improve healthcare delivery worldwide.

In closing, I extend my deepest gratitude to all who have been part of this transformative journey. Your commitment to prioritising patient outcomes has paved the way for a future where healthcare is not just about treating diseases but about enhancing the overall well-being of individuals within a sustainable ecosystem. This book is a tribute to your unwavering dedication and a guide for others to follow in these footsteps.

REFERENCES

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TABLE OF CONTENTS

LIST OF ABBREVIATIONS

AI	Artificial Intelligence
AMC	Athens Medical Centre
API	Application Programming Interface
AULSS2	Azienda Unita Locale Socio Sanitaria N2 Marca Trevigiana
BMI	Body Mass Index
BP	Blood Pressure
CDC	Caritas Diocesana de Coimbra
CEA	Cost Effectiveness Analysis
CEO	Chief Executive Officer
COVID-19	Corona Virus Disease 2019
CVD	Cardio Vascular Disease
ΕΔΔΙΠΦΥ	Hellenic Network for Diabetes in Primary Care
EHR	Electronic health Record
EU	European Union
FBK	Fondazione Bruno Kessler
FFQ	Food Frequency Questionnaire
GDPR	General Data Protection Regulation
HCQO	Healthcare Quality and Outcomes Indicators
HTTP	Hypertext Transfer Protocol
IC	Informed Consent
ICHOM	International Consortium for Health Outcomes Measurements
ICP	Integrated Care Pathways
ICPOP	Integrated Care Programme for Older People
ICT	Information and Communication Technology
iMTA	Institute for Medical Technology Assessment
IPAQ	International Physical Activity Questionnaire
iPCQ	iMTA Productivity Cost Questionnaire
IPU	Integrated Practice Units
ISRAA	Istituto per Servizi di Ricovero e Assistenza aglia Anziani
IT	Information Technology
iVICQ	Valuation of Informal Care Questionnaire
LMICs	Low and Middle Income Countries

MCI	Mild Cognitive Impairment
MMSE	Mini Mental Sate Examination
MoCA	Montreal Cognitive Assessment
MRQ	Motivation for Reading Questionnaire
NQMC	National Quality Measures Clearinghouse
OECD	Organisation for Economic Co-operation and Development
PREMS	Patient Reported Experience Measures
PHQ	Patient Health Questionnaire
POSSASDIA	Diabetic Persons Advocacy Group
PROMIS	Patient-Reported Outcomes Measurement Information System
PROMS	Patient-Reported Outcome Measures
QALY	Quality Adjusted Life Year
QoL	Quality of Life
RAPA	Rapid Assessment of Physical Activity
SDM	Shared Decision Making
SHARE	Survey of Health, Ageing and Retirement in Europe
SNAQ	Short Nutritional Assessment Questionnaire
SUS	System Usability Scale
T2DM	Type 2 Diabetes Mellitus
TDABC	Time Driven Activity Based Costing
UCLA	University of California - Los Angeles
UK	United Kingdom
UN	United Nations
US	United States
VBHC	Value-Based Health Care
VFI	VodaFone Innovus
WHO	World Health Organisation

LIST OF FIGURES

LIST OF TABLES

Chapter 1

The ValueCare project: an introduction

Demi Cheng, Amy van Grieken, Leticia Pérez, Mireia Ferri, Maite Ferrando, Alejandro Gil Salmerón, and Hein Raat

1.1 INTRODUCTION TO THE VALUECARE PROJECT

1.1.1 Response to call SC1-DTH-11-2019

The ValueCare project was a response to the Horizon 2020 call ‘Societal Challenge 1-Digital Transformation in Health and care-11-2019 (SC-DTH-11-2019): large scale pilots of personalised & outcome based integrated care’ in 2019. The specific challenge described in the call was the higher risk for senior people to be cognitively impaired, frail, and have multiple chronic health conditions that have impact on their autonomy and quality of life (QoL) but also the sustainability of health and social care systems. According to the need for secure, scalable, and robust digital solutions for integrated care that ensure a personalised delivery of care, supporting outcome-based gains existed. Large-scale pilots to test personalised digital solutions with integrated care to support older people were requested. One of the greatest public health successes of the 20th century is the increase in life expectancy that has been observed globally (Bally et al., 2022). In 2019, the global population aged ≥ 65 years was estimated to be 703 million, and this number is expected to double by 2050 (United Nations, 2019). It has been reported that there is a correlation between ageing and a higher risk of frailty, multimorbidity, and cognitive impairment (Bally et al., 2022). A lack of coordination is often a result of the fact that older people receive care from multiple providers (Bally et al., 2022). With a common goal and inspiration to achieve this, a consortium was established with 17 partners across Europe from 8 countries to submit a proposal to this call: the ValueCare project.

1.1.2 What is the project about?

The ValueCare project is about a value-based methodology for integrated care that is enabled by information and communication technology (ICT). The aims were to develop and implement efficient outcome-based, integrated health and social care for older people with multimorbidity and/or frailty, and/or mild to moderate cognitive impairment in seven pilot sites across Europe (Bally et al., 2022):

- Athens, Greece
- Coimbra, Portugal
- Cork and Kerry, Ireland
- Rijeka, Croatia
- Rotterdam, the Netherlands
- Treviso, Italy
- Valencia, Spain

The project had a pre-post-controlled study design with an intervention and control group and three measurement time points (baseline, post-intervention after 6-12 months, and follow-up after 10-18 months) (Bally et al., 2022). Each pilot site had to include a certain number of participants: 120 older people in the intervention group and 120 older people in the control group, 50–70 informal caregivers (e.g. relatives, friends), 30–40 health and social care practitioners and 5-10 care coordinators, managers or IT experts.

The ValueCare project aimed to develop a scalable, robust and secure digital solution that is co-designed with the end users (older people, their informal caregivers, and health and social care professionals). The project intended to satisfy the ‘Quadruple Aim’ of improved care experience, better outcomes for citizens, optimisation in the use of resources, and job satisfaction and well-being of care team members (Bally et al., 2022). As also listed in the design paper of the project by Bally et al. (2022, p. 3), the exact purposes of the project were:

1. To compare the benefits of the ValueCare approach versus usual care for older people with regard to indicators of health, well-being, QoL, lifestyle behaviour, and health and social care use.
2. To evaluate the benefits of the ValueCare approach for older people’s caregivers (e.g. relatives, friends), and health and social care practitioners in terms of well-being, perceived burden and (job) satisfaction.
3. To evaluate the acceptability, appropriateness, feasibility, fidelity, and costs of the ValueCare approach.

1.2 VBHC MODEL

1.2.1 What is the VBHC model?

The search for patient care excellence in the constantly changing healthcare environment has prompted the investigation of novel approaches. The value-based healthcare (VBHC) model is an example of a paradigm shift that has gained popularity (Steinmann et al., 2024). This model optimises the trade-offs between cost, quality, and patient experience to maximise value for patients (Porter, 2010; van Hoorn et al., 2024). The general framework of the ValueCare project is based on this VBHC model that was developed by Michael Eugene Porter (M.E. Porter). This sub-chapter explores the potential advantages of VBHC and discusses how the value-based interventions in the ValueCare project, in comparison to traditional standard care, may improve patient satisfaction and care quality.

VBHC is a healthcare delivery and reimbursement model that focuses on providing the highest possible value to patients, where value is described as the health outcomes achieved that matter to patients, considering also their experiences and costs related to the entire care cycle delivery over time (Porter, 2010). In traditional fee-for-service healthcare models, providers are paid based on the volume of services they deliver, often without paying attention to the actual outcomes and quality of care provided. In contrast, value-based healthcare aims to align financial incentives with the quality and effectiveness of care (Porter, 2010).

According to Porter & Teisberg (2006), the key principles and components of a VBHC model are:

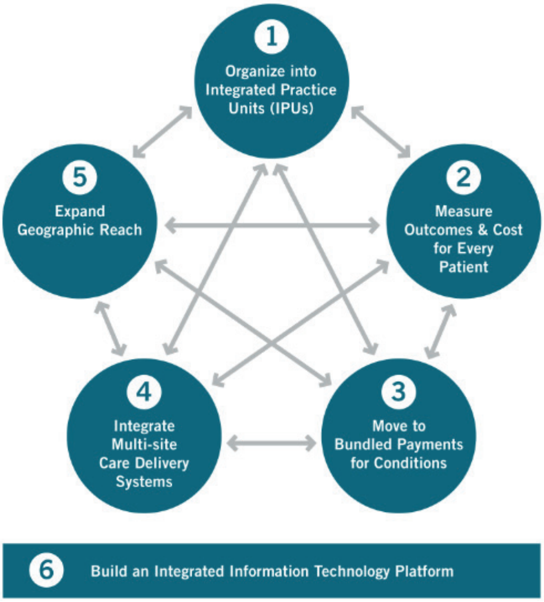
1. **Patient-centred Care:** VBHC places a strong emphasis on patient-centred care, where the needs, preferences, and goals of patients are central to treatment decisions. It aims to improve the patient experience and engage patients in their own care.
2. **Measuring Outcomes:** In a VBHC model, healthcare providers track and measure patient outcomes and quality of care using specific metrics and indicators. These can include clinical outcomes (e.g., reduced mortality, improved functional status), patient-reported outcomes (e.g., QoL), and process outcomes (e.g., adherence to evidence-based guidelines).
3. **Cost Transparency:** Understanding the cost of care is essential in VBHC. Providers are expected to have transparency in pricing and to work on reducing the overall cost of care while maintaining or improving outcomes.
4. **Care Coordination:** VBHC often involves better coordination of care across different healthcare providers and settings to ensure that patients are given the right care at the right moment. This can contribute to the reduction of service duplication and improve the overall efficiency of healthcare delivery.
5. **Payment Reform:** Payment structures are reformed in value-based healthcare. Instead of fee-for-service payments that reward volume, providers may be reimbursed based on outcomes, bundled payments for a specific episode of care, or capitated payments per patient. These models incentivise cost-effective and high-quality care.
6. **Performance Incentives:** In VBHC, financial incentives are tied to the achievement of specific quality and outcome targets. Providers may receive bonuses for meeting or exceeding these targets and may face penalties for underperforming.
7. **Data and Technology:** Advanced data analytics and health information technology play a crucial role in VBHC. Providers use real-world data to monitor outcomes, identify areas for improvement, and make evidence-based decisions about patient care.
8. **Continuous Improvement:** VBHC is an iterative process that emphasises continuous improvement. Providers and healthcare organisations regularly review data and outcomes to identify opportunities for enhancement in care delivery.
9. **Population Health Management**: VBHC extends beyond individual patient care to consider the health of populations. This involves addressing social determinants of health, providing preventive care, and managing the health of a defined patient population.

The goal of VBHC is to improve the quality of care while controlling costs, ultimately leading to better health outcomes for patients (Porter, 2010). There are already several applications of VBHC in the healthcare domain, but fewer VBHC applications can be seen in the field of care for older people (Klop & Rutte, 2021). Moreover, the implementation of VBHC in social care is still lagging. The ValueCare project represents a step ahead in the adaptation and implementation of Porter's VBHC model in the field of health and social care for older people. The core of the VBHC model is the outcome-driven approach. According to Porter's approach, the entire care process is based on the organisational endeavour to reach the specific outcome set that matters for each patient (Porter, 2010).

1.2.2 Application of the VBHC model in the ValueCare project

In the ValueCare project, the health outcomes (i.e. the 'values' that are relevant to the older people) that are used to bring VBHC into practice are being collected via self-reported questionnaires. Considering the seven pilots' patients' diversity, in terms of diseases, the ValueCare pilot sites were free to include other outcome measurements in addition to the general health questionnaire for older people that was based on the standard proposed by the International Consortium for Health Outcomes Measurement (ICHOM). This is a standardised set of approximately 6 to 14 outcomes that was developed in an iterative process with physicians and healthcare providers (ICHOM, 2023). See chapter 3 for a full overview of the health outcomes measured within the project. The outcomes are decided for each patient based on a shared decision-making process between each pilot's care staff members experts and the patient. The VBHC model in the ValueCare project is based on the 'building blocks' for an organisational change towards a "value-based" driven organisation that was proposed by Stowell & Akerman (2015). Figure 1 shows the principles and concepts of Porter that formed the design of the model in the project.

Figure 1. The VBHC Agenda (Harvard Business School, Institute for Strategy and Competitiveness, n.d.)



Note. This image was reprinted from Harvard Business School (2024). Key Concepts Value-based healthcare. Institute for Strategy & Competitiveness. https://www.isc.hbs.edu/health-care/value-based-health-care/key-oncepts/Pages/default.aspx

The VBHC model was applied in each of the seven pilot sites; every pilot adapted the VBHC core concepts to the specific patient condition of the pilot site. Pilot sites created local stakeholder connections, redesigned care pathways and created and adapted the contents of the ICT ecosystem to achieve better user health outcomes. The value calculation was done by the definition of the three elements that feed the numerator and the denominator of the VBHC's formula (Cossio-Gil et al., 2021). The consortium adopted a specific tool that was created for the calculation of the Quality Adjusted Life Years (QALY). This tool was previously used in research that has demonstrated how to go beyond cost-effectiveness analyses (CEA); this tool can be used to integrate all relevant information regarding the implementation of VBHC in a pilot site (Walraven et al., 2021). This tool was chosen because the generic outcome of a CEA, usually expressed in QALYs, has the advantage of capturing both gains from reduced morbidity and reduced mortality with the potential to compare interventions in different areas of healthcare (Drummond et al., 2015). Generic measurement instruments settle for less individual sensitivity in favour of measurement feasibility. Although there are several generic measures of health gain, QALY is the most widely used. VBHC, however, advocates for a condition-specific approach. Treatment pathways and outcomes ought to be defined and measured around clearly defined medical conditions. A condition-specific approach might provide additional insights, and it is therefore advised to not only include generic but also disease-specific outcome measures (Porter, Larsson & Lee, 2016).

Key aspects and goals of the ValueCare project include the following:

1. The ValueCare project radically rethinks how healthcare is delivered. It places a strong emphasis on creating a **patient-centred environment** by understanding patient requirements, preferences, and outcomes.
2. The interventions in the ValueCare project started with recognising the individuality of every patient. **Care plans** tailored to each patient were developed using evaluations of their lifestyle, preferences, and state of health. This method aims to ensure that interventions are in line with the patient's values and goals.
3. Care coordination has been transformed into an artistic endeavour in the ValueCare project. Healthcare professionals working together and exchanging data and insights to maximise patients' experiences inside the healthcare system. This **cooperation** aims to minimise duplication, lower errors, and improve the overall effectiveness of healthcare delivery.
4. The **results** of the ValueCare project in terms of quality of care are expected to be better than those of traditional care models.

5. The ValueCare project emphasises **the ongoing measurement of results**. Healthcare professionals can pinpoint areas for improvement and make adjustments to improve the efficacy of interventions by utilising robust measurements and benchmarks. Healthcare teams may adjust and improve their tactics with the help of real-time feedback loops, which could eventually improve patient outcomes.
6. The project views **preventive care** as a pillar and extends beyond addressing urgent illnesses. Through proactive management of health hazards and wellness promotion, this paradigm enhances individual results while also improving community health overall.
7. A core component of the project is **shared decision-making.** Patients actively participate in the decision-making process, and healthcare professionals communicate openly with them regarding available treatments, associated risks, and advantages. Patients should feel more empowered by this cooperative approach, which raises their level of satisfaction with their care.
8. ValueCare uses **digital technologies** to make patient health information easily accessible. From making appointments to viewing test results, patients can follow the path of their care. This openness fosters a sense of ownership and control over one's health, in addition to improving patient happiness.

Despite the potential of the VBHC approach, the implementation of the ValueCare project was not without challenges. Adoption necessitates financial investments, a sustained dedication to continual improvement, and a culture shift inside healthcare institutions. These difficulties may be justified by the possible gains in patient health prevention along with disease evolution. To sum up, the ValueCare project offers a revolutionary method of providing healthcare. The project aimed to transform patient care by emphasising value creation, personalisation and collaboration. It offers a path forward for a healthcare system that not only treats illnesses but also improves the general well-being of people and communities. The adoption of this approach by healthcare organisations is accelerating the transition to a high-value and patient-centred care ecosystem.

1.3 INTEGRATED CARE

1.3.1 Integrated care for older people

In its broadest sense, integrated care refers to the organising principle for care delivery to achieve improved care through better coordination of services provided (Scobie, 2011). Historically, integrated care has been conceptualised based on the issues it aims to address, which include services that are fragmented, under-resourced primary care, and health systems that do not adequately cater to the needs of an ageing population suffering from multiple chronic diseases (Ferrer and Goodwin, 2014; Lennox-Chhugani, 2021). For this reason, the concept of integrated care challenges the current construction of healthcare systems focused on acute, episodic illness (Nolte, 2021).

Lennox-Chhugani (2021) identified continuity and coordination as the two core defining elements of integrated care. Integrated care includes ‘’initiatives seeking to improve outcomes of care by overcoming issues of fragmentation through linkage or coordination of services of providers along the continuum of care’’ (European Commission, 2017, p. 2). In this regard, continuity refers to a seamless experience for the person who receives formal and informal care across organisational, sectoral, and professional boundaries, enduring over time (Lennox-Chhugani, 2021). Likewise, coordination involves managing transitions between different professions, organisations, or sectors during multiple episodes of care.

For that reason, integrated care is an approach to counteracting care fragmentation and ensuring that potential adverse effects on people’s care experiences and care outcomes are prevented (Goodwin, 2016). Therefore, integrated care aims to deliver person-centred care within a network of care provision in a continuous and coordinated way (Lennox-Chhugani, 2023). In particular, older people receive care from multiple providers at various sites and time points in their care process, particularly when managing a condition, i.e., outpatient units, primary care practises, specialty clinics, hospitals, and others (Bally et al. 2022). The involvement of various health and social care organisations and professionals can often result in a lack of coordination, which can result in poor health outcomes, repeat hospital visits, polypharmacy, and lower satisfaction with care (Mohr and Dessers, 2019).

Integrated care for older people reflects ‘’a continuum of care that helps to reorient health and social services towards a more person-centred and coordinated model of care that helps optimise older people’s intrinsic capacity (physical and mental capacities) and functional ability’’ (Integrated care for older people – ICOPE, 2022, p. VI). Integrated care has been shown to improve patient outcomes (Rocks et al., 2020) and minimise the risk of hospital admissions and improve patient satisfaction with their care experience among older people and individuals living with chronic conditions (Damery et al., 2016; Liljas et al., 2019). Integrated care has been recognised as a means to better organise care processes for older people and support them to live well in their home setting (Redding et al., 2013; Noordman et al., 2015; Van der Heide et al., 2015). Additionally, integrated care has been recognised for its ability to facilitate value-based healthcare and increase value for patients, healthcare professionals, managers and other stakeholders involved in the care process (Porter, 2010).

1.3.2 Integrated care in the ValueCare project

The ValueCare project sought to co-design integrated care based on the values of the key target group (older people, informal caregivers and health and social care providers) supported by digital health technology, and tested in seven pilot sites across Europe (Darley & Carroll, 2022). The inclusive co-design approach within the exploratory study (see next section) aligns with the pillars of integrated care (Lewis and Ehrenberg, 2020), most notably being people as partners in care, shared values and vision, and digital solutions.

1.4 CO-DESIGN

1.4.1 Co-design and its importance for integrated care

Co-design is understood as a methodology aimed at enhancing the design of better healthcare experiences for individuals, their caregivers, and care professionals (NHS,2019). This specific approach is characterised by its value-driven nature, emphasising education, empowerment, and iterative collaboration. Co-design considers patients and care providers as equal partners in the design process, steering clear of assumptions about what may be beneficial to them and instead relying on their lived experiences to inform solutions (Donetto et al., 2015; Boivard et al., 2019). The adoption of co-design in the development of health and social care is recognised for its ability to foster a deeper understanding of people's priorities and preferences in care, ultimately influencing and improving their overall experience within the care process.

Since integrated care has been recognised for its ability to facilitate value-based healthcare and increase the value for patients, healthcare professionals, and other stakeholders involved in the care process (Porter, 2010), the ValueCare project sought to co-design integrated care based on the values of these key stakeholders. The choice of a co-design approach was deliberate, as it was deemed suitable for exploring and identifying the values and care needs of patients, ultimately leading to the development of an integrated care model across all seven pilots. Therefore, co-design within the ValueCare project refers to the process of collaborating with patients to create a new value-based integrated care model (Darley & Carroll, 2022). This model is reinforced by a digital solution designed to advance patients' health and social goals, provide support for informal caregivers, and enhance working conditions for healthcare professionals in clinical practice (Bally et al., 2022).

It is known that the implementation of people-centred care requires strategies that respond to local conditions and contexts and that involve local stakeholders (Sanz et al., 2021). As such, in the ValueCare project, each pilot adopted a flexible approach, utilising a combination of in-person and online methods to conduct co-design activities with project stakeholders. This adaptability became particularly crucial due to the physical constraints imposed by the COVID-19 pandemic. The co-design methods employed in the ValueCare project encompassed a diverse range of activities, including interviews, focus groups, national seminars, world cafes, meetings, presentations, user testing sessions, and a digital literacy survey.

1.4.2 Co-design process in the ValueCare project

Co-design activities in the ValueCare project were designed and developed based on the characteristics of the target groups involved in pilot sites. To follow the co-design experience-based principles, a framework to implement the co-design activities was defined and structured into three rounds. **The first round of co-design** activities focused on defining key aspects such as the perception of value, the appropriate digital solution and treatment pathways. This foundational stage laid the groundwork for understanding the fundamental elements that would shape the integrated care model. **The second round of co-design** activities enabled realistic collaboration among health and social service professionals and citizens in co-designing the new integrated care approach with iterative sessions to guarantee that the final solution responds to what the end-users need. This phase emphasised the importance of practical collaboration in refining and tailoring the integrated care model. Finally, **the third round of co-design** activities addressed critical aspects such as comprehensibility, usability, and potential deployment issues associated with the technical solutions. This proactive step involved evaluating and fine-tuning the technical solutions before their full-scale implementation in the trial, emphasizing a commitment to optimizing the effectiveness and user-friendliness of the proposed solutions.

In the course of the three rounds of co-design activities within the ValueCare project, the proposed methods included national seminars, world cafes, and focus groups (Ferri & Ferrando., 2020). Initially, these activities were suggested with specific target groups and content in mind. However, following internal discussions among project partners, a consensus was reached that allowed pilot sites the flexibility to adapt these methods according to their normal procedures, both in terms of target groups and content. **National seminars** were conceived as open meetings for discussion or training aimed at gathering information to build the ValueCare concept and solution and to present project progress and results (Ferri & Ferrando, 2020). Pilot researchers brought together a large number of stakeholders who are working in the area of the pilot site's specific target condition. Suggestions on how the ValueCare concept and the digital solution should be were collected. The **World Café**, set in an informal café environment, facilitated group discussions on the project's core elements: the ValueCare concept and IT solution. Once the ValueCare concept and the IT support solution were defined by the scientific/technical partners according to the information collected during the national seminars, each pilot site organised these World Cafés to present the ValueCare concept and IT-supported environment, enabling end-users to participate in discussion sessions together to provide valuable feedback on the ValueCare approach. Lastly, **focus groups** were concise events lasting no more than 2 hours, involving small groups of around eight people aimed at collecting qualitative data to gain deep insight into the information, by creating accepting environments where participants felt comfortable sharing their concrete experiences with the rest of the group and giving their opinion (Ferri & Ferrando, 2020). Questions and discussion points were introduced in a group setting to encourage participants to interact with each other, speak and to provide their opinions on the raised topics. In addition to the previous activities described, the ValueCare project took innovative measures to adapt to the challenges posed by the COVID-19 period. Partners developed a video to introduce and socialise the ValueCare project, laying the groundwork for co-design activities. Moreover, pilot sites also initiated online activities, such as interviews and utilising social networks, during this period. Additionally, recognising the challenges in the recruitment process, participants were actively involved in co-design activities, fostering better engagement, adherence, commitment, and retention within the project. This strategy aimed to ensure active participation, prevent dropouts, and enhance the overall success of the project despite the constraints imposed by the pandemic. The implementation of co-design activities provided the pilots with a deeper understanding of the end-users of the ValueCare concept, enabling them to anticipate potential issues, barriers, or difficulties during project implementation.

1.5 ICT SOLUTIONS AND DIGITAL HEALTH TECHNOLOGY FOR INTEGRATED CARE

1.5.1 ICT solutions in healthcare

The use of supportive digital health technology might bring advancements to integrate health and social care for older adults (Øvretveit, 2017), as this group transitions across care sectors and settings. Digital health technologies are being increasingly developed to allow older adults to keep their functional independence as they get older (Ienca et al., 2021). Digital health technology has been valued for its ability to reduce the structural, financial and physical barriers to accessing care for older adults (Kemp et al., 2021; Ahmed et al., 2016). Nonetheless, older adults may experience inequity due to limited exposure to existing technology, low levels of digital literacy, negative perceptions of usefulness and individual physical and cognitive impairments which may inhibit their ability to use digital health technologies in their daily lives (McDonough, 2016). Therefore, it is needed to have more knowledge on how to adapt integrated care interventions enhanced by ICT for older people in individual settings, additionally, more understanding regarding effectiveness and cost-effectiveness of interventions is also necessary (Burke et al., 2021; Franse et al., 2018).

1.5.2 Use and application of ICT in the ValueCare project

In the ValueCare project, three partners have developed the ValueCare digital solution that was adapted to the target population of each of the seven pilot sites. After adaptation, it has been tested among older adults, informal caregivers (e.g. relatives) as well as health and social care professionals. The three main components of the ValueCare digital solution are:

- A web dashboard (platform) for participant registration and personalised care planning, which enables professional care team members and authorised (informal) caregivers to monitor the progress of the participant.

- A mobile app that helps participants to set, alter and track their health goals in several health areas. The app also provided access to educational materials. Some pilots had extra features included in the app to provide additional value for their specific target group.
- A virtual coach (chatbot) integrated into the mobile app that participants can use to chat with. The chatbot helps the participants with their health goals by providing motivational feedback and reminders. Participants could allow notifications to receive timely alerts and updates.

The ValueCare digital solution is discussed in more detail in chapter 6 of this book.

