SHAPES

Smart and **H**ealthy **A**geing through **P**eople **E**ngaging in supportive **S**ystems

D3.2 – Scaling-up Improved Integrated Care Service Delivery V1

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Table of Acronyms and Abbreviations

Table 3 Acronyms and Abbreviations

Acronym	Full Term
ACMA	American Case Management Association
ADL	Activities of Daily Life
AHA	Active Healthy Ageing
APPG UK	All-Party Parliamentary Groups United Kingdom
AVI	Agència Valenciana de la Innovació (Valencian Innovation Agency)
BP	Blood pressure
Carer QoL 7D	Carer (caregiver) Quality of Life 7 Dimensions questionnaire
CAT	complexity assessment tools
CCM	Chronic Care Model
CC	Chains of Care
CDS	Clinical Decision Support
CHAT	Cultural historical activity theory
CM	Case-Management
CMFC	Caswell Family Medical Center
CONOPS	Concept of operations
COVID-19	Coronavirus Disease 2019
CPA	Care Planning Approach
D.	Deliverable
DMP	Disease Management Programmes
E-Health	Electronic Health
EASPD	European Association of Service Providers to Persons with Disabilities
EC	European commission
EHR	Electronic Health Record
EMR	Electronic Medical Record
EQ-5D	Euro Quality of life 5 Dimensions questionnaire
EU	European Union
GRACE	Geriatric Resources for Assessment and Care of Elders
GP	General Practitioner
GPS	Global Positioning System
HIS	Health Information System
IADL	Instrumental Activities of Daily Life
IBC	Integrated Care in Basque Country
ICP OP	Integrated Care Programme for Older Persons in Ireland
ICT	Information and Communication Technology
iOS	IPhone Operating System
IT	Information Technology
KP	Kaiser Permanente

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KPI	Key Performance Indicator
LGBTQ	Lesbian, Gay, Bisexual, Transgender and Queer or Questioning
M.	Milestone
MCN	Manage Clinical Networks
MDT	Multidisciplinary Team
NASSS	Nonadoption, abandonment, scale-up, spread, and sustainability
NHS	National Health System
OECD	Organisation for Economic Co-operation and Development
ON LOK CCODA	On Lok Senior Health Services, Community Care Organization for Dependent Adults
PACE	Programme for All-inclusive Care for the Elderly
PBC	Population-Based Care
PCMH	Primary Care Medical Home
PHB	Personal Health Budget
PHR	Personal Health Record
PRISMA	Program of Research to Integrate the Services for the Maintenance of Autonomy
ProACT	Integrated Technology Systems for ProACTive Patient Centred Care
QoL	Quality of Life
RAI	Resident Assessment Instrument
SaaS	Software as a Service
SCVO	Scottish Council for Voluntary Organisations
SHAPES	Smart & Healthy Ageing through People Engaging in Supportive Systems
SIM card	Subscriber Identification Module card
SIPA	System of Integrated Services for Aged Persons
ToC	Table of Contents
UK	United Kingdom
USA	United States of America
UTAUT	Unified Theory of Acceptance and Use of Technology
VA	Veterans' Health Administration
VHA	Veterans' Health Administration
WP	Work Package
VW	Virtual Ward model
WHO	World Health Organization
WICM	The Walcheren Integrated Care Model

Keywords

Integrated care, Technology adoption, eHealth, Digital Health

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Executive Summary

This deliverable comes in an early stage in the implementation of Task 3.2. which aims to contribute to a better understanding of the factors that impact on the successful deployment, scaling-up and transfer of integrated care programmes. This is relevant for the SHAPES project whose platform and solutions will have to work in real life contexts with the perspective of being included in programmes and to impact on the way care is provided. It reports about the two main activities that have been undertaken so far by the task implementing team.

The first activity is desk research aimed at understanding different aspects of integrated care, including its values, models, trends and evidence. The findings are reported in Chapter 2. The outcomes show that although there is a rather good understanding of the values at the basis of integrated care, the way to get there is windy and complex. There are different models of integrated care embedded in different health and care systems and evidence is not always so clear. Nevertheless, a clear trend is the increasing attention for digital technologies that can facilitate or even enable sustainable integrated care.

The second activity is the collection of case reports of experiences with technology adoption in integrated care programmes across Europe. Based on interviews with managers of the programmes, an initial thirteen experiences were described and analysed, leading to an overview of factors to consider when deploying or upscaling person-centred technology-based solutions in integrated care. The factors have been clustered in different domains and stages in the technology adoption process in integrated care programmes. The research is described in Chapter 3, while the case reports are included in the Annexes to this deliverable.

During the next steps the findings will be enriched with lessons learned during the project implementation and in particular at the pilot sites. The final goal of this task is to contribute to the development of key recommendations for the implementation, adoption and scale-up of the SHAPES Platform and digital solutions across Europe (D3.10 - SHAPES Change Management and Implementation Handbook and D3.11- SHAPES Recommendations).

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1 Introduction

This report follows the research conducted in Task 3.1 where the organisational structures, systems and processes of the health and care services in different European Countries were identified and analysed. It is the start of designing the building blocks for strategies and tools that support the scaling-up of improved integrated care service delivery. Given the nature and ethos of the SHAPES project, the focus will be on strategies that fully capture the opportunities provided by technology and other innovations to improve integrated health and care outcomes.

Health and care systems require reforms and innovative solutions to become more resilient, accessible, and effective in providing quality care to European citizens. Due to the ageing population, economic pressures, and more recently to the experience with global pandemic crisis, the need to improve and adapt the health and care system to new contexts, operational needs and contingent situations has significantly increased.

Both, the development of people-centred integrated care programmes (WHO, 2015) and the use of new technologies (WHO, 2020), are identified by the global community as key strategies to cope with the seriousness of the challenges faced by health and care systems to meet current and future demands for quality care in a flexible and economically sustainable way.

The recently launched Global Strategy on Digital Health 2020-2025 of the WHO (2020) states that "the vision of the global strategy is to improve health for everyone, everywhere by accelerating the development and adoption of appropriate, accessible, affordable, scalable and sustainable person centric digital health solutions to prevent, detect and respond to epidemics and pandemics, developing infrastructure and applications that enable countries to use health data to promote health and wellbeing, and to achieve the health-related Sustainable Development Goals and the triple billion targets of WHO's Thirteenth General Programme of Work, 2019–2023." (WHO, 2020. Article 12).

It further reports that "digital transformation of health care can be disruptive; however, technologies such as the Internet of things, virtual care, remote monitoring, artificial intelligence, big data analytics, blockchain, smart wearables, platforms, tools enabling data exchange and storage and tools enabling remote data capture and the exchange of data and sharing of relevant information across the health ecosystem creating a continuum of care have proven potential to enhance health outcomes by improving medical diagnosis, data-based treatment decisions, digital therapeutics, clinical trials, self-management of care and person-centred care as well as creating more evidence-based knowledge, skills and competence for professionals to support health care." (WHO, 2020. Article 8).

Healthcare organisations need thus to be transformed to absorb innovative technologies and deliver more flexible and personalised services to patients and citizens (D'Erico et.al., 2019).

The widespread expectation is that digital solutions can radically change the way health and care services are delivered to patients, if designed purposefully and implemented in a cost-effective way, increasing the well-being of millions of citizens, some of whom, without those solutions, risk to remain without services for geographical or social-economic reasons (see D3.1.).

According the European Commission (2018) digitalisation in health and care can:

- support the reform of health systems and their transition to new care models, centred on people's needs and enable a shift from hospital-centred systems to more community-based and integrated care structures;

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- help to promote health and prevent disease, including in the work place;
- support the continuity of care across borders, an important aspect for those who spend time abroad for business or leisure purposes.

Despite many experiences, at different level of implementation, with integrated care models and digital solutions for healthcare systems that aim to go beyond the traditional delivery systems and to cope with the challenges listed above, results are still scarce, especially when it comes to scaling up or transferring single experiences to other or larger contexts. In particular technology implementation projects have a high risk of failure, not only in their implementation phase (Greenhalgh et al. 2020), but also in their scaling-up and transfer. A study concluded in 2018 could not find examples of the transfer of digital platforms supporting integrated care from one region to another in Europe. "Over the last decade several digital platforms have been developed to support the delivery of integrated care in community settings. Nevertheless, few of them have been scaled up or moved beyond the geographical and/or service delivery context in which they have been developed, tested, and initially deployed. On the contrary, most of the efforts done so far to provide technology for a more efficient integrated care are ad hoc solutions, what limits the impact and outreach of innovation in the field, being the wheel frequently reinvented." (Ferrando et al., 2019, p. 236).

These are relevant findings for the SHAPES project, which faces the challenge to develop a platform and digital solutions in such a way that the risk of non-adoption, non-use, non-scaling up and non-transfer is reduced to a minimum. The work envisaged for Task 3.2 is therefore to understand the state of the art in integrated care in Europe and to gain all the knowledge necessary to identify factors of potential success and failure in the deployment, scaling-up and transfer of digital solutions supporting integrated care programmes.

1.1 Rationale and purpose of the deliverable

This deliverable reports on work undertaken in the framework of Task 3.2. According to the DoA this Task "will work with users and other experts to critically analyse the models to identify the key inputs, outputs, dependencies, and resources involved in the operation of the SHAPES Platform, particularly in terms of the needs of and proposed benefits to the professional and non-professional users involved in the provision of care. The task will identify individual-centred integrated care programmes supporting and extending healthy ageing and independent living of older individuals who face temporary or permanent reduced functions or capabilities. This knowledge will be applied to strengthen integrated care, prevention and early intervention, safety and efficiency; and to successfully scale-up and transfer these initiatives toother domains and other regions across Europe; by supporting the design and implementation of improvement plans. In this context, the significant body of evidence gathered from SHAPES's large-scale piloting activity will be instrumental to apply and transfer the knowledge gained to other health and care systems and regions, namely by contributing to the SHAPES Recommendations dedicated to informing and supporting the different stakeholders involved in integrated care to manage and improve care for older individuals living at home.

This report and its updated version (D3.3., M30) will detail how to further improve successful integrated care programmes and how to successfully scale-up and transfer these initiatives to other domains and other regions across Europe.

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The Task implementation began in M7 (May 2020). The report therefore provides an initial basis for further analysis and data gathering under the same task between M15 and M30 of the project implementation timeline. Based on desk research and original research valuing the perspective of service providers, it proposes an initial framework of factors to consider in technology adoption aiming at improving integrated care, independent from the purpose, and context of deployment and independent from whether the technology is newly developed, scaled-up or transferred. In the next phase of the implementation of the task we will add to this the knowledge gained by the SHAPES partners engaged with the piloting of the SHAPES platform and its digital solutions. This will allow us to provide recommendations not only useful for the deployment in different contexts and upscaling of SHAPES outputs but for the entire European community of professionals and organisations seeking to boost and improve integrated care.

The design of digital solutions and their development is a complex, though it is a relatively easy challenge that can take place in controlled environments such as research labs or in the framework of research projects. More challenging is making the solutions work for people and for organisations, each of which has different needs, expectations, preferences, and workflows. Also, contextual factors must be taken into account, such as the wider care ecosystem, health and care systems' functioning, policies and regulations, and economics.

For that reason, in this deliverable, we will explore and analyse models of integrated care and identify and describe the challenges related to its advancement. We have further identified and analysed technology enabled person-centred integrated care initiatives supporting and extending healthy ageing and independent living of older individuals across Europe, with the aim to learn from them. The perspective of public and private service providers has been taken as a starting point for this analysis.

1.1.1 Deliverable Objectives

The objective of the deliverable can thus be summarised as:

- To embed the SHAPES project propositions in the wider context of trends in integrated care policies and programmes supporting and extending healthy ageing and independent living of older people.
- To learn from previous experiences of service providers in deploying, upscaling and transfer of digital person-centred solutions supporting integrated care programmes.
- To identify key factors to consider in the deployment, scaling up or transfer of digital solutions supporting integrated care programmes.
- To lay the basis for guidelines and recommendations for the deployment and upscaling of SHAPES (and similar platforms), for the development and integration of current and future digital health and care solutions, and to assist service providers and policy makers in reducing the impact of risk factors and ensure successful scaling up processes.

During the next months the initial results presented in this report will be completed with further data collection inside and outside the consortium with the objective to strengthen the SHAPES guidelines and recommendations.

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1.1.2 Key inputs and outputs

This deliverable incorporates information from D3.1 (SHAPES Ecological Organisation Models) and is intended to support the further development of different WPs and deliverables. It will inform other tasks of WP3 (T3.4 SHAPES Governance Model and Guidelines, T3.3 Development of Pan-European Integrated Care Policy-making Guidelines) and WP9 (T9.1 Co-creation Think-tank for European Integrated Care) about identifying trends in person-centred digitally enabled integrated care programmes. WP5 and WP6 will benefit from information relating to the key factors to consider in deploying digital solutions supporting integrated care and factors for success and failure for scaling up and transfer. More impact is expected once the Task will be concluded in M30. See section 1.3, next steps.

1.2 Structure of the document

The document is structured in two main chapters addressing the objectives foreseen by the project proposal. The first part (Chapter 2), based on desk research, reports about models and trends in integrated care. The second part (Chapter 3) is focused on the analysis of key factors relevant in the process of digitalisation in integrated care as retrieved by the consortium partners analysing existing experiences with technology adoption in integrated care. The case reports are included in the annex, together with the list of factors identified.

1.3 Further steps

During the next months (M16-30), the Task 3.2 team will assess the SHAPES platform and its digital solutions in collaboration with WP6 pilot teams (researchers, professionals and end users) and study how its characteristics and outcomes align with existing models of technology adoption and scaling-up in integrated care. The factors identified in this deliverable will be compared with the characteristics of the SHAPES platform and some of its most relevant digital solutions. Potential risk factors that might occur during a possible large-scale deployment and up-scaling or transfer will be identified, together with possible mitigation strategies. We will do this in collaboration with T3.4 for what concerns governance models and user participation. Finally, the Task outcomes will impact on D3.10 (SHAPES Change Management and Implementation Handbook) and D3.11 (SHAPES Recommendations).

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2 Integrated Care

An important issue when talking about integrated care is to circumscribe its definition. There are indeed different perspectives towards which we could define the care model "integrated": a literature review conducted by Armitage et al. uncovered some 175 overlapping definitions and concepts of integrated care, indicating the absence of consensus in its definition (WHO, 2016).

A study commissioned by the European Commission published in 2018 concluded that "integrated care initiatives, although present in all 30 study countries, vary in terms of their characteristics, depth and breadth of penetration." This is partially explained by the fact that countries have started their journeys towards integrated care at different times, but other factors play a role as well, such as the different philosophies of how health and care systems should be organised that exist across Europe, and the existence of specific barriers or facilitators to the implementation of integrated care. Among the most relevant ones the study lists lack of cooperation between organisations, teams or professions and lack of resources or knowledge. On the other hand, "strong commitment to a vision for integrated care and collaborative networks, as well as good communication and leadership were highlighted as key facilitators of integrated care." (Dates et. al., 2018, p. 10). Although bottom-up approaches are important and have demonstrated potential for success, at higher level "political support, political commitment and clear strategies at national or regional level are fundamental to enable integrated care at the system level." "A top-down approach is also necessary to create an enabling environment and the conditions that accelerate the spread and adoption of integrated care at scale." (Dates et. al., 2018, p. 11).

For the SHAPES consortium integrated care focuses on the needs of the recipient of care, on coordination between diagnosis and treatment and between primary care and secondary care, as well as between different therapeutic areas and specialities. Benefits of integrated care models are clear, such as improved outcomes, established chains of prevention, diagnosis, treatment and care across the system). Still, the complexity of health and care systems in individual countries and regions adds to the challenge. Health literacy, technology and individual involvement in care are key to making health and care more user-friendly and empowering. This means that citizens, including older individuals, should be empowered to majorly engage with their own health (APPG UK, 2014).

2.1 Values of integrated care

The complexity of integrated care is widely recognised (Li, 2018). Goodwin (2013), advances that a shared value system among its actors could be the catalyst needed to simplify this complex network of processes and take integrated care forward. WHO (2015) also states that a unifying values framework should be at the core of integrated care. The importance of a shared value system is also underlined by Valentijn et al. (2013) who use the concept of shared values in their definition of normative integration.

Ferrer and Goodwin (2014) who were also key contributors to the World Health Organisations global strategy on people-centred and integrated health services interim report, identified a set of 16 core guiding principles, which they state should be used as a common set of goals and aspirations to guide future reforms of integrated care health systems (Table 4).

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Table 4 Ferrer and Goodwin's Principles of Integrated Care.
Source: Ferrer and Goodwin, 2014.

Comprehensive
A commitment to universal health coverage to ensure care is comprehensive and tailored to the evolving health needs and aspirations of people and populations.
Equitable
Care that is accessible and available to all.
Sustainable
Care that is both efficient, effective and contributes to sustainable development.
Co-ordinated
Care that is integrated around people's needs and effectively coordinated across different providers and settings.
Continuous
Continuity of care and services that are provided across the life course.
Holistic
A focus physical, socio-economic, mental, and emotional wellness.
Preventative
Tackles the social determinants of ill-health through intra- and inter-sectoral action that promote public health and health promotion.
Empowering
Supports people to manage and take responsibility for their own health.
Goal oriented
In how people make health care decisions, assess outcomes and measure success.
Respectful
To people's dignity, social circumstances and cultural sensitivities.
Collaborative
Care that supports relationship-building, team-based working and collaborative practice across primary, secondary, tertiary care and other sectors.
Co-produced
Through active partnerships with people and communities at an individual, organisational and policy-level.
Endowed with rights and responsibilities
All citizens should expect exercise and respect.
Governed through shared accountability
Shared accountability between care providers for quality of care and health outcomes to local people
Evidence-informed

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Such that policies and strategies are guided by the best available evidence and supported over time through the assessment of measurable objectives for improving quality and outcomes
Led by whole-systems thinking
No description available

To further understand the system of processes in integrated care, Zonneveld et al. (2018) also reflect on the values of integrated care. They begin by differentiating between the concepts of 'value' and 'values'. They note that 'value' refers to the amount of success an integrated care provider has in meeting the needs of its clients, relative to its costs, whereas 'values' relates to the set of attributes possessed by the care system, such as integrity, transparency and efficiency. They follow up this distinction by building on the work of Ferrer and Goodwin to identify a set of 23 underlying values of integrated care (Table 5).

Table 5 Zonneveld et al.'s Values of Integrated Care.
Source: Zonneveld et al. (2018).

Collaborative
Professionals work together in teams, in collaboration with clients, their families and communities, establishing and maintaining good (working) relationships.
Co-ordinated
Connection and alignment between the involved actors and elements in the care chain, matching the needs of the unique person. Between professionals, clients and/or families, within teams and across teams.
Transparent
Openly and honestly giving insight in information, decisions, consequences and results, between clients, their families, professionals and providers.
Empowering
Facilitating and supporting people to build on their strengths, make their own decisions, manage their own health and take responsibility for it.
Comprehensive
The availability of a wide range of services, tailored to the evolving needs and preferences of clients and their families.
Co-produced
Engaging clients, their families and communities in the design, implementation and improvement of services, through partnerships, in collaboration with professionals and providers.
Shared responsibility and accountability
The acknowledgment that multiple actors are responsible and accountable for the quality and outcomes of care, based on collective ownership of actions, goals and objectives, between clients, their families, professionals and providers.
Continuous
Services that are consistent, coherent and connected, that address the needs and preferences of clients across their life course.
Holistic

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Putting the clients and their needs in the centre of the service, whole person oriented, with an eye for physical, social, socio-economical, biomedical, psychological, spiritual and emotional dimensions.
Goal-orientated
Working with clearly described, and concrete, measurable, common goals and objectives for clients, their families, professionals and providers.
Personal
Delivering care by establishing personal contact and relationships, to ensure that services and communication are based on the unique situations of clients and their families.
Evidence-informed
Working processes, policies and strategies are guided by evidence-based knowledge, data and information, supported by technology and periodic assessment.
Respectful
Treating people with respect and dignity, being aware of their experiences, feelings, perceptions, culture and social circumstances.
Equitable
Services are accessible and available for all people, and they are all treated equally.
Sustainable
Services are efficient, effective and economically viable, ensuring that they can adapt to evolving environments.
Led by whole systems thinking
Taking interrelatedness and interconnectedness into account, realising changes in one part of the system can affect other parts.
Flexible
Care that is able to change quickly and effectively, to respond to the unique, evolving needs of clients and their families, both in professional teams and organisations.
Preventative
Early detection and action for clients and their families that promotes individual and public health.
Reciprocal
Care based on equal, interdependent relationships between clients, their families, professionals and providers, and facilitate cooperative, mutual exchange of knowledge, information and other resources.
Innovative
Supporting, facilitating and creating space for innovation and future improvements in professional teams and organisations.
Trustful
Enabling mutual trust between clients, their families, communities, professionals and organisations, in and across teams.
Proficient
Knowledgeable and skilful services are provided by professionals, with a focus on quality.

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Safe
Care services that are safe for clients, their families and professionals, including privacy and confidentiality protection.

2.2 Models of integrated Care

In 2016, the Regional Office for Europe of the World Health Organization (WHO) published an overview about integrated care models, that is a "synthesis of selective reviews of definitions, conceptual frameworks and practical models of integrated care" (WHO, 2016, p. 2). Focusing on the *integrated care models*, the document provides three *key-models* with different levels / scales (Curry & Ham, 2010; WHO, 2016):

- individual models of integrated care (micro);
- group / disease specific models (meso);
- population-based models (macro).