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Chapter 2

The European way for VBHC transformation of health and social care services

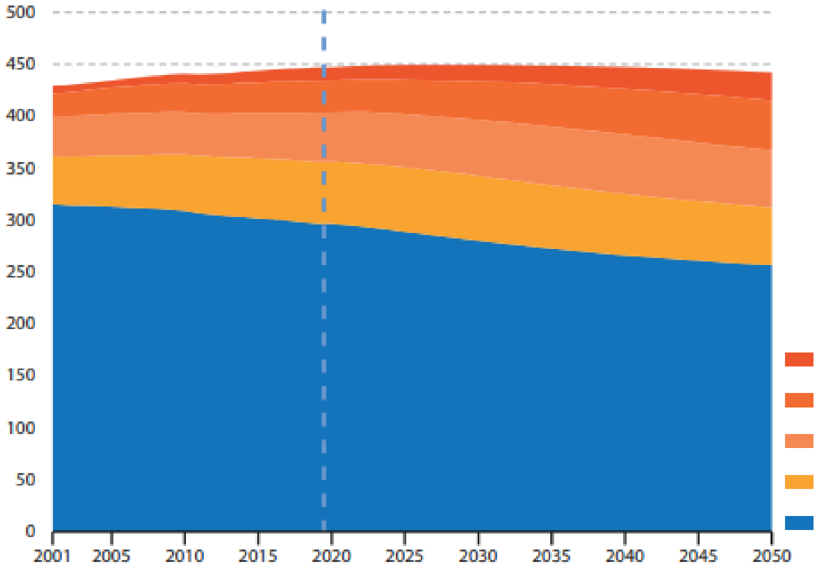
Oscar Zanutto, Sara Ceron, Stefania Macchione, Natalia Allegretti, and Hein Raat

2.1. VBHC MODEL IMPLEMENTATION PATHWAY

2.1.1 The increasing demand for care: the 2050's wave

In 2050, the ageing curve of the world population will reach its peak as the baby-boomers generation will reach its long-lived completion by that time. What deserves further investigation is the relationship between some phenomena connected to this trend to understand the impact that we should expect as individuals, communities, public authorities and, above all, as services to deal with ageing challenges. It is important to note that the largest percentage increase in the population will occur in the 65-74, 75-84 and over 85 years cohorts (see figure 2).

Figure 2. Population by age group EU27 2001-2050 (Eurostat, 2020a)

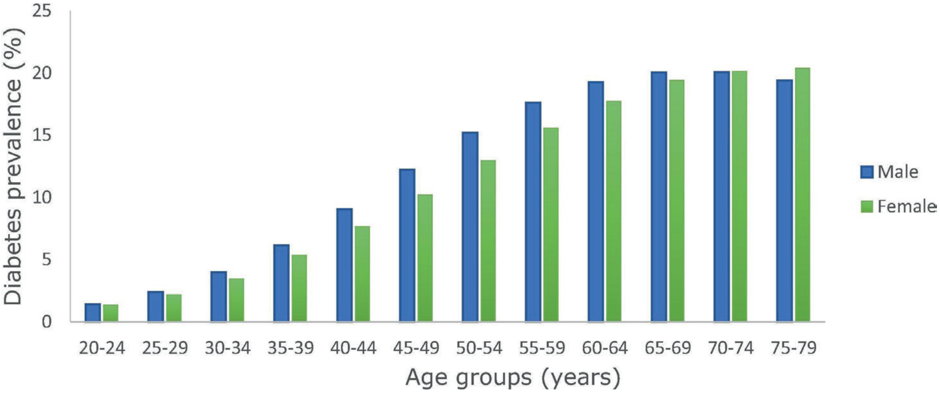


Note. This image was reprinted from the statistical book Ageing Europe | Looking at the lives of older people in the EU | 2020 edition by Eurostat. Luxembourg: Publications Office of the European Union, 2020. ISBN 978-92-76-21520-2. doi:10.2785/628105. https://ec.europa.eu/eurostat/documents/3217494/11478057/KS-02-20-655-EN-N.pdf/9b09606c-d4e8-4c33-63d2-3b20d5c19c91?t=1604055531000

This might seem like good news if we did not consider the fact that the greatest incidence of pathologies, which begin to deteriorate our quality of life statistically explodes after the age of 65, having important and even lethal effects if not managed appropriately in time. Diabetes and high blood pressure are two examples of chronic diseases commonly self-reported by older people (Eurostat, 2020a)

The chronic exposure of the tissues and especially of the vessels to chronic hyperglycaemia increases the risk of developing the complications of diabetes: retinopathy, nephropathy, neuropathy, and atherosclerosis affecting the vessels of the heart (coronary arteries), the vessels afferent to the brain (carotid arteries) and the arteries of the lower limbs (Chiong & Evans-Molina, 2014). T2DM is the leading non-traumatic cause of blindness and chronic renal failure and carries a two- to four-fold increased risk of cardiovascular disease (such as stroke and ischemic heart disease) and a twenty-fold increase in the risk of lower limb amputation (Chiong & Evans-Molina, 2014; Kidanie et al., 2020; Nouira et al., 2023). Other complications include sexual dysfunction and increased susceptibility to infections (Bhasin et al., 2007; Chávez-Reyes et al., 2021). These serious complications account for the reduction in the life expectancy of people with T2DM (Emerging Risk Factors Collaboration, 2023). Also, if not above all, for this reason, in recent years, this disease has taken on the characteristics of a real health emergency given the continuous augmentation in the number of affected people. On the other hand, the reversibility of T2DM has been established and sanctioned since 2016 (WHO, 2016a). The evidence, the result of research and experiments conducted, shows that this pathology can be attacked through strong calorie containment and a specific nutritional regime. Nevertheless, its trend is growing rapidly and almost one in two in Europe and one in three people globally affected by this pathology are unaware of their diabetes status (Ogurtsova et al., 2022). Figure 3 shows the diabetes prevalence by age group and divided by male and female (Saeedi et al., 2019).

Figure 3. Diabetes prevalence by age groups and gender comparison (Saeedi et al., 2019)

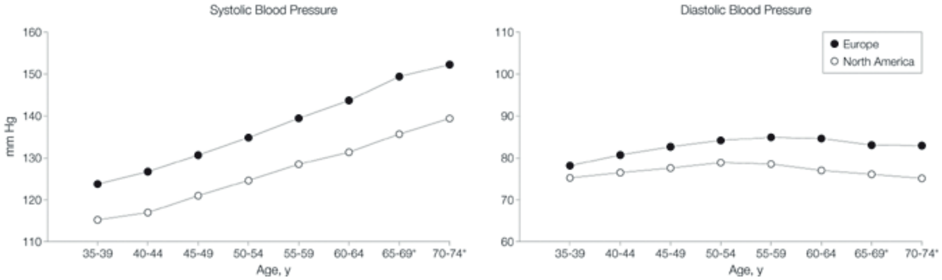


Note. This image was reprinted from the Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition by Saeedi et al., 2019. Diabetes Research and Clinical Practice, Volume 157, 2019, 107843, ISSN 0168-8227, https://doi.org/10.1016/j.diabres.2019.107843

Hypertension is responsible for 7.6 million deaths per year worldwide (13.5% of the total), more than any other risk factor (Arima, Barzi & Chalmers, 2011). Approximately 54% of strokes and 47% of coronary heart disease can be attributed to high blood pressure (Arima, Barzi & Chalmers, 2011). Low- and middle-income countries (LMICs) carry over 80% of this burden, and the associated blood pressure and cardiovascular mortality are rising rapidly in

LMICs. In high-income countries, age-specific blood pressure and cardiovascular mortality are decreasing; however, the overall number of deaths keeps rising in line with the rapidly ageing societies (Arima, Barzi & Chalmers, 2011). Arima, Barzi & Chalmers (2011) also report that blood pressure-related disease contributes to cardiovascular death among people who are below the hypertensive threshold of 140/90 mmHg. Hypertension is therefore also known as "the silent killer". In order to reduce the burden of blood-pressure-related deaths, it is important to apply a population strategy at the community level as well as a clinical strategy that focuses on novel and enhanced treatments for people who suffer from hypertension (Arima, Barzi & Chalmers, 2011).

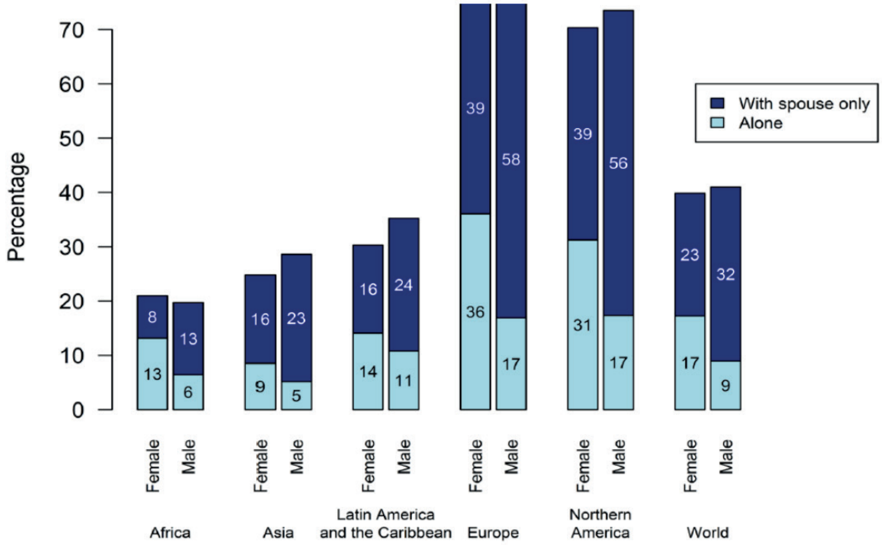
Figure 4. Mean systolic and diastolic blood pressure in six European countries, the USA and Canada, Men and Women combined by age (Wolf-Maier et al., 2003, p. 2366)



Note. This image was reprinted from Hypertension prevalence and blood pressure levels in 6 European countries, Canada, and the United States by Wolf-Maier et al. (2003). JAMA, 289(18), 2363–2369. Page 2366 https://doi.org/10.1001/jama.289.18.2363

Figure 4 shows the mean systolic and diastolic blood pressure in six European countries and two North American countries, male and female combined, by age (Wolf-Maier et al., 2003, p. 2366). As can be seen, blood pressure increased over 60 years old. This pathology cannot be cured but can be contained through lifestyle changes based mainly on diet and increased movement. A further contextual element to consider when placing our reasoning is given by the growing condition of social isolation, frequently associated with experiences of psychological loneliness, in which many elderly people live. Figure 5 shows that 36% of European women and 31% of North American women over 60 live alone (United Nations, 2017). This condition exposes one to an increasing fragility which, if not appropriately compensated for, can facilitate the appearance of experiencing loneliness with all the cascading negative effects related to it.

Figure 5. Percentage of men and women aged 60 years or older living independently alone or with a spouse, by region, circa 2010 (United Nations 2017).

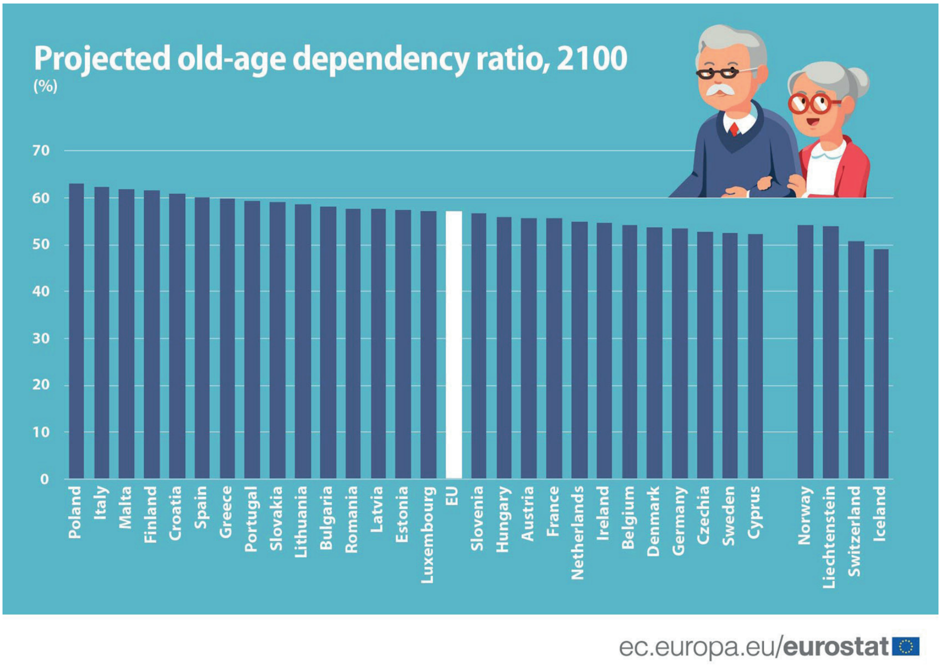


Data source: United Nations (forthcoming). Database on the Living Arrangements of Older Persons, 2017.

Note. This image was reprinted from a presentation on World Population Ageing 2017, Sara Hertog, Population Division, DESA, Highlights launch presentation for the celebration of the United Nations International Day of Older Persons. New York, 5 October 2017. United Nations (2017). Slide 11. https://www.un.org/development/desa/ageing/wp-content/uploads/sites/24/2017/05/WPA-2017-Launch-to-the-IDOP-5-October-2017.pdf

It is necessary to complete the vision of the phenomenon we are dealing with by considering the macroeconomic economic and financial aspects related to the ageing society. There is a question relating to the sustainability of national welfare systems. As can be seen in figure 6, there is a strong increase in the old-age dependency ratio of the European Union that is forecasted for 2100.

Figure 6. Projected old-age dependency ratio, 2100 (Eurostat, 2020b)



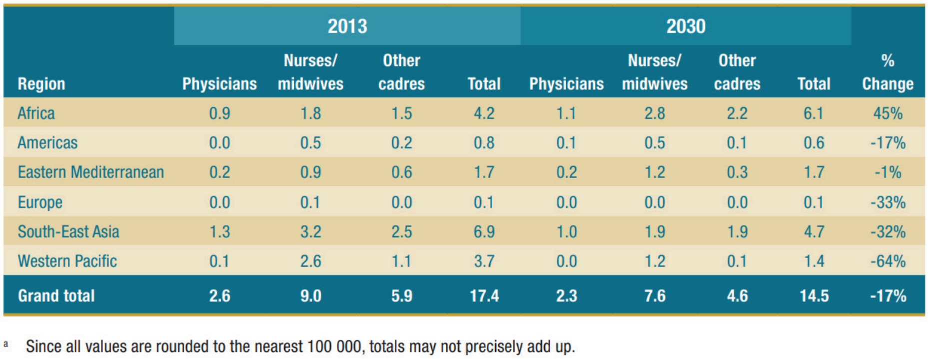
Note. This image was reprinted from Eurostat (2020b). Old-age dependency ratio increasing in the EU. Published 13 July 2020. https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20200713-1

Eurostat (2020b) shows that based on the baseline scenario of the latest population projections, the EU's population will continue to grow older. The old-age dependency ratio of the EU is estimated for 2100 to be at 57%, which is nearly twice the ratio of 2019 (31%). This indicates fewer than two people of working age for each older person who is 65 or older (Eurostat, 2020b). This prediction of an increase in the old-age dependency ratio is following the trend observed in the past decade, which was 26% in 2009 (Eurostat, 2020b).

2.1.2 Shrinking workforce and burden in care

The healthcare industry is experiencing a major difficulty as a result of a diminishing workforce, especially in light of the rising demands brought on by factors like ageing populations and changing healthcare needs (WHO, 2016b). Furthermore, two forces are acting adversely on the care demands of an ageing population: the loss of sense and purpose that health and social care personnel have demonstrated because of the pandemic and the decline in births that is observed in all Western countries. Additionally, there are subsequent needs of the healthcare workforce in 2030 that we are facing (WHO, 2016b). From figure 7, it is clear that Africa is the only continent that is going to improve the number of health workforce. The other regions of the world are facing a severe decrease in the number of employees needed. This indicates that managers and policy makers need to adopt new organizational models that could foster the motivation in young generations who should consider the health and social care domains as the one where they could find a purpose and a motivation to work in.

Figure 7. Estimates of health worker needs-based shortages (in millions)[a] in countries below the SDG index threshold by region, 2013 and 2030 (WHO, 2016b)



	2013				2030				
Region	Physicians	Nurses/ midwives	Other cadres	Total	Physicians	Nurses/ midwives	Other cadres	Total	% Change
Africa	0.9	1.8	1.5	4.2	1.1	2.8	2.2	6.1	45%
Americas	0.0	0.5	0.2	0.8	0.1	0.5	0.1	0.6	-17%
Eastern Mediterranean	0.2	0.9	0.6	1.7	0.2	1.2	0.3	1.7	-1%
Europe	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.1	-33%
South-East Asia	1.3	3.2	2.5	6.9	1.0	1.9	1.9	4.7	-32%
Western Pacific	0.1	2.6	1.1	3.7	0.0	1.2	0.1	1.4	-64%
Grand total	**2.6**	**9.0**	**5.9**	**17.4**	**2.3**	**7.6**	**4.6**	**14.5**	**-17%**

[a] Since all values are rounded to the nearest 100 000, totals may not precisely add up.

Note. This image was reprinted from the World Health Organisation. Estimates of health worker needs-based shortages (in millions)[a] in countries below the SDG index threshold by region, 2013 and 2030 (p.44), Global strategy on human resources for health: workforce2030, https://iris.who.int/bitstream/handle/10665/250368/9789241511131-eng.pdf?sequence=1

The implementation of a VBHC model could provide several solutions to overcome this difficulty (Harvard Business School, Institute for Strategy and Competitiveness, n.d):

- Efficiency through technology: VBHC places a strong emphasis on using technology to increase productivity and streamline procedures. Using electronic health records (EHRs), applying telemedicine, and monitoring patients from a distance allow healthcare practitioners to increase their efficacy and reach without necessarily hiring more staff.
- Preventive care and population health management: To lessen the strain on healthcare systems, VBHC places a strong emphasis on population health management and preventive care. Healthcare organisations have the potential to decrease the need for healthcare personnel by emphasising preventive care rather than only treating patients when they get ill.
- Care coordination and team-based care: VBHC promotes a cooperative method of patient care that entails the cooperation of several medical specialists. This strategy can lessen some of the stresses brought on by labour shortages and enable greater use of the human resources already in place.
- Rewards for quality and outcomes: VBHC bases its rewards for healthcare practitioners on the calibre and results of their work rather than the amount of services rendered.

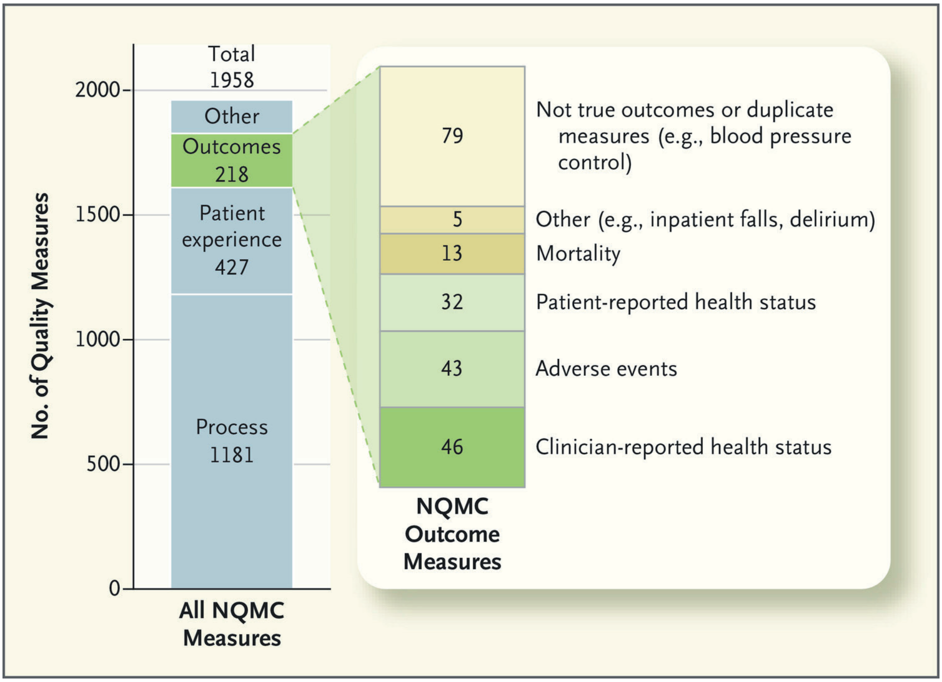
This may encourage healthcare professionals to concentrate on providing effective, high-quality care, thereby lowering the demand for increased staffing.

- Training and development: Healthcare companies can make the most of their current personnel by investing in training and development initiatives. This entails retraining employees to take on different responsibilities and continuing education to maintain current skill sets.

2.1.3 Lack of outcome measurement

A meta-analysis regarding the level of relevance of outcome measurements demonstrated that only eleven per cent (218 / 1958) of the quality measures consider the patient's outcomes but sixty per cent (1181 / 1958) are regarding process measurements, see also figure 8. (Porter, Larsson & Lee, 2016). There is a minor interest in the patient's experience.

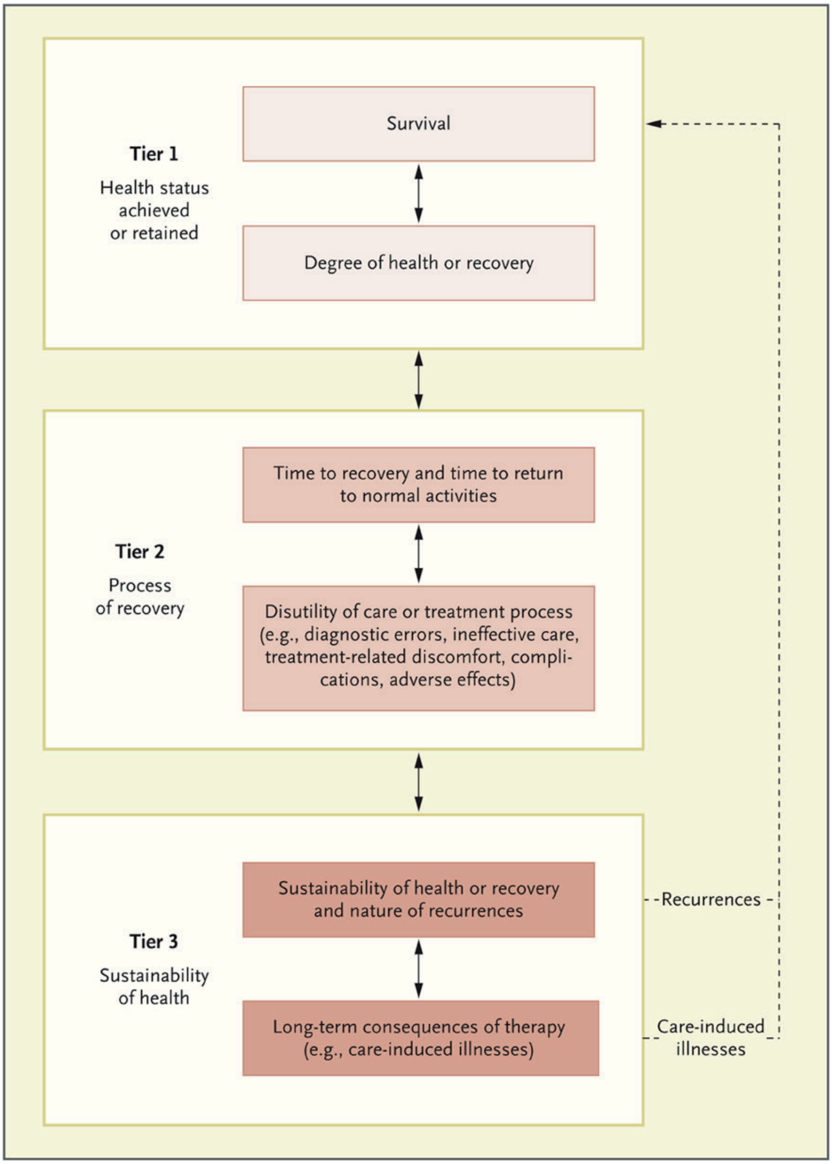
Figure 8. Categories of quality measures by NQMC (Porter, Larsson & Lee 2016)



Note. This image was reprinted from Porter, M.E., Larsson S. & Lee, T.H. (2016).Figure p. 504 showing the Categories of Quality Measures Listed in the National Quality Measures Clearinghouse (NQMC). Standardizing Patient Outcomes Measurement. https://www.nejm.org/doi/pdf/10.1056/NEJMp1511701

Furthermore, once the organisational emphasis moves from processes towards outcomes, it is essential to consider how the outcomes are defined and structured according to Porter's (2010) outcome measures hierarchy (see figure 9).

Figure 9. The outcome measures hierarchy (Porter, 2010)

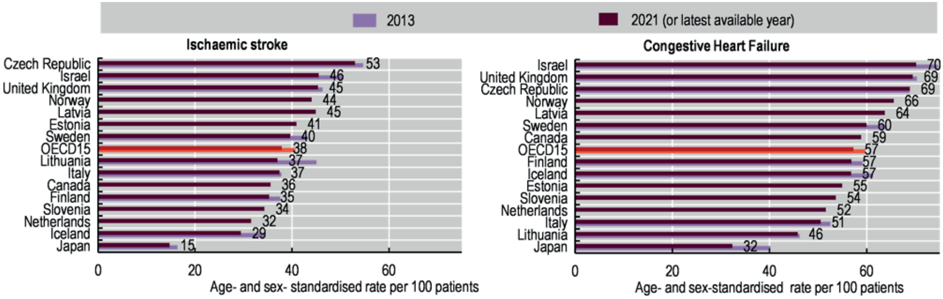


Note. This image was reprinted from Porter, M.E. (2010). Figure 1 The Outcome Measures Hierarchy, p. 2479. What is Value in Health Care? https://www.nejm.org/doi/pdf/10.1056/NEJMp1011024

Within the three hierarchical levels of outcomes, the patient's survival levels are currently prioritised and receive the most attention and measurement. Conversely, the second level in tier 1, given by the degree of recovery, and the level of side or harmful effects generated by the treatments themselves, is given little attention.

The most ″hidden″ part of the care process (tier 2) remains implicitly connected to the treatments and is more difficult to measure and attend to by the care teams. It represents a relevant area of improvement and value creation for the beneficiary of care. Furthermore, in the context of chronic degenerative pathologies, this aspect is even more central given the need to improve clinical conditions within a framework of fragility. With regards to the elderly care domain, it is relevant to consider the possible conditions for maintaining homeostasis, as both a goal and a value. It is therefore highly relevant to push for the adoption of a ″value-based″ approach between the different welfare systems as there are significant differences in outcomes achieved for the same patient conditions. The OECD (2024) shows large differences between countries, see figure 10.

Figure 10. Patients who died or were readmitted within one year of discharge after ischaemic stroke and CHF, 2013 and 2021 (OECD, 2024)



Note. This image was reprinted from the Organisation for Economic Cooperation and Development (OECD). Figure 6.34 Patients who died or were readmitted within one year of discharge after ischaemic stroke and CHF, 2013 and 2021 (or nearest year). OECD HCQO Data Collection on Integrated Care 2022-23.https://www.oecdilibrary.org/sites/7a7afb35en/1/3/6/13/index.html?itemId=/content/publication/7a7afb35-en&_csp_=6cf33e24b6584414b81774026d82a571&itemIGO=oecd&itemContentType=book

It becomes clear that there is a need to focus on "how" value is created, especially when adequate resources are lacking. Moreover, there are several countries, for example, the UK and Norway, that are performing worse when compared to countries that have fewer capabilities such as Slovenia or Lithuania, despite having a public welfare state and large investments in the national health system. As such, the added value of embracing the outcome-driven care approach allows care teams and organisations to improve the quality of care, expanding workforce knowledge by aiming for the redesign of the care delivery chain and by putting "what matters" for the patient at the core of day-to-day operations.

2.1.4 Lack of integration among services

A well-researched problem in the healthcare sector is the lack of integration among healthcare service providers and the difficulties it creates for value-based healthcare delivery: fragmentation of care (Lewis & Ehrenberg, 2020). Healthcare systems are often fragmented, with different providers operating in silos. This fragmentation can lead to gaps in care (Cossio-Gil Y. et. al.2022), duplication of services and inconsistencies in treatment plans. In particular, the main obstacles to integrated care are the following (Porter & Lee, 2013).

- Data silos: The existence of data silos in healthcare organisations is one of the main obstacles to integration. Because EHRs are frequently not interoperable, it can be challenging for healthcare professionals to access patient data in various contexts.
- Absence of care coordination: It is difficult to coordinate care when there is insufficient integration. Without a thorough care plan, patients might receive care from several different physicians, which could result in inefficiencies and even medical mistakes.
- Effect on value-based care: Models of value-based care place a strong emphasis on cost-effectiveness and results. However, it is challenging to monitor results and determine the true cost of care due to the fragmented nature of healthcare delivery.
- Financial implications: Since duplicate testing and processes increase expenses, fragmentation may also have a financial impact. Cost-cutting strategies like community health management programmes and care coordination programmes are difficult to implement without integration.

The International Health Policy Survey from the Commonwealth Fund revealed that patients in countries with more integrated healthcare systems reported higher levels of care coordination and better access to healthcare services (Canadian Institute of Health Information, 2024). Reports from McKinsey & Company (Grant, 2010) have highlighted the financial benefits of integrated care delivery models, including improved efficiency and reduced healthcare spending.

To address these challenges and promote integration in healthcare delivery, policymakers, payers, and providers must work together to incentivise collaboration, invest in health information technology infrastructure, and develop standardised care protocols. Additionally, fostering a culture of teamwork and communication among healthcare professionals is essential for achieving the goals of value-based care. With an increasing demand for healthcare, a rising burden of chronic conditions and multi-morbidity, and pressure on available human and financial resources for health, countries are urged to adjust how they deliver healthcare (European Commission, Consumers, Health, Agriculture and Food Executive Agency, 2020). Countries have to face the fragmentation of health services and move towards integration, bringing together care providers and putting the patient at the centre. Integrated care is key to strategies regarding transforming and making health systems stronger (European Commission, Consumers, Health, Agriculture and Food Executive Agency, 2020). Integrated care is also recognised in policies and actions at both national and EU levels as an important way to improve health outcomes as well as the effectiveness and sustainability of healthcare systems. Additionally, the Steering Group on Health Promotion, Disease Prevention and Management of Non-Communicable Diseases has brought forward several best practises on integrated care for EU countries to improve health systems and care at the national level (European Commission, Consumers, Health, Agriculture and Food Executive Agency, 2020).

2.1.5 Real-time data and collecting benchmark for outcome comparison

The role of the ICHOM organisation in collecting worldwide benchmarks per patient conditions

It is important to align healthcare services to the needs of older people by understanding what health outcomes matter the most to them. The ICHOM outcome set for older people includes six different dimensions that matter to an older person's health and well-being. Having standardised dimensions, questionnaires and metrics makes it possible to compare each organisation's outcome and activate a learning process that goes beyond the single care provider experience.

The use of real-time data to support interventions

The ValueCare project had at its centre the creation of ICT tools capable of generating information, to support clinicians, capable of presenting, in real-time, compliance and trend performance indicators, measured in relation to the use of the technological ecosystem created and provided by the project team in each of the seven pilot sites. The use of the ValueCare App, the smartwatch connected to the ICT ecosystem and the constant interaction of the subject with the pathology-specific chatbot, allowed the experts to proactively play a coaching role for the subjects. What distinguishes the project is that it has created a dedicated key role in the local care process owner that has led the care teams towards a VBHC transition over the pilot time frame. Each of the 120 intervention group participants across the seven pilot sites received the opportunity to be supported by a dedicated "coach" that has created a relationship with the users, through a shared decision-making approach aimed at reaching the personalised goals that were set up dynamically.

2.2 THE VALUE CALCULATION BASED ON M.E. PORTER'S FORMULA

2.2.1 The value calculation adopted in the ValueCare project

Considering the approach by Porter (2010) to calculating the creation of value, value is conceived as the relationship between the variation in clinical outcomes over time and the variation in the costs necessary to achieve these results considering the entire treatment path and the services involved in it. The formula is (Porter, 2006):

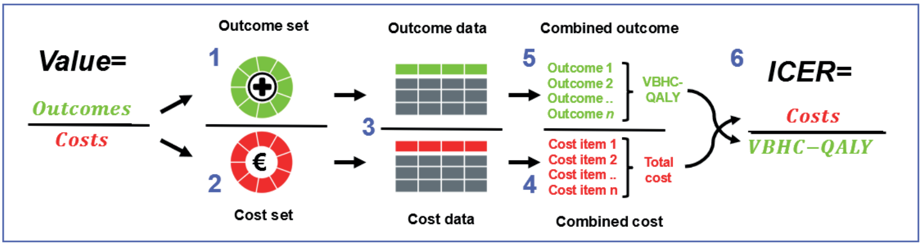
$$\textit{Value} = (\textit{delta outcome}) / (\textit{delta costs})$$

This logical system, however, found a limit in the application context of the ValueCare project for two reasons:

- The diversity of the clinical conditions of the patients undergoing the ValueCare intervention (120 per pilot site, 840 overall)
- The nature of the pathologies treated connected to a chronic-degenerative framework with respect to which, not only was there no option for the potential return "ad integrum" of the patients but, above all, the need to demonstrate, to policy makers, the value generated in terms of effects on the prevention of the occurrence of chronic-degenerative diseases and, where already present, their worsening versus the avoidance of public health costs otherwise required for their treatment.

In light of these challenges, the calculation approach adopted within the ValueCare project was an inverse approach to the formula of Porter, in which the value was understood as the unit increase in investment, per citizen, necessary to stabilise or improve the given clinical conditions. The component of the experience measured in relation to the entire treatment path was included in the formula as an addendum to the change in outcomes. Figure 11 presents the definition of the entire calculation path.

Figure 11. The Value calculation formula (Walraven, J., 2023)



Note. This image was reprinted from a PowerPoint presentation given by Jelle Walraven on January 31, 2023 at Erasmus MC about quantifying value.

Within this value calculation logic, it was possible to carry out a diversified comparison between the pilot sites, for which the effects of the project experimentation were compared in terms of value generation. This was understood as a necessary unit investment cost for the improvement or stabilisation of clinical outcomes, where cost data referring to the benchmark relating to the treatment of the specific pathology over time is available. An example is Treviso pilot site, which was dedicated to mild cognitive impairment (MCI) in the ValueCare project. The data was compared with the annual cost of worsening of the cognitive state of the subject, who evolves from MCI to early forms of dementia.

2.2.2 Value generation in chronic patients: improvement versus homeostasis as sustainable outcomes

The three hierarchical levels of outcomes

The methods for generating value that healthcare and social organisations can adopt must take into account the three levels of hierarchy of health outcomes as defined by the VBHC model (Porter, 2010), which is presented in figure 9.

The adoption of the model implies an analysis of the positioning of the organisation of the processes in relation to their ability to act harmoniously on each of the dimensions in parallel. Therefore, not only the priority action that is required to guarantee maximum survival for the patient in the immediate future should be considered, but also how the treatments are provided and how much they may or may not damage the person's QoL and impact the medium to long term with adverse effects on the expected health outcomes.

Within this tripartition, the second tier (the recovery process), the emphasis in the design of the ValueCare project was placed above all, considering the potential for maintaining and avoiding the worsening of the clinical conditions of the treated subjects. Furthermore, where possible, the elements of care capable of being improved were considered to avoid further inconvenience or negative effects associated with taking care of the subjects. In this sense, the perception of experience lived by the subjects was measured, albeit indirectly, by borrowing the principles provided by the metro mapping care process design tool (https://metromapping.org/en/).

2.2.3 Cost calculation per patient over the full cycle of care: the ValueCare pilots results

The cost component considered by the VBHC model is a key factor that is in the denominator of the value calculation formula. As mentioned above, in the ValueCare project, it has been chosen to reverse Porter's formula because of the need to amplify the visibility of the unity investment needed to generate a delta in patient outcomes or to keep them constant over time. The correct calculation of costs should be based on the following criteria:

a) Consider the entire cycle of care from the initial patient onboarding to the care treatments throughout all the touch points within the single service provider and between them all. In particular, when patients interact with an integrated services system, it is essential to keep track of the single service's cost component.

b) Adopt a time-driven activity-based costing (TDABC) (Kaplan & Anderson, 2004). Moving from a performance fee for service payment towards a value-based driven one requires flexible, timely, and personalised cost tracking that allows to match the outcome reached for each patient with the entire real cost that was spent. In the ValueCare project, the latter method has been taken into account by considering, for each pilot site, the combined cost composition made of direct and indirect cost categories.

Direct cost category

Direct costs are:

- All the human resources dedicated to each patient by all the services engaged by each service provider over the time frame of the intervention duration.
- All the ICT costs due to the ValueCare technical ecosystem development and deployment in terms of technical architecture and infrastructure, application delivery, data storage and virtual coach content development

Indirect cost category

Indirect costs are the administration and related commodities such as offices, energy, internet connectivity, and other budget line costs needed to provide the pilot action operations.

Each pilot has calculated the cost composition based on the care pathway foreseen and the kind of expertise engaged over time.

2.2.4 The hidden cost of inaction versus the value of prevention

In terms of prevention and value creation, there are a set of elements to be considered (Porter & Lee, 2013):

- The increased treatment costs: without preventative measures, diseases frequently progress to advanced stages, necessitating more rigorous and costly treatments. An example is diabetes; early detection and care through preventative measures such as regular screenings, lifestyle changes, and medication can help avoid costly complications like kidney failure or amputation. Individuals who do not take these preventive actions may require expensive procedures such as dialysis or surgery, as well as continuing medical supervision, which will greatly increase healthcare costs.
- Loss of production: preventable illnesses frequently result in missed workdays or decreased production, for both individuals and society as a whole. When people suffer from preventable illnesses, they may need to take time off work for medical visits, recovery periods, or to care for themselves or their families. Employers and society suffer economic losses as a result of lower output and more absenteeism. Furthermore, chronic illnesses caused by a lack of prevention might result in long-term impairment, limiting an individual's ability to contribute meaningfully to society.
- Emergency Care Expenses: a lack of prevention might result in more frequent and severe health emergencies, requiring emergency room visits and hospitalizations. Emergency care is often more expensive than preventive care or outpatient treatment.
- Reduced QoL: preventable illnesses can have a significant impact on someone's QoL. Chronic illnesses that result from a lack of prevention can cause pain, discomfort, and limits in everyday activities, lowering overall well-being and pleasure in life.

- The increased prevalence of avoidable conditions strains healthcare resources such as hospitals, clinics, and medical professionals. This strain presents itself in a variety of ways, including increased demand for services, longer wait times for appointments and procedures, packed emergency departments, and overburdened healthcare workers.
- Mental Health Effects: preventable illnesses can have a substantial mental health impact on individuals and families (Frampton et al.,2017) . Coping with chronic diseases, managing symptoms, and navigating the healthcare system can be emotionally draining, leading to increased stress, worry, and depression.

A value-based healthcare strategy (Porter & Lee, 2015) on the other hand, takes a comprehensive approach to addressing these issues.

2.3 EUROPEAN TRENDS FOR THE DIGITAL TRANSFORMATION OF HEALTH AND SOCIAL CARE SERVICES AND THE VALUECARE MODEL

The global health industry is transforming at an unprecedented speed, driven by factors such as legislative changes, technological innovations, and economic pressures (Siegel, 2024). Although there have been numerous achievements in healthcare over the last forty years, healthcare services around the world, regardless of structure and funding, are now called upon to address big challenges.

Many health systems, especially in high-income and middle-income countries, were developed at a time when life expectancy was about 50-70 years; these health systems are no longer meeting the needs of today's older people, who regularly become more than 70 years old with increased chronic conditions (Lin, 2022).

In such a complex world, healthcare must change and adapt to the times. While 20th-century healthcare was centred around doctors, 21st-century healthcare must place the patient at the centre of the system (Porter, 2010). Patients are now active participants in treatment choices and, just like consumers in other industries, are increasingly informed and accustomed to having access to data (Wiering, de Boer & Delnoij, 2017). If in the last century it was considered "hospital-centric" and bureaucratised, today healthcare must be seen as a network of services, developed around patients with specific diseases or conditions, designed to break down the current siloed structure. Therapeutic and care decisions should be guided by knowledge and value to judiciously and not indiscriminately counter inefficiencies, taking into account health outcomes and not just productivity (Wiering, de Boer & Delnoij, 2017).

Several initiatives have been implemented by the European Union to guide and facilitate this paradigm shift in the healthcare sector. For example, on September 7, 2022, the Commission put forward a European care strategy that ''sets out a vision for transforming care in Europe, outlining supportive measures at the EU level, and calling for action at the national level" (European Union, 2023).

By the time of its first anniversary since its launch, the European Commission had presented a proposal for a Council recommendation on long-term care touching on the following points (European Commission, 2023a):

- Improving healthcare through a strategic and **integrated approach** that enhances coordination across health, social care, and long-term care services, with a focus **on patient-centred care** for better access and quality at all life stages.
- Accelerating the **digital transition**, implementing initiatives like the Europe's Digital Decade Policy Programme 2030 and the European Health Data Space, to make digital public services more inclusive, particularly for people ageing and those with disabilities.

Within the European Union's broader strategy to embrace digital transformation, the Europe's Digital Decade programme sets a governance framework based on an annual cooperation mechanism involving the Commission and Member States for achieving the digital objectives at the Union level by 2030 based on measurable indicators (European Commission 2023b). Within the programme, significant emphasis is placed on transforming healthcare through digital innovations, setting ambitious goals such as 100% access for all EU citizens to their EHRs by 2030 (European Commission, Directorate-General for Communications Networks, Content and Technology, Deimel, L., Hentges, M., Latronico, V. 2023). The EHRs have emerged among health information technology as a key tool to improve the quality and efficiency of healthcare, and reduce health disparities in population health (Kruse et al., 2018). If well-constructed in terms of data quality and accessibility, they can represent a fundamental instrument to facilitate multidisciplinary relationship-building and collaborative decision-making in patients' care and cure (Vos et al., 2020).

In a sector such as healthcare, which generates approximately 30% of the world's data volume, regulations are needed for trustworthy settings for secure access to and processing of health-related data (Thomason, 2024; Weber, 2024). The European Health Data Space has been designed precisely to balance the need for accessing and transforming health data into actionable insights for improving care and reducing costs and patients' rights (Digital Europe, 2021). Along these lines, special mention should be given to the European Union's Artificial Intelligence (AI) Act, approved in March 2024, which plays a significant role in regulating predictive data use in clinical settings. This regulation is crucial as it addresses the ethical challenges and risks associated with AI technologies in healthcare, especially in the deployment of predictive models for clinical purposes (European Commission, 2024).

Value-based systems take a data-driven approach to deliver value for patients, as data, their management, and their analysis are permeating all the dimensions essential for the transition: policies, payments, informatics infrastructure, data analysis tools and organisational models.

All in all, the VBHC is a framework for strategic thinking, entailing an essential vision of how healthcare delivery should be set up based on several key principles around the common goal of achieving the highest value in healthcare delivery (Klop & Rutte, 2021).

Being a transformative approach, an important element of its success is the implementation of structural **and proactive change management** (Klop & Rutte, 2021). When change management is applied alongside **open innovation**, organisations can transform their operations more effectively and foster a culture that embraces continuous improvement and adaptive change. In line with its open innovation strategy, the ValueCare project has actively sought input from various sources, both nationally and internationally to get a broader perspective that goes beyond theoretical considerations and tracking and emphasizing the practical impact and inclination to acceptance of value-based healthcare approaches within the health and social care ecosystem (Vasiljev, et al., 2024). Through open innovation, the ValueCare project has encouraged active participation from relevant stakeholders, creating a collaborative environment that fosters the exchange of ideas and the generation of innovative solutions. This has included consultations with national/local public health organisations, regulatory bodies, health and social care providers, patients and families, and influential experts and opinion leaders who are actively involved in the field of digital transformation in health and care. Engaging these stakeholders and obtaining their perspectives has provided important inputs, validation and endorsement for the value-based approach proposed by ValueCare.

2.4 FROM COMPETITION FOR RESULTS TOWARDS COOPERATION FOR VALUE CREATION IN EUROPEAN HEALTH AND SOCIAL CARE SERVICES

2.4.1 Value for patients and providers: having outcomes as a compass in care

The traditional approach adopted by the healthcare system is pay-per-performance driven (Kaplan & Anderson, 2004; Porter Larsson & Lee, 2016). It means that it leads to the “overspending” phenomena where citizens ask for all the potential services that the insurance could provide. This approach has demonstrated a lot of limitations, in particular the following (Porter & Teisberg, 2006):

- Providing only the set of services that are rigidly included and foreseen by the system instead of considering the real needs and wants of the patient and what, clinically speaking, is needed to pursue the expected health outcomes.
- Leading to higher cost expenditures based on volume and not on value creation based on shared decision-making with the patient.
- Using metrics that are almost quantitative rather than qualitative in the service design, deployment and impact evaluation .

Finally, the budget is allocated among separate managers and services, and nobody is in charge of running and monitoring the entire care process and effort allocation along with a full cycle of care (Kaplan & Anderson, 2004). Moving towards a VBHC approach requires a revolutionary approach where patient conditions, related outcomes and measurements are constantly the "core" focus of the organisation (Wiering, de Boer & Delnoij, 2017). By defining what works in terms of outcomes results, the entire workforce is motivated in expanding their skills and knowledge to activate a direct connection between the outcome reached, the learning process and the quality-of-care improvement that make the provider more attractive.

Organisations that wish to adopt a VBHC approach need to develop specific strategies that can consider all the elements necessary to conduct a transformation of the organisational architecture in accordance with Porter's agenda. In particular, as described in the article: *"The strategy that will fix healthcare"* by Porter & Lee (2013) there are prior actions that could pave the way for the adoption of the VBHC model. Concretely, according to Porter & Lee (2013), these actions should focus on:

- The establishment of Integrated Practice Units (IPUs), i.e. the extension of the connection between the care provider and the set of other local organisations whose activity and skills are relevant and impactful concerning the clinical outcomes of the subjects treated
- The structuring of clear leadership, able to mobilise all team members towards the achievement of common objectives
- The adoption and valorisation of technologies to support patients and care providers and the digitalisation, in real-time, of information useful for making clinical decisions and guiding therapeutic paths
- The choice of outcome indicators to be used and the related tools, frequency and methods of computerization of the data

In the context of the ValueCare project, all of these elements were considered and developed through:

- IPU: the creation of integrated work teams which involved the internal organisational units of each pilot site and other external services capable of contributing to the achievement of the strategic objectives connected to the reference pathologies
- Leadership: in each pilot site, the subjects responsible for creating and leading the care teams have been identified, accompanying them through the training process, implemented in the initial phase of the pilot, and maintaining a constant operational tension towards the implementation of the cycles of improvement of the care paths in the technological innovations connected to the use of the ValueCare App and the entire ICT ecosystem that was developed

- The structuring of the set of outcomes: for each clinical condition being tested in the pilot sites, it was necessary to measure at baseline and at two other follow-up moments after the start of the intervention

In the ValueCare project, all seven pilots have followed the VBHC logic by harmonising the six components of Porter's agenda (Porter & Lee, 2013) by a cooperative approach with the local stakeholders who were engaged since the start of the project. Public and private care providers have been involved in the light of the common interest that is the outcome production that has been defined and agreed upon with each citizen who took part in the pilot phase (EIT Health, 2020). This cooperative approach is the one that could create value in Europe if considering the welfare state panorama. In EU countries there is a relevant state support in providing public care both from public and private perspectives. It should be noted that countries that have a Bismarck welfare-based approach, there is never a fully private system; there is always a basic care provided to citizens that intervenes in a balanced private expenditure. This makes a significant difference in terms of dynamics and approaches that the providers could adopt that are not, usually, based on competition but almost on cooperation, synergies, and networking for the good of the patient. It leads to a local dialogue among the stakeholders and to a complementary way of care service delivery. This is a relevant difference in the European approach to care between the healthcare regulations in the US and the European – National ones. This is also a lesson learnt by the ValueCare project that provides the opportunity to adapt VBHC in seven different welfare systems across the EU and demonstrates the flexibility of the model in embracing and amplifying the strengths that are already there, in terms of care staff's skills and knowledge. The ValueCare project has demonstrated the potential that comes from unleashing the single expertise and in linking them together. This is in particular true about the results coming from having connected the social and the healthcare services.

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Chapter 3

The adapted outcome measurement sets for the measurement and evaluation of the ValueCare project

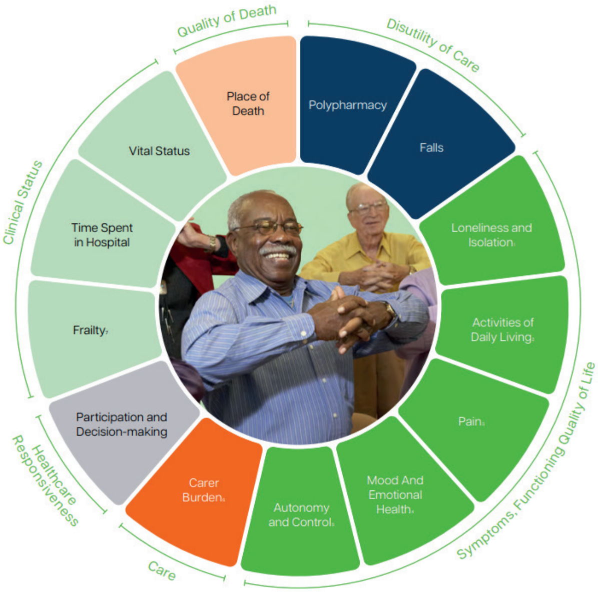
Demi Cheng, Amy van Grieken, Vanja Vasiljev, Denis Juraga, and Hein Raat

3.1 THE ADAPTED OUTCOME MEASUREMENT SETS FOR THE VALUECARE PROJECT

3.1.1 ICHOM older people set

It is known that the number of older people is increasing, as is their life expectancy and the fact that they usually have more than one chronic condition (Akpan et al., 2018). Hence, older people frequently have different healthcare providers due to these multiple conditions, and the provision of care can be fragmented (Akpan et al., 2018). It is important to align healthcare services with the needs of older people by understanding what health outcomes matter the most to them. The International Consortium for Health Outcomes Measurements (ICHOM) older people set was created by a group of leading physicians, measurement experts, and patients through a consensus-driven modified Delphi technique (Akpan et al., 2018). The outcomes included in the set are those that they recommend that matter most to older people, and these outcomes will be supportive for healthcare systems to improve their care pathways and quality of care for older people (ICHOM, 2023; Akpan et al., 2018). The ICHOM outcome set for older people includes six different dimensions that matter to an older person's health and well-being. The set covers loneliness and isolation, pain, mood and emotional health, autonomy and control, care burden, participation and decision-making, frailty, falls, and time spent in the hospital (see figure 12). ICHOM has also created outcome sets for specific conditions or diseases.

Figure 12. ICHOM outcome set for older people (ICHOM, 2023)



Note. This image was reprinted from the International Consortium for Health Outcomes Measurement - ICHOM (2023). Patient-Centred Outcome Measures – Older Person. Retrieved on 30 September 2023 from: https://connect.ichom.org/patient-centered-outcome-measures/older-person/

3.1.2 The measurement set in the ValueCare project

In the ValueCare project, 16 questionnaires were developed: one for each target group and one for each of the three measurement moments (1. Older people, 2. Informal caregivers and 3. Health and social care professionals or managers). The measurements took place at the start of the study (T0), after the intervention period (T1) and after a few months follow-up (T2). At the T1 measurement time point, there were separate questionnaires for the intervention group and control group. The questionnaires were deployed among both the intervention and control groups. However, in the intervention group, the questionnaire assessment was done to find out the distinctive care needs of the participant and to talk about the findings of the questionnaire assessment with the participant and their caregivers (Bally et al., 2022). Additionally, monitoring the findings was also done. Finally, a personalised care plan was developed together with the participant based on the findings and outcomes of the assessment as well as the identified needs of the participant (Bally et al., 2022). The care plan was developed through shared-decision making between the participant (patient), the health and social care professional and when applicable the informal caregiver was involved as well. Regular reviews of the care plan were performed and during the reviews, the care plan could be modified based on the participant's health status, well-being and preferences (Bally et al., 2022).

3.1.3 Content of the baseline questionnaire

Older people

The ValueCare questionnaire for older people is based on the ICHOM outcome set for older people. Each dimension in the older people ICHOM outcome set was assessed with regard to the target groups and conditions in the pilot sites of the ValueCare project. In the end, a selection of the ICHOM outcome set questions was complemented with additional questionnaires assessing in more detail for example, frailty. One questionnaire was developed for use in the project across all seven pilot sites in order to be able to generate overall conclusions. Pilots were free to add their own questionnaires that relate to the condition of their pilot sites, such as stroke, frailty, diabetes or mild cognitive impairment. Some pilots used the ICHOM outcome sets for the specific disease or condition of their pilot sites. The questionnaire developed for the project contains seven parts, within each part there are one or more validated questionnaires. As also listed in the study protocol by Bally et al. (2022), Table 1 provides, in detail, an overview of the specific validated questionnaires used.