By way of different pathways and experiences, these three models of integrated care have contributed to i) the integration of health and social services, both intra/within and inter/between services, and ii) the integration of providers (formal caregivers) and individuals (patients, users, families, communities), based on a "people-centred" approach.

2.2.1 Individual-Based Models (micro)

The first *key-model* of integrated care, Individual-based Models, is focused on the individuals' health plans, and normally involves only two or three individuals (e.g., health care provider, patient and family member). The integrated care delivery is designed for a single person, in order to "facilitate the appropriate delivery of health care services". These individual-based models are more tailored for high-risk patients or specific health needs and interests, and their main innovative features are "patient follow-up and care co-ordination", "smooth transitions between providers and everyone involved in an individual's care", and "involving patients in their care" (activate patients) (Curry & Ham, 2010, p. 33).

These individual models of integrated care are structured by individual care planning and care co-ordinators who manage/coordinate the health care delivery. The Care Planning Approach (CPA) and Case-Management (CM) are the most distinguished models reviewed in the expert literature, but also in the healthcare field. According WHO, the Care Planning Approach is being adopted to improve the healthcare pathway in terms efficiency ("quality of medical care", "appropriated treatment", "standards" and "patient's rights"), but also to enable the co-coordination between health and social systems (WHO, 2016, p. 8).

The latter approach, Case-Management, is widely disseminated and promoted by the *American Case Management Association* (ACMA), as an "health care delivery systems [that] is a collaborative practice including patients, caregivers, nurses, social workers, physicians, payers, support staff, other

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practitioners and the community"1. In this regard, ACMA established a national framework of standards that provide a guide for implementation and evaluation for the effective patients' transitions between levels of care (Figure 1).

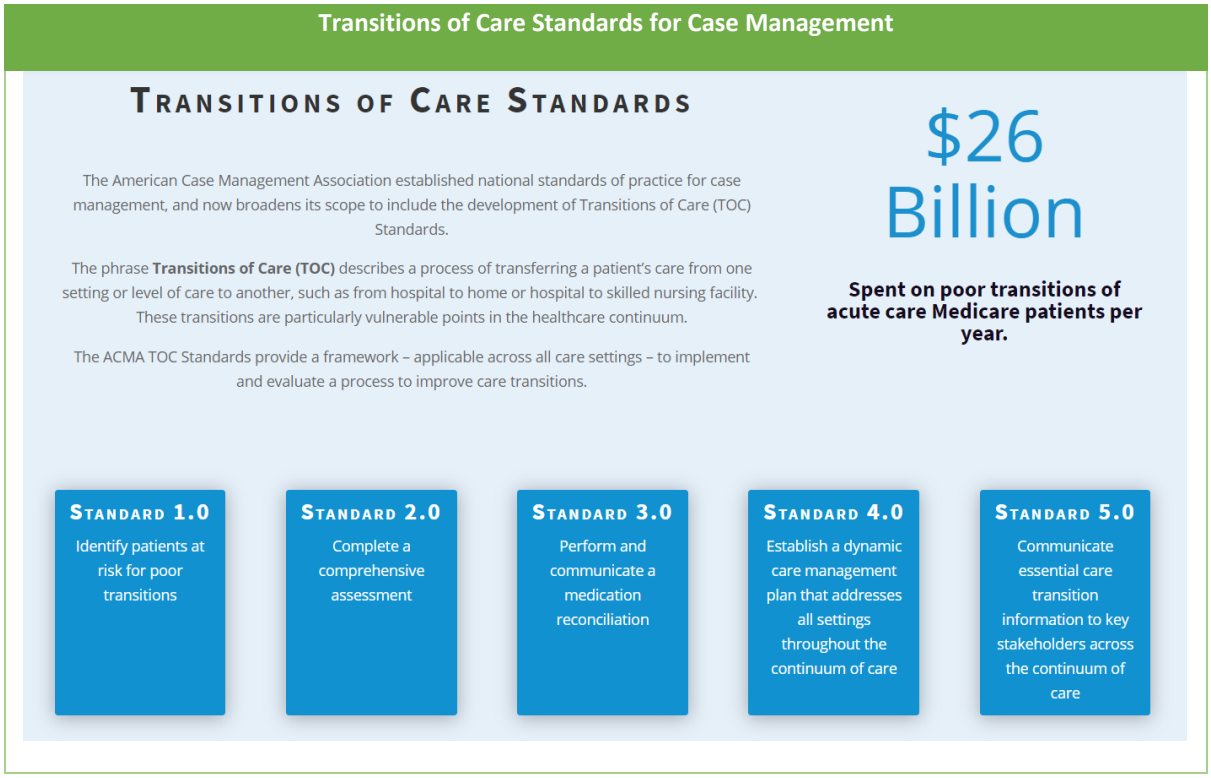

Figure 1 ACMA's flyer to announce the framework of "Transitions of Care Standards".
Source: https://transitionsofcare.org (accessed in January 2021).

Alongside these key-models group, other approaches (or models) are mentioned as well, because of their innovative mechanisms for increasing the co-coordination effectiveness and efficiency of individual-based integrated care, namely personal health budgets and technology (Curry & Ham, 2010).

In the USA, but also in Europe (Faber et al., 2013), Primary Care Medical Home (PCMH), or Patient-Centred Medical Home, is one of the most acknowledged approaches. This is a key-model example because its "holistic approach" focuses on "care co-ordination", and "accessible, continuous, co-ordinated" and "family-centred" health and care services (WHO, 2016: 8; Curry & Ham, 2010). It is also an example of eHealth and ICT solutions are being strongly recommended and implemented for increasing connectivity (patients, professionals, carers, hospitals, health agencies, nursing homes, community, family, public/private community-based services) (Curry & Ham, 2010, p. 36).

The Figure below (Figure 2) describes a singular case of this approach (PCMH), by two perspectives. On the one hand, the organisational perspective was addressed in order to understand what kind of organisations and its governance model are able to employ this approach. In this case, it's a non-for-

[1] This is the official definition of "Case Management" provided by ACMA on its website: https://www.acmaweb.org/section.aspx?sID=4 (accessed in January 2021).

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profit organisation. On the other hand, a perspective about care delivery and its pathways were also provided in order to have an example how this approach works.

Primary Care Medical Home

Caswell Family Medical Center (CMFC) is "not-for-profit organization guided by a dedicated board of directors representing the communities CFMC serves. From the beginning, has been committed to a "Vision of Excellence" and to patient safety and quality care. CFMC continues to provide affordable, high quality, comprehensive healthcare services, and education to citizens of Caswell County and the surrounding area. Highly skilled staff and physicians, nurse practitioners and physician assistants offer medical services for all ages, from infants to the elderly, with special emphasis on the underserved and uninsured".

CMFC Principles of Primary Care Medical Home

The Patient-Centred Medical Home is a care delivery model that focuses on the whole patient. This means that treatment coordinated by primary care providers (PCP) is provided when it is needed, and in a manner that the patient understand.

- Patient as the centre of care supported by an interdisciplinary team-based approach from primary care providers
- Healthcare focus on individual needs and interests
- Augmenting primary care with behavioural and mental health, specialists, hospitals, pharmacies and medicine prescription, patient and family.
- Accessible, communicable, co-coordination, education, economical (reduce health burden), personalized, patient-engaged, comprehensive

Figure 2 Use Case of Primary Care Medical Home: Caswell Family Medical Center.
Source: https://caswellmedical.org (accessed in October 2020).

Moreover, this model is a "payer-centric" model, but payers are employers and insurance companies. Thereby, as a main payers, employers and insurance companies have been interested in decreasing its financial burden with healthcare and, at the same time, increase more positive outcomes. In this regard, technology and digitalisation have been strongly recommended to achieve this goal. Videoconferencing, teleconference, electronic consultations, electronic medical records, self-management devices, online patient portals, have been "reduce unjustified services, improve healthcare efficiency, increase availability of services, and engage beneficiaries in their own care" (Hughes et al., 2010, p. 497).

A "payer-centred" model as well, Virtual Ward model (VW) is being one solution empowered by a private healthcare company, "Healthcare at Home Ltd", to UK National Health System (NHS). By this option, NHS-UK aims to increase the healthcare in home, but also to provide a healthcare model coordinated by health and social care professionals. As an individual-based model, the individual's care plans, the multidisciplinary teams (hospitals, case manager, local health units, social organisations, family) and the technology are the main tools that are empowering this approach[2].

The "Personal Health Budget" model (PHB), or "Self-directed Care", is based on the perspective that individuals (patients) have the best solutions and budget for their own care. Also, from the UK, the most disseminated experience is the National Health System (NHS). For the last 90 years, the NHS have developed "direct payments for social care for disabled adults above the age of 16 years, elderly

[2] Information about Virtual Ward model was learned on Healthcare at Home Ltd Website (https://hah.co.uk), but especially on a Report from the same company (https://hah.co.uk/wp-content/uploads/2017/07/Virtual-Hospital-Report_AW_Final2.pdf). This data was accessed in January 2021.

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people, and carers of disabled children" (Alakeson, 2008, p. 807). Eligible people gain an amount of money for providing health and wellbeing needs, "which is planned and agreed"[3] between individuals or their representatives and the local NHS team.

Despite evidence about the patients' satisfaction (flexibility, autonomy and health services performance), this model is strongly criticised because almost all the administrative burden and risk "falls on patient and their carer" (WHO, 2016, p. 10), which requires a high level of previous expertise of health care and health needs/interests. Moreover, the model's impact remains dubious and questionable (in terms of similar benefits) if it is expanded for all citizens, without an individual assessment and selection (Alakeson, 2008).

Figure 3 resumes these approaches and their organisations governance.

[3] This expression is cited from NHS-UK Website: https://www.nhs.uk/nhs-services/help-with-health-costs/what-is-a-personal-health-budget/ (accessed in January 2021).

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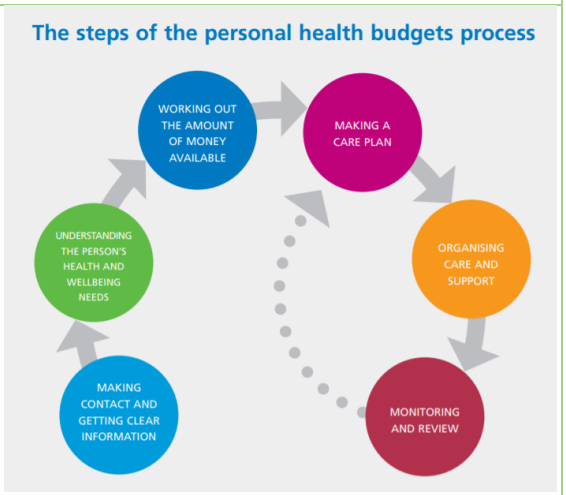
Healthcare at Home (Virtual Ward Model)		Personal Health Budget Model
"Healthcare at Home is the UK's leading full service, clinical provider of healthcare out-of-hospital, wherever you are, at home, at work and in communities. Clinical care in the home can range from a nurse visiting you to administer your treatment, to the delivery of your medication at home. Our specialist teams are dedicated to providing exceptional clinical services including complex nursing, chemotherapy in the home, intravenous antibiotics, blood transfusions. We also have a team of highly qualified therapists who provide a range of therapies in the home, including physiotherapy and occupational therapy".		PeopleHub Personalised Care Community aims "to connect, empower and give people a voice in order to influence the development of personalised health care, so that it stays true to purpose". Founded by citizens and scaled up through a pilot from the UK Department of Health, PeopleHub runs a "collaborative approach, working in partnership with NHS". Their key-success features: experience of PHB and personalised care; use people's voices rather representatives; high informed participation from patients (users); political lobby; meaningful co-production.
Healthcare pathway		**Healthcare pathway (six stages pathway)**
Recovery at Home Service	**Admission Avoidance Service**	
Patient cared for in hospital	**Patient cared for at home**	
Identify patient		
Assessments conducted		
Care plan agreed		
Treatment		
Discharge planning in place		
Telephone-based Care Bureau		
Monitoring		
Completion of treatment and discharge		
Patient Satisfaction		

Figure 3 Resumes of Virtual Ward model and Personal Health Budget Model
Source: https://www.peoplehub.org.uk; https://hah.co.uk; https://hah.co.uk/wp-content/uploads/2017/07/Virtual-Hospital-Report_AW_Final2.pdf (accessed in January 2021).

2.2.2 Group/disease-specific Models (meso)

The second *key-model* of integrated care, Group/Disease-specific Models, is focused on the care of people with specific diseases or groups of people, like older individuals or people with specific health needs. In general, these models have been distinguished by the strong inter-link (interoperability) between health and social services, as well as the active participation of people and communities on care delivery.

Particularly for older individuals, the Integrated Care Models for the Elderly and Frail aim to organise (or reorganise) the "integration of health and social services", in order to provide a "high specificity of service individual needs". Widely disseminated in literature, health, and social services, the Program of Research to Integrate the Services for the Maintenance of Autonomy (PRISMA) is a "single entry-

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point" model (see Figure 4) that works to preserve "functional autonomy of community-dwelling older people", "functional autonomy of individuals", "network of different providers", "case-management" approach, and "computerised charts" solutions" (WHO, 2016, p. 12).

This model is also differentiated by its own governance model, "co-ordination" model, managed by a "board of health and social care provider organisations, including the voluntary sector", which decides the "strategy and allocates pooled resources to fund the network"; moreover, their "multidisciplinary teams of practitioners are managed collectively through a mix of contracts and/or direct management" (Curry & Ham, 2010, p. 23).

Program of Research to Integrate the Services for the Maintenance of Autonomy

PRISMA Care Approach

- Coordination among services (3 governance levels: strategic, tactical and clinical): hospitals, rehabilitation services, specialised geriatric programmes, retirement homes and group homes, case management, in-home nursing, therapy, social work, pharmacy, primary care physicians, home support, day programmes.
- Single point of entry: self-referred clients are screened at the time of initial contact with the programme.
- Unique assessment tool: assessment tool used to ascertain functioning in five areas (ADLs, IADLs, mobility, communication and mental abilities); to monitor service planning and usage across similar types of clients; to adjust admission criteria; to estimate the funding allocation for the programme.
- Information tool (computerised client chart): to track assessment and reassessment data, the care plan and provider interventions; assessed by all professionals and institutions participating in the programme.
- Case management
- Individualised service plan

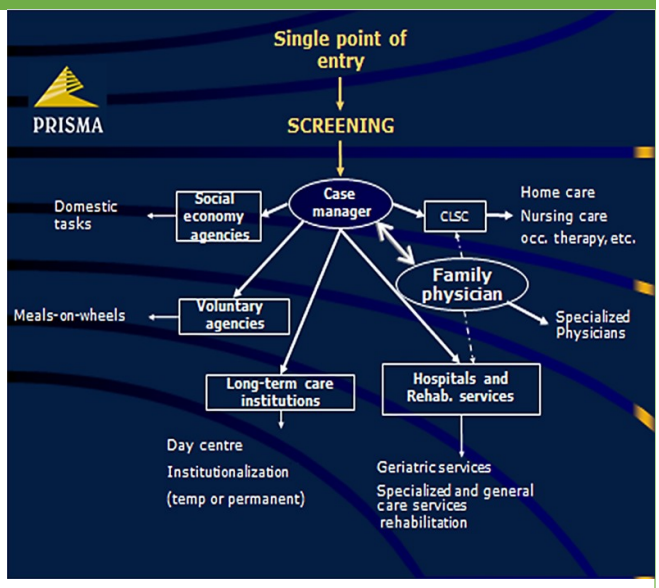

Figure 4 PRISMA approach to care and steps and flow of eligible clients.
Source: MacAdam, 2015, pp.1-14.

The PRISMA model has been implemented by three European municipalities (Torbay in England; Rovereto and Vittorio Veneto in Italy), as a solution for reducing the "fragmentation of care for older people" (WHO, 2016, p. 13). Both examples follow the community-dwelling approach, with a similar organisation, namely a single-entry to the system, and local coordinators or managers who lead a multidisciplinary team / group of providers from health services and social services.

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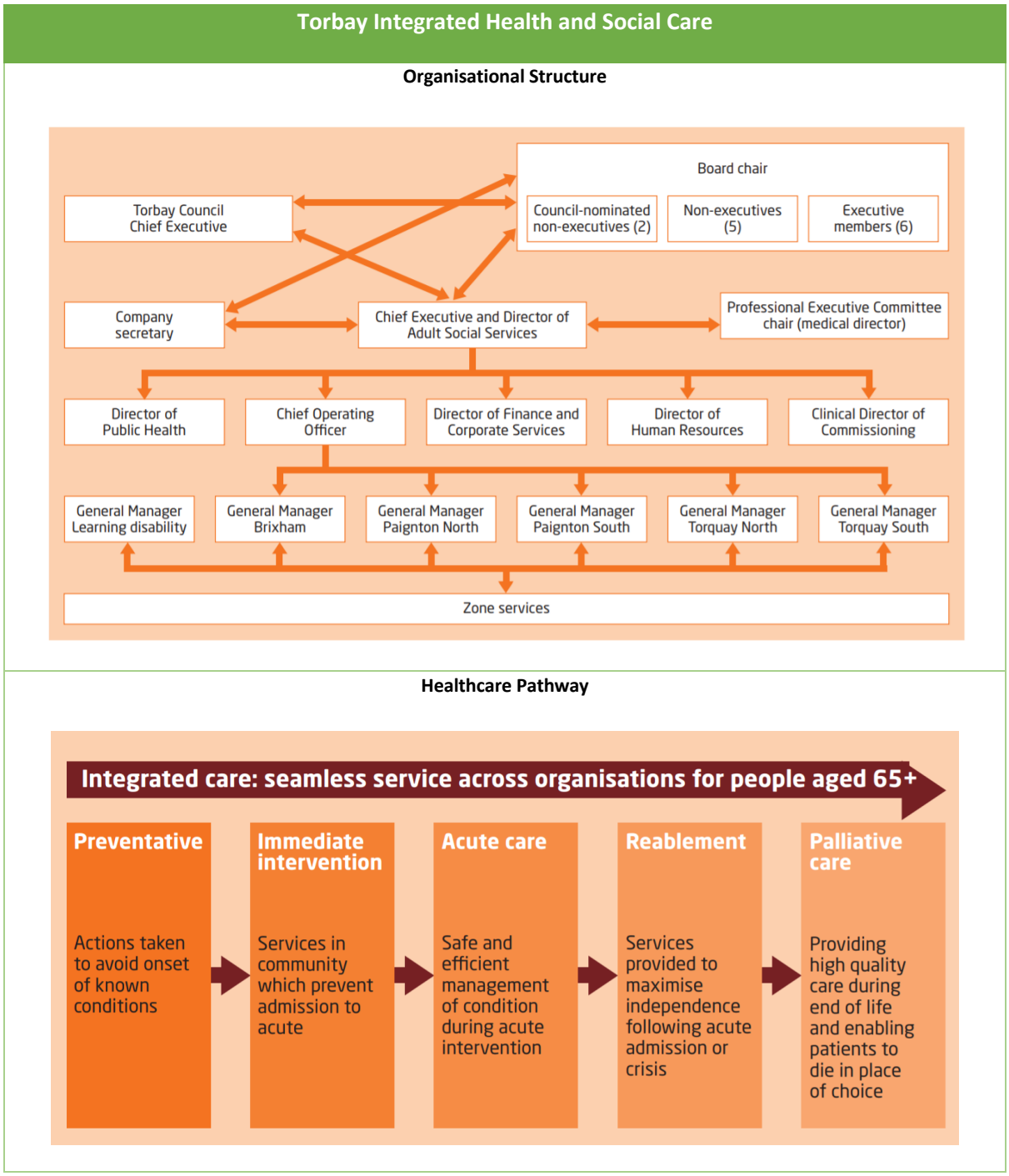

Figure 5 Torbay Integrated Health and Social Care
Source: Thistlethwaite, 2011, pp.: 1-28.

Additionally, two integrated care models for older individuals are often mentioned in literature and health recommendations (Marino et al., 2018):

- Programme for All-inclusive Care for the Elderly (PACE), On Lok Senior Health Services, Community Care Organization for Dependent Adults (ON LOK CCODA) based on PACE model
- Geriatric Resources for Assessment and Care of Elders (GRACE) from North American; System of Integrated Services for Aged Persons (SIPA) from Canadian (Quebec); Integrated Care

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Programme for Older Persons in Ireland (ICP OP), and The Walcheren Integrated Care Model (WICM) from Netherlands.

In common, these programs are addressing a community-dwelling approach for older individuals. This means that health and care delivery are empowered to allow a longer life in community, independent and autonomy. By different methodologies, these approaches are characterised by a comprehensive and holistic health and care pathways, a co-ordinated governance and a multidisciplinary team. However, there are no strong cost-effectiveness evidences, because efforts from each provider engaged in health and care delivery difficult to measure.

Figure 6 resumes all these approaches or models.

PROGRAMME FOR ALL-INCLUSIVE CARE FOR THE ELDERLY

Model of Care | Outcomes

ON LOK SENIOR HEALTH SERVICES, COMMUNITY CARE ORGANIZATION FOR DEPENDENT ADULTS

On Lok began in 1971 in San Francisco (USA), because the traditional models of care for ageing were not meeting its needs. Indeed, older people wanted to age at home, but they needed services to maintain their independence. Dr. William L. Gee and social worker Marie-Louise Ansak joined forces to create a program that would enable older adults to continue living in their community. Propelled by their drive and vision, On Lok founded the PACE Model.

Programms ON LOK

Senior Center: senior activites (gardening, dance, lifelong learning, arts and crafts, games, group outings, trips, events), health workshops (fitness fall prevention, health management), Senior Meals, Volunteering, Community Day Center.

LGBTQ Program: Openhouse (life-affirming space), On Lok Community Day Services (first community-based adult for LGBTQ population), Meals, Care, Events, Tramsportation.

Aging and Disability Resource Center: information, advice and resources to remain safe and active in the community (Caregiver support, Employment and training, Meals and nutrition, Housing and shelter, In-home care, Legal assistance, translation, assistance with forms, Medicare and Medi-Cal, Mental health and counseling, Senior centers and recreational opportunities, Transportation)

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GERIATRIC RESOURCES FOR ASSESSMENT AND CARE OF ELDERS

GRACE TEAM CARE™

Geriatric Resources for Assessment and Care of Elders (GRACE) Team Care, was developed by the Indiana University School of Medicine's Center for Aging Research (2007), as a solution to the healthcare for low-income seniors with multiple chronic conditions, in order to optimise health and functional status, decrease excess usage of health care services, and prevent unnecessary long-term nursing home placement.

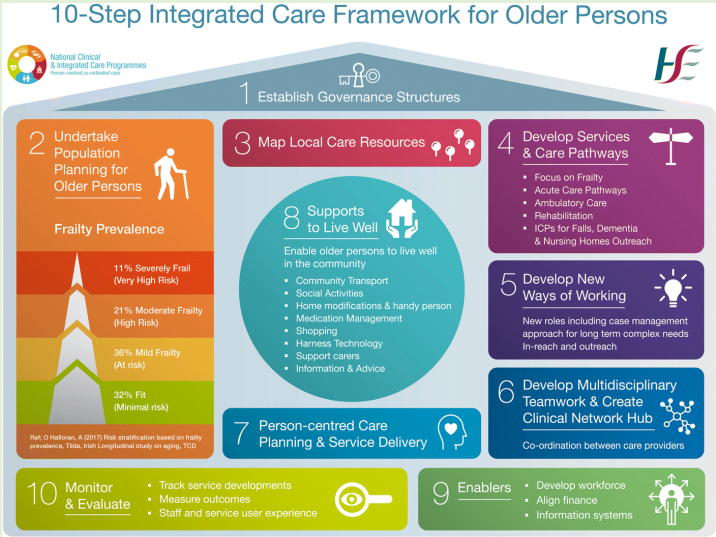
Key-success Factors

- Comprehensive in-home assessment performed by a nurse practitioner and social worker (the GRACE Support Team).
- GRACE team is often led by a geriatrician and includes a pharmacist, a mental health professional who are linked with a licensed clinical social worker.
- GRACE Team Care Training and Technical Assistance Tools: a wide range of tools and support, which can be packaged or are available a la carte (Conf. Calls; Intensive Training; GRACE Manual; Online Tools and Resources; GRACE Dashboard.
- Adapted to a variety of patient populations and health care settings, it has consistently improved patient and caregiver satisfaction, quality indicators, and acute care utilisation.

SYSTEM OF INTEGRATED SERVICES FOR AGED PERSONS

- **Health and Social Services**: Vaccination; Health Covered Outside; confidential phone service; optometry; medical prescription.
- **Home Help**: domestic help; meals and wheels.
- **Housing**: legal information for seniors; Rights Commission; grants for older individuals; financial assistance.
- **Transportation**: ambulance service; driven licence state of health.
- **Justice**: exclusion; abuse; ageism; grandparents' rights; power of attorney; contracts; properties and heirs.
- **Tax Credits and Pensions**: tax assistance; Independent Living Tax Credit; pension; credits.

INTEGRATED CARE PROGRAMME FOR OLDER PERSONS IN IRELAND



- Ireland National program, led by Health Service Executive
- Provide a "cohesive primary and secondary care for older people"
- Model based on "integrated services and pathways for complex health and social care needs"
- From "hospitals towards community based, planned and coordinated care"
- Accessibility, personalised plans, independent live at home and community

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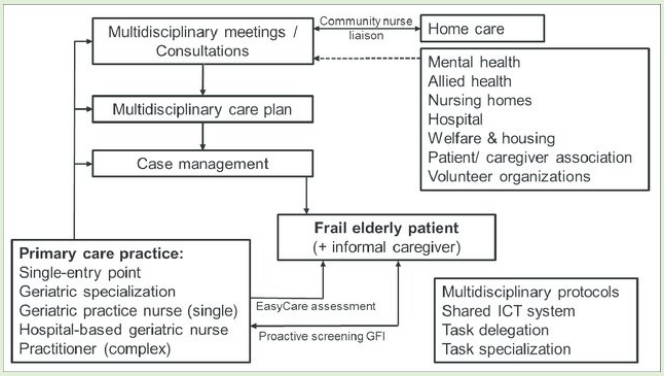
THE WALCHEREN INTEGRATED CARE MODEL



Description

"Communication and information- exchanges between primary, secondary and tertiary professionals is typically bilateral and ad hoc. The aim of the Walcheren Integrated Care Model was to address these issues in the care for frail elderly patients in the community using the following components: a single entry-point, proactive screening, comprehensive needs assessments, case management, multidisciplinary group meetings, care plans and protocols, a shared information system, and tasks specialisation and tasks delegation" (Janse et al., 2016)

Figure 6 PACE, SIPA and ICPOP integrated care models for older individuals.
Sources: National PACE Association (https://www.npaonline.org), ON LOK CCODA (https://onlok.org), (http://graceteamcare.indiana.edu/home.html & http://graceteamcare.indiana.edu/home.html), Québec Government (https://www.quebec.ca/en/family-and-support-for-individuals/seniors/msg/3/#c34503), and Ireland HSE (https://www.hse.ie/eng/about/who/cspd/icp/older-persons/) (accessed in October 2020).

Alongside, there are disease-specific models of integrated care. In general, these models propose effective and contractual links between services provided by health system (hospitals, primary care) and community-based services (e.g., diagnosis, therapeutics, pharmacies, social services, social economy). They are still person-based models, but they provide innovative tools for integrating different levels and types of services, providers and deliveries.

Widely adopted by health and social services, the Chronic Care Model (See Figure 7) was developed by researchers to introduce a "comprehensive framework" on healthcare for people with chronic disease. It's structured by a "longitudinal, preventative, community-based" approaches, with six main domains of integration: "community; health system; self-management support; delivery system design; decision support; and clinical information systems". On the last revision (2003), "cultural competency, patient safety, care coordination, community policies, and case management were added to the initial scheme" (WHO, 2016, p. 11).

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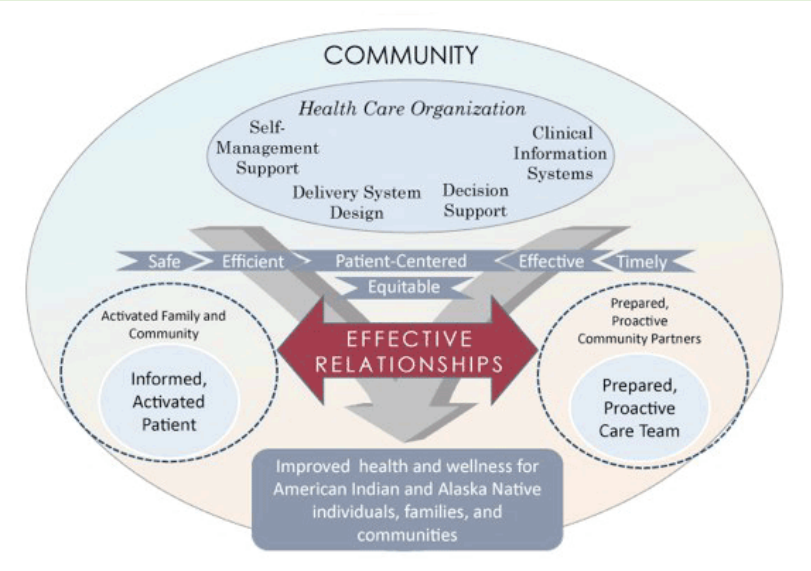
Chronic Care Model



Assure the delivery of effective and efficient clinical care and self-management support

- Define roles and distribute tasks among team members
- Use planned interactions to support evidence-based care
- Provide clinical case management services for complex patients (2003 update)
- Ensure regular follow-up by the care team
- Give care that patients understand and that fits with their cultural background (2003 update)

Health literacy and cultural sensitivity are two important emerging concepts in health care

Figure 7 Delivery System Design of Chronic Care Model.
Source: http://www.improvingchroniccare.org/index.php?p=Delivery_System_Design&s=21 (accessed online October 2020).

Under disease-specific models, the literature has highlighted European models that provide long-term care for people with specific diseases, such as Chains of Care (Sweden), Managed Clinical Networks (Scotland) and Disease Management Programmes (Germany) (See Table 6). The Swedish model is based on "contractual agreements and alignment of incentives that enable efficient use of resources"; Scotland's includes a "virtual integration that puts patients at the centre to enhance access to services"; and Germany's model adopts "IT-supported documentation and patient information, shared-decision making and patient education" (WHO, 2016, p. 14).

Table 6 Key-success features of Chains of Care, Managed Clinical Networks, and Disease Management Programmes.
Source: Curry & Ham, 2010, pp. 28-31.

Disease-specific Models		
Chains of Care	**Managed Clinical Networks**	**Disease Management Programmes**
▪ Linking primary care, hospital care and community care. ▪ Local agreements between providers (contractual integration). ▪ Primary care, specialist centre at the local hospital, rehabilitation in community.	▪ High quality clinically effective services, without new formal entities / organisations. ▪ Working relationship between organisations and individuals. ▪ Co-ordination of services, consistent advice, care and prevention.	▪ Standard elements: evidence-based; patient involvement and self-management; intersectoral care; quality assurance measures. ▪ Patient involvement, education and self-management. ▪ Financial incentives for providers and patients.

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2.2.3 Population-based Models (macro)

The third *key-model* of integrated care, Population-based Models, has a focus on macro-level health delivery, rather the specific groups and diseases or an individualist approach.

In the USA, this population-based model is widely used and has a big impact in reducing the fragmentation of health and care systems and associated issues, such as poor quality, overlapping, inefficiency, duplications, but especially for integrating three elements of healthcare system: health plan (or health commissioner), ambulatory health delivery and hospitalisations (Curry & Ham, 2010).

The literature points to three examples of this *key-model*. According to the WHO (2016), the first two are the US Kaiser Permanente and Veterans Health Administration models, which are for all individuals who, respectively, have a healthcare plan (private) or are a military veteran. The third *key-model* is the integrated care in Basque country that is structured by clinical criteria (e.g., chronic disease), alongside the burden generated by chronicity in caregivers (formal, informal) and services (especially health services) (Basque Government, 2010).

During the Great Depression in the USA, *as a first prepayment model for healthcare for workers*, Kaiser Permanente is one of the biggest "health maintenance organizations in USA" which integrate three inter-linked services: "a non-profit health plan that bears insurance risks (Kaiser Foundation Health Plan), self-governed for-profit medical groups of physicians (Permanente Medical Groups), and a non-profit hospital system (Kaiser Foundation Hospitals)" (WHO, 2016, p. 15). This model is structured by several key principles that aim to ensure that patients, as citizens, are healthy (See Table 7).

Table 7 Key principles of Kaiser Permanente Model.
Source: Curry & Ham, 2010: 10.

Integration of Care
Integration of inside and outside healthcare. Move easily between hospitals and the community. Multispecialty medical practice. Specialists work alongside generalists. No deliveries at the expense of other services.
Chronic Care
Priority for chronic diseases because represent the major source of demand among the membership. Stratifying the population according to risk. Emphasis on prevention, self-management, disease and case management.
Population Management
Unplanned hospital admissions are a sign of system failure. To avoid inappropriate use of hospitals. Hospital treatments not planned are not optimum care. Evidence-based guidelines. Reducing unacceptable variations.
Active Management of Patients in Hospital
Lower use of beds. Care pathways for common conditions. Discharge planners to move patients through pathways. Availability of skilled nursing. Work only with inpatients and to ensure appropriate level of care.
Self-management Support

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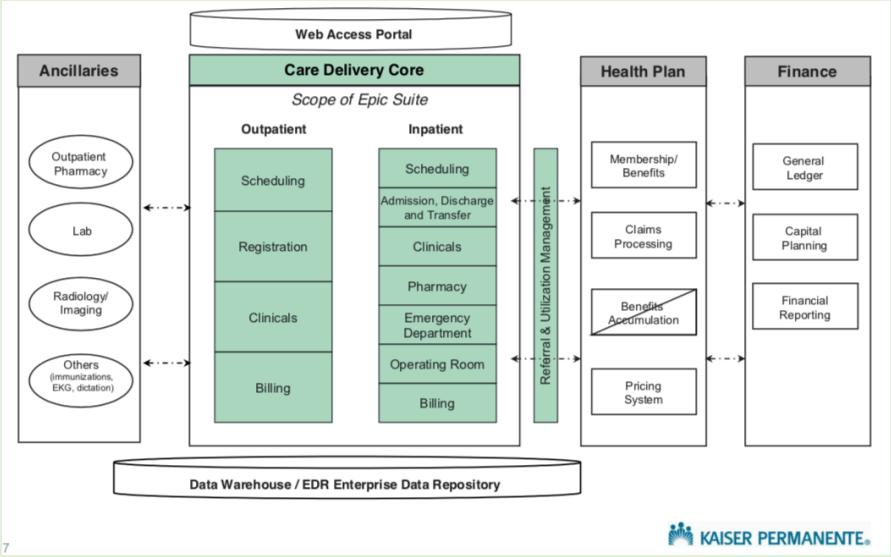
Health delivery is underpinned by self-management support to members. Provision of information and patient education programmes, increasingly supported by information technology.
HealthConnect
Significant investment in information technology. Kaiser Permanente online enables members to communicate by email, access their medical records, make appointments and order prescription refills.
Mutual Exclusivity & Leadership Development
Mutual exclusivity between the Health Plan and the Permanente Medical Groups. Doctors take on leadership roles in the medical groups, and it is within these groups that decisions are made on clinically appropriate care. Physicians take responsibility for the performance of the organisation and are actively committed to its success.

From these principles, the HealthConnect Programme (Figure 8) displays one main innovative feature of this model, that being an "extensive information system", which has essential "inpatient and ambulatory patient records" and allows "patient self-management (access records, make appointments and order prescription refills)" (WHO, 2016, p. 15).

HealthConnect Programme – Kaiser Permanente



Consumer-centric Model

Home as the Hub: local of care; include other community and family resources.

Customization: patients can choose own health plans, cost sharing, individual care pathways, and communication modalities.

Integration and Leveraging: health and well-being integrated; care delivery and health plan integrated; IT leverages scarce or specialized clinical resources.

Secure and seamless transitions: effectively, efficiently, and compassionately.

Figure 8 HealthConnect Programme – Kaiser Permanente.
Source: http://www.fgcasal.org/medicinaenred2/wiesentathal.pdf (accessed in October 2020).

The other model of integrated care is from the Veterans Health Administration, which "is an example of real integration, in contrast to Kaiser Permanente, which is virtually integrated". Thereby, this model has their own physicians, hospital, medical offices, manages services, and it is financed by a Federal Government, and it supports the National Health System, especially the delivery of care services for older individuals and complex cases (Curry & Ham, 2010, p. 11).

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Only in the nineteen-nineties, this model was reorganised into "regionalised based" and "integrated service networks"; moreover, from a "fee-for-service payment system", the model works through "capitation basis to each network which is then responsible for providing all care with those resources" (Curry & Ham, 2010, p. 12). This approach has been structured to enhance "coordination between facilities, the synergy of resources and provision of care", a "shared accountability" and "continuous performance improvement" between healthcare services, providers and delivery, as well as the "patient self-management" culture (WHO, 2016, pp. 15-17).

The digitalisation of health and well-being care services have been critical in improving the care provided by the Veterans Health Administration, especially in the expansion of the presential healthcare, such as regular check-ups, access to health care services, access to medical equipment, prosthetics, and prescriptions, and others. The "Office of Connected Care" model aims to extend "access to care beyond the traditional office visit", and "to deliver care to patients where and when they need it"[4]. There are three eHealth solutions empowered by Veterans Health Administration: VA Mobile, My HealtheVet, and VA Telehealth Services (See Figure 9).

eHealth Solutions from VA Model

VA Mobile

- **VA Video Connect**: quick and easy health care access from any mobile or web-based device.
- **Stay Quit Coach**: provides tools to help with urges to smoke, and messages to help you stay smoke-free.
- **Airborne Hazards and Open Burn**: an online database on airborne hazards for Veterans exposed during conflicts in Iraq, Afghanistan, and Golf War.
- **AIMS**: offers education about anger and opportunities for finding support.
- **CBT-i Coach**: Cognitive Behavioural Therapy for Insomnia.
- **VA Video Connect**: quick and easy health care access from any mobile or web-based device.
- **COVID Coach**: support self-care and overall mental health during the coronavirus (COVID-19) pandemic.

My healthevet

- **Basic Account (for all)**: add personal health information; record and track personal information, contacts; health insurance wallet ID card; set personal goals.
- **Advanced Account (for VA Patients and CHAMPVA Beneficiaries)**: access to features offered in My HealtheVet. For VA Patient, this type of account lets refill VA prescriptions online using My HealtheVet.
- **Premium Account (for Veterans and/or VA Patients)**: VA Admissions and Discharges; VA Allergies; VA Appointments (future); VA Appointments (limited to past 2 years); VA Demographics; VA Electrocardiogram (EKG); VA Immunizations; VA Laboratory; VA Medication History; VA Pathology Report; VA Problem List (active health problems); VA Notes; VA Radiology; VA Vitals and Readings; VA Wellness Reminders; VA electronic health record information; Department of Defense (DoD) Military Service Information; Use the VA Blue Button; Service Information; VA Continuity of Care Document (VA CCD); Use Secure Messaging.

VA Telehealth

VA Telehealth Services is an easily connection between patients and professionals and services, from home, clinic, or hospital.

- **From home**: meet with VA providers virtually and send important health data from the comfort of home, using computer or mobile device.
- **From clinic**: brings specialty staff and services closer to home; to connect with VA health specialists at medical centers nationwide from your community clinic; providers make diagnoses, manage care and perform check-ups virtually.
- **From hospital**: to help physicians and medical professionals discuss matters related to singular care.

Figure 9 eHealth solution empowered by Veteran Health Administration.
Source: https://www.va.gov/health-care/#get-va-health-care (accessed in October 2020).

[4] Information about Veterans Health Administration model was learned and cited from its Website (https://www.va.gov/health-care/#get-va-health-care). This data was accessed in January 2021.

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In Europe, the Integrated care in the Basque country is a result of the "Strategy to tackle the challenge of chronicity in the Basque Country", launched in 2010 to introduce "integrated care approaches to transform health services delivery" (WHO, 2016, p. 17).

The new organisational arrangement is based on two approaches. A bottom-up approach, which aims to integrate primary and secondary health delivery, both clinically and functionally. A top-down approach, that aims to create a single system, "Integrated Healthcare Organisations", for bringing together "hospital and primary care structures". Based on these changes, it has established "units for continuity of care" and a "individual continuity of care plans", which allow an improved "coordination and liaisons between providers, namely internists, medical and nurse professionals" (WHO, 2016, p. 17).

Moreover, this model is "digitally-enabled" and "person-centred", thereby, it is based on "preventive interventions, patient empowerment, and personalized medical care", but also in "continuity of care, security, adherence and patient experience". The model is structured by a "strategy for coordination of health and social care", as well as "an eHealth strategy comprising a unified universal Electronic Health Record (ERH), ePrescription, Personal Health Folder, 24X7 Nursing and Call Centre" (Basque Government, as cited by Manuel Kinoy, 2018) (See Figure 10).

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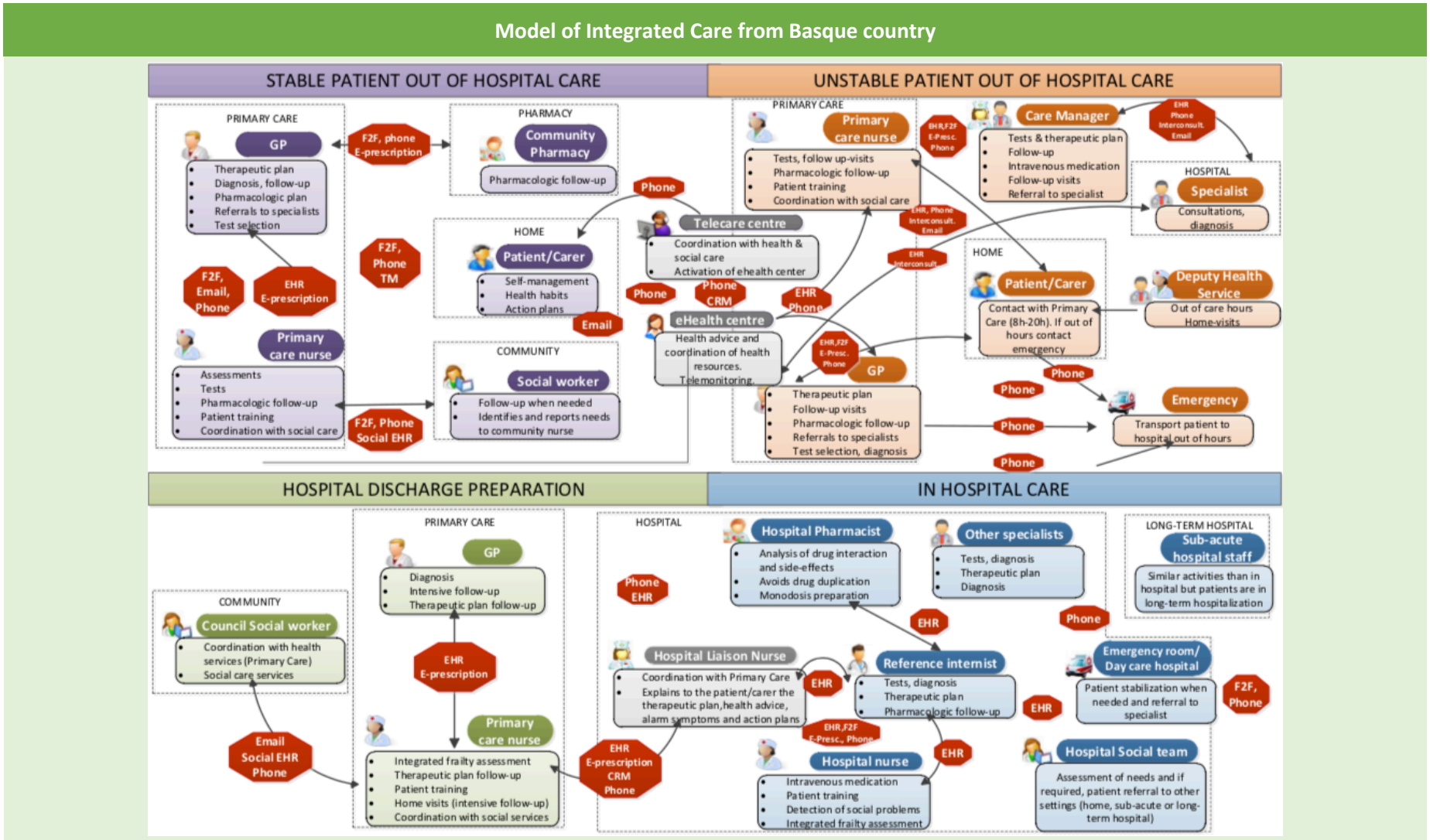

Figure 10 Model of Integrated Care from Basque country

Source: de Manuel Kinoy, 2018.