- Quality of Life
- Health and well-being
- Physical functioning
- Lifestyle behaviour
- Medication use
- Health and social care use

- General questions and productivity losses for paid and unpaid work

As for general questions, a study by Abbas Syed et al. (2022) pointed out that among older people, there are issues of health inequalities mainly attributable to gender, ethnicity, and socio-economic position. Therefore, several questions related to these elements are included in the last part of the questionnaire.

Table 1. Information of older people collected through the questionnaire

Outcome	Outcome measure	Methods and Instruments
Health, well-being and quality of life	Physical HR-QoL Mental HR-QoL	PROMIS-10
	Quality of Life	EQ-5D-5L
	Frailty	Tilburg Frailty Indicator
	Comorbidities	ICHOM older person set
	Loneliness	UCLA-3 item loneliness scale
	Activities of daily living	Modified 10-item Barthel Index
	Falls	Visual Analogue Scale for Fear of Falling
Lifestyle behaviour	BMI	ICHOM older person set
	Smoking status	ICHOM older person set
	Alcohol consumption	ICHOM older person set
	Physical Activity	One item of the SHARE-Frailty
	Nutrition and undernutrition	One item of the International Physical Activity Questionnaire (IPAQ)
	Medication intake	Medication Risk Questionnaire (MRQ-10)
Care use	Care utilisation	Modified SMRC Health Care Utilisation questionnaire
Productivity	Productivity losses	iMTA Productivity Cost Questionnaire (iPCQ)

Informal caregivers and professionals

As the ValueCare project not only intends to advance the quality of life of older people and their families but also to improve the sustainability of health and social care systems in Europe, the job satisfaction and well-being of health and social care professionals are also measured (quadruple aim). The questionnaire for informal caregivers and professionals consisted both of 3 parts (see table 2).

Table 2. Information of informal caregivers and professionals collected through the questionnaire

Informal caregivers	**Professionals**
Quality of Life • PROMIS-10	Quality of Life • PROMIS-10
Care provided • Zarit Burden Interview 4 item • iMTA Valuation of informal Care Questionnaire (iVICQ)	Working conditions, job satisfaction, burnout • Culture of Care Barometer • Minnesota Satisfaction Questionnaire • Copenhagen Burnout Inventory
General questions and productivity losses for paid and unpaid work • iMTA Productivity Cost Questionnaire (iPCQ)	General questions

3.1.4 Use of the questionnaire

The questionnaires were created in English and all pilots translated it to their local language. Pilots were encouraged to deploy the online questionnaires for their participants, however, given the target group of older people, paper questionnaires were available as a back-up. WP5 provided a pdf with the correct translations that pilot sites could print, and the online questionnaire was available in Generic Medical Survey Tracker (GemsTracker). GemsTracker is a software programme that is developed for secure data collection. Each pilot site appointed colleagues to have access to the system to deploy questionnaires, enter data and also to check data. GemsTracker also calculated participant scores, which were directly visible as soon as a participant completed the questionnaire online. The calculations used for the scores were based on the manuals and scoring guides of the questionnaires, when available. The scores were not presented for every questionnaire but for those that were deemed relevant for the health and social care professionals or researchers to carry out the shared decision-making consultation and care plan creation. Table 3 demonstrates the possible outcomes a participant could have and how to interpret them.

Table 3. Possible outcomes of a participant

Part A – Your Quality of Life – possible outcomes and interpretation	
PROMIS **general** health	Excellent Very good Good Fair Poor
PROMIS **physical** health T score is	.... (50 is the population mean and 10 standard deviation)[1]
PROMIS **mental** health T score is	..... (50 is the population mean and 10 standard deviation) [1]
Part B – Your Health and Well-being– possible outcomes and interpretation	
Tilburg Frailty Indicator **physical** score	0-2 = not physical fragile[2] 3-8 = physical fragile[2]
Tilburg Frailty Indicator **psychological** score	0-1 = not psychological fragile[2] 2-4 = psychological fragile[2]
Tilburg Frailty Indicator **social** score	0-1 = not social fragile[2] 2-3 = social fragile[2]
Total Tilburg Frailty Indicator score	0-4= not fragile[2] 5-15=fragile[2]
Comorbidities	The participant has 0 comorbidities The participant has > 0 comorbidities
UCLA **loneliness**	3-5 = absence of loneliness[3] 6-9 = presence of loneliness[3]
Part C – Your physical functioning – possible outcomes and interpretation	
Barthel **Activities Daily Living** score	0-14 = low risk[4] 15-49 = moderate risk[4] 50-60 = high risk[4]
Barthel **Mobility** score	0-14 = low risk[4] 15-29 = moderate risk[4] 30-40 = high risk[4]
Fear of Falling score	0 = no fear[5] 1-2 = some fear[5] 3-4-5 = fear[5] 6-7-8-9-10 = high fear[5]
Number of falls	No falls in the past 12 months 1 fall in the past 12 months 2 falls in the past 12 months 3 falls in the past 12 months 4 times or more falls in the past 12 months
Part D – Lifestyle Behaviour – possible outcomes and interpretation	
Body Mass Index (kg/m^2)	Underweight <23 normal/healthy weight 23-28 overweight 28-30 obese >31
Smoking status	smoker non-smoker ex-smoker

Alcohol consumption	No alcohol use in the past year. The participant drinks once a month or less/2-4 times a month/2-3 times a week/4 times a week or more, and when he/she drinks, the average alcohol consumption is 1-2 glasses/3-4 glasses/5-6 glasses/7-9 glasses/10 or more glasses.
Hours **sitting**	The participant sits 0-24 hour(s) per day.
Low or moderate level of **energy activities**	More than once a week / once a week / on or three times a month / hardly ever, or never
Malnutrition (SNAQ 65+ score)	0 = no risk of malnutrition[6] 1-6 = risk of malnutrition[6]
Part E – Your Medication use – possible outcomes and interpretation	
Risk of inappropriate medication use (MRQ-10)	0-3 = low risk of inappropriate medication use[7] 4-8 = high risk of inappropriate medication use[7]

[1] Health Measures (2023). https://www.healthmeasures.net/score-and-interpret/interpret-scores/promis/promis-score-cut-points

[2] Gobbens et al., (2020). The Tilburg Frailty Indicator (TFI): New Evidence for Its Validity. https://doi.org/10.2147/CIA.S243233

[3] Campaign to end loneliness (n.d.). https://www.campaigntoendloneliness.org/wp-content/uploads/Loneliness-Measurement-Guidance1.pdf

[4] Zora S, Custodero C, Pers Y-M, et al. Impact of the chronic disease self-management program (CDSMP) on self-perceived frailty condition: the EU-EFFICHRONIC project. Therapeutic Advances in Chronic Disease. 2021;12. https://doi.org/10.1177/204062232110567

[5] These fear of falling score interpretations were decided by the involved researchers.

[6] Kenniscentrum ondervoeding (2022). SNAQ 65+. https://www.kenniscentrumondervoeding.nl/wp-content/uploads/2022/05/2022-00328_Snaq_65-plus_NL_V1_def.pdf

[7] Ye, L., Yang-Huang, J., Franse, C.B. et al. Factors associated with polypharmacy and the high risk of medication-related problems among older community-dwelling adults in European countries: a longitudinal study. BMC Geriatrics,22, 841 (2022). https://doi.org/10.1186/s12877-022-03536-z

A pdf with the scores could be created by the pilot site researchers and uploaded into the Vida24 dashboard for the professionals to access. Subsequently, the professionals can use it in the consultation with the older person to discuss the questionnaire and create a care plan together based on shared decision-making. During the consultation, the professional together with the older person discusses the results and preferences, feelings and wishes of the participant, but the professional also introduces the ValueCare app and the different modules it offers. Based on the results from the questionnaire, the professional can recommend one or more modules of the ValueCare app for the participant to try. Once it has been decided together which modules the participant would like to use and where the participant would like to work on, the professional can create the care plan and activate the modules in the Vida24 dashboard. The dashboard is linked with the ValueCare app, so the modules are directly sent to the app from the dashboard once the professional activates it. The participant can then log-in with the username and password provided by the professional and start using the app.

3.1.5 Follow-up questionnaires

Within the project, there were two follow-up questionnaires; the first one was when the intervention ended (T1) and the second one was after a follow-up of several months (T2). The first questionnaire aims to measure any effects of the intervention and costs, as well as the perception and satisfaction of the intervention. Therefore, the T1 questionnaire had a version for the intervention group and a version for the control group. It was decided to keep all other (health) outcomes the same as the baseline. The deployment of the questionnaires was the same as the baseline; pilot sites could decide if they wanted to provide the questionnaire on paper or online. The second follow-up questionnaire (T2) was only about the (health) outcomes. Questions regarding intervention were considered irrelevant and questions about costs can be modulated. For both T1 and T2, it was decided not to repeat any socio-demographic questions that would not change over time.

3.2 ADDITIONAL ASSESSMENT TOOLS IN PILOT SITES

The basis of the intervention phase, as well as providing care that is aligned with the values and needs of older people, is the process of shared decision-making between them and the interdisciplinary team. This approach involved healthcare professionals collaborating with patients to choose care pathways tailored to their individual needs and values. These decisions were made based on the outcomes of the adapted ICHOM questionnaire Standard Set for Older People. In certain pilot sites (Athens, Cork and Kerry, Rijeka, and Treviso), additional assessment tools were used to evaluate the effectiveness of the interventions. All shared decision-making tools per pilot site are shown in table 4. More details about the theory of shared decision-making as well as the process pilot sites used are described in chapter 4.

Table 4. Shared decision-making tools per pilot site

Pilot site	ICHOM Standard Set for Older People	Additional assessment tools (questionnaires/ measurements)	Individual consultations
Athens	Yes	Clinical Indicators for Diabetes, GR-DMSES, FFQ, IPAQ and RAPA 2	Yes, by clinical team members
Coimbra	Yes	n/a	n/a
Cork and Kerry	Yes	MoCa test and clinical frailty assessment (Rockwood scale)	Yes, by clinical team members
Rijeka	Yes	Public Health Lab measurements and medical findings	Yes, by cardiologists
Rotterdam	Yes	n/a	Yes, by stroke after-care nurses and researchers/research assistants
Treviso	Yes	MMSE (Mini Mental State Examination)	Yes, by clinical and/or research team members
Valencia	Yes	n/a	Yes, by healthcare professionals

3.2.1 Athens pilot site

In addition to the ValueCare questionnaire, the Athens pilot decided to include a baseline, T1, and T2 evaluation with the following variables:

- Weight, height and BMI, inputted in Vida24 web dashboard,
- Complications of Diabetes (according to ICHOM Diabetes Reference Set),
- Comorbidities of Diabetes (according to ICHOM Diabetes Reference Set),
- FFQ (*Food Frequency Questionnaire*), a questionnaire that consists of a finite list of foods and beverages with answer categories to indicate the usual frequency of consumption during the period asked about (Aoun et al., 2019),
- PHQ – 9 (nine-item *Patient Health Questionnaire*), an instrument used to diagnose and determine the severity of depressive symptoms (Ford et al., 2020),
- IPAQ (*International Physical Activity Questionnaire*), a commonly used measurement tool to assess the level of physical activity and determine sedentary behaviour (Cleland et al., 2018),
- RAPA – 2 (*Rapid Assessment of Physical Activity 1 Questionnaire*), a questionnaire to evaluate the strength and flexibility training among participants (Azfar et al., 2019),
- GR – DMSES (the Greek version of the *Diabetes Management Self-Efficacy Scale*), a questionnaire to evaluate the self-efficacy of diabetic patients (Fappa et al., 2016).

Also, the System Usability Scale (SUS) was included in Vida24 only for T2 assessment, to assess the usefulness of the ValueCare app to patients in the intervention group (Hyzy et al., 2022).

3.2.2 Cork and Kerry pilot site

To determine the cognitive impairments of graded severity among participants, the *Montreal Cognitive Assessment* (MoCA) questionnaire was used. The MoCA is a quick (5–10'), psychometrically robust screening tool that assesses both non-instrumental (executive functions, attention) and instrumental (language, memory, visual-spatial skills, orientation) areas (Aiello et al., 2022). Those participants who had a MoCa score of at least 20 and experienced mild to moderate levels of frailty were approached about the project. The results of the questionnaire were discussed by the clinical team members. A research assistant then arranged an in-person meeting with the multi-disciplinary team to discuss the results and goals of each of the participants. Once a care pathway was designed for the patient, in-person training with the patient and an informal caregiver began, where they had the option to review the care plan and make changes if required. In the community, the Rockwood scale, a semi-quantitative tool used to estimate an individual's degree of frailty, was used to guide the research team on accessing mild to moderate levels of frailty among the citizens (Prendiville et al, 2022).

3.2.3 Rijeka pilot site

After the introduction to the project activities and training, the intervention participants were invited to the Public Health Lab of the Department of Social Medicine and Epidemiology of the Faculty of Medicine of the University of Rijeka, which was set up as an added value for the needs of the project, to carry out the first measurements before the personalised care plan was defined. The measurements were taken twice during the intervention, at the beginning and at the end of the intervention. These measurements included: height (cm), weight (kg), visceral fat (%), total body fat (%), skeletal muscle (%), body mass index (kg/m^2), resting metabolic rate (kcal), blood pressure (mmHg), heart rate, oxygen saturation (%), subcutaneous adipose tissue (mm), left and right-hand dynamometry (kg), electrocardiography, spirometry, and blood glucose levels (mmol/L). These analyses have broadened the approach to personalised care and enabled healthcare professionals to better tailor the necessary care pathway for the participant. Based on the measurement results from the Public Health Lab, ICHOM set outcomes, the participants' values, and their medical findings from the last examinations within regular healthcare service utilisation, the cardiologists set up a personalised care plan.

3.2.4 Treviso pilot site

As an additional pre-post tool for evaluating model effectiveness at T0 and T2, the Treviso pilot site research team used the Mini Mental State Examination (MMSE). This is one of the most often used tools for assessing cognitive impairment in older people (Shigemori et al., 2010). The aim of the instrument is to discern between older people with or without a neuropsychiatric disorder at an early stage of the disease process (Shigemori et al., 2010). It consists of eleven questions that evaluate immediate memory, temporal orientation, attention/concentration, spatial orientation, delayed recall, naming, verbal repetition, verbal comprehension, writing, reading a sentence, and constructional praxis (Shigemori et al., 2010). The MMSE has a maximum score of 30, with five different domains of cognition being analysed: (1) orientation, with a maximum score of 10, (2) memory, with a maximum score of 6, (3) attention and calculation, as a measure of working memory, with a maximum score of 5, (4) language, with a maximum score of 8, and (5) design copying, with a maximum score of 1 (Shigemori et al., 2010).

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Chapter 4

Shared decision-making

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4.1 THE PATIENT AND PRACTITIONERS' INTERACTION FOR VALUE CREATION IN THE CARE PATHWAYS IMPLEMENTATION

Value creation in care pathways is a critical concept in healthcare that focuses on optimising patient outcomes while minimising costs (Porter, 2010). Care pathways are structured, multidisciplinary plans that outline the sequence of interventions and expected outcomes for a specific condition or procedure (Porter, 2010). By enhancing value in care pathways, healthcare organisations can improve patient satisfaction, quality of care, and overall efficiency (Porter, 2010).

The patient-practitioner interaction

The patient-practitioner interaction is a key aspect of value creation in care pathways. Engaging patients in decision-making, providing education and support, and incorporating patient preferences into care plans can lead to better outcomes and increased patient satisfaction (Coleman et al., 2009). Patient involvement in care pathways has been shown to improve adherence to treatment plans, reduce hospital readmissions, and enhance overall health outcomes (Coleman et al., 2009).

The role of the patient

Patients play an active role in value creation in care pathways by:

- Participating in decision-making about their care
- Providing feedback on their experiences
- Advocating for their needs
- Following their care plans

The role of the practitioner

Practitioners play a vital role in value creation in care pathways by:

- Engaging patients in decision-making
- Providing education and support
- Incorporating patient preferences into care plans
- Monitoring patient progress
- Adjusting care plans as needed

Benefits of patient-practitioner collaboration

Patient-practitioner collaboration can lead to a number of benefits, including:

- Improved patient outcomes
- Increased patient satisfaction
- Reduced costs
- Improved efficiency

Enhancing the patient-practitioner interaction

To enhance patient-practitioner interaction and maximise value creation in care pathways, healthcare organisations can implement several strategies, such as:

- Shared decision-making: Involving patients in decision-making regarding their care, including treatment options and goals (General Secretariat of the Council, 2017).
- Patient education and support: providing patients with clear and accessible information about their condition, treatment options, and self-management strategies.
- Patient-centred care: tailoring care plans to the individual needs and preferences of patients.
- Patient feedback: regularly collecting feedback from patients to identify areas for improvement and enhance the patient experience.

The patient-practitioner interaction is essential for value creation in care pathway implementation. By engaging patients in decision-making, providing education and support, and incorporating patient preferences into care plans, healthcare organisations can improve patient outcomes, enhance patient satisfaction, and improve overall efficiency in care delivery. Value creation in care pathways is essential for delivering high-quality, cost-effective care to patients. By focusing on patient-centred care, evidence-based practises, and technology-driven solutions, healthcare organisations can optimise outcomes, enhance patient satisfaction, and improve overall efficiency in care delivery.

4.2 PATIENT AND CARE TEAM INTERACTIONS BASED ON THE SHARED DECISION-MAKING APPROACH

This subchapter describes the overall framework and approach that were applied by the seven pilot sites in terms of patient and care team interaction based on shared decision-making (SDM). SDM has been defined as a decision-making process that occurs between patients and their health and social care providers regarding care and treatment (Légaré et al., 2008). Elwyn (2017, p.1) describes SDM as “a process in which decisions are made in a collaborative way, where trustworthy information is provided in accessible formats about a set of options, typically in situations where the concerns, personal circumstances, and contexts of patients and their families play a major role in decisions”. The main objective of this process is to place patients or clients at the centre of their care in order to make informed decisions. In this way, people and their care providers both have key input into care plans to facilitate the best quality of life and care for the person (Stiggelbout et al., 2012).

In the context of care for older people living with health conditions, SDM is often used to reach health decisions to reach meaningful outcomes and achieve personal goals (Pel-Littel et al., 2023). The best treatment for a condition for an older person does not necessarily mean that it is also the best treatment for the patient as a whole (Pel-Littel et al., 2023).

Another style of healthcare communication is needed for this, according to Pel-Littel et al. (2023): ‘’instead of focusing on the treatment of each individual condition, the conversation should start with exploring an older adult’s priorities regarding preferred health outcomes, thus guiding the discussion of options and decisions about treatment or care” (Pel-Little et al., 2023, p.2). In a recent systematic review, it was observed that SDM is not yet commonly used in the care of older people, with many barriers to it occurring such as cognitive/ physical impairment, pressurised clinical environments, and clinician views of older people’s capabilities (Pel-Littel et al., 2021). Nonetheless, this approach can have many benefits, such as the development of trust (Croker et al., 2013) and increased awareness of the risks and benefits of care decisions (Van Weert et al., 2016; Jansen et al., 2016).

Within the ValueCare project, a general SDM approach was provided for pilots to follow, however, each pilot had adapted the SDM approach according to their patient condition; this adaptation is described in the next subchapter. Pilots had to apply the SDM approach during the consultation, where the baseline questionnaire scores and results were discussed. This consultation is between an older person, his/her informal caregiver and one or more healthcare professionals. Per pilot site it differed whether it was one healthcare professional or if the whole care team was involved. Additionally, the older person could choose whether he or she wanted his/her informal caregiver to join the consultation. During the consultation, the professional together with the older person discusses the results as well as the feelings, preferences, and wishes of the participant, but the professional also introduces the ValueCare app and the different modules it offers. Based on the results of the questionnaire, the professional can recommend one or more modules of the ValueCare app for the participant to try. Once it has been decided together which modules the participant would like to use and where the participant would like to work on, the professional can create the care plan and activate the modules in the Vida24 dashboard. The dashboard is linked with the ValueCare app, so the modules are directly sent to the app from the dashboard once the professional activates it. The participant can then log in with the username and password provided by the professional and start using the app.

4.3 ADAPTATION OF THE SHARED DECISION-MAKING APPROACH BY PILOTS ACCORDING TO THE PILOT-SPECIFIC PATIENT CONDITION

Athens pilot site

In Greece, no research has been done so far on SDM as part of the clinical practice process, and it is not known why patient decision aids aren′t used. In the Athens pilot site, the target population was older adults (over 65 years old) who are diagnosed with type 2 diabetes mellitus (T2DM) and hypertension, living independently in community settings. In many cases, they have been living with the disease for many years, and good glycemic control has been achieved. T2DM is a disease that can be self-managed based on the degree of willingness and readiness of a person to change his/her way of life and it greatly depends on the self-efficacy of the individual to self-manage the condition. It is a disease where adherence to medication and lifestyle changes concerning the uptake of physical activity and a balanced diet based on evidence-based dietetics is largely beneficial to patients so that they keep on enjoying a good quality of life and avoiding complications.

The process of SDM in the Athens Pilot was as follows: after recruitment at Athens Medical Centre (AMC) and inclusion in the study, each patient in the intervention group was invited to a dedicated meeting with the clinical specialist (nurse or physician) to jointly discuss the results of the ValueCare baseline assessment.

The results of the ValueCare older adults' outcomes questionnaire (from GemsTracker) and the Athens pilots-specific outcomes measurement questionnaires (GR-DMSES, FFQ, IPAQ/RAPA - 2, PHQ - 9), from Vida24, were presented to the older adults, and a full interpretation of the results was verbally given. The clinical team member also sent by e-mail or handed over manually a paper sheet displaying the results from the questionnaires completed by the individual and the interpretation of each result in simple and understandable Greek.

A discussion ensued between the patient and the clinical professional regarding the implications emerging from the "outcomes" profile and with respect to participation in the ValueCare digital health intervention. The discussion was focused on the outcomes that had a significant impact on the progress of the 2 conditions in the study (status of physical activity measured by IPAQ/RAPA-2, self-efficacy in self-management of diabetes measured by GR-DMSES, health nutrition measured by the Food Frequency Questionnaire and could be improved based on the design of the three ValueCare app virtual coach pathways, i.e., the monitoring of glucose and blood pressure and adherence to the medication pathway, the healthy nutrition pathway, and the physical activity pathway. For the other outcomes not directly related to the virtual coach pathways, i.e., mainly the ValueCare questionnaire outcomes, no specific advice was given to the participant, but the patient was prompted to contact their attending physician for further information and, if needed, to contact the ValueCare physician.

The discussion sessions were always warmly received by patients and supporting family caregivers (when available) and the communication was professional but non-judgmental and was characterised by empathy from the site of the clinical professionals participating, which is particularly important with uncooperative patients.

The patients who decided to co-create a care plan in the Vida24 platform and use the ValueCare app, all chose to follow all three pathways in the virtual coach component of the app because they perceived all pathways as critically important for their well-being and they felt safer when all pathways were activated. There was no coercion imposed by clinical professionals for this free choice and there was a lot of enthusiasm from the possibility of using all three components.

From discussions with intervention group patients, it appears that the SDM process was well appreciated. The communication approach was very helpful as they felt that the clinical team was ‘hearing’ their voice in the design of the care pathways, and it was not all a “doctor’s “decision. Also, the goals and pathways were clearly explained and as a result, the expectation and reality gap was minimised. From the side of the clinical team members, SDM was also a very helpful process. Quality decision aid tools (GemsTracker, Vida24 platform interface and the results sheet) were all crucially important to communicate the goals and the process of SDM towards following the digital intervention. Despite some time being dedicated to this process that was not previously followed, the whole experience was very positive for clinical team members as well.

Coimbra pilot site

In the Coimbra pilot site, the target group consisted of older adults aged 65+, with scarce socio-family support, in frail conditions, at risk of social isolation, and with mild cognitive impairment and physical comorbidities. The recruitment phase involved close collaboration with the technical directors responsible for each social response (daycare centres, nursing homes and home support) and the active participation of the older adults.

The piloting test at Cáritas Coimbra encompassed a more social and well-being kind of approach; therefore, SDM was adjusted towards an extensive creative process to include digital solutions, tailor the content accordingly (ValueCare coach) and provide personalised follow-up. A notorious effort was made to include the participants in all the phases of the project, which means, they decided how and which content would be included in the ValueCare App. Lots of feedback was collected on the interface and usability, the definition of the intervention areas and their sequence was decided among older adults′ necessities, carers′ suggestions based on their day-to-day perceptions and the research team′s background with evidence-based interventions.

Since the beginning through a collaborative multidisciplinary team with older persons at the centre of the intervention, the design of the methodology has been defined to tackle issues related to mental well-being, socialisation, and physical well-being, in this order, based on the impacts during/after the pandemic (Luísa, 2021; Pacheco, 2021; Novais et al, 2021). The ValueCare intervention came out after a long period of isolation due to the COVID-19 pandemic. Older people reported the impact of loneliness and isolation they felt; carers noticed a decrease in cognitive status and enthusiasm, and an increase in vulnerabilities; and the research team was able to attest to these facts through iterative desk research.

The SDM was also adjusted to collect practical information on how the solutions should be designed, for example, the inclusion of videos of people the older people already knew, the use of simple, inclusive and gender-neutral language, the size of fonts and icons, etc. After these preparatory actions, the SDM was carried out through the assessment of the defined patterns via questionnaires, and the follow-up on the results of the interaction with the app. For the Coimbra pilot, the consultations were converted into 1-1 sessions held by the multidisciplinary team – as no clinical follow-up was foreseen for this intervention.

A standard care plan and goals were defined with representatives of all target groups, and each participant got a personalised accompaniment, due to their ability (or lack of ability) to interact with the digital solution. By T1 questionnaires, every participant got a 1-1 session to debate the findings so far and adjust the intervention, if necessary. In-person activities were also deployed to foster acceptance and retention, always based on the participants' preferences and needs. Beyond the digital approach, due to the necessity of the target groups, in-paper materials (extra activities, manuals, flyers, and participants′ folders – which included the copy of the informed consent, the questionnaires, and the care plan) were delivered to support the value-based approach.

Cork and Kerry pilot site

In the Cork and Kerry pilot, the initial target group was older people aged 75+ with mild to moderate levels of frailty as measured by the Rockwood frailty score and a MoCA (Montreal Cognitive Assessment) test score of at least 20. It became apparent early on in the recruitment process that many participants attending the ICPOP (Integrated Care Programme for Older People) clinical hub were not meeting the criteria for inclusion, and so, the age profile was reduced to 65+. Despite this change, recruitment remained challenging, and after consultation with the pilot steering group, the decision was taken to expand recruitment to take a more community-based approach for the remainder of recruitment, where the participants were not being provided with specific care plans but general health guidelines.