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2.2.4 Resume

This literature review shows that all (main) models of Integrated Care aim to change the current health and social care paradigms, both organisationally, clinically and socially. Despite internal differences, all models are finding new approaches to increase efficiency, efficacy and effectivity (sustainability) of health and social care systems and their organisations and professionals, but also the better patient's experience and participation on health and social care pathway. Moreover, all models have been empowered a "digitalisation" of systems, especially solutions for remote monitoring, training and medical appointments.

The first model, individual based, is strongly patient-centred. This means that health and social care delivery is designed for one person/patient and it's determinate by their personal context (social, educational, economic, familiar), including its economic power. This model is adopting especially for people with specific diseases (e.g., rare disease) or health condition (e.g., to be older individual with multi chronic disease). Nevertheless, the model is payer-centred, which means people who have a higher economic power, they will have a higher services delivery as well.

For these reasons, this model should be understood as comprehensive, holistic and evidence based. In this regard, the model is also longitudinal, which means it's for all ages and continuum. By an individual care plan, the model is designed and implemented for one person and their needs and interests. For instance, a person who is born with cerebral palsy can adopt an individual integrated care model that includes the integration of all healthcare services and it also includes the social services in the community. In this regard, some experiences of this model are also community-dwelling centred, that means there are services and deliveries that aim to keep patients in their homes and communities supported by professionals and informal caregivers (e.g., family, friends, neighbours).

The second model, group or disease based, is structured by a specific set of health and social care interests and needs regarding a group of people or diseases. Instead of first model, which is more personalised and tailored, the second model is deployed for a group of people (e.g., older people; citizens of a small village; a group of sportsmen) or disease with similar impacts in all individuals (e.g., diabetes, asthma). Thereby, this model is widely adopted for older individuals, as well as it's not longitudinal and continuum. Often, this model is adopted only a person has been reached to a specific health and social condition (e.g., frail, morbidity).

The model is strongly community-dwelling centred, in order to engage all social organisations and people in health and care pathways, and to keep patients in their homes and communities supported both by professionals and informal caregivers (e.g., family, friends, neighbours) – like a first model. Thereby, model is often deployed by partnerships (agreements) between social and health organisations, and they are supported by private companies, volunteers, NGOs, municipalities and other stakeholders from local communities.

The third model, population based, is designed and implemented for all population and it's acknowledged by its governance model. Instead of the previous models, this model is strongly related with healthcare financing from public or private sources. In other words, the focus of this model is to

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keep health and social care economic sustainable and, at the same time, higher performing and guaranteeing quality of health and social care. In other words, all experiences analysed (KP; VA; ICBC) were founded, and they are running, to keep systems financially sustainable through a pre-payment governance, that is funded by insurance companies or companies' taxes (from employees).

This model is strongly focused on integration of health pathways, but also between healthcare pathway and social services in community and patients' homes. Moreover, this model is digital based definitively, especially for integrating healthcare pathways (and respective data and information) and adopting effective remote monitoring / assistance systems, but also for proving training tools, medicaments' prescription, and others. For that reason, this model is really evidence based, which means that all actions (organisationally and clinically) should be based on concrete standards, numbers and facts.

In the Table below, there is a list of key-features that were captured from all models and associated experiences (or approaches) analysed. Despite features listed are regarding to all models and their approaches (e.g., all models and approaches are payer-centred, but only ones were pointed this feature as a key-feature), the list aims to resume key-features by model and their approaches.

Table 8 Resume of Key-features of Integrated Care Models.

Features	Key-models by Level		
	Individual	Group or Disease	Population
Patient-centred	CPA; CM; PCMH; VW; PHB	PRISMA; THSC; ICPOP; COM; MCS	
Community-dwelling centred	PCMH	PACE; LOK; GRACE; SIPA; WICM; CCM; CC	KP; VHA; ICBC
Integration of Health and Care	VW; PHB	PRISMA; THSC; PACE; LOK; GRACE; SIPA; ICPOP; WICM; CC	KP
Holistic / Comprehensive	CPA; CM; PCMH; VW; PHB	PRISMA; THSC; PACE; LOK; GRACE; SIPA; ICPOP; WICM; CC; MCS; DMP	VHA; ICBC
Tailored / Personalised	CPA; CM; VW; PHB	SIPA; ICPOP	
Digital and Technological	PCMH; VW	PRISMA; THSC; PACE; LOK; GRACE; SIPA; ICPOP; WICM; MCS; DMP	KP; VHA; ICBC
Evidenced base	CPA; CM; VW; PHB	PRISMA; THSC; GRACE; ICPOP; WICM; MCS; DMP	KP; VHA; ICBC
Payer-centred	VW; PHB		KP; VHA
Reduce hospitalisations	CPA; CM; PRISMA; VW; PHB	PRISMA; THSC; PACE; LOK; GRACE; SIPA; ICPOP; WICM; CCM; CC; MCS; DMP	KP; VHA; ICBC

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Reduce fragmentation of care	CPA; CM; PRISMA; VW; PHB	PRISMA; THSC; PACE; LOK; GRACE; SIPA; ICPOP; WICM; CCM; CC; MCS; DMP	KP; VHA; ICBC
Continuous / Longitudinal	CPA; CM; PRISMA; VW; PHB	CCM; CC; MCS; DMP	KP; VHA; ICBC

2.3 Trends in integrated care

Based on the values and models of integrated care described above, this section highlights several trends as the consolidated paths followed when implementing models of integrated health and care services. For the purpose of this deliverable, and according to the definition offered by Minkman (2018), "trends" will be understood as responding to the following criteria:

- Corresponding to a change in values as well as to the needs of people (see for example the growing need and strive for independency)
- Driven by larger, separate, influences (e.g. digitalisation)
- Manifesting itself (either in products or in initiatives)

According to these criteria, three trends will be described in more detail in this section: 2.3.1: A holistic understanding of the person (as opposed to "the patient"); 2.3.2: Cross sectoral cooperation; and 2.3.3.: The role of technology.

2.3.1 Holistic and person-centred approach

In line with WHO's understanding that "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1946, p.1), over the last decades, in health care, people are less considered as "patients", and more as individual human beings, working and living in environments they have little power upon, facing different health challenges and opportunities for access to health and care services. This approach therefore includes a more comprehensive understanding of the determinants of health themselves and paves the way for person-centred, preventive and health promoting services – as opposed to being standardised, reactive and disease-curing.

> "(…) person-focused care, reflects a bio-psycho-social, perspective of health, as it acknowledges that health problems are not synonymous to biological terms, diagnoses or diseases. It bridges the gap between medical and social problems as it acknowledges that diseases are simultaneously a medical, psychological and social problem." (Valentijn, 2013, p. 4)

WHO has been advocating for placing individuals and communities at the centre, treating their global needs as opposed to single illnesses. At the same time, this leaves room for the individuals to play a greater role in the management of their own health. Sharing data, the underlying principle of integrated care, comes along with the firm belief that individuals should not only be the nodal point of each health system, it also aims to guarantee patient empowerment thanks to people's ownership

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of their own health data. As a result, the person-centred trend in integrated care comes hand in hand with a push in health (and digital) literacy. Participatory approaches are key to consolidating the person-centred trend in integrated care. A more empowered, educated and consulted individual will automatically receive health and care services better tailored to his/her needs. As such, individuals will be encouraged to manage their own health whenever possible.

2.3.2 Cross-sectorial cooperation

2.3.2.1 De-institutionalisation

Cross-sectoral cooperation is closely linked to the trend of person-centred care. Strengthened cooperation across sectors and disciplines is a prerequisite for the provision of personalised care services. At the same time, more cooperation structures promote the sustainable establishment of integrated care and can be qualified as an external "push" criterion defining a trend. Transdisciplinary education, cross-sectoral capacity building and the establishment of dialogue structures across sectors and disciplines are essential in securing long-lasting integrated care structures.

The so-called "de-institutionalisation" is an outcome of the above: further to person-centredness, the spotlight for an improved provision of healthcare is shifted away from health facilities (Minkman, 2020). However de-hospitalisation needs to rely on alternative structures. De-institutionalisation is also pushed by the need in many health systems to shift costs from in-patient to out-patient care. As such, the role of GPs, specialists, outpatient clinics and further health professionals is gaining of importance. In addition to this "vertical" integration as a consequence of de-institutionalisation, a "horizontal" de-institutionalisation is taking place within local communities with increased involvement of family members and neighbours. "Caring" or "vital" communities develop throughout Europe, with strong engagement of informal help and carers – hence creating the need of better integrating them into treating and caring for other individuals (Lewis et al., 2020).

Happy and longer living within one's own home is at the heart of this trend and impacts on the organisation of care itself. The active involvement of communities and the intertwinement of sectors such as education, the wellbeing and leisure industry as well as work and social environments, are responding to the complex demand of an ageing but more active, less dependent population.

2.3.2.2 Policy push: at the European, national and local levels

Demographic change and the shortage of skilled health and care workers has pushed the EU as well as its member states and all their policy levels, to provide incentives for innovative solutions for their health systems. Joining worldwide discussions (in particular initiated by Australia, China, Norway, Switzerland and the United States to name a few), WHO Europe and the EU dedicated their attentions to integrated care policies. Under the umbrella of the European Innovation Partnership on Active and Health Ageing (EIPonAHA) the "B3 Action Group Integrated Care" was established, gathering representatives of European regions involved in pursuing integrating efforts. Indeed, it has been argued in the past (and became very much apparent in the current COVID-pandemic), that health is a localised public good. Also, regional authorities are often vested with financing and legal powers regarding the provision of health (and care) services. As such, chances to ensure a better development

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and deployment of integrated care seemed higher when involving policymakers at all levels. Examples of measures taken by the Basque Country and the UK can be found above.

In order to verify whether policy can have an impact on the deployment of integrated care processes, it is relevant to compare not only the policies pushing for more integration of care but also the institutional settings themselves (Mur-Veeman, van Raak & Paulus 2008: 179). This study for example looked into policies and systems in Austria, England, Finland, Spain, Sweden and The Netherlands, i.e. some centralised and some decentralised governments. Some have been introducing integrated care policies for over four decades, others only recently. All face barriers for collaboration across health and care sectors as well as within the sectors themselves (service fragmentation), see Table 8 below.

Table 9 Overview of the state of affairs of integrated care per country
Source: Mur-Veeman et al. 2008

	Integrated care policy since	Stage of policy making	Dominant dividing lines	Dominant problems
Finland	1970–1980s	Policy implementation and continued policy formulation	Between primary and secondary care	Lack of continuity of care, fragmentation of services
Sweden	Early 1990s	Policy implementation and continued policy formulation	Inter-regional between primary and secondary care	Hampering patient flows, poor information exchange, fragmentation of services
Austria	2000	Agenda-setting and early policy formulation	Among primary care and hospitals	Limited/lack of integrated care policy, lack of cooperation among providers, social insurance agencies, service users and authorities, fragmentation of the system
Spain	Currently preliminary	First steps leading to agenda setting	Inter-governmental Among health care provisions Inter-regional	Lack of inter-governmental coordination, residential and long-term social care under developed, limited coordination powers in primary care, lack of resources, fragmentation of the system
The Netherlands	Early 1990s	Policy implementation and continued policy formulation	Between long-term and acute care	Lack of continuity of care, lack of dissemination of integrated care, fragmentation of services
England	1980–1990s	Policy implementation and continued policy formulation	Between health and social care	Barriers to joint working, fragmentation of policy and service systems

The authors conclude that in order for policy to make a difference, more dependencies need to be taken into account. First and foremost, the reimbursement model (Beveridge or Bismarck, for example) requires a stronger policy push: markets will not have a great impact on the development of integrated health and care services (Mur-Veemann, 2008: 182). Finally, the above-named research recommends that policy focuses on specific aspects of integrated care in order to ensure better uptake.

2.3.2.3 Population health

Together with the trend of a more person-centred care understanding of health issues, one finds what could be understood as the opposite trend: population-based care (PBC). Indeed, PBC attempts “to address all health-related needs in a defined population” (Valentijn, 2013, p. 4). However, the discrepancy in approach is only apparent and integrated care models, as seen above, provide both keys to understand and improve health services. Actually, PBC is at the basis of the delivery of

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integrated care and follows the goal of basing services specifically on "the needs and health characteristics of a population (including political, economic, social, and environmental characteristics) to improve an equitable distribution of health (and well-being) in a population" (Valentijn, 2013, p. 4).

This understanding has been having a significant influence on the policy push at all levels. Thanks to the increased availability of data, it is informing about potential measures for populations geographically defined or more at risk.

2.3.3 The role of ICT (Information and communications technology)

2.3.3.1 ICT and integrated care

The possibility to deliver person-centred health and care services at the "point-of-care" (i.e. in the home setting) comes along with the increased availability of telemedicine and monitoring options for e.g. chronic conditions. Integrated care and an increased use of technologies cannot be considered separately, both aspects being push and pull factors in the other's development. There is therefore widespread agreement that the use of technical solutions such as ICT (information and communications technology) is precious for the future of integrated care (Monaco et al., 2020).

The EU also aims to empower individuals to organise their own health care through the use of technical tools (WE4AHA, 2019). Communication channels via innovative technologies make it possible to generate feedback from the care-receiver and provide exchanges between care-receiver and caregiver. The more interactions among users, i.e., patients, carers, and health care providers, the more processes of integrated care are being secured. This requires capacity building in terms of health literacy, digital literacy and a combination of both: eHealth literacy.

2.3.3.2 Digitalisation as a booster of integrated care

Digitalisation certainly is a trend in health care that is very directly linked to the uptake of the provision of integrated care services. A few definitions are required to navigate to Section 3 further analysing IT-Solutions in integrated care.

Digitisation vs. digitalisation

The digitisation of health data is the process of leaving pen and paper behind and record health information on ICT devices, store them electronically and possibly share them with others. Digitalisation on the other hand stands for the procedure of implementing digital technologies in sectors previously unaffected, because they were not yet digitised, and, most importantly, the added value from collected data. In current research surrounding digital innovation, there are often definitions of digitalisation from consulting or advisory companies. One of these definitions is provided by the Gartner online glossary stating that "[d]igitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business" (Gartner, 2021). This definition implies to use gathered data and information to improve work performance and subsequently transform the business through

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digital innovation. As a result of this digital transformation, new concepts can be exploited to provide advantages for providers and users.

In a nutshell, digitalisation is based on a combination of multiple technologies, including cloud and cognitive computing, mobile applications, and the internet of things. Most importantly, next to digital technologies, digitalisation comprises to rethink business and operating models as well as the customer and partner relationships by focusing fundamentally on the customer need.

A number of factors have made digitisation of the health care system n possible, because in the beginning only very simple processes were digitised. A leap in the use of digital solutions in health care was only possible after computers began to work with an enormous increase in performance. This made it possible to process a very large amount of data in a very short time. In addition, there were new mobile phones on the market, which enabled the communication of large amounts of data and established various apps, including health apps (Müschenich, 2017).

Today, these developments enable new diagnostic and therapeutic options based on patient data. For example, it is possible to record the patient's health parameters remotely thanks to sensors measuring health data, servers storing this information and algorithms possibly providing first indications on clinical decision support (CDS). But technology does not have to be innovative itself: video calls for example, when applied to the health services, become telemedicine with the opportunity for video consultations between patients living in remote areas and their health specialist. Services usually provided during consultations have also been digitised and digitalised such as in some countries the prescription of medicine or sick-leaves, the creation of medication plans, the scheduling of follow-up appointments.

Among health professionals themselves, the digitising of health information has opened the door to more collaborative work, from one clinic to the other or across the health and care sectors for example. This however requires the interoperability of data, i.e., the possibility for these different entities to actually access and "read" the patients' health data recorded by colleagues. Unfortunately, this is rarely the case, mostly due to the highly competitive market of health information system providers (HIS).

Sharing information digitally has a number of advantages in addition to benefitting the patient whose data becomes "mobile": digitalisation addresses all challenges health systems face. By simplifying the observation and recording of health data, moving it 'to the point of care' thanks to sensors, it shortens both the time and effort spent by health professionals usually in charge of these tasks and overcomes the shortage of qualified staff, the gaps in medical care as well as mobility issues, especially in rural areas. Many claim that these positive impacts will also result in medical care ultimately becoming more affordable, for instance because over-treatment will be documented more transparently, time-intensive tasks will be automated (editing of health information e.g.) and incentives can be more easily set (see below).

However, the disadvantage is that in parallel with the additional workload for the staff at the beginning, patients fear losing control over their own private health data. In addition, many patients worry about watering down the direct relationship they like to have with their GPs (Minkman, 2020) when actually true digitalisation could achieve the opposite. In order for health care systems to

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become truly digitalised (as opposed to digitised), roles and responsibilities need to be thought over, access to information universalised and decision-making power shared. In that sense, digitalisation of health equals a Copernican revolution more than the introduction of IT-based data recording.

From Electronic Medical Records (EMR) to Electronic Health Records (EHR) and Personal Health Records (PHR)

Digitising health records leads to the implementation and use of electronic records. It is important to differentiate in this respect between similar terms: Electronic Patient Record or Electronic Medical Records (EMR) and Electronic Health Records (EHR); all depict digital versions of the patients' health information. The former (EMR) however stays at the health professional's office and records diagnoses and treatments provided by one doctor. The latter (EHR) by contrast is recording information from multiple health and care providers hence offers intersectoral and long-term information on the patients. As such, one can say that while they share commonalities, they do serve different purposes and solely EHR are truly responding to the integrated care criteria. In addition to the EHR, Personal Health Records (PHR) enable insured individuals to exchange, alter, add and/or delete information in their record in real time. PHR grant individuals access to their EHR as well as empowering them in the health and care processes. Therefore, PHR are essential in the promotion of healthy lifestyles, the management of health risks and chronic conditions, the access to health and care services as well as informed decision making for the patients.

Solely the achievement of PHR allows true person-centredness and participation of individuals as providers of health information since it creates the opportunity for them to monitor and record health related data thanks to wearables and enhance their (personal) health record with this data.

Data exchange

Secure access to and exchange of health data across national borders are important policy targets. On the one hand, this will enable patients to benefit from a high level of health care in the EU without having to fear a loss of information or personalised care. On the other hand, the exchange of health data makes it much easier to evaluate and research in the health sector. Researchers from all over the EU will be able to access the data, and a variety of data sets will provide much stronger evidence on health conditions or interventions (WE4AHA, 2019). In data traffic privacy and data protection are top priorities that need to respond to stringent legislation and regulations. The European Commission is currently developing a work programme for 2021 on 'European health data space' which will "is essential for advances in preventing, detecting and curing diseases as well as for informed, evidence-based decisions to improve the accessibility, effectiveness and sustainability of the healthcare systems." (European Commission, 2020a, p.22). The set of rules and governance is being determined through consultation process. The European health data space will:

- promote safe exchange of patients' data (including when they travel abroad) and citizens' control over their health data;
- support research on treatments, medicines, medical devices and outcomes;
- encourage the access to and use of health data for research, policy-making and regulation, with a trusted governance framework and upholding data-protection rules;
- support digital health services;

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- clarify the safety and liability of artificial intelligence in health.

The importance of such as European Health Data Space for achieving "better data-driven health care" was underlined by the Commission and Germany's Presidency of the Council of the EU in November 2020 (European Commission 2020b).

2.4 Evidence in integrated care

2.4.1 Introduction

In this section, evidence in integrated care is investigated in relation to a range of positive outcomes, including quality of care and care receiver satisfaction, improved quality of life and well-being, mortality rates, outcomes for informal and professional caregivers, cost-effectiveness of integrated care, and reduction in length of hospital stay and re/admission rates. This literature review is primarily based on systematic review studies and meta-analyses of the evidence of the efficacy of integrated care to the extent that such an evaluation is possible. However, as various authors have pointed out, the evidence in integrated care is difficult to assess. As mentioned at the beginning of this chapter (Chapter 2), this is because 'integrated care' is a heterogeneous umbrella term which refers to a wide variety of models and methods of intervention (Baxter et al., 2018; Rocks et al., 2020) seeking to "facilitate improvement in patient experience through enhanced coordination and continuity of care" (Rocks et al., 2020, p. 1211). Moreover, integrated care seeks to overcome the fragmentation of care (Liljas et al., 2019).

Nolte and Pitchforth (2014) found that integrated care in the extant literature may be referred to as "case management, care coordination, collaborative care or a combination of these" (p. v). Consequently, the resulting fragmentation (Looman et al., 2019) and scarcity of robust evidence (Platzer et al., 2020) make it difficult to evaluate the efficacy of integrated care. Moreover, Looman et al. (2019), who carried out a systematic review of the (cost) effectiveness of integrated care, pointed out that variation in "population, interventions and outcomes" (p. 25) render the existing research inconclusive. This is because it is difficult to compare both approaches and evaluation to integrated care. However, as several review studies have highlighted, despite the lack of generalisable results, individual studies have yielded some evidence that integrated care can result in a variety of positive outcomes.

2.4.2 Outcomes

2.4.2.1 Quality of care and care receiver satisfaction

There is some evidence (Baxter et al., 2018; Czypionka et al., 2020; Hopman et al., 2016; Liljas et al., 2019) that integrated care programmes may increase quality of care and care receivers' satisfaction with the care provided. Liljas et al.'s (2019) systematic review of the impact of integrated care on outcomes for care receivers revealed mixed evidence regarding care receiver satisfaction "with services, delivery of care and organisation of care" (p.4) in the longer term (i.e. follow up after four years) as well satisfaction with their treatment by staff, i.e. "level of concern and attentiveness" (p. 9) at 18 months follow-up. However, the authors also pointed out that other studies did not find any improvement in care receiver satisfaction in the short, medium or long-term. Hopman et al.'s (2016) systematic review of the effectiveness of comprehensive care programmes with focus on both

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multimorbidity and frailty found mixed evidence that integrated care can improve care receiver satisfaction with home care and possibly also with healthcare services. However, variations in quality of the three reviewed studies did not allow the authors to draw robust conclusions.

An evaluation of 17 European integrated care programmes by Czypionka et al. (2020) revealed that coordination and continuity of care played an important role in care receiver satisfaction. The authors highlighted the importance of a single point of contact whose role it is to help care receivers and informal caregivers to navigate complex and fragmented health and care systems. Czypionka et al. (2020) stressed the importance of positioning the care receiver at the centre of the care procedure and to involve them and their informal caregivers in the decisions about the care they receive. Moreover, collaboration of care professionals from different disciplines seems to have a positive effect on quality of care and satisfaction (Czypionka et al., 2020; Platzer et al., 2020). Baxter et al.'s (2018) systematic review of the effects of integrated care found evidence of improved care receiver satisfaction and self-reported quality of care by both staff and care receiver. There was some evidence that integrated care could improve access to care and shorter waiting times. However, the authors also pointed out that these effects were primarily reported in UK-based studies but were less conclusively reported in the international literature. Moreover, the researchers also underlined that better access to care may be a positive outcome for care receivers but not for healthcare providers due to increased costs and reduced capacity.

2.4.2.2 Improved quality of life and well-being

Integrated care models may have positive effects on quality of life and well-being, which may include physical and psychosocial components. However, the existing evidence is not sufficient enough for robust conclusions (Looman et al., 2019). They reported some evidence that integrated care could positively impact physical outcomes, e.g., frailty and fall prevention. However, they stressed that their research focused on the broad literature and that studies with greater focus on specific outcomes could not substantiate this finding. Platzer et al. (2020), who systematically reviewed the evidence of integrated care in relation to a variety of outcomes, reported mixed (i.e. either neutral or positive) findings indicating improved physical functioning, including a reduction in falls. Deschodt et al. (2020) who assessed the effects of nurse-led integrated care programmes on outcomes for older people living at home found one study indicating short-term improvements following surgery, e.g. the ability to carry out daily routine tasks within one week following surgery. Unfortunately, these improvements did not persist after one year. It is possible that specific models, such as chronic care models (CCM), might improve physical functioning (Hopman et al., 2016) but again, the evidence is not conclusive. Lastly, Frost et al. (2020) found evidence of the positive effects of integrated care teams, rather than the composition of care teams (i.e. specific roles within a care team). In particular, the authors reported findings indicating better health outcomes in people with dementia in both acute and long-term care settings, as well as in frail people more generally.

Integrated care programmes could potentially lead to better health-related quality of life, as suggested by Deschodt et al. (2020) who assessed the effects of nurse-led integrated care programmes on outcomes for older people living at home. Likewise, Hopman et al.'s (2016) systematic review of the effectiveness of comprehensive care programmes for people with multimorbidity or frailty suggested that chronic care models (CCM) could result in better health-related quality of life.

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However, they stressed that the existing evidence was insufficient. Similarly, Flanagan et al. (2017) found some indication that CCM interventions could improve quality of life but with the caveat that the approach needs to include multiple components. By contrast, Looman et al. (2019), who examined research on the effectiveness and cost-effectiveness of preventive, integrated care programmes, reported that the although the most promising health outcomes related to well-being and overall life satisfaction, did not find any impact on health-related quality of life. Flanagan et al. (2017) suggested that integrated care interventions might be most successful in improving quality of life focussing on specific – rather than overall – conditions. However, they also noted that the positive effects appear to be short-lived and could no longer be observed at different follow-up stages.

It is possible that integrated care models have a positive effect on mental health, particularly on depressive symptoms (Deschodt et al., 2020; Flanagan et al., 2017; Frost et al., 2020; Hopman et al., 2016). Frost et al. (2020, p. 1923) found "strong evidence" (p. 1923) that a holistic primary or community care setting approach that involves the integration of care professionals from different fields of expertise had positive effects on mental health, highlighting the beneficial impact on depressive symptoms. Similarly, Flanagan et al.'s (2017) systematic review examining whether integrated care programmes positively impact quality of life found that multi-component programmes can improve mental health. By contrast, Hopman et al.'s (2016) findings were less conclusive suggesting that out of four studies, only one reported a marked improvement of depressive symptoms as a result of comprehensive care, whereas the other three found no difference between comprehensive and usual care. Likewise, Platzer et al. (2020) also reported mixed results regarding the efficacy of inter/multi-professional and comprehensive interventions on mental health. Similarly, Deschodt et al. (2020) stated that experimental studies indicated a reduction in depressive symptoms as a result of comprehensive care provision but cautioned that the existing evidence was too scarce to be conclusive. Yet, physical and psychosocial well-being are interrelated, rather than separate states of being which, according to Czypionka et al. (2020), matters both on a theoretical and practical level and needs to be realised through coordination and continuation of care.

2.4.2.3 Mortality rates

A reduction in mortality rates can serve as indicator of the effectiveness of the treatment approach. Yet, most review studies have found no effect on mortality rates. Liljas et al.'s (2019) systematic review of the effect of integrated care on, amongst other outcomes, mortality, found no evidence that integrated care can reduce mortality. Likewise, Platzer et al., (2020), who conducted a systematic review of the impact of inter-professional or multi-professional interventions suggested that these had no impact on mortality rates. Hopman et al.'s (2016) review studies on the effectiveness of comprehensive care programmes found no "significant difference between comprehensive care and usual care groups in mortality rates" (p. 827). Deschodt et al.'s (2020) review of nurse-led integrated care services found some evidence of the efficacy of integrated care on mortality rates in individual studies. However, they pointed out that meta-analyses could not replicate this finding. Lastly, Frost et al. (2020) suggested that multidisciplinary care teams may improve mortality rates in the short-term.

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2.4.2.4 Outcomes for informal and professional caregivers

According to Looman et al.'s (2019) systematic review, the impact of care provision on caregivers tends to be neglected and needs to be studied more thoroughly. Still, Czypionka et al.'s (2020) recent study takes some steps towards closing this gap by examining the relationships with between care professionals. They highlighted that the culture of care provision is important for the delivery of continuous, good quality care. They highlighted the importance of trust, open-mindedness and continuous communication for a collaboration environment.

2.4.2.5 Cost-effectiveness of integrated care

It is expected that integrated care is more cost-effective than non-integrated care. Cost-effectiveness tends to be understood in terms of cost savings and discussed primarily in relation to healthcare utilisation (see next section), but also in terms of the minimisation of complications, and participation in both the labour market and society in general (Nolte & Pitchforth, 2014). However, the cost-effectiveness of integrated care difficult to assess because of the lack of reliable, good quality economic evaluations (Nolte & Pitchforth, 2014; Rocks et al., 2020). Moreover, it is not always clear what the care elements and effect sizes are that studies are referring to when making claims about the cost effectiveness of integrated care (Damery et al., 2016; Rocks et al., 2020). There is some indication that integrated care may reduce costs if it leads to earlier discharge from hospitals, and if home care or home rehabilitation can be provided (Damery et al., 2016). Rocks et al.'s (2020) meta-analysis revealed that integrated care may result in both a reduction in costs and better outcomes, particularly in the long-term. However, the authors underlined that the positive long-term effect may not have been adequately captured in the literature and hence, the evidence is inconclusive. Although chronic disease management models may lead to a reduction in costs as observed in some reviews (Cronin et al., 2017; Rocks et al., 2020), Looman et al. (2019) cautioned that their systematic review found no clear evidence that integrative care programmes would reduce costs. In general, the extant literature is too fragmented due to substantial differences in terms of population, interventions and outcomes and does not allow for conclusions on the cost-effectiveness of integrated care (Looman et al., 2019; Nolte & Pitchforth, 2014).

2.4.2.6 Healthcare utilisation

Healthcare utilisation is an important component regarding the cost effectiveness of integrated care (Liljas et al., 2019; Looman et al., 2019). Inpatient healthcare utilisation, e.g. length of hospital stay, hospital/ nursing home admission or readmission, number of visits to the emergency department (ED) and number of patients, may be mitigated through integrated care programmes (Damery et al., 2016; Facchinetti et al., 2020; Liljas et al., 2019; Looman et al., 2019; Platzer et al., 2020). Damery et al. (2016), who carried out a review of systematic reviews, assessed the extent to which integrated care for people with chronic illnesses could positively impact hospital activity. They suggested that the most promising care interventions involved "discharge planning and post-discharge support for hospital inpatients, MDT [multi-disciplinary teams] care … and interventions based on multiple components of the CCM [chronic case management]" (Damery et al., 2016, p. 27). However, due to a lack of data the researchers were unable to specify the components involved in CCM. Yet, they concluded that all interventions lead to reduced hospital admissions and readmissions, fewer ED visits

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and shorter hospital stays. Likewise, Facchinetti et al. (2020) found some evidence that integrated care facilitating the continuity of care for older people with chronic diseases may lead to a reduction in hospital readmissions in the short term, i.e. 30 days. However, the authors point out that the data on the long-term impact of continuity of care on readmissions is too heterogenous to allow for unbiased conclusions about the efficacy of the intervention. Liljas et al.'s (2019) systematic review on the extent to which integrated care may lead to better outcomes for healthcare receivers, including healthcare utilisation, found positive effects on hospital admission rates. The authors cautiously suggested that integrated care might also reduce length of stay and hospital readmission rates. Platzer et al.'s (2020) systematic review of the efficacy of inter/multi-professional care on healthcare utilisation also suggested that care through multi-professional teams could result in lower readmission rates but the authors stressed that the evidence is too scarce and hence, inconclusive. Looman et al. (2019), based on their systematic review of the effectiveness of integrated care for frail older people who live in their community, argued that there is some evidence that integrated care may indeed have a positive effect on inpatient-based healthcare utilisation. However, the data regarding reductions in nursing home admissions was inconclusive. By contrast, Deschodt et al. (2020), systematically reviewing the effects of nurse-led integrated care models, found no indication that integrated care could reduce admission to both hospitals and nursing homes.

2.4.3 Summary - Evidence in integrated care

This section explored the evidence in integrated care with regards to the following outcomes: quality of care and care receiver satisfaction, quality of life and well-being, mortality rates, outcomes for informal and professional caregivers, cost-effectiveness and lastly, healthcare utilisation. This review of reviews revealed that there is some evidence of the efficacy of integrated care. However, as described in the present section (Section 2.4), the lack of a clear definition, variation in quality of the extant research, and differences in populations, approaches to integrated care and outcomes make it difficult to draw robust conclusions. Still, individual studies have reported some evidence that integrated care can improve some outcomes for care receivers, particularly with regards to quality of care and care receiver satisfaction, quality of life and well-being, and healthcare utilisation.

2.5 Deployment and scaling-up of integrated care

Since many years, factors that impact on the successful development and scaling up of integrated care models have been subject to the interest of academics, policy-makers and health authorities, very often informed by concern over the lack of progress in scaling up or transfer of what works in a given context (Grooten et al., 2018).

The challenges related to the development and scaling up of integrated care have been addressed by the B3 Action Group on Integrated Care of the European Innovation Partnership on Active and Healthy Ageing. Efforts to understand the factors that impact on the successful scaling up and transfer of integrated care have led to the definition of the Maturity Model. In the Maturity Model, the many activities that need to be managed in order to deliver integrated care have been grouped into 12 dimensions, each of which addresses part of the overall effort. By considering each dimension, assessing the current situation, and allocating a measure of maturity within that domain (scale from

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0-5), it is possible for a country or region to develop a radar diagram which reveals areas of strengths and also gaps in capability.

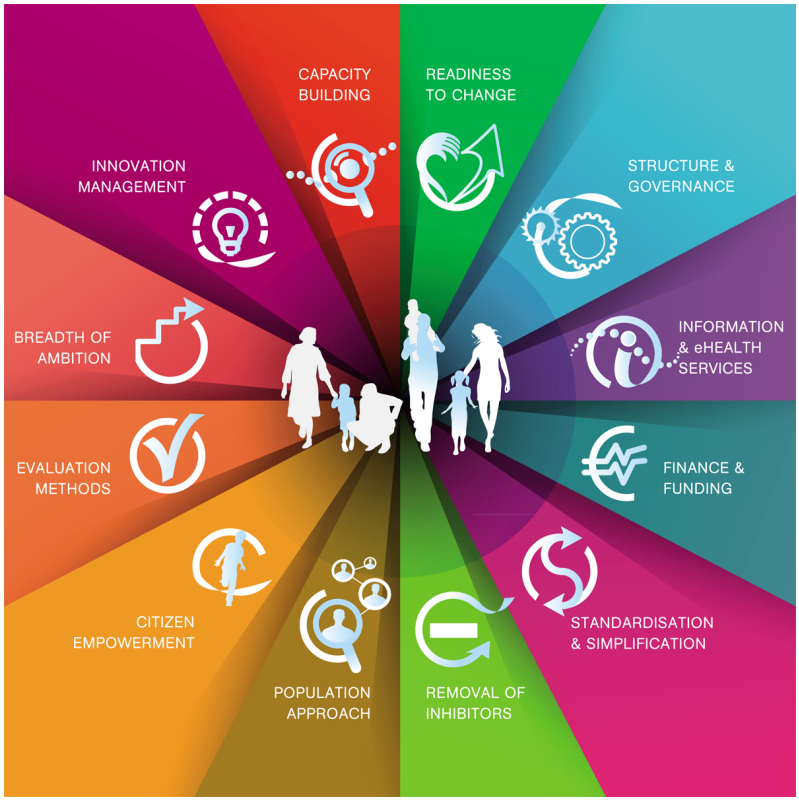

Figure 11 The graphical overview of the Maturity Model for Integrated Care as designed by the B3 Action Group of the European Innovation Partnership on Active and healthy Ageing.

The following dimensions are taking into account by the Maturity Model: Readiness to Change, Structure & Governance, eHealth Services, Standardisation & Simplification, Funding, Removal of Inhibitors, Population Approach, Citizen Empowerment, Evaluation Methods, Breadth of Ambition, Innovation Management, Capacity Building.

The Scirocco Project (https://www.scirocco-project.eu/) has taken the Maturity Model further and has developed an online self-assessment tool that regions or countries can use assess their readiness for integrated care. It builds on the conceptual Maturity Model for Integrated Care. The tool helps authorities and policymakers to assess the strengths and weaknesses of a regional context to adopt an integrated care approach in the further development or implementation of integration-oriented health and social care models and structures. It can also help to assess the maturity requirements of integrated care good practices, thus helping organisations to understand what is involved in case they would like to gear their service delivery models towards more integrated approaches.

A study commissioned by the European Commission concluded in 2018 that “while the Maturity Model tool provided insights into the implementation of integrated care in different health systems, the assessments provided by stakeholders are context-sensitive and do not allow for in-depth comparison of health systems.” (Dates et al., 2018, p.76)

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Under the same study performance assessment indicators were defined, that could help organisations in the development and implementation of integrated care services. See Table 9.

Table 9 Performance assessment indicators for integrated care development
Source: Dates et al., 2018

List of core indicators	Clarification of the indicator
Area Advancement of integration	
Personalised plans	A personalised care plan is a tool that records the outcome of the care planning discussion between an individual and their care practitioners, how and when the services have interacted with the individual and the care and support included in the care plan. Personalised care plans are owned by individuals and contain all the information they need to manage their own care.
Shared care plans	A shared care plan is a tool enabling a multi-disciplinary care team to access a common set of clinical information about a patient, containing information on problems, goals, timeframes and accountabilities for all involved. They promote personal responsibility increasing patients; confidence and active participation in care.
Take-up of case management	Case management is an established tool in integrating services around the needs of individuals with long-term conditions. Case-management refers to a targeted and pro-active approach to care that involves case-finding, assessment, care planning and care co-ordination in multi-disciplinary teams.
Quality of case management	Case management is an established tool in integrating services around the needs of individuals with long-term conditions. Targeted and pro-active approach to care that involves case-finding, assessment, care planning and care co-ordination in multi-disciplinary teams.
Alignment of resources to patients / population needs	A needs assessment is carried out at certain points in time to establish what are the issues that the local (patient) population is facing and care resources are allocated in order to meet those needs.
Take-up of multi-disciplinary training	Training programme focused on multi-disciplinary working practices and tools to improve quality of care.
Area Use of care services	
Home and / or community-based long-term services and support	Services are provided to patients with identified needs (e.g. older adults and people with disabilities) to assist them with their daily activities so they can remain in their homes or cared after in the community.
Coordinated transitions across the continuum of care without undue delays (identified by case managers, MDTs, or care providers)	A delayed transfer of care occurs when a patient is ready to leave their current care provider but is still occupying a bed. Delays can occur when patients are being discharged home or another supported care facility, such as a residential or nursing home, or are awaiting transfer to a community hospital or hospice.

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Medication management in patients receiving multiple and/or long-term medication	Medication management is a structured evaluation of a patient's medicines with the aim of optimising medicines use (including medication reconciliation), acting upon the review of prescribed medicines, and improving health outcomes.
Area Health outcomes	
Improved level of independence in patients with an identified impairment	A series of scales and tools have been developed to assess the level of impairment of individuals across Activities of Daily Living (ADL), self-care, and independence.
Patient Reported Outcome Measures	Any report of the status of a patient's health condition that comes directly from the patient, without interpretation of the patient's response by a clinician or anyone else.
Improvement of [INSERT HEALTH OUTCOME]	Other relevant health outcomes specific to IC initiative
Area Patient experiences of care	
Level of met needs among patients	Patients report that their needs have been met satisfactorily by health and social care services.
Patients quality of life	WHO defines Quality of Life as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns.
Carers quality of life	
Inclusion of carers	Caregivers are included in decisions regarding their relatives and friends receiving care.
Staff experience of the integrated care initiative being implemented	Staff feel confident and supported through the implementation of the transformation programme towards the integration of care, including their new roles, the new systems in place and co-ordination with other professional groups or organisations.

2.6 The future of integrated care

It is difficult to predict how innovation will further transform health and care provision in the ageing society. The recent COVID-19 pandemic has demonstrated that unpredictable factors play a role as well.

2.6.1 The impact of COVID-19

The current COVID-19 pandemic undoubtedly has an impact on the future delivery of integrated care health and services. Albeit to a different extent, all health care systems worldwide have been challenged by rapid spread of the SARS-COV-2. From insufficient numbers of intensive care beds, availability of reanimation/respiratory units and protective gear, and especially shortages of staff, all systems have over the course of 2020 come close to or exceeded their limits. Once the outbreak,

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reported from China to the WHO in December 2019, diffused throughout Europe and the rest of the world, rapid mobilisation of resources has been necessary. This includes technical (medical and non-medical) material but above all, a "rethinking kit". Hopefully "COVID-19 pandemic will prove to be the catalyst for countries and regions across the world to rethink and redesign our health and care systems" (Lewis & Ehrenberg, 2020, p. 5). Indeed, the COVID-19 pandemic has drawn attention to various problems in all health systems. Most health systems are very fragmented, yet all systems are interdependent since viruses know no border (WHO 2020). International cooperation, e.g., in the purchasing of vaccines as well as in border control seems essential in order to combat further excess mortality related to SARS-COV-2. In this sense, the collection and exchange of patient-related data is essential. In addition, face-to-face communication with service providers was no longer possible for some routine consultations, and so that a network for telemedicine diagnosis and treatment with the help of technical solutions was quickly established or reinforced. It is fair to say that most countries would not have experienced the digitalisation curve in their health systems and health services if no pandemic had emerged in 2020.