In the clinical setting, the initial consultation was held with a healthcare professional and/or a research assistant, the results of the questionnaire were discussed with the patient and then the research assistant arranged meetings with the healthcare professionals to determine a specific care pathway for the patient based on the results from the questionnaire and the assessment from the healthcare professionals. Training was then arranged with the patient for the digital solution where they had the opportunity to choose all or a select few of the modules that were included in the digital solution.

In the community setting, although there was no formal care pathway created for the intervention participants, participants and their informal caregivers together with healthcare providers together decided on the most suitable care plan. Based on the priority areas that had been identified through the co-design activities, participants were provided with general health, well-being and nutrition guidelines through educational seminars organised in Cork and Kerry and through an alternative digital solution. A physiotherapist, nurse and dietician, supported by the research assistant, attended these educational seminars to provide advice and guidelines regarding physical activity, nutrition, social activities and medication through general health guidelines. Participants that attended the in-person activities had the opportunity to speak with the physiotherapist, nurse, dietician and research assistant about any personal questions they had about their own general health and well-being. Those who opted for the alternative digital solution were provided with daily reminders similar to the ValueCare digital solution along with nutritional guidance and recipes.

Rijeka pilot site

The Rijeka pilot site target group were older persons (65+) who suffered from myocardial infarction and finished the rehabilitation, after which they were released to their respective homes. Recruitment efforts at the Rijeka pilot site involved collaboration with local and regional healthcare providers such as the Community Health Centre of Primorje-Gorski Kotar County and Thalassotherapia Opatija, the Clinic for rehabilitation, treatment, and prevention of diseases of the heart and blood vessels. The participants were introduced to the ValueCare concept by the community patronage nurses and asked if they would be willing to participate in the study, either in the intervention or control group. After the introduction, they filled out the initial questionnaire before the intervention started.

After the recruitment process and the questionnaires were completed, eligible older intervention participants were invited to the Department of Social Medicine and Epidemiology of the Faculty of Medicine at the University of Rijeka where the research team introduced them to the project and its activities, as well as conducted training activities on how to use the smartphones, the ValueCare digital solution and Viber. After the introduction to the project activities and the training, the intervention participants were invited to the Public Health Lab at the Department of Social medicine and Epidemiology of the Faculty of Medicine at the University of Rijeka. At the Public Health Lab, several measurements were done, as described in chapter 3.

Based on the measurement results from the Public Health Lab, ICHOM set outcomes (initial questionnaire), the participants' values, and their medical findings from the last examinations within regular healthcare services utilisation, the cardiologists set up a personalised care plan via a share-decision making process also considering the participant's overall well-being and physical state. The care plan(s) of each intervention participant was set up within the Vida24 web dashboard, one of the ValueCare digital solution segments. Depending on ICHOM set outcomes and/or all other aforementioned parameters, the cardiologist and GPs set up one or more pathways for the participant considering the values of the older person. The Virtual Coach consisted of three pathways: *Physical Activity, Adherence to Medications,* and *Nutrition Awareness*. As an additional pathway, *Social Inclusion* was also included as part of the Viber Community feature.

The cardiologists were involved in individual consultations that took place twice during the intervention (To and T1) in a private, one-on-one environment and were responsible for revising the care plan according to the participants' progress and needs. They also conducted occasional face-to-face consultations with participants as needed. It is worth mentioning that informal caregivers played a pivotal role during the intervention phase, as they were actively engaged from the beginning of the shared decision-making process and were also involved in monitoring participants' goals while providing informal medical or other types of care to their family members or friends.

Rotterdam pilot site

In the Rotterdam pilot, the target group is older people 65 or older who had a (minor) stroke. Due to recruitment challenges, there have been two groups of participants; one group recruited by stroke after-care nurses and one group recruited by researchers through advertisements (community recruitment). The consultation and care plan creation for the first group of participants were performed by stroke-after-care nurses. The consultation and care plan creation for the second group of participants were performed by research assistants and researchers.

The consultations with the participants are based on the results of the baseline questionnaire which encompasses various health-related topics, such as quality of life, medication use, loneliness and lifestyle. Following the different topics and the scores that were generated in GemsTracker, the professionals/research assistants/researchers discussed with the participants the results. However, before discussing, it was always asked how they were feeling in all aspects of life. After the conversation and sharing the results, the participant was asked for any further input or comments they would like to share. After the results, the four modules of the ValueCare app were explained and module for module, the participant could indicate whether they would like to use it. The professionals/research assistants/researchers would also provide advice based on the results. The consultation by the stroke after care nurses was carried out through their own working method and the consultation performed by the research assistants and researchers followed a strict protocol. The protocol contains questions that could be asked to help the participant decide.

Treviso pilot site

For the Treviso pilot site, the target group was people aged 65 or older with a diagnosis of mild cognitive impairment. This meant the inclusion criteria were an age higher than 65, one or more cognitive domains impaired (e.g. memory, attention etc) but concurrent integrity in instrumental and daily living autonomies. Such a patient population had been identified within the outpatient service of AULSS2 in Treviso called the Centre for Cognitive Disorders and Dementia, a service dedicated precisely to diagnosis in the area of cognitive problems. Once patients with this diagnosis were identified and involved in the project with adherence through the administration of informed consent, an initial interview was organised to administer the questionnaire. In many cases, people were accompanied by their caregiver, who was then involved in the process. The results from the responses to the questionnaire formed the basis for discussion with the person to understand what the current problems were, the desired goals, the resources available, and any obstacles to achieving the goals.

Thus, there was no a priori approach to propose but rather followed a process of choosing from among the activities identified as key for our population (physical activity, mindfulness/awareness, socialization, and cognitive stimulation) the one or those that were most relevant to the person and on which they were interested in engaging. For each one, shared goals were set, again based on the person′s ability, to be reviewed later in the following weeks through in-person meetings or phone calls, the use of the app, and the dashboard.

Since the technological support of the app and dashboard was not available with the first patients recruited, we temporarily resolved the situation by using ″old fashion,″ i.e., paper-based, care plans and activities. In addition, since for a number of patients the technology was not accessible (e.g., not everyone had adequate smartphones for the app), another adaptation was to propose group activities for the area's mindfulness/awareness and cognitive stimulation (the socialization part was satisfied precisely by the fact that they were group activities). Overall, people greatly appreciated being able to contribute their preferences to the care plan and generally being involved and monitored in their activities.

Valencia pilot site

In the Valencia pilot, the target group was older people aged > 65 years old with mild to moderate levels of frailty. However, due to the challenges encountered during the recruitment process, this age was brought down to > 60 years old. In a first step, health and social professionals from different healthcare centres in the city of Valencia identified patients who could be potential participants in the project. After a while, to address the recruitment difficulties, the researchers of the project also recruited older adults from other daycare centres and popular universities. They were informed about the ValueCare project objectives, the implementation process and the possible benefits in order to decide if they wanted to join the pilot. Then, they performed different questionnaires to determine the level of frailty, dependency, or cognitive impairment and those who met the inclusion criteria (Frail>2, Barthel>60, Pfeiffer<2)., were included in the project. Once involved and signed the corresponding informed consent, a comprehensive evaluation of the participants' health was made using the ICHOM set for older people together with extra validated questionnaires related to frailty. The participants received all the necessary information about the four areas into which the questionnaire was subdivided (physical activity, nutrition, adherence to medication and psychosocial prescription) as well as help in answering those questions in which they found some difficulties.

Then, in a first consultation among older people, the health and/or social professional and the researcher of the project, the results of the questionnaires were shown to each participant by providing them with graphic materials to make the information in each module more understandable. In some cases, informal caregivers were also present in this first consultation, according to the preferences of the participant. The main goal of this meeting was to develop, through a co-design process, a personalised care plan for each participant according to their specific needs, preferences and wishes. The care plan included specific personalised objectives for each area in which participants were required to be included (physical activity, nutrition, adherence to medication and psychosocial prescription). In some cases, the participant decided (in collaboration with professionals and researchers) to be included in specific areas in which, based on the questionnaire results, they did not need to be. However, since they expressed a desire to improve habits within these areas, specific objectives were established. Once decided which modules the participant would like to use and where the participant would like to work, all together (older person, health and social professionals, researchers -and in some cases, informal carers) set a series of weekly objectives within each area, fully adapted to the specific conditions of each person, as well as to their preferences and needs.

In a second consultation, the researchers of the project introduced the ValueCare app and the different modules it offered to older people. The initial idea was that health and social professionals would enter these goals into Vida24 and seniors would be able to see them through the application. However, due to the impossibility of setting completely personalised goals within the ValueCare app and also due to the lack of time on the part of the professionals, the pilot researchers finally decided to send the weekly goals via email to each participant so that they would be completely adapted to their lifestyle.

To monitor the care plans and modify or readjust them when necessary, weekly interviews were held with the participants to discuss the process and to be updated about possible important changes. Additionally, a series of face-to-face workshops focused on different themes (decided by researchers in collaboration with participants based on their interests) were also monthly organised to maintain close contact with the participants, strengthen their adherence to the implementation, and encourage them to fulfil their objectives.

All this process of SDM was aimed at putting older people at the centre of their own health care. They really appreciated being involved in the establishment and monitoring of their specific care plans while feeling empowered to reach their own goals and improve their own health and well-being.

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Chapter 5

Health Continuum: Integrated Care Perspectives

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5.1 INTEGRATED CARE SOLUTIONS: CARE PATHWAYS

Vanhaecht et al. (2007, p.137) defined the term care pathway as “a complex intervention for the mutual decision-making and organisation of care processes for a well-defined group of individuals during a well-defined period”. In this regard, highlighting the concept of integration and coordination within the care pathways, Riley (1998, p.1) defines care pathways as “locally agreed multidisciplinary practice based on guidelines and evidence where available, for a specific patient/client group. It forms all or part of the clinical record, documents the care given, and facilitates the evaluation of outcomes for continuous quality monitoring.” The term care pathway includes the path within a clinic, the outpatient department’s activities, discharge from the hospital and after-care, and it has to be understood as a model of integrated care (Schrijvers et al., 2012).

The characteristics of care pathways determined by Vanhaecht et al. (2007, p.8) include:

- “An explicit statement of the goals and key elements of care based on evidence, best practice, and patients’ expectations and their characteristics.
- The facilitation of the communication among the team members and with patients and families.
- The coordination of the care process by coordinating the roles and sequencing the activities of the multidisciplinary care team, the patients and their relatives.
- The documentation, monitoring, and evaluation of variances and outcomes, and
- The identification of the appropriate resources.”

Care pathways aim to boost efficiency by breaking down the care delivery process into separate, and analysable steps (Zwaan and Umans, 2012). Therefore, a care pathway aims to improve the quality of care throughout the continuum by enhancing risk-adjusted patient outcomes, ensuring patient safety, boosting patient satisfaction, and optimising resource utilisation (Vanhaecht et al., 2007).

In this regard, Vissers and Beech (2005, p. 95) distinguished five levels of care pathways:

- ”A care plan for each patient (patient planning and protocol).
- The planning of care in care pathways (patient group planning and control).
- The capacity planning of professionals, equipment, and space (resource planning and control).
- The planning of the number of patients to be treated and care activities to be carried out (patient volume planning and control), and
- The long-term policy of the institution (strategic planning).”

5.2 THE INTEGRATED CARE APPROACH FOR PATIENT OUTCOME PRODUCTION

5.2.1 Benefits of integrated care pathways for older people

Integrated care pathways (ICPs) are a collaborative approach to healthcare that aims to improve the quality, efficiency, and coordination of care for older adults (Coulter & Ellins, 2017). ICPs involve a team of healthcare professionals working together to develop a personalised care plan that meets the individual needs of each patient. In the 7 pilot sites, an integrated care approach was implemented and modified based on patient conditions, needs ,and input from informal carers.

ICPs offer numerous benefits for older adults, including:

- **Improved health outcomes:** ICPs have been shown to improve health outcomes for older adults, including reduced hospitalizations, emergency department visits, and mortality rates (Everink et al., 2018). This is because ICPs provide a comprehensive and coordinated approach to care, which can help prevent and manage chronic conditions.
- **Enhanced quality of life:** ICPs can improve the quality of life for older adults by providing them with access to a range of services and support, such as social work, nutrition counselling, and physical therapy (Coulter & Ellins, 2017). These services can help older adults maintain their independence, manage their health conditions, and live fulfilling lives.
- **Reduced healthcare costs:** ICPs can reduce healthcare costs by preventing unnecessary emergency department visits and hospitalizations (Everink et al., 2018). This is because ICPs provide a proactive approach to care, which can help identify and address health problems early on.
- **Improved patient satisfaction:** Older adults who participate in ICPs report higher levels of satisfaction with their care (Coulter & Ellins, 2017). This is because ICPs provide a patient-centred approach to care, which involves older adults in the decision-making process and ensures that their needs are met.

ICPs are typically established by a group of healthcare professionals where the use of a multidisciplinary approach is coordinated. The team works together to assess the needs of the patient and develop a care plan that includes specific goals, interventions, and timelines. The care plan is then implemented by the team, and the patient's progress is monitored regularly. Within the different pilots, each pilot implemented the ValueCare approach by allowing the participants to have a say in their care plan. This approach was well received by patients, as they felt they, in support of their caregivers, had a say in the care being provided to them.

ICPs can be tailored to meet the specific needs of each patient. For example, an ICP for an older adult with heart failure might include goals such as reducing hospitalizations, improving quality of life, and managing symptoms. The ICP would then outline specific interventions, such as medication management, lifestyle changes, and regular follow-up appointments, to help the patient achieve these goals. Regular follow-up on patient needs was implemented by healthcare professionals to ensure engagement was maintained throughout the intervention.

ICPs are a valuable tool for improving the health and well-being of older adults. They can improve health outcomes, enhance quality of life, reduce healthcare costs, and improve patient satisfaction. By providing a comprehensive and coordinated approach to care, ICPs can help older adults live healthier, more fulfilling lives.

5.3 THE CARE PATHWAYS ANALYSIS IMPROVEMENTS ALONG WITH THE PILOT PHASE IMPLEMENTATION

5.3.1 The ValueCare integrated care pathway

The ValueCare consortium aimed at implementing a care pathway enhanced by an ICT solution that spanned across 7 geographical areas and encompassed vastly different care settings. Achieving this goal necessitated the adoption of a systematic approach to guarantee the successful scalability of this initiative. The pilot partners within the ValueCare pilot partners targeted an older adult population with similar characteristics or conditions. The pilot partners delineated each step of the care team's activities involving the participants and caregivers. Subsequently, the International Foundation for Integrated Care (IFIC) took the lead in devising a comprehensive care pathway. This care pathway addressed the shared elements observed across all pilot sites, encompassing aspects such as inclusion in the intervention, multidisciplinary geriatric assessment, the different services provided in the pilot (including the community services), the process of continuous monitoring and support, and a final phase of discharge from the care pathway. Thus, the design of the processes within each of the pilot sites within ValueCare was intricately crafted to align with the overarching goal of the project, ensuring cohesive and effective integrated care delivery across diverse settings and geographical areas for the older population.

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Chapter 6

Requirements and architecture of the ValueCare digital solution

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6.1 REQUIREMENTS OF THE VALUECARE DIGITAL SOLUTION

The newly integrated care approach of the ValueCare project fully engages citizens and health/social care practitioners as it was co-designed with them. An integrated care plan for older people was developed and supported by the ValueCare digital solution. The ValueCare digital solution is based on existing systems (Vida24 and Horus AI) which are integrated into the final fully functional ValueCare digital solution and communicate with each other to function as a whole with the new customizable mobile app and new modules. The VBHC approach is based on general principles for healthcare providers, patients, payers and policymakers to maximise value, also referred to as the "value agenda" (Porter and Lee, 2013). Five components are considered to stimulate the transformation to a high-value healthcare delivery system in the ValueCare project.

1. Healthcare delivery needs to be organised around the medical conditions' patients have. This includes value-based criteria such as providing continuous support over the full cycle of care and clinical management to oversee each patient's care.
2. Measuring outcomes that matter to the patient and the costs for every patient are essential elements. Standardised patient-reported outcome measures are important information for both patients so that they can make informed decisions, and for healthcare organisations to improve the quality of care.
3. Care integration is achieved by networks of care providing the right services, at the right location with the right providers. This requires increased communication and collaboration between care organisations and between patients and their healthcare providers.
4. Expansion of the geographical reach of health services to reduce fragmentation and geographic "gaps" in services.
5. Implementation of the ValueCare technical solution that supports all stakeholders in the integrated health and social care pathways.

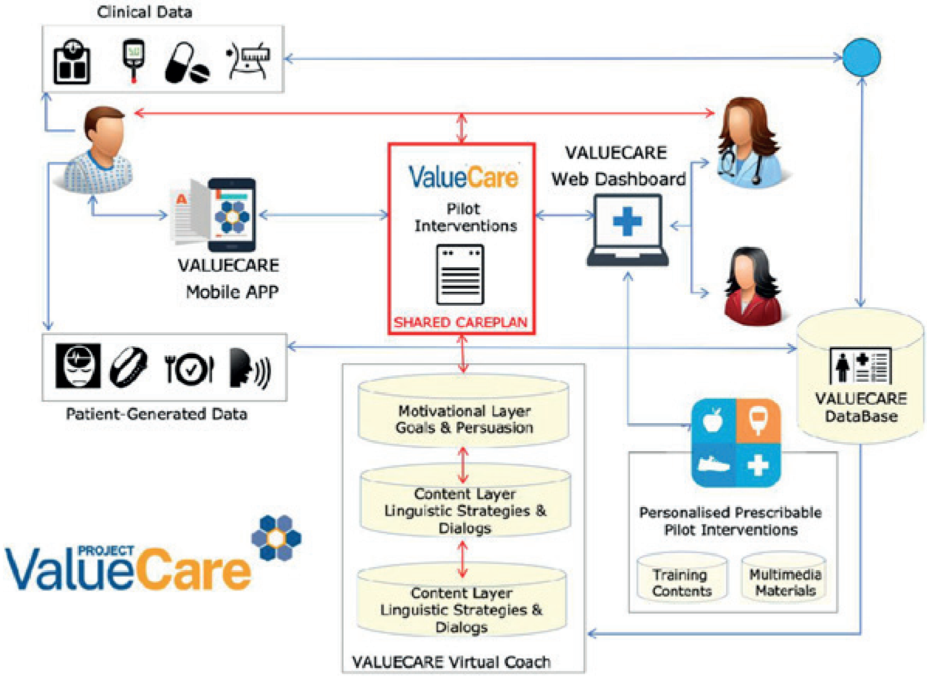
A self-reported questionnaire is used to assess the different health outcomes of the participant. It aims to select the individual care needed and to monitor and discuss the outcomes with the patient and their family. The adoption of the ValueCare technical solution serves two key aims: restructuring care delivery and measuring results.

One of the aims of the ValueCare project is to bring tools and methods to deliver efficient outcome-based care to older people to improve their quality of life (and of their caregivers) and to advance the sustainability of the health and social care systems in Europe. On reaching this high-level objective, the ValueCare project implemented a conceptual framework, considering both, the organisational aspects involved in outcome-based care and the technological instruments to support such a framework with a double-ended aim. On the one hand, to empower patients by increasing awareness and self-management of their own health, and on the other hand, to support healthcare professionals and informal caregivers in providing high-quality attention to patients while making their interaction and management of patients more efficient. In this regard, the ValueCare solution incorporates a series of tools that support the whole process of care provisioning from the registration of a new patient all the way until patient remission, as follows:

- A web dashboard in which patients are registered, personalised periodic care objectives and interventions are introduced, and authorised clinical professionals and informal caregivers can follow the everyday evolution of patients.
- A mobile app in which patients are enabled to conduct a series of operations related to their awareness of the evolution of their goals, the increase of their disease literacy through dedicated materials, and the possibility of being in touch with their caregivers.
- A dedicated virtual coach embedded in the mobile app in which patients are supported in the achievement of their personalised care plan by utilising motivational feedback, reminders, and targeted interventions according to their condition.

The various technical components of the solution are integrated in a way fully compliant with regulatory requirements (such as GDPR) and are contextualised for supporting patients in managing different types of diseases following a single, value-based approach tuned on specific health outcome measures (i.e., as in each pilot site involved in ValueCare). The overall conceptual representation of the ValueCare architecture is represented in figure 13.

Figure 13. ValueCare Concept driven by value-based requirements



6.2 THE MAIN BUILDING BLOCKS OF THE APPLICATION

The application is not a single monolithic application. It consists of 3 distinct items:

1. A web application with exposed web API – web app – developed by Vidavo

- Registration of a patient, along with questionnaire storage
- Care plan per patient
- Dashboard: a quick overall overview of the patients

This web app is an augmented version of Vida24, developed by Vidavo. Its main function is to support a healthcare professional in the management of a patient. The web application can run on popular browsers (latest updates and security patches), Google Chrome is suggested.

2. A chatbot embedded in the mobile app – the virtual coach – developed by FBK

- Its main function is to engage with the patient and help him follow his care plan; it is a coach or a “pal” to help the patient through the day.

- The chatbot is a Java-based engine that interacts with the mobile application via web messages and API rest calls.

3. A custom built from scratch mobile application – developed by Vodafone Innovus (VI)

- The mobile application embeds different functionalities for the patient, such as data visualisation, chatbot-based interactions, direct communication with caregivers, multimedia materials display, etc.
- The mobile application is the container of the virtual coach
- It provides a friendly and easy interaction between the patient and the ValueCare technical solution
- It caters the doctor/patient interaction

The mobile application is based on the latest framework by Google (Flutter). It uses an abstraction layer between the Android OS (10+) and the graphical UI. This makes this framework capable of running on Android and iOS devices. Table 5 presents the features that are enabled through the ICT solution.

Table 5. Functions enabled by ICT solution

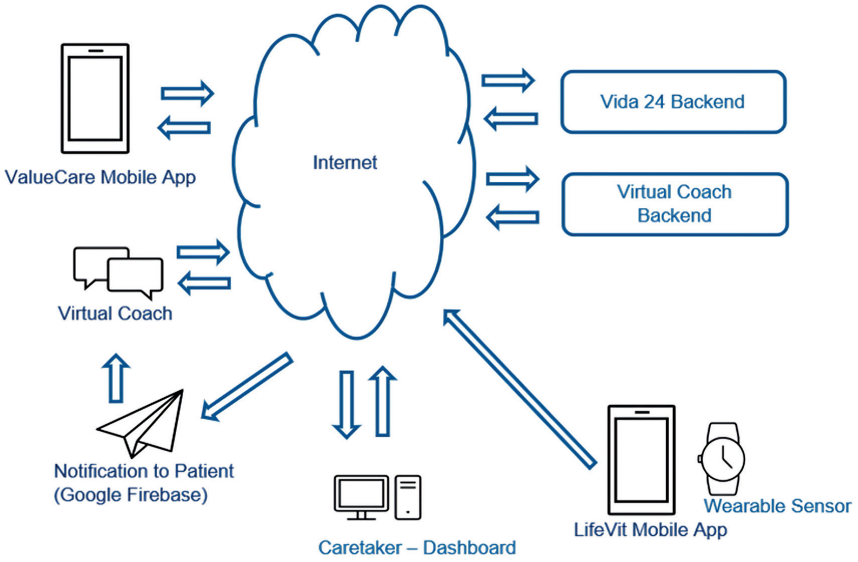
Feature	Description
Care plan	The professional can create the care plan and choose the areas that want to activate.
Messaging	In this module, the professional can send a message (by text) to the patient. It will also be possible to send a message to the caregiver of the participant and to the other practitioners involved in the care plan of the participant.
Appointments	The professional can enter the information of the next appointment that participant has with them.
Questionnaires	Dynamic questionnaires can build on the admin panel and/or can be synchronised on the app.
Vital signs	The professional can add manually a vital sign and the patient can do the same from the app (optional) and can be monitored via the connected medical devices or the activity tracker.
Notifications	The professional will receive notifications e.g. when the participant is not engaging with the mobile app for more than X days, when they are not reaching their objectives, etc.
Physical activity	The app will support (1) capturing the steps using the mobile phone (2) monitor activity using the activity tracker.
Nutrition	Nutrition is monitored via the virtual coach, on the app the patient can see the progress.
Social interaction	Usage of the mobile phone e.g. social media time, calls etc. if the device allows it.
Videos	Links on the app via the virtual coach
Cognitive Games	Cognitive stimulation games are embedded on the app
Medication adherence	The professional can add medication and the patient can receive notification for taking it.
Mood	Track mood. The patient can choose their mood by selecting an emoji on the app.

6.3 ARCHITECTURE OF THE ICT SOLUTION

The preferred architecture of the system is based on a clean and straight-forward setup (figure 14). The reason behind this is to allow the technical partners to address and manage issues more effectively, work on established technologies, and deliver a modular solution that can be reconfigured for future projects or cater to different needs.

The backend system is hosted at VI infrastructure, following all the security requirements for a modern web application. The APIs are visible via HTTPs to the outside world via a proxy (firewalls, balancers etc.) and they are used by the mobile application. For messaging capabilities, the Google Firebase software is used.

Figure 14. Simplified architecture of the ValueCare ICT solution



6.4 ICT SOLUTION INTERFACES

6.4.1 Web application - Health Professionals' Interface

Vida24 is an Internet of Things (IoT) connected care platform that allows quickly adding custom condition-specific modules. Vida24 is used as the main platform where end users (caregivers, doctors) register users, evaluate, activate the care plan, and monitor their patients remotely. The web dashboard is accessible to users through a web browser and is responsive for desktop, web and mobile. This dashboard is built with jQuery, bootstrap, CSS, JavaScript, PHP and HTML. Figures 15 and 16 are two screenshots from the Vida24 dashboard used in the ValueCare project.