> "Integrated care has often emerged, or been accelerated, in times of crisis. The impact of COVID-19 again tells us that "where there's a will, there's a way" to solving problems, including to long-established policies and fragmentations in financing." (Lewis & Ehrenberg, 2020, p. 20)

While a number of processes, roles and responsibilities have evolved, acceptance might still need to be consolidated. Some observers however foresee that:

> "Care in the next normal could be increasingly delivered in distributed sites of care, integrated around the patient through digital and analytics across patient-centered ecosystems, and driven by at-scale players pursuing proven models to outperform." (McKinsey, 2021, p. 82)

2.6.2 A stronger shift of paradigm onto the local policy level

COVID-19 will have been a magnifying glass of a great number of shortcomings of all health systems. One lesson-learned is the power of regional authorities in the pandemic responses. These range from the mobilisation of staff to the choice of restrictions and regulations, and even the logistics around vaccination centres. The role regional and/or local authorities played in handling local outbreaks, contact tracing and being available to answer their populations' questions regarding the new SARS-COV-2 will necessarily have an impact on their leverage when implementing models of integrated care.

Citizens, in particular European citizens, have been critical towards the COVID-responses of their governments, national or local. Indeed, individuals have been facing for an extended period of time (9 months at submission time of this deliverable) ever changing rules and various infringements of freedoms usually ensured by the European Union and its Single Market Treaty (i.e., the so-called "four freedoms" of movement of goods, persons, services and capital – the latter two being less to not affected). However, national governments seem to have lost most trust as opposed to the closer regional policy makers. The uptake of e-governance, e-health and citizen digital services tailored onto local needs was unprecedented (OECD, 2020). Municipalities and regional authorities addressed e.g.,

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mental health issues due to prolonged social distancing or cared for minorities or groups struggling to access health and care services (Hildebrandt, 2020).

As described above, the implementation of integrated care requires negotiations between a number of partners as well as leadership and diplomacy skills. Notorious barriers to the implementation of integrated care models have been identified as a lack of power allocated to local governments regarding the shaping of measures and health policy decision-making (Stokes et al. 2016). As such, and even before the game changing pandemic situation, the regional and/or local level had been crucial in identifying and implementing adapted integrated care solutions. Cuts in public spending have had a negative impact on health systems in general; assessing local needs is essential in order to highlight the added value offered by integrated care models. Opportunities for local businesses can be a decisive push factor for policy makers (Hildebrandt, 2020).

2.6.3 E-Health data mining

Digitisation and digitalisation (see section 2.3.3.2.) when coupled with integrated care structures, sharing person-centred information, aggregated at population-health level, lead the way to most promising trends in E-Health. In order to best cluster these opportunities, a few definitions are necessary:

> Cloud computing: "a technique for data storage and sharing, is widely used in information system. The use of cloud computing in HIS is well known and very common for data processing, data backup, and information sharing between different organisations, such as cloud-based PACS and cloud-based EHR systems" (Hong et al., 2018, p. 181).
>
> Data mining: "the analysis of large data sets to discover patterns and use those patterns to forecast or predict the likelihood of future events" (Crockett & Eliason, 2017, p. 1)

Among others, Hildebrandt (2020) suggested following aspects of data mining in an e-health setting:

- Process analyses
- Patient journey
- Medication algorithms
- Quality improvement
- Case-management prediction models.

These categories help envision the opportunities data mining brings to medical research on for example orphan diseases; a more comprehensive understanding of health systems failures thanks to a holistic understanding of the patient's points of contact in healthcare as well as evidence to improve health outcomes; implementation of Clinical Decision Support (CDS); safer polypharmacy for chronically ill patients and further population-health management.

Data mining will take medical research to the next level. Limits to the current magic bullet "data mining" can be seen in cyber security issues, storage limitations and the analysis of bad quality data (Hong et al., 2018). Despite the seemingly endless possibilities offered by cloud computing, the use of

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data collected for a purpose other than research (e.g. reimbursement) might lead to false deductions and call for great care in the deployment of these opportunities.

2.6.4 Further evaluation of economic incentives mechanism for integration

Integrated care goes hand in hand with financial optimisation of health care system (cf. 2.4.2.5. above). However, one of the main barriers to the implementation of integrated care processes can be seen within reimbursement models (cf. Section 3). Many scholars would agree on stating that "The problem with traditional payment schemes is that they do not provide adequate financial incentives to integrate care." (Tsiachristas, 2016, p.1). Therefore financial/economic incentives have been deemed the most crucial prerequisites for successfully implementing integrated care structures (Nolte & McKee, 2008). The following figure lists a number of financial incentives and links them to a level of health and care integration. At the top of the scale of both payment and care integration population-based payments are unequalled. For regional examples of these types of incentives, please refer to Section 3.

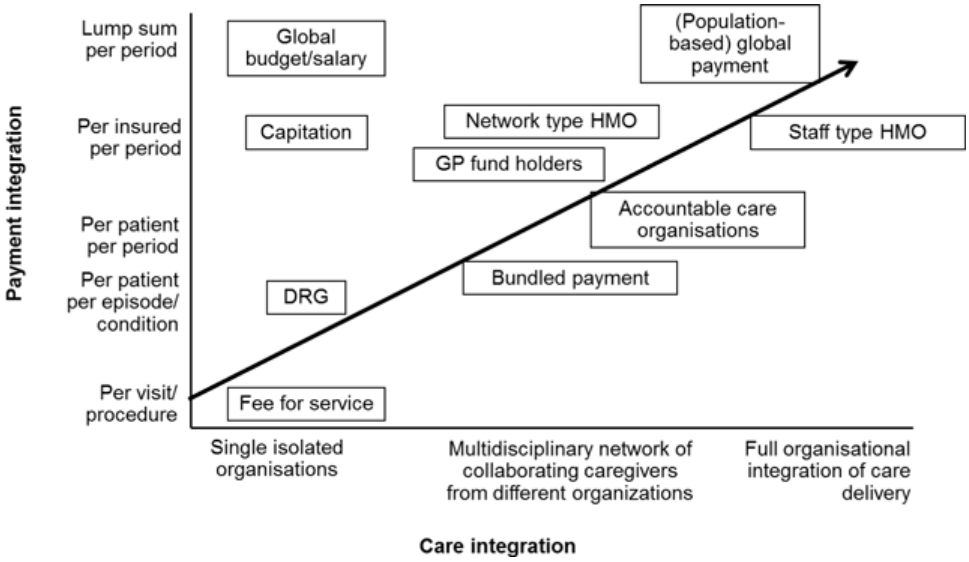

Figure 12 Payments alongside integration of care
Source: Tsiachristas, 2016. The figure is based on Shih al. The Commonwealth Fund 2008 & Eijkenaar et al Eur J Health Econ 2013; 14: 117–31; adjusted by Maureen Rutten-van Mölken and Apostolos Tsiachristas, 2016.

Beyond the cost-effective potential of integrated care, incentives should address intrinsic motivation of the different stakeholder groups and hence promote behavioural and organisational changes. Therefore, they need to be based on long-term cost evaluations, matched-pair evaluations and prevalence evaluations (Hildebrandt, 2020).

2.7 Conclusions

Integrated care is not a new concept. It has roots in the late nineteen-forties, when the WHO started to redefine the concept of illness. Current understanding of concepts such as wellbeing and quality of life has pushed the person and his or her interrelated needs in the forefront.

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Notwithstanding this new "cultural" perspective and a growing attention from policymakers in health and social care for integrated care, at the care implementation and organisational level barriers make it hard to change the way care is delivered. Factors that impact on this are the silo's in which health and social care are planned, funded and delivered, the related well-defined professional roles with little incentives to change the way of working, and the limited emancipation and empowerment of patients many of which are not ready to become managers of their own health condition.

Nevertheless, the integration of health and social care, with the contribution from the educational sector and technology providers is the way to go for a sustainable Europe where people are at the centre and societies and communities "leave no one behind".

One of the longer-term actions proposed by the WHO in its *Global strategy on digital health 2020–2025* is to "Foster intersectoral and integrated engagement in digital health development across governments and expand support on adopting and managing digital health solutions." (WHO, 2020. Annex, Strategic Objective 1.)

The pervasive nature of the digitalisation process does not leave only the care sector unaffected. The impact on human beings and the enhancement of human functioning by technology is often underestimated. The "bio-psycho-social-tech" framework, hypothesised by Marcia Scherer (2020) and which in an extension of the biopsychosocial model of human functioning, takes all these dimensions into account and recognises the fundamental role of technology in supporting people's quality of life.

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3 Person-centred digital solutions in integrated care

This chapter analyses the role of person-centred technologies in the enhancement of integrated care. The term person centred technology is used by the European Association of Service Providers to Persons with Disabilities (EASPD) to reflect a user-centred, user empowering and user involving approach to the design and application of digital technologies in care. Where "integrated care" is per definition person-centred, the use of digital technologies becomes so if the enabling use of technology is equally focussed on improving the empowerment and quality of life of the service users.

In this chapter we will first discuss the role of persons-centred digital solutions in integrated care delivery, followed by an overview of models and frameworks that map key factors to consider for successful deployment of technologies enabling integrated care. We will further report on experiences with the implementation of digital solutions for integrated care in Europe and their main results. For this section we have identified some of the best practices developed in Europe and carried out direct interviews with managers involved, trying to gather relevant information for the SHAPES platform and digital solutions and its adoption and scaling-up.

3.1 Technologies enabling integrated care

Digitalisation of health and social care services is increasingly seen as an integral part of the solution to many of the challenges faced by the health, social care, and wellness sector, especially by enabling more effective integration of care (Deloitte, 2015). It is widely agreed that IT holds great promises for improving the quality of integrated care, for reducing costs and making innovative models for providing integrated care possible. Technologies can be used in different ways in improving integrated care: creating and strengthening coordination within delivery networks, creating new ways of interaction with patients and service users, and to collect and manage data for planning more effective and efficient intervention.

Modern person-centred integrated care models recognise most care is self-care and/or care provided by close-carer family members. The person assumes a central role in the model, with informal and formal care providers and professionals supporting the person in need of care. IT enables services to transition to this model, as well as to bring new and more innovative ways of providing care along with the principle of "move data not the patient" with the aim of reducing unnecessary and unwanted visits (Øvretveit, 2017).

Technological innovation is thus a fundamental drive for the evolution of integrated care, as it lays the basis for a communication infrastructure enabling end users and others in the care ecosystem to collect and share data in an autonomous way and to manage decision making processes based on data elaborations.

Although different definitions and names are used to describe these relatively young areas of technology (e.g., eHealth, Digital Health, Telemedicine, etc.), the importance and the role of the digitalisation of health and social care services and the use of IT in delivering new models of integrated care are nowadays widely recognised (WHO, 2020).

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To avoid confusion, it is important to define an overall technology classification framework while talking about digital solutions for integrated care.

Frost & Sullivan (2015) have made a clear representation of the segmentation of the market. The Framework identifies four main overlapping segments: Remote Monitoring, Video Telemedicine, mHealth and HealthCare IT.

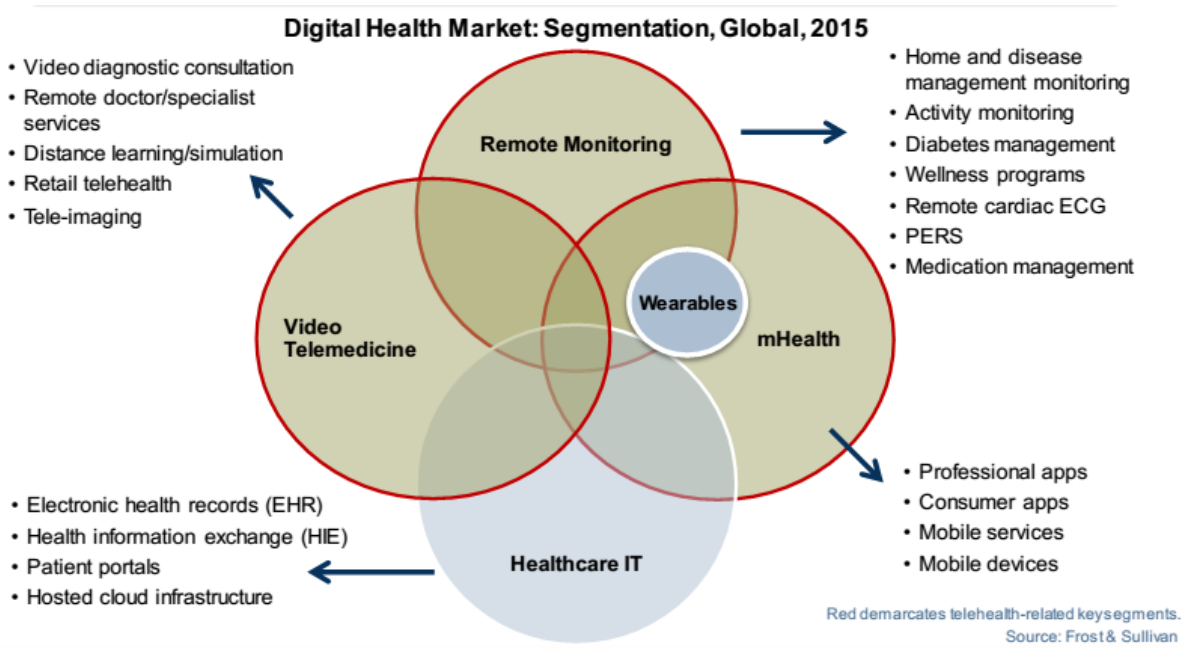

Figure 13 Digital health market segmentation
Source: Frost & Sullivan, 2015

Different digital solutions can be collocated in different intersections of the schema, depending on the target they address, the scope of the solution (i.e., solutions that are entirely for self-management of the condition vs. solutions that are linked to professional services), the level of interoperability with existing systems, the devices used, etc…

It is possible the examine the link between the performance assessment indicators (PAI) for integrated care as presented in 2.5. and the opportunities provided by person-centred technology to improve integrated care outcomes (See Table 10). It is possible to describe for each indicator how technology can enhance outcomes, instead of adding an additional indicator for the use of technology. This approach is in line with a view that sees technology not as an "add-on" in integrated care, but as an integral part of integrated care pathways. The outcomes we will look at are in the areas of health-outcomes, person-centredness, safety, communication, and efficiency.

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Table 10 The Performance assessment indicators for Integrated Care and the enhancing role of technology

List of core indicators	Role of technology
Area Advancement of integration	
Personalised plans	Cloud based technology can help to better define, store, retrieve and review personalised care plans. These can be made easily and 24 h. a day accessible. They can be agreed upon and shared without physically contact. Patients can be given full control over their data and decision power to share the plan with whom they want.
Shared care plans	Technology can help to more efficiently link different actors in a care ecosystem, sharing all kind of data (vita parameters, activity, planning, tasks, etc.) in uniform formats and allowing for integrating the contribution of different professionals in a unique care management system.
Take-up of case management	Flows with remotely connected patient data will facilitate planning and inform care coordination and task assignment. Artificial Intelligence can support prevention, early intervention programmes and early case-finding by automatically comparing the data of individuals with big data sets and population data.
Quality of case management	Technology can facilitate the development of a targeted and pro-active approach to care that involves case-finding, assessment, care planning and care co-ordination in multi-disciplinary teams. Integrated services around the needs of individuals with (multiple) long-term conditions can use digital data platforms to remotely retrieve data and analyse these, plan interventions and coordinate care.
Alignment of resources to patients / population needs	Digital health platforms and remote monitoring will provide the data necessary to better do needs assessments to establish what are the issues that the local (patient) population is facing and thus to optimise the use of resources.
Take-up of multi-disciplinary training	Training programmes focused on multi-disciplinary working practices and tools to improve quality of care can be delivered online or guidance can be integrated in the digital tools to allow “learning by doing”.
Area Use of care services	
Home and / or community-based long-term services and support	Technology can enable highly customisable and personalised services or make new options available for services that are provided to patients with identified needs to assist them with their daily activities, but also to promote active and healthy ageing and to keep people safe.
Coordinated transitions across the continuum of care without undue delays	Digital tools allow different organisations to share data and availabilities and to develop in the most efficient way personalised care pathways
Medication management in patients receiving	Technology facilitates remote medication management, including control on the actual use of medicines.

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multiple and/or long-term medication	
Area Health outcomes	
Improved level of independence in patients with an identified impairment	Scales and assessment metrics be digitally scored, shared and added to health records.
Patient Reported Outcome Measures	Digital connections make it possible for professionals to directly acquire health condition data coming directly from the patient.
Improvement of [INSERT HEALTH OUTCOME]	Different technologies have been developed for the (remote) management of specific conditions.
Area Patient experiences of care	
Level of met needs among patients	Patients satisfaction reports can be collected using mobile tools (smart phones, tablets, etc.).
Patients quality of life	Different communication tools can be used to collect feedback on the perceived quality of life of patients and carers. Video conferencing platforms allow direct contact between services and service users.
Carers quality of life	
Inclusion of carers	Caregivers can be given access to relevant data with the permission of the patient.
Staff experience of the integrated care initiative being implemented	Staff might feel that technology increases their efficiency through the use of role qualifying tools.

The EC funded (7th Framework Programme) INTEGRATE Project has formulated recommendations to help organisations making better use of IT systems in integrated care, among which (Øvretveit, 2017):

- IT systems should be able to receive and send data, and in a way which the data cannot be accessed by unauthorised parties.
- IT systems will need to enable beneficiaries and close carers to specify their needs and goals and to allow them and providers easily to monitor and review their care plans.
- IT systems will need to involve users in their design and implementation and will need to balance standardisation with local tailoring to advance the model of integrated care that is envisioned.
- IT systems should provide the managers who are planning coordinated care with information on which they can base proposals or plans for such services.

These requirements reflect the potential role of IT in integrated care which is to make integrated care delivery more effective and efficient.

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The aim of this chapter is however not to specifically investigate which are the possible solutions/platforms that are used, experimented or that can be implemented in different system, but to reflect on the key factors for the successful deployment of such solutions and on the outcomes and the lessons learnt from existing experiences around Europe.

3.2 Key factors for successful deployment and scaling up of digital technologies in integrated care programmes

Many person-centred digital solutions addressing challenges in the health and social care sector increasingly facilitate or even enable an integrated approach to care provision. Nevertheless, it seems that the adoption of those solutions in the care sector remains difficult for various reasons. Even more difficult is the deployment of solutions in a determined care context that were developed elsewhere and thus have to be adapted and localised. The SHAPES platform and the digital solutions it aggregates will have to address the same challenges if the aim is to boost the technology uptake to support integrated care pathways in the care sector across Europe.

The implementation, scaling up and transfer of solutions supporting integrated care is thus a complex process. Different models and frameworks have tried to bring together factors that have to be considered, or that describe complexity in technology uptake in integrated care. Some of these are used in WP6 by the SHAPES piloting teams.

3.2.1 The NASSS framework

The NASSS framework offers a model to describe the complexity of any technology adoption model in integrated care. NASSS stands for “non-adoption”, “abandonment”, and challenges to “scale-up”, “spread”, and “sustainability”. Seven domains were identified: The Illness or Condition, the Technology, the Value Proposition, the Intended Adopters, the Organisation(s), the Wider System and the Evolution Over Time, resulting in the framework represented in Figure 14.

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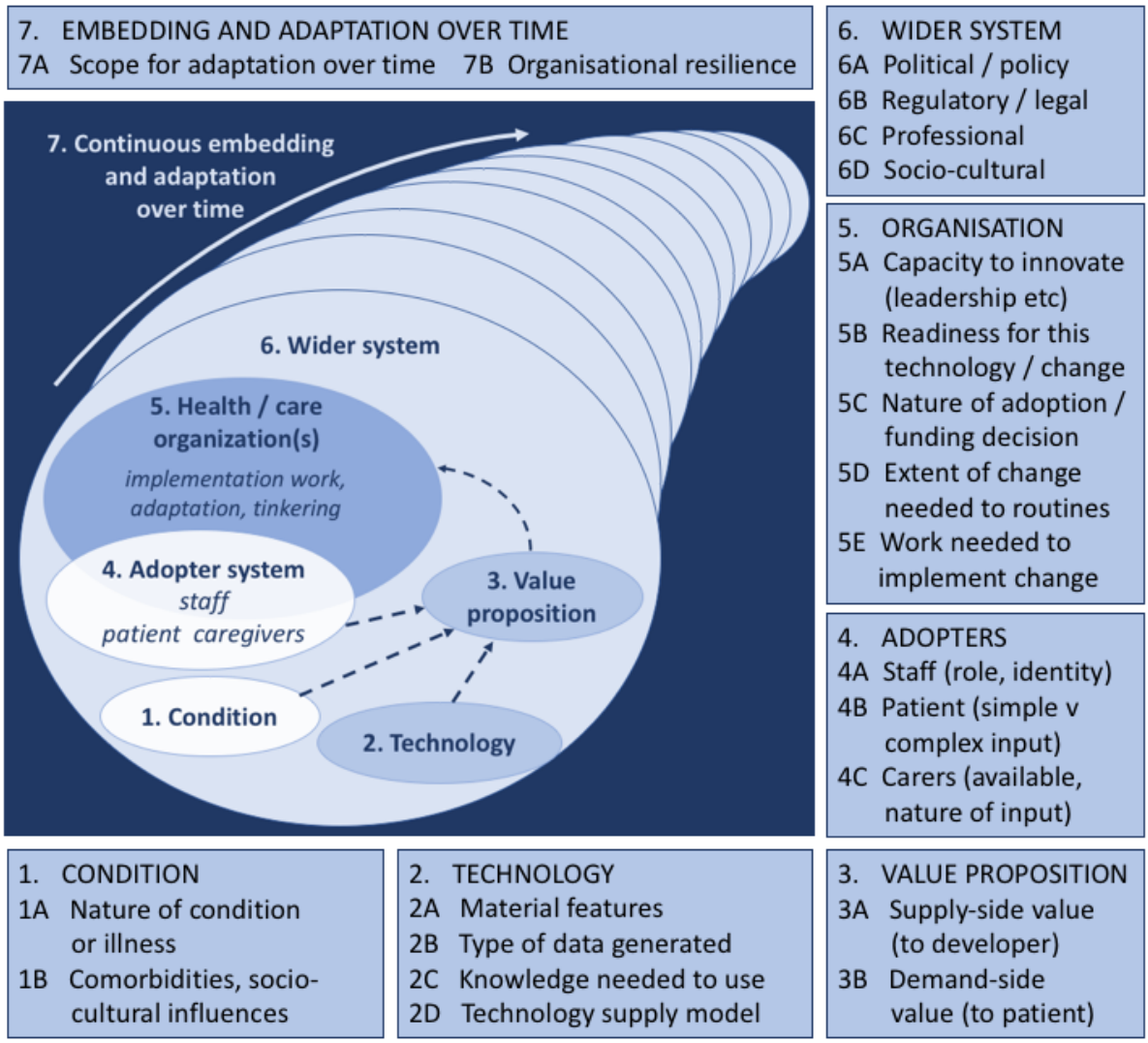

Figure 14 The NASSS framework
Source: Greenhalgh et al., 2020.