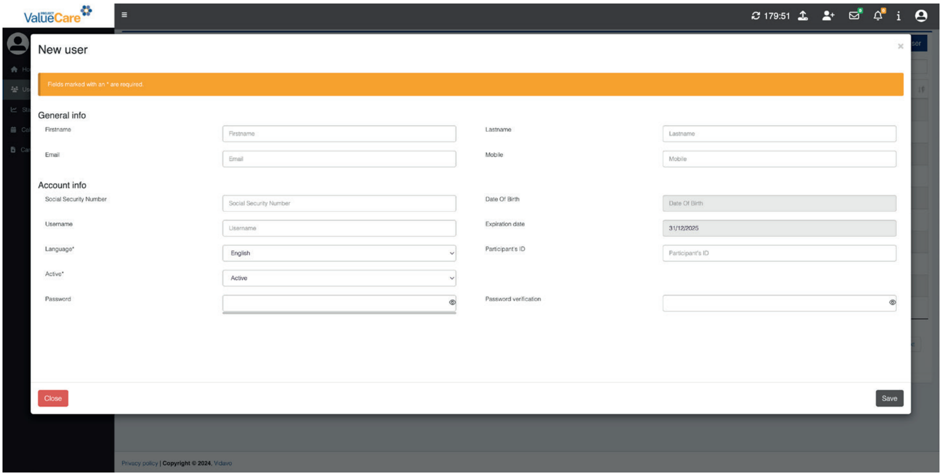
The Vida24 platform provides these main features:

- RBAC (role-based access control)
- Easy-to-build questionnaires and forms for clinical research
- Embedded risk assessment tools for CVD diseases, kidney diseases, metabolic disorders, mental health, Women's menopause and more
- Responsive and customizable user interfaces
- Supports multi-language interface
- Supports a wide range of self-monitoring devices
- Provision data access for partners and 3rd party applications (via API)
- Set up scheduled jobs, such as reminders and notifications
- Supports 2-way text messaging.
- Modular – different modules are activated to facilitate different business and organisational settings

The Vida24 platform supports multiple types of modules, including:

- Prescription, medication management allowing prescription using ICD-10 classification and official medicine list
- Files and exams management
- Upload of medical information, lab and test results, vitals and images PDF or JPG (Vidavo, 2020)
- Teleconference
- Nutrition and physical activity management
- "Second Opinion" capability between physicians
- Online appointments management service, synchronisation with Google Calendar
- Speech to text, easy data entry by converting voice commands to written text (Vidavo, 2020)
- Integrated the e-prescription and national database of approved medicines in Greece offered by the National Health System.
- Message exchanging
- Admin management

Figure 15. Screenshot of the Vida24 dashboard - create user screen



Fields marked with an * are required.

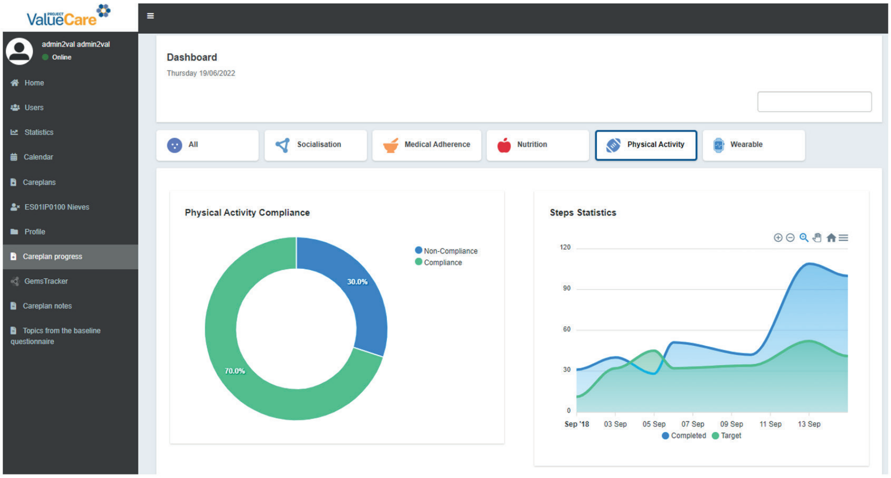
General info

Firstname: Firstname
Lastname: Lastname
Email: Email
Mobile: Mobile

Account info

Social Security Number: Social Security Number
Date Of Birth: Date Of Birth
Username: Username
Expiration date: 31/12/2025
Language*: English
Participant's ID: Participant's ID
Active*: Active
Password:
Password verification:

Figure 16. Screenshot of the Vida24 dashboard - careplan progress



6.5 MOBILE APPLICATION – PATIENTS INTERFACE

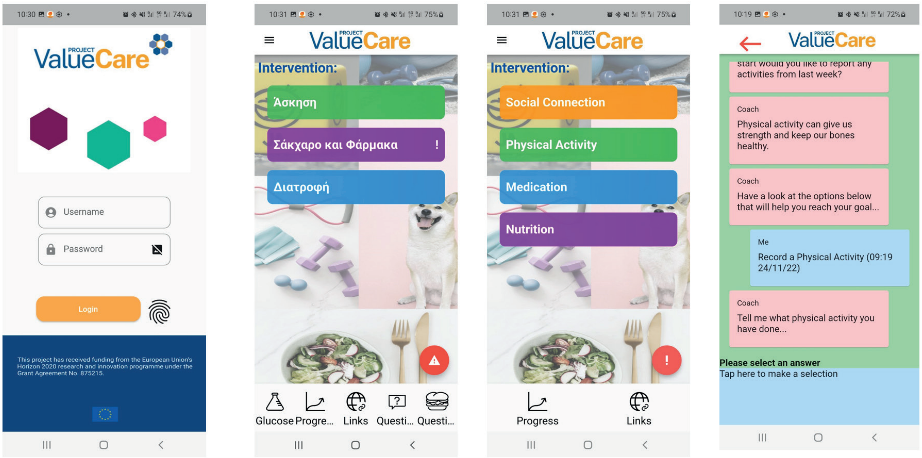
Vodafone Innovus (VI) developed the mobile application of the ICT solution for ValueCare. The mobile application is based on the Google Flutter framework and is targeted for both Android and iOS devices.

The main technical features of the application are:

- Authentication/authorization. The app uses a WJT (web json token) authentication process; all calls originating from the application contain a time-expiring token (sent at the authentication header) that identifies each user.
- Local storage access. The application uses local storage to store user preferences and auto-login data.
- Push notification messages. The application, to supplement the ICT solution, is enabled to handle push notification messages that notify the user about the pending intervention.

The application will render the interface of the Virtual Coach and the intervention actions from Vida24. The requirements were defined during co-design activities. Figure 17 presents some screenshots of the app.

Figure 17. Screenshots of the ValueCare app (from left to right; log-in screen, main screen with the modules in Greek, main screen in English, example of a chat conversation with the virtual coach)



This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Grant Agreement No. 875215.

start would you like to report any activities from last week?

Coach

Physical activity can give us strength and keep our bones healthy.

Coach

Have a look at the options below that will help you reach your goal...

Me

Record a Physical Activity (09:19 24/11/22)

Coach

Tell me what physical activity you have done...

Please select an answer

Tap here to make a selection

6.6 VIRTUAL COACH

The virtual coach component of the solution is embedded within the ValueCare mobile app. It includes a series of functionalities that could be configured and personalised for each patient through the web application during the patient registration phase. Once a patient is configured for their specific goals and interventions, he or she can download the ValueCare app with the embedded virtual coach already configured for him or her. In this way, the end-user is able to get into interactions with the virtual coach on specific system-initiated dialogues supporting the personalised goal achievement. The end-users are able also to start patient-initiated dialogues with the virtual coach regarding the different possibilities of interaction according to the specific stage of care (i.e. introductory materials about the virtual coach, day-to-day activities, education on disease aspects increasing patients' literacy, etc.).

A dialogue between virtual coach and patient could be initiated as mentioned above either from a patient's intention or through a system attention prompt as shown in figure 18.

Figure 18. Screenshots of the virtual coach chatbot in the ValueCare app

start would you like to report any activities from last week?

Coach
Physical activity can give us strength and keep our bones healthy.

Coach
Have a look at the options below that will help you reach your goal...

Me
Record a Physical Activity (09:19 24/11/22)

Coach
Tell me what physical activity you have done...

Please select an answer
Tap here to make a selection

today?

Coach
Hi there, in this area you can report your daily intake of food types. Please watch the two videos on Importance of Good Nutrition and Portion Sizes.

I will check in with you every evening at 9pm to see which meals and food types you have had in a day. Try to include as many foods as you remember in the day!

How many meals did you eat today?

Coach
How many meals did you eat today?

Please select an answer
Tap here to make a selection

Please select up to 7 option(s)

- Met a friend or relative + -
- Called a friend or relative +
- Attended a social event +
- Attended exercise class +
- Played a game with others +
- Attended day care centre +
- Other Activity + −

6.7 DATA COLLECTION

The ICT solution is designed to collect data from 4 different sources and the collected data resides in the cloud of each application.

- The mobile application. The application is designed to collect data from user interaction with the application. This includes cognitive functions (games) and virtual library interaction (reading articles, viewing videos).
- The chatbot. One of the main interaction points between the patient and the platform is the virtual coach chatbot interface. This interface holds all the interactions and answers provided by patients towards the ICT solution
- Wearable. Health data recorded by the wearable, such as (steps, exercise duration, etc)
- Patient/doctor interaction. Via the web application, the doctor sets up the health plans and any other relevant information.

6.8 PATIENT EXPERIENCES AND SUGGESTIONS FOR FUTURE ICT IMPROVEMENTS

Patient-focused mobile health (mHealth) apps that are publicly available are being used more often in routine chronic disease management-related self-care. Nevertheless, there has not been a lot of research on the experiences of the users (patients) using those mHealth apps for self-care in real-world settings (Mustafa et al., 2022; Stampe, Kishik & Müller, 2021). In this subchapter, the intervention group participant's experiences from using the ValueCare mobile app that is embedded with the virtual coach are reported, and an appraisal of the findings is given.

Patient experiences with the use of the ValueCare solution were reported in deliverable 5.5 of the ValueCare project. They were collected and analysed through a rigorous process of participatory research together with participants. In addition, before To and during the third round of co-design activities, the system usability scale (SUS) was completed by a sample of participants in all pilots in order to assess the perceived usability of the ValueCare app. Usability is defined as ''a key factor affecting the acceptance of mobile health applications (mHealth apps) for elderly individuals'' (Wang et al., 2022, p.1). The contribution in the total score of the odd-numbered items of the questionnaire (the positive statements) is the position of the item in the questionnaire, minus 1, and, respectively, the contribution of the even items (the negative statements) is 5 minus the position of the item in the questionnaire. The total score is the sum of all items multiplied by 2.5 and can have a range from 0 to 100. For benchmarking purposes, the average SUS score from 500 studies is 68. A SUS score above 68 would be considered above average (i.e. indicating good usability) and anything below 68 is below average (i.e. indicating bad usability) (Hyzy et al., 2022).

6.8.1 Patient Experiences from the System Usability Scale Analysis at early app development stages

During the third round of co-design activities, all pilot sites (n=7) asked a sample of older people who participated in the intervention group to fill out the SUS questionnaire after using an early version of the ValueCare app for a limited period of days. This was a limitation since the participants did not have the chance to evaluate the usability of the final app, but it still gave significant information to the technical partners of the project to improve its characteristics and features. The results of the analysis indicated the following:

1. The highest SUS score was encountered in Valencia (SUS Score average was 67) and the lowest in Cork and Kerry (SUS score average was 35). In Coimbra, the SUS score average was 49, in Athens, it was 53, in Rijeka, it was 51, in Rotterdam, it was 60 and in Treviso, it was 58. These results are not comparable though, since the functionalities of the app were different in every pilot, practically meaning that different apps were compared. Also, at the time of the SUS questionnaire completion, the app was not in the same development phase in pilot sites; in some pilots' app functionalities and features were almost complete, while in other pilots, the app development was still in progress. In addition, not all the needs of the end users were captured in the co-design process, and it is possible that some crucial elements that would make the apps more usable were missing, culminating in lower-than-expected SUS scores.
2. In all pilots, the apps were not valued well in terms of their usability by end users (older adults in the intervention group) as all SUS average scores were below the benchmark (SUS score = 68). A possible reason was the immaturity of the app functionalities and features at the time of the SUS questionnaire completion.
3. Research indicates that SUS is not a unidimensional construct and that it consists of at least two factors. However, for a factor analysis, a much larger sample per pilot site would be needed to investigate further (Lewis & Sauro, 2009).

6.8.2 Patient Experiences from Debriefing Interviews with Older People

During the formative evaluation of the ValueCare approach in the ValueCare pilot sites, conducted during the last trimester of 2023, end users' feedback was collected from debriefing interviews. Feedback was collected about implementation aspects of the digital solution used in the project, including the patient's experiences regarding the utility and suitability of the solution for its everyday use. In the 7 pilot sites of the ValueCare project, a total of 27 older people belonging to the intervention group provided feedback on the technical solution. Of relevance to the experiences of the older people with the use of the app were questions 3, 4 5 and 6:

- Question – 3: Is the ValueCare app/wearable helpful in achieving your personal goals set in the care plan? Why?
- Question – 4: Does anything within the ValueCare app/wearable seem out of place or unnecessary?
- Question – 5: Are there any functions in this technical solution you would expect that are not there?

- Question – 6: Have you received any support during the time you used the ValueCare app/wearable? What kind of support?

The following themes were identified from the analysis of the participants' responses:

1. Features of the app/wearable that aid in the achievement of personal goals in the individual care plan
2. Features of the app/wearable that are unnecessary and should not be included/studied
3. Features of the app that should be added in the future and suggested improvements
4. Existence of facilitators for the app's continuous use, such as technical support availability

Theme 1: Features of the app/wearable that aid in the achievement of personal goals in the individual care plan

In most cases, older people using the app did not perceive the app as useful in the achievement of personal goals, but the numbers were different per pilot as the conditions under study were also different and the need to monitor and achieve goals would be emphasised in some pilots as opposed to others. In the Athens pilot site, all participants in the debriefing interviews considered that the app would be useful in this regard, and this could be due to the fact that the conditions under study require stringent goal monitoring and goal planning, i.e., diabetes mellitus in Athens and heart infarction in Rijeka. One item that aids in the achievement of personal goals is the existence of notifications that act as an alarm clock for some participants to be proactive and do the things needed in their care plan. As one participant stated in the Athens Pilot: "T*he concept behind the app is good, but there are a lot of practical issues that need to be resolved. I particularly like the glucose monitoring pathway. It helps me to follow my blood glucose every day and to check how well my medication works in practice. The physical activity and nutrition pathways are useful and sometimes I can reach the targets, depending on my mood, which fluctuates because of the problems I have with my eyes and feet"*.

Theme 2: Features of the app/wearable that are unnecessary and should not be included/studied

All older people taking part in the debriefing interviews said they believe the functionalities the app contains are enough to cover their needs and do not need more complexity.

Theme 3: Features of the app that should be added in the future and suggested improvements

All participants stated that no more features should be added to the app, apart from two participants from Treviso who mentioned that a better integration of the app with iPhones should be achieved in the future and two participants from the Athens pilot who stated they would like more scientific evidence and explanation on the nutrition pathway. As one participant stated: *"I would like to have more details in the video clips. Recipes with exact calories, what combinations are allowed in diabetes, when we can eat, and in what portions. All based on medical evidence".*

Theme 4: Existence of facilitators for the app's continuous use, such as technical support availability

All participants in the debriefing interviews mentioned how important it is to have continuous support from the research team to continue with the use of the app and the wearable but also to be motivated when the app or the wearable are not functional. Many participants also engaged their informal caregivers where possible, in supporting them, mainly emotionally, to carry on with the use of the devices.

6.8.3 Suggestions for future improvements

It has been reported that patients cease using an mHealth app within 30 days (about 4 and a half weeks) of installing the app (Madujibeya et al., 2023). The principle reason for stopping the use was mentioned to be the lack of perceived usefulness of app features to reach the intended behaviour modification (Madujibeya et al., 2023). The app should be easy to use, and tailored patient training and technical support should be continuously provided to the older participants. However, we should bear in mind that the ValueCare app is a research app, with many potential issues affecting its functionality during the limited period of testing with the older patients in the pilots. At the end of the day though, the efficacy of research stage apps (not commercial) in improving the outcomes of people with chronic conditions, should also be assessed on a standardised basis, using specific quality criteria (such as those suggested by the label2enable H2020 project).

It is important to note that SUS score assessment should be performed during the whole lifecycle of the app's functioning, targeting the early stages of the app's use as well as the later stages when the app is more mature, and the end users are more accustomed to the use of the features.

Qualitative analysis of patient's experiences with the use of self-management apps should also be polythematic, including as many themes as possible from the data. Of particular importance is the analysis of the experiences related to the features that enhance the self-management of the chronic condition, the perceived benefits of using the app, the difficulties of using the app for self-care, the facilitators, and the suggested improvements (Madujibeya et al., 2023).

Finally, avoidance of recall bias is important when trying to analyse the validity of the data collected on end-users' experiences, meaning that such surveys should be completed as soon as possible after the end of the digital intervention with the app.

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Chapter 7

From Vision to Reality: Leadership and Care Teams' Engagement in VBHC Transition

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7.1 INTRODUCTION

This chapter describes the transformative field of value-based healthcare (VBHC), which was examined in seven European pilot sites in the ValueCare project. In the rapidly evolving healthcare landscape, the shift towards value-based care has become a critical paradigm that is redefining the way healthcare organisations deliver services and measure their success. The successful transition from traditional fee-for-service models to VBHC depends not only on policy changes or technological advances but, more importantly, on the commitment, leadership, and dynamics of care teams; these are essential elements that determine the trajectory of value-based healthcare initiatives. The central role of leadership and teamwork is explored through their synergies in promoting a patient-centred approach, optimising operational efficiency, and fostering a culture of continuous improvement in seven European pilot sites.

In “Redefining Health Care”, Porter and Teisberg (2006) as well as Leung and Van Merode (2018) in “Value-Based Health Care Supported by Data Science” asserted that the value of healthcare is measured by outcomes achieved relative to costs, which fundamentally changes how the effectiveness of care is evaluated (Teisberg, Wallace & O’Hara, 2020). Adopting this perspective requires a radical rethinking of roles, responsibilities, and working strategies within healthcare teams. Leaders in this environment not only manage, but also inspire, guide, and align the vision of their teams with the core principles of VBHC (Porter, 2010).

In this context, effective leadership is characterised by a unique set of challenges. As Bohmer (2016) suggests in ″The Instrumental Value of Medical Leadership″, it is about managing complex change in care, fostering a culture of continuous improvement, and ensuring that patient-centred care remains at the forefront. Furthermore, engaging care teams in this transformation is not just about adhering to new protocols but also about fostering an environment where every member is proactively involved in the journey to high-quality care (Hughes, 2008; George & Massey, 2020).

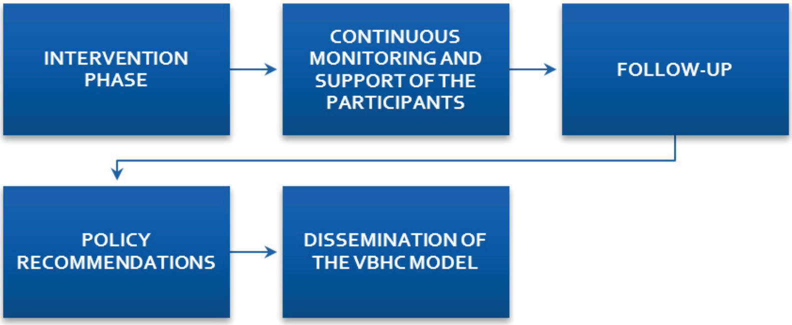
This chapter aims to explore these dynamic roles and responsibilities and provide insights and strategies for leaders and teams transitioning to a VBHC system. We present the best practises and leadership models that have successfully driven this change and provide a comprehensive guide for navigating this complex landscape.

7.2 ROLE OF LEADERS AND CARE TEAMS IN PREPARING THE IMPLEMENTATION PHASE ACROSS SEVEN EUROPEAN PILOT SITES

The importance of the preparatory activities that precede each intervention phase cannot be underestimated. These preparatory steps form the crucial foundation on which the success of the entire endeavour depends. Whether in healthcare, scientific research, or any other multifaceted field, the thorough planning and execution of preparatory activities are essential to navigate the complicated perspective of implementation. These activities encompass a whole spectrum of tasks, from defining the roles and responsibilities of the research or care team to obtaining ethical approval(s), engaging relevant stakeholders, assembling teams, and developing and organising training activities. The purpose of these preparatory activities is not just procedural. Rather, they are essential to shaping the course of the intervention by addressing potential challenges, fostering collaboration, and ensuring a seamless transition to subsequent phases.

As the first stage of preparatory activities, obtaining ethical approval across all seven pilot sites was essential. The leader of each involved pilot site took responsibility for liaising with the relevant ethical committees, ensuring that all proposed activities complied with ethical standards and guidelines. While this process was essential, it was also challenging as it involved bureaucratic processes and time pressures. The role of the pilot site leaders went beyond the administrative tasks as well as understanding the ethical review process and therefore involved effective communication and cooperation with the ethical committees. The general flow of preparatory activities conducted at each pilot site is shown in figure 19. The next subchapter provides an overview of how each pilot site carried out the preparations for implementation.

Figure 19. The general flow of preparatory activities



Athens pilot site

In Greece, there is currently very limited experience with the development and implementation of VBHC approaches in healthcare delivery and reimbursement. It was not until 2021 that the National Organisation for Quality Assurance in HealthCare (www.odipy.gov.gr) was established, and one of its targets is to develop models of care based on PROMS and PREMS that can inform reimbursement decisions related to medical devices under the Medical Device Regulation. The timing of the ValueCare project was good to start communicating with ODIPY about the scope of the project and the results related to the specific topic of

VBHC in Type 2 Diabetes Mellitus in older people in community settings, supported by digital technologies. Ethical committee approval of the study was not an issue, as the clinical team presented coherently the study protocol to the Ethics Committee of Athens Medical Centre (AMC). As soon as the approval was granted, the Alliance for Integrated Care (AfIC) and AMC contacted the CEO of ODIPY and invited him to participate in two co-design sessions regarding the model definition, the PROMS and PREMS to be measured and the digital solution development in the Athens pilot. The scope, aims, potential results and tools used in the project were presented. Hence, the leaders from AMC and AfIC identified an important stakeholder who showed interest in transferring the experiences from the project to national settings. This was quite challenging, because the project was at an infancy stage, and it was difficult to convince this important stakeholder to participate in the activities of the project and offer strategic advice and tips for successful implementation. Additional stakeholders that had interests in the aims and results of the project were also identified and approached to engage in project activities. These stakeholders were the Diabetic Persons Advocacy Group (POSSASDIA), Municipal Authorities (The City of Athens) and Professionals from the Hellenic Network for Diabetes in Primary Care (ΕΔΔΙΠΦΥ). The role of the leaders was to establish meaningful relationships with all stakeholders, to communicate effectively and coordinate common actions towards the achievement of project results that could be beneficial to all.

Parallel to the engagement of stakeholders, the leaders established regular internal meetings through a steering group, including all clinical and research team members to discuss and define project activities based on a bimonthly plan and to identify emerging risks and challenges to the project and potential solutions to these risks. One of the main challenges for the project was the recruitment of patients in the control and intervention groups. Through the initial discussions within the group, the need to cooperate with the relevant stakeholders to expand the recruitment sample was identified, and actions were planned in coordination with them to deploy efficient strategies to recruit patients affiliated with ΕΔΔΙΠΦΥ, POSSASDIA and the City of Athens i.e. the ValueCare Alliance. The other important challenge was to train the members of the research and clinical teams in the tools and methodologies used in the ValueCare approach and also to prepare them to engage with potential participants through motivational interviewing techniques and the use of positive psychology techniques including showing empathy, being non-critical and emphasising the strengths of the individuals to overcome any difficulties that could be an obstacle to achieving the personal goals throughout the project intervention. The leaders, therefore, organised internal sessions with the research and clinical team members to master the techniques and tools to be used in the ValueCare intervention phase, such as the shared decision-making process, filling out the ValueCare questionnaires, the discussion of findings from the questionnaire, creating the personal plan and setting goals in the digital solution, and finally, the use of the technical solution (the platform and the app for the intervention group).

Following the training of the professionals, the next step was for the leaders to communicate with the members of the ValueCare Alliance to support the forthcoming recruitment process by notifying potential participants, especially in the patient group. This collaboration proved very significant for the continuation of the study in the intervention phase since it boosted the recruitment process significantly.

The next phase was the recruitment phase. Participants identified at an earlier stage through regular channels of AfIC and AMC, but also through ValueCare stakeholders, were approached by researchers by telephone and appointments and baseline assessments were arranged. Upon appointments, completion of the ValueCare questionnaires and the extra Vida24 questionnaires was implemented. To ensure transparency and trust in the project's results, a paper copy of the results of the baseline assessment was given to all participants belonging to all three target groups (older patients, health and psychosocial care professionals and informal caregivers) and the results were explained to them. In parallel to these activities, the research and clinical team members participated in training sessions organised by the technical partners, on how to pair the smartwatch with the mobile phone of the user, how to install the ValueCare app and the smartwatch app in the mobile phone of the intervention group participant and how to use the two mobile apps and the smartwatch. Training on the functionalities of the web app dedicated to the clinical team members also took place through online training sessions. Indeed, this was a very demanding process for the research and the clinical team members since the ValueCare web app and the ValueCare mobile app were continuously being improved by technical partners, both in terms of content and to solve problems with bugs during the development phase. The role of the leaders was to keep the clinical and research members motivated and inspired to ″prescribe" to participants in the intervention group a digital tool that was not fully functional and to guide them on how to manage receipt of the negative comments (expression of dissatisfaction or disappointment) and subsequent dropouts from intervention group participants. To better prepare for the forthcoming intervention phase, the leaders also guided research and clinical team members to develop the draft version of a user manual for the mobile ValueCare app, the smartwatch app and the smartwatch itself.

Coimbra pilot site

The Coimbra pilot was organised by the Innovation Department of Cáritas Coimbra (CDC) and aimed at older people (≥ 65 years old), at risk of social isolation, with a lack of social and family support, in situations of frailty, with mild cognitive impairment, and with physical comorbidities.

Ethical approval was obtained from the Regional Health Administration of the Centre, the responsible entity for studies in the geographical region of central Portugal. The project was coordinated by a principal investigator at the local level, who, together with a research/implementation team, was responsible for carrying out the tasks within the project in a constant process of active participation and co-creation. At first, the research team established a network of stakeholders inside and outside CDC to understand how the project can pragmatically contribute to the real needs of those who are impacted by the results of the intervention (primary, secondary and tertiary users). In this way, the value-based and person-centred model was implemented in a horizontal, dialogical and co-participatory way. The stakeholders' involvement in the iterative cycle is what drives the work of the research team, which jointly and collaboratively establishes the priorities, objectives and values to be pursued within the scope of the activities. The Innovation Department was the connecting bridge between the project opportunities and CDC social responses necessities and possibilities. In the preparatory phase, part of the work was to map which of these social responses will be engaged in the testing phase and start to focus on the training of the professionals and informal caregivers that will support the implementation. For example, in the ValueCare project, more than 15 social responses of CDC were mobilised across the entire central region of Portugal. Beyond that, professional and community associations, academic sector and municipalities were engaged.

Working on inclusiveness, technology acceptance, person-centred care, an ethical approach towards vulnerable groups, and research methods were some of the essential topics in terms of piloting preparation. In the specific case of the ValueCare project, it was necessary to have a thorough understanding of the free and informed consent for participation and how to ensure it; information on the digital solutions to be used in the testing phase (mobile app and web dashboard); knowledge of how to use GemsTracker for data collection; comprehensive knowledge on research methods; and a previous understanding of the value-based approach to social and healthcare to adapt it to the pilot reality.

Cork and Kerry pilot site

In the Cork and Kerry pilot, it was key for the team to establish a variety of stakeholders in the implementation phase to ensure a value-based and person-centred approach was achieved. Once ethical approval was granted, the next step was to arrange meetings with the relevant stakeholders. A monthly steering group was held to update the relevant stakeholders and receive advice on challenges being faced and future ideas. It was important to maintain a relationship with all parties throughout the process, as the combined efforts of all were crucial in progressing through each of the stages of the project. The next step was to meet with the care teams from the 2 Integrated Care Programme for Older People (ICPOP) hubs located in Cork and Kerry. The initial phase involved discussing the project in detail with the clinicians and going through the recruitment process step-by-step. A shared decision-making approach was implemented between the clinicians to ensure that all suitable patients coming through the hub were approached about the project. Maintaining regular contact and healthy relationships between the pilot team and clinicians was vital in the recruitment process. This allowed all relevant parties to stay informed and updated on the project.

Recruitment was slow within the hub and after a month of recruiting, a decision was taken to move to a community-based approach where participant recruitment was completed within 2 months. Once recruitment was completed, the next step was to arrange clinician training for the dashboard/digital solution; this was done within both ICPOP hubs and commenced before participants' training started.

The next phase of the project was to begin the intervention phase where training was organised for participants in Cork and Kerry. Unfortunately, due to ongoing issues with the ValueCare digital solution, a decision was made to abandon the digital solution due to the fact it was not fit for purpose. This interrupted the plan to recruit informal caregivers during the training process which is why the Cork and Kerry pilot failed to meet the minimum numbers for informal caregivers. Several alternative interventions were organised in Cork and Kerry such as educational and wellness seminars. The participants were also provided with information packs and leaflets, and some opted to use the researcher's alternative digital solution.

Rijeka pilot site

After getting the ethical approval, the leader of the Rijeka pilot site initiated a stakeholder engagement strategy while identifying key stakeholders, defining their roles, and establishing engagement activities. The leader's ability to manage the different stakeholders' interests and encourage collaboration was crucial. While communicating with relevant stakeholders that were included in the value-based approach, the alignment of interests and maintaining a shared commitment to the initiative was also one of the leader's responsibilities and challenges. To overcome that, the pilot leader established transparent communication channels and encouraged stakeholders to openly express their expectations and concerns. A clear definition of roles and expectations, documented in a comprehensive agreement with stakeholders, served as a point of reference to defuse potential disputes. In addition, the leader had to demonstrate flexibility and adaptability, recognising that stakeholder expectations may change over time. Finally, creating an inclusive and empowering environment for stakeholders encouraged active participation and contributed to a collaborative atmosphere.

After the stakeholders' engagement process, the conscientious definition of the care team members and their respective roles by the pilot leader was emphasised. This leader not only played a crucial role in identifying individuals with different skills but also in assigning responsibilities based on their expertise. The leader's ability to manage the complexity of assembling a well-rounded care team was critical in laying the foundation for subsequent steps. Based on an evidence-based decision-making process, the Rijeka pilot site leader decided that the care team should consist of two main groups: the research team, which consisted of public health researchers and healthcare professionals which included patronage nurses and clinicians. In this step, the leader's role was to provide clear responsibilities and promote accountability and effective coordination.

As a final step before the recruitment phase, the training of healthcare professionals (patronage nurses and clinicians) was organised by the research team. This training aimed to provide a deep understanding of the value-based, person-centred approach to highlight its importance for healthcare and to learn skills on how to improve the motivation of intervention participants. The training also included learning how to use the ValueCare digital solution, a technological tool designed to support intervention participants and improve their health outcomes. After recruiting all target groups, the leader, together with the research team, organised training activities for the intervention participants to address the main challenge of developing digital skills. These skills were the main 'learning objective' that was addressed so that the older people could continue to use the ValueCare mobile app during the intervention and beyond. This approach provided a sense of trust and reliability that was essential for transparent and strong user engagement throughout the intervention phase.

Rotterdam pilot site

In the Rotterdam pilot where the target group were older people who had a stroke, the Rotterdam Stroke Service (RSS) was involved since the beginning of the project. The RSS is a network of 17 organisations in the healthcare sector: seven hospitals, seven nursing homes, a rehabilitation centre, home care and the primary care network of cerebrovascular accident (CVA) Rotterdam. Through the network, many connections were established that were willing to help in the project. These included several other hospitals in the region as well as the stroke after-care organisation in the city. Moreover, the neurology department of Erasmus MC Hospital was also a key partner in the Rotterdam pilot site. After defining the recruitment strategies and considering and deciding how to implement the ValueCare approach, the relevant health and social care professionals who were able and willing to help were trained. Close communication was kept with all hospitals and organisations involved. The researchers and student assistant researchers mostly did recruitment. The consultation and care plan creation were performed by stroke after-care nurses, they were explained how the questionnaire was set up, how the GemsTracker system works as well as the Vida24 web dashboard. All the networking, communication and training was organised by the Rotterdam pilot team.

Treviso pilot site

The Treviso pilot site involved collaboration and close integration between two very important organisational entities. On the one hand, AULSS2, i.e., the local health authority and its Centre for Cognitive Disorders and Memory, through which patients were recruited; on the other hand, ISRAA, with its expertise regarding older people issues and project management. From the outset, therefore, it was important to create an atmosphere of trust and collaboration so that roles and tasks could be divided concerning the preparation and implementation phases. The preparation phase involved the drafting of the protocol adapted to the Italian pilot site by the pilot leader and subsequent submission to the ethics committee. In the meantime, a strategy for recruiting patients had been prepared, as well as the involvement of stakeholders through a special meeting to explain the project. At the same time, appropriate training was provided to clinicians to be ready for the recruitment phase and administration of GemsTracker questionnaires. Once ethics committee approval was received, they were then ready to start with recruitment and administration of the baseline (T0) questionnaire. After the questionnaire was completed and based on the results, the care plan was discussed and agreed upon with each person in the intervention group. Since the digital solution was not available at that time, the first care plans were implemented through paper exercises based on the proposed areas of intervention through technology. Once the technology component was received, people were trained through delivery meetings and instruction in the use of the smartwatch and app.

Valencia pilot site

After getting ethical approval, the Valencia pilot partners started to carry out a specific strategy to identify key stakeholders, define their roles, and establish engagement activities. For the stakeholders′ engagement process, the ValueCare project was presented at specific events and to healthcare professionals, local and regional activities, older people, informal caregivers, and IT experts. In this sense, the project researchers established direct communication through regular meetings with the stakeholders to learn more about their interests and encourage their collaboration. After the stakeholders' engagement process, the Valencia pilot site research team established collaborations with the healthcare professionals of healthcare centres, activity centres, and universities involved in the project. All these professionals deeply explained the ValueCare project and were trained to profoundly understand the value-based approach and its importance in the healthcare system.

Next was the recruitment process. In the Valencia pilot, the target group was older people (>65 years old) suffering from frailty. Over 8 months, participants were recruited from seven different primary healthcare centres (all belong to the same health department of the city of Valencia), one activity centre for older people, and two universities for older people (Pérez-Saiz et al., 2023). In the health centres, health professionals (physicians and social workers) were contacted who proposed suitable patients who meet the inclusion criteria and could participate in the intervention of the ValueCare project. For this, the medical history and personal lives of the patients were considered (Pérez-Saiz et al., 2023). In the other centres (universities and activity centre), the researchers carried out the first selection process based on an initial voluntary meeting with older people. Finally, people who were 65 years of age or older with mild to moderate levels of frailty (according to the FRAIL scale) were included in the project (Pérez-Saiz et al., 2023).

After recruiting all target groups, Valencia pilot researchers carried out training activities both for healthcare professionals and intervention group participants (older people and informal caregivers). In the case of professionals, they were trained in the functioning of the digital solution to follow-up on the intervention process of patients. In the case of older people in the intervention group, the main aim of these training activities was to address the main challenge of developing digital skills.

7.3 ROLE OF LEADERS AND CARE TEAMS IN CONDUCTING INTERVENTION PHASE ACTIVITIES ACROSS SEVEN EUROPEAN PILOT SITES

In this subchapter, we describe the critical importance of leadership and team dynamics in the context of the changing healthcare landscape throughout the implementation phase. Below you can find a description of the requirements and obstacles that leaders and their care teams had to overcome to successfully implement the VBHC model in the pilot cities. Flow of activities and tasks in the implementation phase is shown in figure 20.

Figure 20. The flow of activities and tasks in the implementation phase

Athens pilot site

In the Athens Pilot, leaders, researchers, and clinical team members were very clear on the steps to be followed, the roles and responsibilities of team members carried out, the expected risks, and the ways to mitigate them during the intervention phase from the very beginning. The intervention phase began with the completion of the profile for the intervention group participants online (in the Vida24 web app), shared decision-making on the care pathways to be implemented, and activation of the care plan in the web app. The care plan consisted of a maximum of three pathway:, one on healthy nutrition in diabetes with a goal setting for a healthy diet, one on physical activity in diabetes with a goal setting for physical activity in diabetes, and one focusing on monitoring daily glucose, blood pressure levels, and adherence to medication. All intervention group participants agreed to follow all three care pathways in the care plan, and following that, they received training in the installation and use of the ValueCare and the smartwatch app as well as on the use of the smartwatch itself.

Due to the problems with the proper functioning of the ValueCare mobile app throughout the implementation phase, the leaders instructed the clinical team members to offer telephone and, where possible, face-to-face support to intervention group participants. This level-1 support focused mainly on solving issues such as registration with the app, pairing the smartwatch with the mobile phone, and engaging in the virtual coach dialogues. This proved to be a very difficult task since the ValueCare mobile app was only partly and intermittently functional, and as a result, participants expressed dissatisfaction with it and stopped using it as many of them believed that although it could be helpful in self-management of their condition, in the end it created more problems than solved problems due to its instability.

The follow-up phase proved to be difficult since many participants did not respond to the calls of the researchers for follow-up purposes. Quite a few people, especially in the intervention pathway, were satisfied with the human-centric approach used in the intervention but expressed their dissatisfaction with the ValueCare app since they found it not useful and untrustworthy.

Coimbra pilot site

The research coordination team and the effort from the social and care teams were crucial for accomplishing the key concepts of the ValueCare project, namely the design and content development of the virtual coach according to the requirements collected during the co-creative process, the establishment of the participants' pathways, and the setup of standards for the care plans.

The research team and social and care team acted together to support the implementation on several levels. During the intervention phase, each older adult (intervention and control group) received 1-1 assistance to fill out all the questionnaires (baseline; To and two follow-ups; T1 and T2). They were also engaged in many activities related to the accomplishment of the goals, beyond the ones previously tailored to a digital intervention (many extra activities were carried out). These activities also served to involve informal caregivers in understanding the project initiatives as an added value in the face of the workload of care.

Many challenges were faced during the intervention, such as the lack of literacy and digital literacy skills for both older people and informal caregivers, digital solutions presenting several usability bugs and not meeting expectations, the web dashboard not being used by the professionals, a long list of assessment tools, a lack of time available by informal caregivers and professionals, the distance between the various CDC centres, and the profile of participants was not autonomous to perform project activities.

The barriers were overcome by:

- Strong individualised and regular follow-ups of the participants provided by the research team,

- Partnerships with professionals from the centres to enhance the collective use of the digital solutions,
- The promotion of digital literacy sessions for older people,
- Installation of games on the tablet to encourage the use of technology,
- The development of paper materials to support the use of digital solutions (instructions for use and manuals),
- Regular and close contact between the research team and the social and care teams,
- Quick reactions to participants′ issues, such as support in technological use or replacement of damaged devices/tablets,
- Face-to-face activities related to a value-based approach.

These activities played a pivotal role in the intervention because they could help make up for the lack of the digital solution, while at the same time supporting the daily work of the various CDC services. The activities were developed according to the phase of the intervention that the participants were in, and at each meeting, they served as a reminder of the goals set at each moment. The synergy and trust created between the research team, the care and social teams, and the older people helped to achieve a robust relationship, which facilitated the intervention process. In this way, the goal of pursuing person-centred care and the shift towards a value-based model does not end with a project but can continue with a way of integrating stakeholders to achieve specific objectives for the well-being and healthy lifestyles of older people and their caregivers.

Cork and Kerry pilot site

On completion of participant recruitment in the Cork and Kerry pilot site, the research team began implementing the intervention phase across the clinical setting. After 5 months of trying to implement the digital solution, it was clear the solution was not fit for purpose, and the care team or the research team could not work together on implementing the solution. Despite this, the team continued to make every effort to implement the care pathways for the patient on the digital solution by arranging one-to-one sessions within the clinical setting going through the individualised care goals for the patient and additionally providing the training for the digital solution. It is key to factor in that a lot of the time was spent in one-to-one settings going through the basic usability of the provided tablets due to the lack of digital literacy among patients attending the sessions.

In the initial phases of designing care pathways for individual patients, the research team attended multidisciplinary team meetings and discussed the individual needs of each of the patients in detail with the clinical team before making decisions on individual goals for the digital solution. The research team kept regular contact with the clinical team in person and through online video meetings to discuss the patients' individual care plans. Regular contact was maintained with the clinical participants until the research team decided to stop using the digital solution. After taking a community-based approach, it was not possible to involve the clinical team in the decision-making for individual participants as they were not under the care of ICPOP. In this case, the research team took over the organising and implementation of alternative intervention activities in the Cork and Kerry pilot.

Rijeka pilot site

Every implementation is fraught with a certain level of unpredictability, obstacles, and challenges. Leaders and their care teams have the responsibility and power to overcome certain obstacles and successfully implement project activities. Considering the target group in the project, one of the first challenges faced by the team from Rijeka was the poor digital literacy of the respondents involved. The problem was addressed by the previously described training related to the use of the digital solution in the project, but also by the determined support, either in person or by phone, of the members of the care team, primarily researchers and community patronage nurses. In the city of Rijeka, as an added value to the project activities, the researchers established the Public Health Laboratory. Participants were regularly monitored by patronage nurses who discussed adherence to care pathways and measured their blood pressure. Additional measurements were taken twice during the intervention at the Public Health Laboratory, at the beginning and the end of the intervention. These measurements included: height, weight, visceral fat, total body fat, skeletal muscle, body mass index, resting metabolic rate, blood pressure, heart rate, oxygen saturation, subcutaneous adipose tissue, left and right-hand dynamometry, electrocardiography, spirometry, and blood glucose levels. These analyses have expanded the approach to personalised care and allowed healthcare professionals to better tailor the necessary care pathway for each participant. If certain questions or insecurities arose for individual respondents, they also received additional support from the involved clinicians through occasional personalised approaches. During the personalised approaches, participants could consult with clinicians about the fulfilment of set goals but also about their current state of health. To gather opinions and feedback about the project activities, the researchers together, with the patronage nurses conducted a follow-up. Throughout the follow-up process, the care team was able to gather relevant information on the views and perceptions of key end users and service users, integrating their feedback into the solutions proposed.

Rotterdam pilot site

The Rotterdam pilot team had several roles during the intervention phase. During recruitment, it became clear that the health and social care professionals involved in recruitment did not see as many suitable participants as expected, which indicated that another recruitment strategy needs to be used to reach the foreseen target number. Moreover, the professionals were also too busy to dedicate enough time to the project. This led to a recruitment strategy in the community through advertisements in newspapers and on social media. As a result of the new recruitment strategy, the Rotterdam pilot team had to take over the tasks of consultation, shared decision-making, and care plan creation. A protocol was made, and training was provided to the researchers and research assistants. During the intervention phase, challenges regarding the usage of the app and smartwatch among participants were noticed, and the Rotterdam pilot team provided support where needed to the participants via phone and email.

Treviso pilot site

Concerning the implementation phase, to better coordinate the two teams, it was decided to create a flowchart to identify the steps to be followed and the roles to be assigned. This allowed for the identification by the pilot teams of the critical situation of slow recruitment and not reaching the recruitment target in time. An additional recruitment campaign was then set up through the proposal of ″memory screening,″ again through the collaboration of the two organisations involved. Because of the campaign, it was possible to complete recruitment on time. Moreover, during the implementation phase, some gaps in the technology module were detected, and once again this was resolved through ″analogue″ interventions, i.e., through the organisation of meeting groups on the topics proposed through the app, namely mindfulness, cognitive stimulation, awareness, and healthy lifestyles. Once the implementation phase was over, it was easy to organise follow-up meetings. The constant communication and collaboration of the AULSS2 and ISRAA teams was a key point in monitoring all the phases the pilot went through and in detecting any possible situation that could affect the successful implementation of the ValueCare activities.

Valencia pilot site

Once the recruitment finished, the research team of the Valencia pilot site started the implementation activities. Participants completed the baseline assessment based on the standardised questionnaire. From the results of this questionnaire, the specific areas of intervention in which participants needed to receive support were defined (Pérez-Saiz et al., 2023). These areas are nutrition, physical activity, use of medication and/or socialisation. Firstly, healthcare professionals agreed to oversee this task, and consequently design, together with older people, their care plans. However, due to the lack of time and commitment to the project, the research team of the Valencia pilot site finally carried out this activity. This indicates that the researchers explained the questionnaire results to the participant in a face-to-face meeting. This meeting was the starting point for co-designing the intervention plans (Pérez-Saiz et al., 2023). The care plans were designed by establishing personalised objectives, which was updated by the researcher team on a weekly basis. These objectives were established through the digital solution, in which participants had been previously trained, so they could access and track their progress. During the implementation, researchers had to face different challenges and adapt themselves to the difficulties of this phase of the project. Some of these challenges were the feeling of loneliness among older people, the lack of access to healthcare and the difficulty in handling the digital solution. These reasons led researchers to implement face-to-face workshops, focused on specific themes and motivational interviews.

7.4 CONCLUSION

In conclusion, the final product, formulated under the leadership of the team leaders from all seven pilot sites, comprises well-crafted policy recommendations and future steps in delivering value-based health care within different settings. This step highlights the leader's adeptness at synthesizing all implemented activities and incorporating feedback from the entire care team and relevant stakeholders. The primary aim of this approach was to provide comprehensive guidelines to all relevant stakeholders in health and social care systems. These guidelines are designed to foster the delivery of value-based, integrated health and social care for older individuals, that is assisted by innovative digital tools. This strategic framework ensures that the care provided is both effective and respectful of the dignity and rights of older people.

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Chapter 8

The theoretical economic framework for the value metrics

Natalia Allegretti, Hein Raat, and Oscar Zanutto

8.1 INTRODUCTION

Solidarity forms the foundation of European healthcare systems, and since it is closely associated with redistribution, it can be regarded as a way to tackle health disparities. Health, regardless of cultural, economic, or social context, is considered an intrinsic value as it is inherently valuable and desirable in itself. It is the prerequisite for a person′s autonomy, the foundation for an individual′s overall well-being and quality of life, and the enabler for individuals’ opportunities to engage fully in social, economic, and political activities. Every society and individual inherently values health, making it a universal good that transcends other differences. From an ethical standpoint, health is seen as a right rather than a privilege. This perspective emphasises the moral obligation to ensure the maximum life span that everyone could, potentially, achieve. In Europe, the political commitment to universal healthcare is codified in Article 35 of the Charter of Fundamental Rights of the European Union. Universal healthcare aims to provide health services to the entire population, targeting the equitable achievement of health for all as a precondition for socially cohesive European societies (Charter 2012/C 326/02). Solidarity forms the foundational principle of European healthcare systems, ensuring that this aim is pursued collectively and inclusively for access to healthcare for all.

In the context of healthcare, the concept of ***value*** should not only refer to health outcomes relative to costs, as defined by Professor Michael Porter, in a pure logic of increasing cost-effectiveness, but to fully align with the guiding principles underlying solidarity-based healthcare systems it should also consider additional dimensions: how well resources are distributed to different population groups (allocative value), how appropriately these resources are used to achieve health outcomes, relative to individuals with specific needs present in the population (technical value), and how much these health outcomes are aligned with the value system of each individual and their preferences (personal value).

What is necessary, therefore, is to reorganise healthcare systems around a specific disease/condition to maximise value for the populations and individuals they serve.

Today′s healthcare is characterised by being organised in a way that is opposite to a system. A healthcare system, to be defined as such, should group a set of activities with common, measurable, and comparable purposes against standards that undergo periodic revision due to the evolution of scientific knowledge. These purposes must be carried out by individuals and organisational structures networked with each other, thereby abandoning the silo mentality. The following sections provide an overview of the activities carried out in ValueCare to reinterpret Porter′s formula. The process followed to determine the value of the implemented interventions and assess their comparative and cost effectiveness is explained (CDC, 2021). Furthermore, we describe what is needed to simplify the evolution to value-based healthcare by supporting the needed shift in strategic thinking.

8.2 THE ADAPTATION OF M.E. PORTER'S FORMULA TO THE VALUECARE PROJECT

The assumption that has been made within the ValueCare project is that the overall goal of implementing the VBHC model is aimed at generating value using local interventions, generating wanted variations as a delta before and after the specific personalised actions supported by technology. For this purpose, Porter's formula has been informed by the outcomes measurement defined and described in chapter 3 by calculating their average scores in the To and T1.

$$value = \frac{cost}{\text{delta outcomes} + \text{delta metro mapping}}$$

Depending on the relevance of each clinical dimension, related to the patient's condition, each pilot has given a specific weight to each sub-outcome parameter by considering the level of impact and change that local ValueCare interventions would have generated. In parallel the project consortium has also considered the quality of the experience of users. This parameter has been evaluated from the practitioners' perspective both at baseline and follow-up.

Regarding the costs, each pilot has calculated the entire effort required to set up the local pilot deployment including all the costs in terms of personnel, services and administration. The technical component of the cost has been defined, per pilot, considering the effort required by the three technical partners of the project, namely: FBK, VI and Vidavo, to develop and adapt the ValueCare App, the dashboard and the virtual coach according to co-design needs gathered. Due to the framework of the ValueCare project and its scope, we did not use the Time Activity Based Costing foreseen by Porter. It would have required a detailed and constant cost-racking approach; each pilot has calculated a pro-capita cost that covered the entire testing time frame. In the end, Porter's formula has been reversed by having the unit cost required per user, divided by the delta variation generated in terms of outcomes and its sum by the delta generated in terms of the patient experience. The calculated value has the meaning of quantifying the investment that should be done to produce the improvement and/or to maintain the patient's clinical conditions for longer in the context of chronic disease of frail older people.

8.3 THE OUTCOMES MEASUREMENTS AND DATA GATHERED FOR THE QALY METRICS FOR THE CALCULATION OF THE VALUE

To calculate the 'value' with the formula explained in chapter 8.1, several of the health outcomes that were gathered for the evaluation were utilised. The health outcomes are self-reported data from the baseline (T0) and first follow-up (T1) questionnaires. Each pilot site received the pilot-specific data for T0 and T1 from GemsTracker. The data was provided in Excel files. Each pilot site subsequently followed instructions and a script provided by ISRAA to calculate standardised outcomes in RStudio to get a normalised score distribution among the different questionnaires utilised.

The following outcomes are used:

- Health-related quality of life
- Frailty
- Loneliness
- Lifestyle behaviour
- Care utilisation
- Comorbidities
- Falls
- Independence (Activities of Daily Living)

More details about these outcome measures and how they are gathered are described in chapter 3.

8.4 VBHC MODEL ADOPTION IN SOCIAL AND HEALTHCARE ORGANISATIONS – LESSONS LEARNED AND METHODOLOGICAL SUPPORT FOR ORGANISATIONAL CHANGE

Although originally conceived and inspired by the US context, VBHC is also applicable to universalist systems, as demonstrated by numerous European experiences characterised by pragmatism and concrete results. To have health systems that are accessible, effective, and resilient, even the European Commission has increasingly emphasised the importance of VBHC, highlighting not only the economic aspects, which in themselves risk being reduced merely to cost-cutting, but also the strategic reallocation of resources based on the value of outcomes (Turner, 2020).

VBHC proves to be challenging to get beyond the pilot phase and to be implemented on a large scale for several reasons. In addition to having preconditions in place for successful implementation (e.g. financing and reimbursement mechanisms, data structures and connectivity), VBHC should be intended as an integral framework of strategic thinking on how to re-organise healthcare delivery. As such, structural and proactive change management is an essential, and often ignored, aspect of the VBHC journey.

As analysed by Klop & Rutte (2021, p. 30), ''VBHC-related changes only succeed if change management is also sufficiently incorporated, both in terms of mindset and change process''. In terms of mindset, VBHC can be approached from two directions (Klop & Rutte, 2021, p.30):

1. Focus on integration and cooperation - the logistical/practical approach
2. Focus on measuring and improving outcomes - the medical/scientific approach

Regardless of the direction chosen by an organisation, it is essential to have a mindset where the patient is put at the centre and that care is enhanced in accordance with the patient's perspective (Klop & Rutte, 2021). What we have learned within the ValueCare project is that redesigning the healthcare pathways has to happen across all the stakeholders that could play a role in the creation of an Integrated Practice Unit (IPU).

Furthermore, there have been two key elements that ValueCare pilots have pursued:

- The identification of the local project manager who played the role of "care process owner" transversally to several care services and actors had the clear goal of maximising patient outcomes.
- To have delivered initial training about the VBHC Mode, the ValueCare project aimed to combine technology deployment, patient experience improvement, and staff skills adaptation to the VBHC model logic and its day-to-day implementation.

Having introduced the outcome measurement approach that has created a concrete baseline for the quality of care improvement and continuous organisational learning. To support the organisational change, we have conceived a structured VBHC training model that has been translated into the VBHC Green Belt training that foresees a dedicated knowledge set that explains how leaders should behave and operate to drive the transition from standard care towards a value-based and outcome driven one.

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Chapter 9

Policy Insights, Sustainability and Future Research Guidelines for VBHC in Europe

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9.1 REFLECTIONS ON SUSTAINABILITY FROM PILOTING VALUECARE IN 7 EU MEMBER STATES

This chapter aims to provide a comprehensive summary of the benefits, challenges, and future directions for value-based health care in Europe, based on the lessons learned from the ValueCare project. Through targeted policy recommendations and a roadmap for future research, we hope to contribute to the ongoing evolution of healthcare systems towards more value-based, integrated, efficient, and patient-centred care.