For each domain different sub domains are distinguished. The philosophy behind the model is that the higher the complexity, the higher the chance of failure, frustration, and abandonment. Vice versa, the lower the complexity, the higher the chances of success. Once identified, the areas of major complexity measures can be taken to reduce or revise the complicating factors. A set of complexity assessment tools (CAT) are developed for technology development and adoption processes in different stages (Greenhalgh et al., 2020).

The NASSS is more extensively described in D6.1 (SHAPES Pan-European Pilot Campaign Plan) as the framework will be used to prepare and evaluate the WP6 large scale pilots.

As part of the methodology for D3.1 Ecological Organisational Models of Health and Care Systems for Ageing, another framework was employed which provides a broader sociotechnical systems approach to the development of a SHAPES concept of operations (CONOPS) framework. This approach known as Cultural Historical Activity Theory (CHAT), allows for a structured but critical analysis of the elements that comprise any system in terms of their relationality. While this is discussed in more detail in D3.1, it is worth mentioning that in conjunction with the NASSS framework, with which there is a

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good degree of compatibility, this framework may usefully contributed to how we "read" NASSS. It is not presented here as an alternative framework, but as a complementary approach that potentially links the objectives of scaling-up and transferring of integrated care systems, with the need for a person-centred (activity-centred) approach, examining in a critical way how technology mediates the relationship between people and their objectives (for engaging with a system), their motivations, and also the competing and often conflicting values of others within the social structures.

3.2.2 The ProACT Transferability Model

The EC funded (Horizon 2020) ProACT Project was one of the first European projects to consider the transferability of digital solutions enhancing integrated care. It aimed at building a European Model for transferability of such solutions, by investigating the lessons learned from the transfer of digital platforms, defining these as "digital health and wellbeing platforms that enhance the delivery of integrated care, empowering the person/patient to self-manage and contribute to the improvement of collaboration of individuals/stakeholders within the care ecosystem through the management and sharing of patient generated information". Desk research and research among many organisations and networks implemented in 2017 led to the conclusion that "there are very few documented experiences related to transferability of digital solutions for integrated care from one European region/country to another, with most of the digital solutions being created ad-hoc to support the implementation of integrated care in the specific settings" (Ferrando et. al., 2019). As Chapter 3 of this deliverable shows, there is not much evidence that this situation has changed significantly.

Interviews with key stakeholders across Europe into the barriers for technology-based solutions transfer in this field, allowed the researchers to identify factors that impact on the likeliness of success in case of the deployment of transferred digital solutions. These factors can either act as barriers or enablers, depending on whether they are taken into consideration or not. Factors were classified as either "Solution-specific", "Organisation-specific", "Process-specific" or "Individual-specific" and either "Relevant" or "Essential". Figure 15 provides an overview of those factors.

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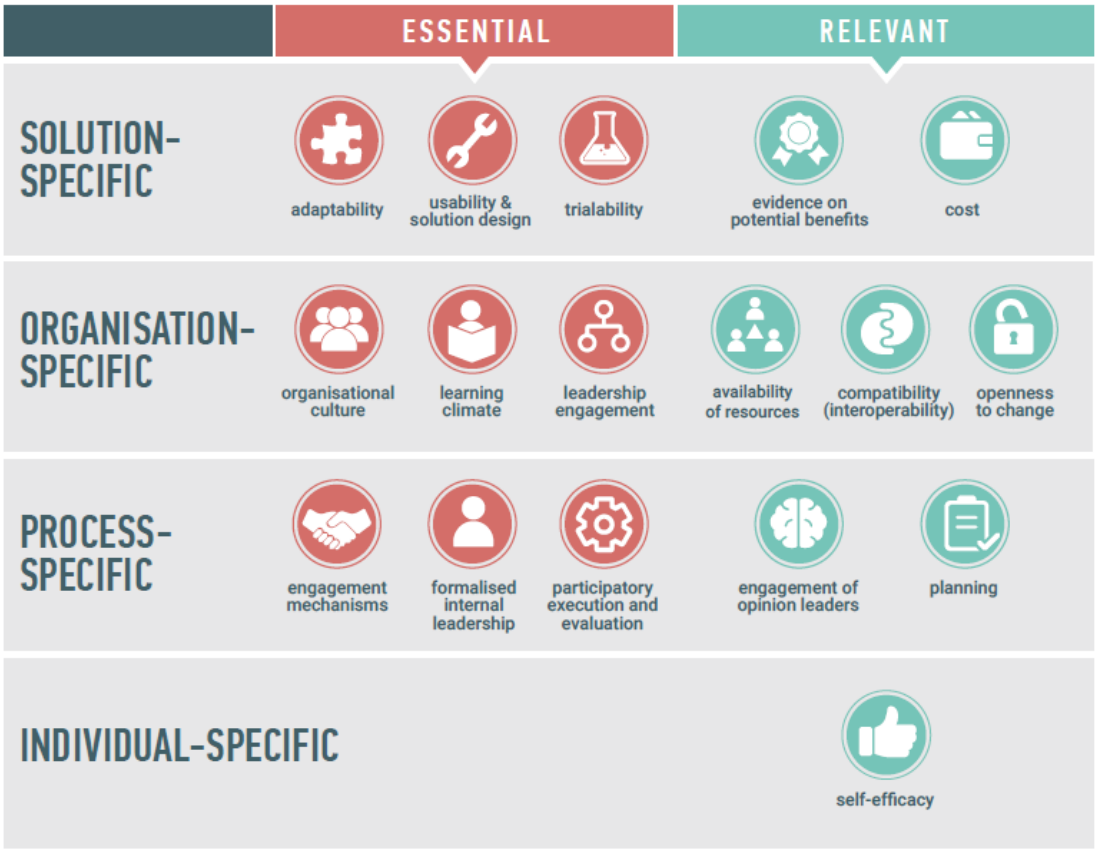

Figure 15 Essential and relevant factors to consider when transferring digital solutions for integrated care. Source: ProACT project.

3.2.3 The Momentum Blueprint

The Momentum Blueprint has been developed by the Momentum project consortium and network. Among other activities the project has focused on building stakeholder consensus around the key activities of how precisely deployment of telemedicine innovations can take place effectively at scale. The initiative has identified 18 critical success factors needed to take telemedicine from a pilot phase towards large-scale deployment and thus integrate it into healthcare delivery systems.

The following critical success factors have been identified (Table 11):

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Table 11 MOMENTUM critical success factors.
Source: Momentum Consortium, 2015. Deliverable 3.4. Personalised Blueprint for telemedicine deployment: validated and tested version

The context
1) Ensure that there is cultural readiness for the telemedicine service.
2) Come to a consensus on the advantages of telemedicine in meeting compelling need(s).
People
3) Ensure leadership through a champion.
4) Involve healthcare professionals and decision-makers.
5) Put the patient at the centre of the service.
6) Ensure that the technology is user-friendly.
Plan
7) Pull together the resources needed for deployment.
8) Address the needs of the primary client(s).
9) Prepare and implement a business plan.
10) Prepare and implement a change management plan.
11) Assess the conditions under which the service is legal
12) Guarantee that the technology has the potential for scale-up.
Run
13) Identify and apply relevant legal and security guidelines.
14) Involve legal and security experts.
15) Ensure that telemedicine doers and users are privacy aware.
16) Ensure that the appropriate information technology infrastructure and eHealth infrastructure are available.
17) Put in place the technology and processes needed to monitor the service.
18) Establish and maintain good procurement processes.

The MOMENTUM Blueprint is more extensively described in D6.1. as it will be used in the WP6 large scale pilots.

3.2.4 Factors and processes: the outcomes of the 2nd SHAPES Dialogue Workshop

During the 2nd SHAPES Dialogue workshop (October 29th, 2020 online event) a parallel session was dedicated to a brainstorming with the participants on the key factors to consider when adopting a digital solution in a specific care context and to what extent these key concerns belong to specific phases of the technology adoption process, such as “Needs identification”, “Definitions of functions”, “Choice of technology”, “Procurement”, “Implementation”, “Evaluation and outcome measurement”. Also, the implication for the definition of system requirements were discussed. Approximately 50 participants overall took part in the 4 times repeated 50-minutes sessions, many of whom were linked to the consortium, but not only.

The following factors and requirements were identified and discussed by the participants (Table 12):

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Table 12 Outcomes of the 2nd SHAPES Dialogue Workshop

	Key factors to consider	Requirements
Needs Identification	The importance of a good understanding of the care contexts, the values expressed in that care context (e.g., multidisciplinarity) and the needs expressed by the different stakeholders (identify them and ask!) and how these are interrelated to reach overall higher outcomes. Assessment of the technology adoption readiness of the context.	Adaptability to a variety of needs of different stakeholders Reflect a holistic approach to care.
Definition of functions	Clear need of the objectives and goals. Correct definition of requested functions and functionalities of the solution considering the complexity of the needs and their evolution over time. Definition in functions based on nature of the organisation (e.g., public statutory or private for profit or non-for profit). Need of data and data analytics and the response time of the system to data needs. Clear awareness of how the way of working will change, definition of responsibilities.	Scalability and Modularity of functions allowing for incremental development and deployment. Interconnection of functions. Different levels of data output and analysis as well as response time are foreseen.
Choice of technology	The importance of choosing technologies that are interoperable among themselves, scalable, mature, robust, stable, and supported over time by local providers. Connectivity issues are considered. Providers of the solution and its components are traceable.	Interoperability of technologies included in the solution. Solution can cope with different levels of connectivity (e.g., alternative solutions are available).
Procurement	The need to have tailor suited solutions. Legislative compliancy, including privacy and date protection. Compliancy with local regulations and practices in terms of data storage and data exchange protocols. Appropriate language version available. Reliability of the company. Costs of procurement and support/maintenance over time. Trial out period or pilots should be foreseen. Clear responsibilities.	Compliancy with industrial and commercial standards and legislation. Compliancy with data protection legislation. Different language versions are available.
Implementation	The solution should be understood and trusted by end-users, accessible (tech-wise, cost-wise),	*Universal design* principles are respected

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	adaptable to different cases, fed by updates in new format/products and services as context evolves (laws, needs of the users etc). Learnability for the correct use of the functions provided by the solution. The need for training of staff and end users. The easiness of use.	Manuals and tutorials are available. Training and support is provided on an as needs basis and in the local language.
Evaluation and outcome assessment	Assessment of the impact the technology can make on the outcomes of care. The definition of appropriate assessment and evaluation protocols and tools: Standard outcome measurement parameters and tools/scales can be used, or specific ones need to be defined. Monitoring should be possible, as well as intervention adjustment. Awareness that results might only come in the medium long term. Evaluation should not only include usability but impact on the lives of the people and the quality of care.	Solutions provide data allowing for monitoring, outcome measurement and evaluation.

As a conclusion it can be stated that the participants managed in a relatively short time to put together a comprehensive and shared view on key factors to consider and corresponding requirements. Summing up the requirements apparently only highly adaptable modular and complex systems available in different languages and well supported in time and locally can respond to these expectations. For this reason, we should not be surprised that there is little transfer of existing holistic solutions. Maybe we need to think more about the transfer of single components that are interoperable through standardised protocols. Recognising that interoperability is much broader than technological interoperability it might further be worth to investigate the existence of holistic ontologies describing different aspects of the technology uptake process in integrated care programmes, starting from the needs, the functions, the ecosystems, the technology itself, the actual deployment and the outcomes assessment.

At higher systems level the question was discussed who should lead the changes at institutional level: national level, regional or local administrators. There was not a clear answer, but it is important to identify the appropriate policy level to seek a dialogue aiming at fostering the technology uptake in the sector.

3.3 Additional field research

Under Task 3.2. field research was implemented to trace the factors that impact on the successful deployment of technology in integrated care programmes. The scope of this work was to learn from existing experiences, especially those of care delivering organisations that are using on a daily basis digital person-centred technology in the way they deliver their services. They very likely have gone

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through a process of technology adoption in their care models and much can be learned from their experience.

3.3.1 Methodology

This research has followed the below listed steps (Table 13):

Table 13 Steps in the collection and analysis of case reports of technology adoption in integrated care

Step	Description	Outcomes
1	Definition of criteria for the selection of cases	The following 5 criteria were identified: - Person-centred solutions - Part of operational service delivery models - Connecting different actors in a care ecosystem - Non-exclusively focussed on short term medical treatment - Evaluated from the perspective of different stakeholders
2	Identification of cases using different methodologies	22 potentially interested cases were identified through the T3.1, recognition of pilot sites, literature study and by approaching different European networks (ETHEL, ECHAlliance, ICF, ActiveAge, AgePlatform, EIPAHA AG C2)). Of these 16 were approached for an interview.
3	Definition of semi-structured interview and guidelines for interviews	Guidelines were produced for the interviewing researchers specifying themes, sub-themes, profiles for the interviewee, informed consent modules. See Annex 1.
4	Interviews with key people in the organisations	13 interviews were successfully concluded by researchers from AIAS (2), GEWI (2), CH (1), UNRF (2), UCC (2), UP (1), LAUREA (1), NHSCT (2).
5	Production of case reports	All interviews resulted in case reports. See Annex 2.
6	First level analysis consisting in the collection of enabling factors and barriers, as well as lessons learned and recommendations	The case reports were analysed by the task leader and the involved researcher for enabling factors and barriers, as well as lessons learned and recommendations. This resulted in a long list of codified items.
7	Second level analysis consisting in the clustering relevant factors and the definition of a draft framework	The items have been clustered in different domains which have been further clustered in steps in the technology adoption process.

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8	Contrasting of the draft framework with existing models to describe complexity in technology uptake in health and care	The resulting framework has been contrasted with the NASSS frameworks, as well as with the ProACT transferability model for digital solutions supporting integrated care.
9	Finalising of the analytical model and assessment tool.	This has resulted in a draft analytical model and associated assessment tool which should provide guidance to those developing and implementing digital solutions for the improvement of integrated care.

3.3.2 Case reports

The 13 cases collected and analysed are listed in Table 14. It has been very hard to find cases responding to all criteria, which highlights the need to further increase the knowledge on enabling factors and barriers. The cases have therefore been further classified according to the following breakdown:

- TI: Technology implemented and embedded in care organisation
- TD: Technology developed, piloted, and evaluated but not yet embedded in daily operation of care organisations yet
- NTY: Policy developed but limited use of technology yet

The reported cases show a certain variety of technologies, ranging from simple mainstream to more complex engineered solutions. Some cases report on patient management system with associated electronic health records, others on systems for patient or service user support through video calls, others again on remote monitoring of the condition of the service user.

Table 14 Cases collected and analysed

Case n°	Name	Country	Technology	Status
Case 1	Remote Health Pathways BP scale-up	Scotland, UK	Blood pressure meter and remote communication	TI
Case 2	Attend Anywhere/Near Me	Scotland, UK	Remote video consultation	TI
Case 3	MedGuide	Cyprus	Intelligent pill boxes, digital platform, social communication	TD
Case 4	Pro-ACT	Leinster, Ireland	eHealth solution (HW&SW) for self-management and data sharing	TD
Case 5	CleverCogs	Scotland, UK	Client supporting software suite on tablet	TI

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Case 6	Healthy Kinzigtal	Baden-Württemberg, Germany		NTY
Case 7	Healthy Wirral	Wirral Peninsula, UK	On-line integrated health record	TI
Case 8	Patient data management and reporting system	Mallorca, Spain	Patient management and data sharing platform	TI
Case 9	FrailSafe	Cyprus	Different sensors and applications connected to a platform to monitor frailty	TD
Case 10	VideoVisit	Finland	Remote video consultation	TI
Case 11	ULS MATOSINHOS	Porto, PT	Telehealth and remote monitoring linked to a central data repository	TI
Case 12	LOCS	Valencia, Spain	Indoor and outdoor monitoring through sensors and GPS	TD
Case 13	Post Stoke platform	Estonia	Patient management and data sharing platform	TD

3.3.3 Data analysis

More than 120 enabling factors were identified in the TI and NTY cases.
More than 20 barriers were identified in the TI and NTY cases.
More than 45 reported lessons were collected from the TI, TD and NTY cases.
More than 45 recommendations were collected from the TI, TD and NTY cases.

Many lessons learned and recommendations shown significant overlap with enabling factors and barriers, making it thus possible to identify additional enabling factors or barriers.

Some enabling factors were quite similar one to another, which is not surprising. Others were contradictory, for example those mentioning the importance of mixed public/private funding compared to those mentioning the importance of public funding only, thus highlighting the impact of the health context where the experience was developed. This led to the conclusion that context awareness is important and that there are certainly enabling factors and barriers, but there are also many factors that are much harder to classify. More than dividing factors in enabling factors and barriers it makes sense to consider all impacting factors, whose impact has to be taken into account when developing people-centred technology enabled services improving integrating care.

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It was nevertheless possible, focussing on the technology adoption process, to group all retrieved factors in either one of the following domains:

- Target groups and needs
- Policy and regulations
- Values, vision, and goals
- Health system
- Care pathways and service flow (re)design
- Economic
- Human
- Technology
- Solution design
- Information and communication
- Implementation process management
- Outcomes and impact

Not surprisingly, most of what were initially considered barriers were found in the domains with health system, human, technology and implementation management related factors.

The thus obtained domains where enabling factors and barriers play a role in the technology adoption process for improving integrated care outcomes, play a different role according to the stages of development, implementation, and consolidation of the solution, namely conceptualisation, contextualisation, development and implementation, and evaluation and consolidation.
This relationship can be summarised as represented in Table 15.

Table 15 Relationship between domains and stages in the technology uptake for improved integrated care

Stage	Domains of impacting factors
Conceptualisation *In this "imaginary" stage a possible solution to existing needs is imagined and theorised.*	Target groups and needs Policy and regulations Values, vision, and goals
Contextualisation *In this "feasibility" stage a possible solution is assessed according to its compatibility with existing local health and care systems, cultures and practices and its financial sustainability.*	Health system Care pathways and service flow (re)design Economic
Development and implementation *In this "realisation" stage a feasible solution is made into reality and technology is embedded in a service flow.*	Human Technology Solution design Information and communication Implementation process management
Evaluation and consolidation *In this "evaluative" stage the solution outcomes are measured, and plans are made for adaptation, scaling-up or transfer of the solution and its results.*	Outcomes Impact

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The full list of factors belonging to the different domains are included in Annex 3 of this deliverable.

A final consideration can be made regarding the relationship between stages in the technology adoption process and the domains of impacting factors.
Solution design processes and even more person-centred design processes are cyclical in nature. This means that each stage will have to continually assess the impact of the factors in its domains, as well as those of an earlier and future stage.
Graphically this concept can be envisaged as in figure 16.