The ValueCare project, piloted across seven EU Member States, aimed to improve healthcare outcomes through the Value-Based Healthcare (VBHC) model. Each pilot site provided unique insights into the feasibility and sustainability of VBHC, revealing crucial lessons for future implementations. From Rotterdam's efforts to enhance post-stroke care to Coimbra's focus on healthy ageing with ICT solutions, Treviso's approach to managing Mild Cognitive Impairment, and Rijeka's post-myocardial infarction support, the pilot sites demonstrated the diverse applications of the ValueCare model. Additionally, the Athens pilot tackled diabetes care for older people, while Valencia worked on addressing frailty in older people, and Cork and Kerry integrated VBHC concepts into local care programmes. Despite the varied contexts, common themes emerged that inform the following recommendations for sustainability in the time of such programmes.

One of the critical components for the success of the ValueCare initiative was the ability to adapt the central idea to the different health needs and cultural and demographic contexts of each pilot site. This adaptation not only ensured relevance but also maximised the effectiveness of the interventions. This approach emphasises the importance of developing a methodology from scratch and fundamentally redesigning interventions to meet the unique challenges and opportunities of each site. Customised strategies and in-depth knowledge are critical to the success of healthcare innovation, not a one-size-fits-all approach. The project highlighted the profound impact of synergies and collaboration between different disciplines. This interdisciplinary team, which brought together healthcare professionals, public health experts, organisational specialists, and ICT professionals, created a holistic understanding of patient needs and a unified approach to care delivery. Such alliances break traditional boundaries, promote innovation, and provide comprehensive, seamless care.

During the implementation phase of the ValueCare project, a strategic focus was placed on engagement and education. Initiatives that not only informed but also empowered healthcare professionals, patients, and informal caregivers have proven how deep engagement and thorough training can catalyse change. This approach ensured that stakeholders were well-equipped and motivated to adopt new practises and technologies. By focusing on tailored training programmes, the project ensured that every participant, whether healthcare provider or informal caregiver, was adequately prepared to use ValueCare's digital solutions effectively. The training sessions were designed to be interactive and hands-on so that participants could familiarise themselves with the technology and understand its practical applications in their daily lives. This emphasis on hands-on training helped bridge the gap between theoretical knowledge and practical application and boosted user confidence and competence.

Continuous training and professional development of healthcare personnel are vital. As mentioned in other chapters, VBHC delivery is a team sport. Investing in the education and motivation of healthcare professionals to adopt and apply the VBHC approach will maintain the quality and consistency of care. Additionally, training team leaders and managers on VBHC principles ensures effective implementation and oversight. For example, Coimbra′s focus on training team leaders and providing lifelong digital approaches underscored the importance of ongoing education and support for health and social care staff.

The rigorous pursuit of ethical approvals and the strategic engagement of local stakeholders through local alliances were critical to strengthening the project′s credibility and securing community support. This focus on ethical integrity and stakeholder engagement emphasises a fundamental principle: successful healthcare interventions are built on a foundation of trust, respect for participants′ rights and compliance with European, national and institutional norms and regulations. Each pilot site carefully adhered to ethical guidelines and ensured that all interactions with participants were conducted according to the highest standards of confidentiality and respect.

Customisation of interventions and involvement of older people are, therefore, other crucial points for the success and sustainability of VBHC models. Digital solutions and interventions should be tailored to meet the specific needs and preferences of older people, thereby increasing engagement and improving health outcomes. These interventions must be adaptable to various healthcare settings and patient populations to ensure broader applicability. For instance, in Rotterdam, the intervention was personalised to ensure stroke patients felt supported after discharge, which highlighted the need for adaptable and engaging digital tools.

Contrary to initial fears, the ValueCare digital solution has been found to be an important enabler of personalised care. As described in chapter 6, the use of ICT tools facilitated customised interventions and empowered participants to have an active role in their own care, demonstrating the transformative potential of technology in healthcare. Participants reported that they were more satisfied with their care. They cited the ease of communication, the ability to track their health progress, and the personalised nature of the interventions as key benefits. This positive feedback emphasises the importance of integrating user-friendly digital solutions into healthcare to improve patient engagement and outcomes and contribute to the sustainability of the model.

Developing and maintaining a robust IT infrastructure is thus fundamental. This infrastructure should support the integration and sharing of data across different health providers, facilitating comprehensive outcome measurement and coordination of care. Enhancing digital tools to be more user-friendly and engaging for patients is also necessary to ensure they are effective in managing and monitoring health outcomes. The use of a central electronic patient dossier in Coimbra and Rijeka's planned enhancements to digital tools illustrate the importance of a solid IT foundation.

Continuous monitoring of outcomes and improvement of interventions are crucial. Patient outcomes should be measured and monitored continuously to assess the effectiveness of VBHC interventions. This data, ideally using quantitative and qualitative methods, should be used to make informed decisions and improvements. Establishing feedback loops to gather insights from patients and health and social care professionals can refine and enhance VBHC interventions over time. The experiences from all pilot sites, such as Coimbra's comprehensive monitoring and Rijeka's commitment to ongoing evaluation, highlight the importance of continuous improvement.

In the ValueCare project, the measurement process described in chapter 3 provides an overall view of an older person's health and well-being. Also, for informal caregivers this overview was helpful. The consultation and the ValueCare Care pathway co-creation with professionals were highly appreciated by older people. Older people thought the digital solution was useful; however, they reported it could be further improved. Also, the wearable was considered to add value to working toward set goals. This added value was also noted by informal caregivers. Older people appreciated the organisation of physical meetings where they could learn more, meet others, and gain motivation to improve their health.

Following the user feedback, some key recommendations can be provided to increase feasibility and sustainability:

- As it was with the ValueCare set of questionnaires described in chapter 3, we recommend keeping the questionnaires as short as possible and avoiding repetitive questions. Include all relevant health outcomes for the patients, such as memory or sexual health.
- Create a relationship of trust between older people and professionals to ensure a safe space for discussing health and well-being and to be able to collaboratively work on a care plan and goals.
- Pilot test and pre-test a digital solution before using it in real-world conditions. Major bugs and issues should be fixed before daily use to prevent frustration among users.
- Personalise the digital solution, like the care plan, as much as possible. Digital tools such as wearables can increase personalisation and motivation to work toward goals.
- Apply user-friendly, appropriate design in a digital solution for the user at hand. For example, larger font size for older people; easy to navigate dashboard for professionals.
- Organise follow-up meetings.

- Organise face-to-face consultations and/or other activities to increase motivation and feelings of support.

Engaging stakeholders and fostering collaboration is key to the sustainability of VBHC. It is essential to actively involve all relevant stakeholders, including healthcare providers, older people, caregivers, and family, in developing and implementing VBHC initiatives. Furthermore, forming partnerships with academic institutions, healthcare organisations, and policymakers can support the dissemination and scaling of VBHC concepts. Treviso's collaboration with Padua University to introduce VBHC to healthcare students exemplifies the value of such partnerships. Stakeholder involvement went beyond mere participation and fostered a sense of ownership and collaboration between local communities, healthcare providers, and policymakers. This collaborative approach not only facilitated smoother implementation but also ensured that interventions were culturally and contextually relevant, increasing their acceptability and effectiveness.

Integration into existing healthcare programmes can enhance sustainability. Aligning VBHC interventions with existing healthcare programmes and initiatives allows for the leveraging of existing resources and infrastructure, making the interventions more sustainable. Designing VBHC interventions with scalability in mind ensures they can be expanded to other regions or health and social care settings as needed. The integration of ValueCare concepts with existing programmes in Dublin and the strategic effort in Valencia to promote and build upon the benefits generated by the pilot demonstrate how crucial integration and scalability are for long-term success.

Strategic dissemination and awareness-raising play a significant role in sustaining VBHC initiatives. Disseminating project results and best practises widely helps to raise awareness and promote the adoption of VBHC. Utilising conferences, publications, and other platforms to share insights and success stories can be particularly effective. Engaging with policymakers to advocate for the adoption of VBHC principles at local, regional, and national levels is also crucial. Providing evidence of cost-effectiveness and improved patient outcomes can support policy changes. The strong stakeholder interest in Athens and Cork and Kerry's integration into the local Integrated Care Programme for Older People highlights the impact of effective communication and advocacy.

Lastly, identifying and securing sustainable funding models is essential for the long-term success of VBHC initiatives. Diverse funding sources, including government grants, private investments, and partnerships with healthcare organisations, should be pursued. Conducting thorough cost-effectiveness analyses and sharing these findings with stakeholders can help secure long-term funding and support. Treviso's intention to perform cost-effectiveness analyses and seek funding for wider deployment is a key strategy for sustainability. By focusing on these areas, future projects can enhance the sustainability of VBHC interventions and ensure their long-term success in improving healthcare outcomes.

9.2 DIRECTIVES FOR TOMORROW: POLICY RECOMMENDATIONS FOR A VBHC TRANSITION IN EUROPE

By framing care as a problem, limiting its access, and offering uncoordinated services with questionable quality, society fails to explore more in depth the need to ensure healthy ageing throughout individuals' lives and adopt a human-rights-based perspective. Such an approach could help not only to prevent care needs in the future but also to improve the social value of care and support as elements inherent to people's lives (AGE Platform Europe, 2021).

Despite the prevailing perception within the health care sector and society in general that they represent an economic burden, older people have an indispensable role in the foundation of health care systems, our society and our economy as thinkers, producers, consumers, volunteers and informal caregivers, which is often underscored (Inouye, 2021; Cylus, Figueras & Normand, 2019). Older people, with their wealth of experience and expertise, should be recognised and by fostering their potential contributions, society can reap benefits that span across all generations (Inouye, 2021).

To design and deliver health and care that is tailored to the individuals' needs, and flexible enough to be adapted over time and across different levels (AGE Platform Europe, 2021), this subchapter will, anchored on a human-rights-based approach, set the pace on how care can empower and promote a healthier population across the lifespan through the implementation of VBHC models in policy. It will provide recommendations and tools from the ValueCare project to support the transition to a healthcare system that is value-based in Europe.

9.2.1 How is Europe framing care?

In 2021, the European institutions (DG for employment, Social Affairs and Inclusion, European Commission, 2021) compiled a significant study on long-term care reinforcing the need for reform and acting on the problems of staff turnover, shortage, lack of training, instances of abuse, and the grey economy of care. The most surprising finding was that about 50% of those requiring care are unable to receive it, mostly due to financial constraints. Care at home continues to be a privilege for only 33% of those requiring it. In 11 EU member states, 60% of those using care services faced a significant risk of poverty, even after receiving public assistance. As a result, 80% of care is administered by informal carers, mainly family and women, the majority without the choice of not sacrificing their professional commitments to address the lack of a workforce.

To respond to these findings and align with global initiatives such as the UN Decade of Healthy Ageing (United Nations, 2020) and the Madrid International Plan of Action on Ageing (United Nations, 2002), the European Care Strategy is born (EC, 2022). Without being a binding framework, it allows member states to prioritise and implement actions according to their specific needs and preferences. Nonetheless, this strategy encourages high-quality, affordable, and easily accessible care services across the European Union. It focuses on improving conditions for both people in need of care and care providers, whether in professional or informal roles.

People in need of care, along with their families, informal caregivers, or the workforce do not recognise current care systems as humanistic systems that look after their well-being (AGE Platform Europe, 2021). As a society, we need to go beyond biomedical needs and patient management to empower everyone to enjoy all our fundamental rights (e.g. right to quality of care; right to voice the perceived value of care, right to be treated with dignity, right to autonomy and decision-making…). Thus, VBHC can be one important puzzle piece to meet the society we all want to age in.

9.2.2 Our vision for healthcare delivery

We call on policymakers to move into a value-based health and social care integrated system, where value is the measured improvement in the individual's outcomes and experience of care for the cost of achieving that improvement. Older people define the perceived value of care and the quality of care received; they should be at the centre driving the change. This new vision is based on a team-oriented approach to care and secure sharing of data so that care is coordinated, and older people's outcomes and experience of care can be measured easily. It also focuses on the improvement of staff well-being and achieving better efficiency in the use of resources.

A human rights-based approach requires a fundamental redesign of the healthcare system, and care must be seen as a means to facilitate rehabilitation and societal integration and participation. Instead of imposing existing care "one-fits-all" services on individuals in need, the emphasis should be on recognising each person's right to independent living and customising their care plan to meet their specific needs and aspirations (AGE Platform Europe, 2021). This model of care centres around the principle that individuals have the right to freedom and autonomy, allowing those needing care to participate and contribute meaningfully to society globally. It requires involving individuals requiring care and their families in decisions concerning them and giving them voice to pave the way.

Where to start?

#1 Facilitate Older People Engagement and Empowerment

- Empower older people, their families and communities to actively participate in care decisions, by reconstructing trust, creating a safe space with time for dialogue, and expressing their perceived value and feelings about care received.
- Encourage the co-development of personalised 'ValueCare pathways', with a multidisciplinary team and holistic approach, putting the values and feelings of patients at the centre.

- Fund awareness campaigns and training to fight ageism in the health and social care sectors to grant greater consideration and respect for older people's rights.

#2 Co-define, co-monitor and co-evaluate the quality of care

- Get inspiration from ValueCare outcomes reports to define qualitative and quantitative standardised measures of patients′ outcomes, including clinical, functional, psychological, and quality of life metrics.
- Encourage mixed methods of measuring the quality of care (outcomes), in which the results of these measures should always be interpreted with older people and informal carers based on the ValueCare approach.
- Make sure reporting data is safe and easily accessible to older people, care professionals, and payers (e.g., insurance companies), to encourage transparency and informed decision-making.
- Fund learning communities within and among healthcare providers to inspire each other on how to improve the quality of care.

#3 Enhance collaboration, coordination and communication mechanisms around older people's living environment

- Incentivise health and social care providers to collaborate, share information, and coordinate care, among themselves and with the community to reduce bureaucracy, duplication of interventions, and improve outcomes.
- Invest in and promote the adoption of electronic health records and digital platforms to measure in real-time the co-defined value-based care outcomes indicators.
- Develop standards for care data exchange within high ethical patterns, to enable seamless sharing of older people's information, across different health and social care settings.
- Provide clear and transparent public information about data use, data protection, and data treatment for older people to be able to act and make evidence-based decisions.
- Promote cooperation, research and knowledge exchange in the field of value-based care at the European level, to become a global leader in accessible, affordable, and high-quality standards of care delivery, taking a right-based approach.

#4 Focus on prevention, population health, and digital literacy

- Implement and fund preventive care measures, such as meaningful campaigns promoting healthy lifestyles, health and digital literacy training for all.
- Integrate a life-course approach, considering social determinants of health, including (digital) education, housing conditions, and nutrition, impacting care outcomes.
- Aim at the elimination of practises that aggravate physical and cognitive decline, including restraints and inadequate medication prescribing.

#5 Improve working conditions, satisfaction, and well-being of care providers and professionals

- Increase the attractiveness of the careers, and ensure sufficient human resources, according to the trend data on your population.
- Invest in the training and education of health and social care professionals to ensure they have the skills and knowledge needed to provide value-based care.
- Promote the development and coordination of multidisciplinary teams including trained volunteers, that can work efficiently together to provide comprehensive and holistic care.
- Provide adequate resources and support to health and social care professionals, with extreme attention to mental health and work-life balance, considering wider conditions, e.g., childcare, transportation, and pension provisions.

#6 Support alternative payment models that reward high-quality care delivery

- Shift reimbursement models from fee-for-service to value-based payment systems, ensuring value through strategic purchasing.
- Give (non-)financial incentives that reward providers for achieving quality benchmarks, improving patient outcomes, and reducing costs (e.g., reward providers for improving patient satisfaction, and implementing preventive care measures).
- Fund research and evaluation efforts to assess the impact of value-based care initiatives and adjust policies accordingly.

To view the full research supporting these policy guidelines, consult deliverable 6.6 at www.projectvaluecare.eu

Another principle for the change to be made from a long-term perspective is that all policy levels should be implicated in the delivery of value-based care. Therefore, some concrete steps are recommended to the several layers of government in table 6.

Table 6. Concrete recommendations and steps for different levels of policymakers

Policymakers levels	Expected improvements	Concrete steps
European policymakers	- To promote the value-based care approach in the health and social care systems and policy guidelines.	- To enter a dialogue with the Member States to discuss the perspectives on value-based care as an alternative to supply-driven care. - Setting up an "Alliance on value-based care", e.g., under the European Care Strategy. - To make sure that all funding opportunities under the EU budget including the Horizon Europe programme - Cluster 1: Health, consider closely value-based care approach. - To promote further research on value-based care and help disseminate the research findings.
	- To improve and standardised the value-based care framework	- To provide EU regulations and guidelines on standardised outcomes measurements to appropriately monitor the implementation of value-based care within the EU care systems. - Then, work jointly with the Member States to follow-up on measures to be implemented in response to the EU regulations and guidelines (which must be also taken into account in the respective national action plans).
National policymakers	- To define the contribution of political decision-makers to the concept of value for the healthcare system and communicate it to all actors.	- To design or update the National Health Plan including the definition of the healthcare system value, listing specific objectives and monitoring the performance to be reached in terms of value of care, as well as ensuring governance arrangements are implemented. - To develop national criteria for monitoring the implementation of value-based care and for measuring the value of the care delivered (based on the EU regulations and guidelines on standardised outcomes measurements).
	- To promote the implementation of the value-based care approach in the national healthcare system	- To support a regionally balanced implementation of value-based care within the national care system. - To provide appropriate resource allocation and funding sources to support the health system according to this concept of value. - To offer training opportunities within the public education system (e.g., public university degrees and postgraduate programmes) for care professionals to learn and achieve the necessary skills to deliver value-based care.

Local/regional policymakers	• To promote the implementation of value-based care in the local and regional care systems.	• To ensure the effective participation of citizens in their care planning, make sure that their needs and preferences are heard by professionals. • To help set up advisory bodies providing guidance and technical assistance for citizens and professionals on value-based care delivery.
	• To improve health and social professionals' motivation and willingness to work in coordination with other professionals and to engage patients in conversations about their care plan.	• To offer training in integrated care and value-based care among health and social professionals. • To disseminate good/best practice examples and showcases of an appropriate delivery of value-based care to regional and municipal authorities.
	• To monitor the impact of the policies implemented on public health and ensure improvements.	• To adapt the national criteria locally or regionally for monitoring the implementation of value-based care and for measuring the value of the care delivered.

How can the experience of the ValueCare project help to implement such recommendations?

- **The methodology** used to develop new integrated care built on value-based principles and the framework to evaluate them can serve as valuable guides (i.e., ValueCare pathway; codesign methodology; data identification; engagement strategy; among others).
- **Standardised measurements** to collect relevant patient-reported outcomes were collected through the International Consortium for Health Outcomes Measurements (ICHOM) standard sets and can serve as one evidence-based example of measurement.
- **Green Belt Certification** on VBHC training for healthcare professionals and managers (more information available in www.projectvaluecare.eu) adapted from the experience of the project and is in line with international certifications.
- The **ValueCare digital solutions** that enabled people's access to their health and care data regarding the ValueCare project outcomes and follow-up. The ValueCare app for older people provides access to a personalised and co-designed care plan, offering a range of functionalities, such as lifestyle coaching and health management (e.g., medication reminders) and can be further explored in research (Bally et al., 2022).

9.2.3 Societal benefits of the implementation of VBHC policies

Pursuing a health and care system that is based on value delivery and person-centred care will lead to the following societal benefits:

Improved patient experiences and outcomes: allowing to meet the needs of diverse populations within society and encouraging the use of evidence-based practises, quality standards, and clinical guidelines to ensure that patients receive timely, effective and suitable care, leading to better health and well-being for individuals within society (Teisberg et al. 2020).

Better education among healthcare professionals regarding value-based care: this will enhance the quality of care and contribute to better health outcomes for individuals within society while emphasising the efficient use of healthcare resources (Patel et al., 2012).

Improved health and digital literacy and empowerment: by providing older individuals and their caregivers with the knowledge to navigate the healthcare system, they will make informed decisions and actively manage their health. This fosters empowerment, leading to better health outcomes and reduced healthcare costs (Shearer et al., 2012).

Fights back against ageism: the value-based care approach combats ageism by respecting older people′s preferences and aspirations. It promotes person-centred care, equal access, prevention, shared decision-making, comprehensive assessments, and tailored interventions, fostering a respectful healthcare environment and challenging ageist attitudes (Inouye, 2021).

Health and care systems are integrated and professionals are better coordinated: the integration and coordination of professionals within the care systems lead to improved care experience, better outcomes for patients, greater efficiency in the use of resources and also take into account job satisfaction and the well-being of the care provider (‘Quadruple Aim’) and better support for informal carers (van Engen et al., 2022).

Improved quality of care: by using common metrics to provide a standardised framework for evaluating healthcare quality and outcomes, it becomes easier to compare and assess the performance of healthcare systems. This promotes transparency, accountability, and the identification of areas for improvement. This coordination also enhances communication, reduces duplication of services, and promotes seamless transitions between preventive, acute, and rehabilitative care (WHO, 2018).

Enhanced digitalisation and better digital skills: Improved digital infrastructure and skills enhance access to healthcare information, promoting equity and empowerment. Better digital workflows and online platforms streamline data processing, communication, and collaboration, increasing productivity and reducing administrative burdens, allowing more focus on value-added activities (Haleem et al., 2022).

Reduction and transparency of healthcare costs: value-based care can contribute to reducing healthcare costs by promoting preventive care, care coordination, outcomes-driven practises, population health management, shared decision-making, and payment reforms that incentivise efficiency and quality. This shift in healthcare delivery models has the potential to create a more sustainable and cost-effective healthcare system (Porter, 2008, 2010).

Better health outcomes and enhanced quality of life: By eliminating practises that exacerbate physical and cognitive decline, healthcare providers can prevent unnecessary harm and promote better health outcomes, and individuals can experience a better quality of life, also for their families and communities. (WHO, 2021).

In conclusion, the project ValueCare, with its tools and experiences, can serve as a starting point for realising these societal benefits. By embracing a health and care system grounded in value and person-centredness, improved older people's outcomes can be achieved, serving our social rights. This approach combats ageism, integrates and coordinates care systems, and improves the quality of care. ValueCare can thus pave the way for a more sustainable and effective healthcare system that truly meets the needs of diverse populations within society.

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Conclusions

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The ValueCare Horizon 2020 project has been a ground-breaking initiative that aimed to integrate health and social care for older people through a value-based framework. This framework focused on personalised patient-centred care while improving healthcare for people with acute and chronic conditions in seven European pilot sites. The main objective of the project was to validate the ValueCare concept and the supporting information and communication technology and ensure its replicability. The integration of the ValueCare ICT solution, particularly the Vida24 web dashboard, the mobile app, and the virtual coach, marked the start of a new era of digital tools in pilot-level healthcare service. By facilitating ongoing interaction, feedback and dynamic adjustment of care plans, these digital platforms emphasised the transformative potential of technology in improving care. Future initiatives should utilise digital solutions not as additional tools but as 'mandatory' elements of integrated care. The Vida24 web dashboard provided a centralised platform for monitoring and managing patient data. Based on real-time information, the dashboard enabled healthcare providers to make informed decisions. The mobile app provided a convenient way for patients to track their health metrics and care plan outcomes, access personalised care plans, and communicate with their healthcare team. The Virtual Coach functioned as an ongoing support system that provided guidance, reminders, and encouragement to patients, promoting care plan adherence and a proactive approach to health management.

The application of ethical standards and approvals and the strategic engagement of local stakeholders through local alliances were critical to creating the project′s credibility and securing community support. Stakeholder involvement went beyond mere participation and fostered a sense of ownership and collaboration between local communities, healthcare providers, and policymakers. This collaborative approach not only facilitated smoother implementation but also ensured that interventions were culturally and contextually relevant, increasing their acceptability and effectiveness. One notable gap identified during implementation concerned the varying levels of digital literacy among older people and informal caregivers. Although digital solutions were at the centre of the ValueCare approach, their effective use was occasionally hindered by participants′ unfamiliarity with these technologies. Future interventions should recognise these differences and offer alternative, non-digital means of engagement where necessary to ensure inclusion. To address this issue, the project included additional training focused on basic digital skills to ensure participants were confident using digital tools. In addition, non-digital materials and support were provided to ensure that all participants, regardless of their technical knowledge, could benefit from the ValueCare interventions.

Despite efforts to involve a wide range of stakeholders, the implementation phase showed how difficult it is to maintain active participation throughout the project. The varying levels of participation across the different sites highlighted the need for customised strategies to address the specific motivations and barriers of the different stakeholder groups. The project team developed specific engagement plans for each stakeholder group, as the motivations of healthcare professionals may differ from those of patients or informal caregivers. These tailored strategies included regular feedback sessions, personalised communication, and incentives to maintain high levels of engagement and participation.

The ValueCare project advocates a holistic, patient-centred approach, setting a benchmark for future healthcare frameworks that aim to provide compassionate, value-based care. By focusing on individual needs through innovative technology and shared decision-making, ValueCare is redefining the standards of care for older people. The legacy of the project lies in its contribution to a shift towards more holistic, person-centred healthcare paradigms that prioritise the values and preferences of older people. Looking to the future, the lessons learned and successes achieved will provide a solid foundation for expanding and refining the model to improve the health and well-being of older people across Europe and beyond. Building on the foundations laid by the ValueCare project, future work will investigate the scalability and replicability of the model in different regions and healthcare contexts. Key areas include improving the technological solutions to make them more intuitive and accessible, further integrating health and social care services, and extending the model to meet the needs of other vulnerable populations.

Based on M.E. Porter’s formula it has been possible to calculate the “value” generated by the project implementation in terms of desired variations in terms of patient outcomes and experiences. This approach has allowed us to evaluate the cost of interventions and make an estimation of the cost of not intervening (control group), which is something that we need to do to make it evident that, once policymakers are not adopting proper strategies promptly, it could lead to worsening the quality of life of citizens and possible avoidable costs.

Finally, at the end of the project, it was possible to transform the knowledge and experience into a certified training course. The certified training course can be offered to all innovators and all people who are aiming to apply the principles of value-based care and to integrate ICT solutions in Europe, to make integrated care for older people with chronic conditions better, and more efficient. The certified ‘ValueCare’ course aims to contribute to all initiatives to create more value for older people in Europe, by making care more centred around the patient, and thereby better. The ‘ValueCare’ course is a relevant outcome of the project that will enhance the sustainability of ValueCare’s findings in the near future.

ValueCare’s findings and the certified ‘ValueCare’ course aim to promote the development of health policies that prioritise value-based, integrated care. The legacy of the ValueCare project lies in its significant role as a catalyst for transformative change towards more holistic, person-centred health paradigms that prioritise the values and preferences of older people. This project aimed to improve the health and well-being of older people in Europe and seeks to extend its reach globally. It promises a future in which the healthcare system is inherently attuned to the needs of the ageing population and ensures that their dignity, autonomy, and quality of life are preserved in every facet of care.