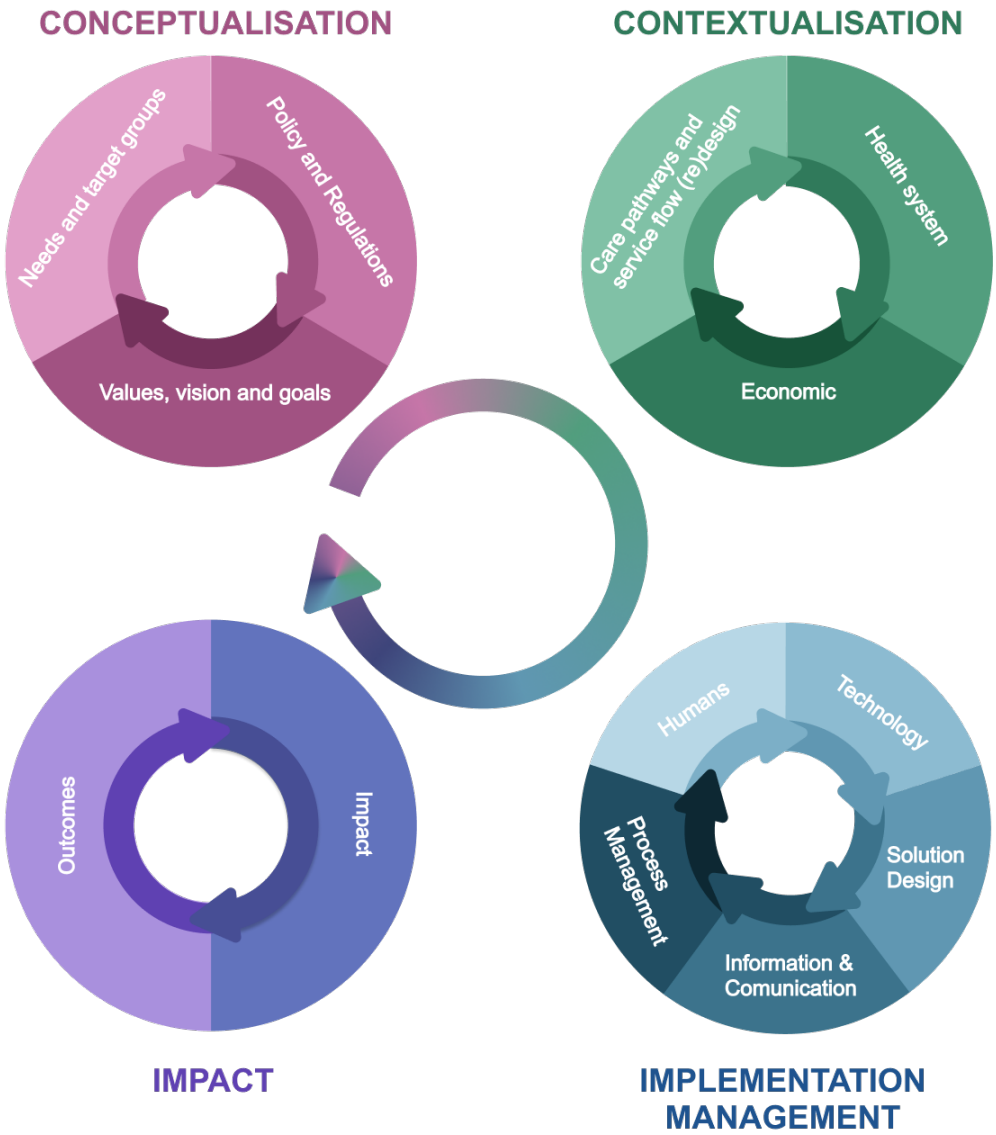

Figure 16 The Four-Wheel framework

Based on the outcomes of the technology adoption process adaptations of further development can be expected (e.g., new deployments, scaling up and/or transfer). In both cases, adaptation or new adoption, the four wheels will start a new cycle.

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3.3.4 A comparison between models and frameworks

The models and frameworks considered, although different in nature, scope and possible use, show a considerable overlap in terms of components or domains and in terms of factors highlighted as having a significant impact on the technology adoption process.

In Table 16 an attempt is made to make that overlap clear, starting from the original findings of this study as laid down in the Four-Wheel Framework. In the table we have identified for each domain comparable components/concepts of the other frameworks examined.

Table 16 Areas of overlap between different models/framework of factors for technology adoption in integrated care

Four-Wheel framework domains	NASSS domains of complexity	ProACT success factors	MOMENTUM success factors
Needs and target groups	Condition Value proposition		Primary client
Policy and regulations	Wider system		Legal and security conditions
Values, vision and goals	Value proposition		Cultural readiness
Care pathways & service flow	Organisation	Compatibility (interoperability)	Patient-centredness
Health system	Wider system	Compatibility (interoperability)	
Economics	Technology Value proposition	Costs Resources	Resource aggregation Business plan Market procurement
Humans	Adopters	Learning climate Openness to change Engagement mechanisms Self-efficacy	Privacy awareness
Technology	Technology		IT and eHealth infrastructure Potential for scaling-up
Solution design	Technology	Usability	User friendliness
Information and communication		Engagement of opinion leaders	
Process management	Organisation	Organisational culture Leadership engagement	Leadership Stakeholder involvement

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		Resources Participatory execution Formalised internal leadership Planning	Change management Legal and security guidelines and expertise
Outcome	Adaption over time	Triability Evidence of potential of benefits	Service monitoring
Impact	Adaption over time	Adaptability	

The frameworks that come closest to each other are, not surprisingly, the validated NASSS framework and the newly emerging Four-Wheel Framework. As mentioned before the NASSS framework and associated tools have the specific aim to describe complexity related to technology adoption, predicting success or failure based on the expected complexity in a certain domain. It is used in WP6 to assess the expected difficulties in the piloting of the digital solutions. The Four-Wheel Framework is more focussed on the process of technology adoption and its various stages indicating factors to consider. This makes it a flexible collection of domains and factors that can be used for different scopes.

3.3.5 Contextual compatibility

An interesting concept related to technology adoption is its compatibility with all personal and environmental factors. At individual level, the Matching Person and Technology Model (Scherer, 2002) can serve as an example, though focussed on assistive technology for people with functional limitations, but what about organisations? It is not only important to assess complexities or factors that may help the implementing organisation to reach its goals, but also to assess whether the technology is actually compatible with its context of deployment. Rogers (1995) defines the term compatibility as follows: "*compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters. An innovation can be compatible or incompatible: with socio-cultural values and beliefs, with previously introduced ideas, or with clients' needs for innovations*".

Table 17 holds a list of the core items from the Four-Wheel Framework formulated as to check compatibility of the solution with its context of deployment and use. It is easy to imagine how this table can be transformed into a self-assessment tool to validate context compatibility.

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Table 17 Core items for compatibility validation

Compatibility core items
Conceptualisation
The envisaged solution responds to the retrieved needs of the target users
The envisaged solution is compatible with relevant policy frameworks
The envisaged solution reflects the values of IC
Contextualisation
The solution is compatible with existing IC care pathways
The solution enables new IC care pathways
The solution is compatible with the existing Health and Care system
The solution is compatible with the existing funding models
Implementation
The build solution is compatible with the skills of the users
The build solution is compatible with the expectations of the users
The build solution is compatible with the environment of use
The build solution is compatible with other technologies
The build solution is compatible with legislation/regulations (e.g., safety, privacy, etc.)
The build solution is compatible with the care management procedures
Evaluation
The solution is compatible with the evaluation practices in the organisation
The solution can cope with larger numbers of users
The solution is interoperable with different care contexts and cultures

Non compatible innovations have a high risk of failure and it might therefore be useful check how risks related to non-context compatibility can be traced and addressed, especially for human factors, which are the most important ones for success in technology adoption in integrated care.

3.3.6 Conclusions

A wide range of factors have to be taken into account when planning a technology adoption process aiming at improving integrated care programmes or helping integrated care programmes to change and adapt to evolving needs and preferences in care. These factors can be clustered according to different logics (e.g., complexity analysis, process management, etc). Nevertheless, all frameworks examined, including that developed under Task 3.2, show a significant level of overlap in terms of factors to consider for the success of matching technological innovation with desired or natural integrated care ecosystems development. This provides us not only with a toolbox to assess alignment or compatibility of technology with desired change in the care environment, but also with building stones for developing strategies for the adoption, scaling up and transfer of the SHAPES platform and its digital solutions.

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4 Conclusions

This deliverable constitutes one third of the overall task implementation. It has aimed to provide the basis for a better understanding of the challenges related to the implementation and upscaling of integrated care across Europe. Among different factors that play a role in the advancement of integrated care it has focussed on the adoption of technology in integrated care programmes. There are various reasons for that choice, the most important ones being the objectives of the SHAPES project and the predominant view that digitalisation is a "game-changer" in the thinking about care and the development of sustainable care models for the near future.

The deliverable has been informed by a literature review and by field research based on the collection and analysis of experiences of service providers with the adoption of person-centred technology in their integrated care focussed models. The outcomes form the knowledge base for the description of core features of a model of integrated care which is transferable across European contexts with emphasis on factors facilitating scaling-up and sustainability. In the next phases of our work we will finetune our findings with the outcomes of the SHAPES project.

4.1 Next steps

In Chapter 2 of this deliverable, different aspects of integrated care have been examined. In particular the Performance Assessment Indicators are relevant for designing pathways to improve integrated are. As became clear from Chapter 3, the use of person-centred technology is an important driver for enabling or improving integrated care.

The objectives of the next phase of the implementation of Task 3.2 are to further develop our insights in the factors that impact on the improvement of integrated care programmes and the role that human factors and technology adoption play in that process. We will focus on the role of different human and technology adoption related factors during the process of large-scale deployment or up-scaling from pilot stage to full embedment in care organisations and their programmes. The final goal of this task is to contribute to the development of key recommendations for the implementation, adoption and scale-up of the SHAPES Platform and digital solutions across Europe (D3.10 and D3.11).

Operationally, this means that we will:

- Come back, by M26, to the organisations that have provided the information for the case reports in order to hear from them about further developments in 2021 and to review the lessons learned. This is particularly relevant for those cases where the technology was tested but not yet fully included in established care procedures. This information will help us to finalise the sets of factors to consider in the large-scale deployment of technology for improved integrate care.
- Interconnect with the large-scale pilots of WP6 to understand their use of NASSS and MOMENTUM and other relevant assessment and evaluation tools, to collect their experiences with those tools and to collect from those tools the factors that more specifically than others impact on the adoption and up-scaling of the SHAPES platform.

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- To work with the outputs of T3.1 both in terms of the models discussed and analysed, and the CHAT framework while monitoring the development of the SHAPES CONOPS throughout WP3/WP6, in order to better understand and describe the relationship between integrated care development and technology adoption in the context of intersecting needs, values, priorities and concerns of a wide range of different actors.
- Observe the results of the evaluations in WP6 and identify the lessons learned for future implementation, improvement, upscaling, and transfer.
- Produce core features of a technology enabled model of integrated care which is transferable across European contexts, and which is based on and validated by both the evidence gathered in D3.2 and on the lessons learned from the pilots, with emphasis on factors facilitating scaling-up and sustainability.

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5 Ethical Requirements Check

Ethical issue (corresponding number of D8.4 subsection in parenthesis)	How we have taken this into account in this deliverable (if relevant)
Fundamental Rights (3.1)	N / A
Biomedical Ethics and Ethics of Care (3.2)	N / A
CRPD and supported decision-making (3.3)	N / A
Capabilities approach (3.4)	N / A
Sustainable Development and CSR (4.1)	N / A
Customer logic approach (4.2)	N / A
Artificial intelligence (4.3)	N / A
Digital transformation (4.4)	N / A
Privacy and data protection (5)	Informants have signed a consent form with information on the data protection policy of the project.
Cyber security and resilience (6)	N / A
Digital inclusion (7.1)	N / A
The moral division of labor (7.2)	N / A
Care givers and welfare technology (7.3)	N / A
Movement of caregivers across Europe (7.4)	N / A

Comments: _____

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Annex 1. Data collection guidelines

Aim

Under this task we would like to collect relevant information about **cases of deployment of digital person-centred solutions** in integrated care programmes or systems.

The criteria used by selecting those cases are:

- Patient/user centred solutions

  (e.g., technology is deployed for the benefit of older adults that have consented in the acquisition of personal data regarding their condition with technological means and have consented in the sharing of those data with different professionals and informal caregivers that with different roles are involved in their care ecosystem).

- Part of operational service delivery models

  (e.g., solutions are regularly, frequently or permanently used since at least one year and are meaningfully part of a wider health and/or social care service delivery model involving also human intervention, with a clear lead organisation responsible for the deployment of the solution.)

- Connecting different actors in a care ecosystem.

  (e.g., solutions collect data that are distributed to different stakeholders in a care ecosystem that are aware of each other, and that have the possibility to contact each other).

- Non-exclusively focussed on short term medical treatment.

  (e.g., solutions are explicitly deployed over a longer period for preferably more than one purpose in the health and social domain, for example prevention, stimulation, treatment, monitoring, self-management, therapy adherence, quality of life, social connectedness, communication)

- Evaluated from the perspective of different stakeholders

  (e.g., the provider or commissioner of the solution has collected feedback from multiple stakeholders about the effectiveness of the solution).

It might be that not all selected cases fully meet these criteria. For that reason, you will be invited at the end of your data collection to express a rating for each case against the criteria.

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Informants

Because the data collection regarding the case involves different aspects, it is important that you identify as the informant a person or a group of persons that have excellent knowledge about the case. Technical knowledge is less relevant compared to knowledge about the actual outcomes of the solutions.

The profile of the informant to identify can thus be summarised as such:

- A professional working for the organisation responsible for the deployment of the solution.
- No commercial interest in selling the solution to others.
- Good knowledge of the history of the services involved and why the solution was adopted, as well as how it was defined, selected, purchased, or built on purpose.
- Good knowledge of the role of the technology in the wider care programme and in the care ecosystem.
- Access to information sources produced in and outside the organisation regarding the solution (e.g. manuals, guidelines, training programmes, evaluation reports, impact studies, etc.)
- Ability and availability to critically reflect on the solution and to highlight weak and strong aspects of the solution, including the capacity to separate own opinions of those of others.
- Knowledge about the future plans of the organisation with regard to the use of the solution.

Again, at the end of the interview you will be invited to rate the informant against the set criteria.

Steps

The following steps have to be followed:

1. Upon assignment of the case try to collect as much information as possible about the solution and the organisation deploying it.
2. Contact the organisation presenting yourself and the credentials of the SHAPES project (prepared standard letter).
3. In case collaboration is obtained, identify, together with your interlocutor, the right person to be interviewed and ask beforehand to be send all relevant information (reports, guidelines, instructions, evaluations, etc.).
4. Contact the informant, fix a date, collect the informed consent form and prepare the interview by already completing parts of the data collection template that you can complete on the basis of the information in your possession.
5. On the established date, conduct the interview and focus on collecting information that you haven't found yet. In case of doubts regarding previously provided information, ask for clarification.
6. After the interview, complete the data collection template with the collected information.
7. It is possible to share the template with the informants, both before and after you have completed it for them to check the information. This might include certain sections being completed by the informant, but don't rely too much on this as we need as much as possible independent views and to respect our deadlines.

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Data collection tool

The data collection tool provides guidance on the areas of investigation. It is not to be understood as a closed list of questions that have to be worked through at all costs. The information requested also doesn't have to be collected all at once. What we expect from the local researchers is that they act as investigators looking for the information also in different sources, including websites, service descriptions, public and internal reports, etc. To have access to internal data it is important to establish a good contact with the primary informant, demonstrating genuine scientific and professional interest, empathy and competence. This will help the informant to see the researcher as a qualified speech partner, to understand the benefits of collaborating with the research and to perceive the whole acquisition of information as an opportunity to critically reflect on an experience that has changed the way of working of the organisation.

The first part of the data collection tool serves two scopes: on the one hand it will help to get basic information about the solution, on the other hand it will help the informant to focus on the issues in order to produce more balanced and underpinned views in part 2 and especially part 3.

Name of the solution:

Responsible organisation:
Name of the informant(s):
Contact details:
Role in the organisation:
Years of professional activity in the field:
Researcher:
Contact details researcher:

PART 1 SOLUTION DESCRIPTION

In this part we are interested to get a brief but rather precise description of the solution.

Background – history

Why was the solution developed? Which needs were identified?
When was it developed and with which resources (e.g., project money, venture capital, etc.)? Who was involved?
Was the solution already operational elsewhere? Was it developed locally, transferred, purchased, imported? Was the solution tailor-made, adapted, etc.?
Has there been a pilot period before full deployment?
Has there been a scaling up process?

Supported care ecosystem

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Who are the primary and secondary beneficiaries of the solution? *Check whether the following categories belong to the beneficiaries: older adults, people with specific pathologies or chronic conditions, informal caregivers (e.g. family members, friends), formal caregivers (home care workforce), health professionals (e.g. doctors, nurses, therapists), social workers (managers of care plans), other…*

To what extent have the different actors in the care ecosystem be involved in the development or implementation of the solution?
Are the different actors in the care ecosystem in contact one with another (with or without the use of the solution)?
Is there some kind of agreement/negotiation on the objectives of the care plan?
How would the informant define integrated care?
What is the role of the solution in the care ecosystem? Would the same objectives be thinkable without the solution? Is the solution supporting or allowing integrated care?

Functioning

Please describe in maximum 5 lines the functioning of the solution in terms of enabled "processes".
Add some technical details, for example devices and apps used, connectivity requirements, etc.
Who has access to the data produced by the solution?
What is the approach to data protection?
What kind of human intervention is triggered by the data output of the solution, e.g., triage, follow up, emergency calls, revised care plan or medications, etc.
What are the most innovative aspects of the solution?
What are the main causes for under performance or failure of the solution, if any?

Economic sustainability

What is the business model? Who pays for the solution and the services?
Are there data available regarding the financial sustainability of the solution?
Are there data available regarding the impact of the solution on the overall costs of care?
Or on the distribution of the cost per budget item (e.g., shift from staff costs to technology, costs for training, etc.)
Has the solution brought about changes in the way the costs of care are calculated?
Are there other savings or is there additional expenditure to report (e.g., reduction of social costs, additional costs for management, training, etc.)?

PART 2 SOLUTION EVALUATION

In this part we are interested to hear more about the factors that are used to evaluate the solution and on the actual evaluation by the responsible organisation.

Evaluation practice

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How is the actual use of the solution evaluated? Are there tools that are used? Have these changed over time?
How are the outcomes evaluated? Are there measurement tools in place? (For example, Mafeip). What are the factors for evaluation that are being used (e.g., quality of life, impact on health condition or functioning, impact on use of resources)? Have these changed over time?
Are different stakeholders involved in the evaluation? In what way?
Are there outcome data available? Are these public or confidential?
How are these outcome data used? Have they impacted on the organisational model or led to further investments?
What is the impact of the solution on the way care is perceived? Are the values underlying your care model challenged or enhanced by the solution? Are they changed?

Expectations vs. reality

Were there expectations regarding the use and outcome of the solution? Were these formalised or not?
Are these expectations met? Which ones were, and which ones were not?

Further development

Are there plans regarding the further use of the solution? What are these plans?
Do these plans involve: up-scaling or transfer to other settings or target groups?

PART 3 RECOMMENDATIONS

In this part we are interested in learning from the experience and to understand the learning process the responsible organisation has gone through.

Lessons learned

What are the main lessons learned in this process of technology adoption?
What would you do differently if you could repeat the solution implementation?

Recommendations

What would you recommend to an organisation wanting to digitalise part of its care provision with person-centred solutions?
Are there specific recommendations you could make regarding:
-technology infrastructure
-staff
-change management
-general management issues
-monitoring and evaluation

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Annex 2. Single case reports

ID	Case 01
Name of the initiative/solution	Remote Health Pathways BP scale-up
Country	United Kingdom
Region	Scotland
Responsible organisation	Scottish Government (Technology Enabled Care)
Contact person	Morag Hearty
Role in the organisation	6 years working within remote monitoring
Website	https://tec.scot/bp-scale-up/
Keywords	Blood pressure, hypertension
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	One quarter of deaths in Scotland are from cardiovascular disease at a cost of £800M each year. Blood pressure (BP) is a leading, modifiable risk factor with 1.2 million appointments for blood pressure monitoring alone. Approximately 30% of adults in Scotland have high blood pressure only 25% of these had a diagnosis and fewer still were being optimally managed. Remote monitoring was seen as being an opportunity to provide better patient and clinical management. Hypertension was chosen initially as it is a relatively straightforward and common condition. Hypertension was used to demonstrate the use of telemonitoring and having blood pressure checked was something that most people were familiar with. Two pilots were started, one focused on pre-diagnosis and the other on long-term BP monitoring. These pilots provided the clinical evidence showing that patients who were being telemonitored maintained their optimum blood pressure for longer than those who were not, identified potential cost savings and changed culture. An inquiry was launched from the Cross-Party Group on heart disease and stroke within Scottish Government and this led to scale-up blood pressure monitoring programme funded by the Scottish Government. It also ensured that remote monitoring was cited in the programme for Government, this provided strategic buy-in and support to local areas. The pilots were very successful, and this resulted in a scale-up programme. Momentum built as more surgeries requested access and patients then started requesting the technology. Initial funding came from the Scottish Government. Local health boards then chose to apply for this funding (a maximum of £150k pro rata) and, if successful, they were required to provide a matched resource (e.g., personnel/management). Government funding covered licences, peripherals e.g., blood pressure monitors, SMS text messages and some project support. The digital solution, Florence, was the only solution available and affordable at the time of deployment. It consisted of the patient being

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	provided with a blood pressure monitor and asked to text their reading using their own mobile phone to 'Florence'. It allowed clinicians to communicate securely with patients and provided a browser-based overview of the patient's readings to clinicians. It was a simple system that could be locally procured, and this enabled a quick roll-out. Scotland-wide hypertension protocols and pathways based on clinical guidance were developed; these are continuously updated and improved.
Target group and care ecosystem involved	The primary beneficiary of the solution are those suspected of having hypertension or diagnosed with hypertension and living at home. An additional benefit was that remote BP monitoring was warmly received by carers, providing reassurance that family members are being looked after and reducing the need for carers to organise time off work for GP visits. Family members are also able to support the person with hypertension by sending readings via text message. An unexpected benefit was the identification of friends, family members, carers, neighbours etc. who tried out the blood pressure monitor and were alerted to their own potentially undiagnosed hypertension. Remote monitoring has also been beneficial for people who speak English as a second language. In terms of healthcare professional use, the primary users are predominately practice nurses in primary care. Practice pharmacists are a fast-growing group involved in this aspect of care. The solution sends reminders to patients to take a blood pressure reading and provides healthcare professionals with a summary of readings over time. During the pilot period there was a project funded by the British Heart Foundation to train leisure and culture staff to take BP readings. This involved the provision of validated training and BP monitors. Remote blood pressure monitoring was a co-designed service. A patient management plan was developed in conjunction with practice nurses and patients. During piloting, extensive feedback was gathered from GPs, practice nurses, patients and caregivers through interviews which informed a national evaluation. During scale-up, the emphasis is on spread of the service and while feedback was welcomed, it was not the focus. During COVID there was the belief that the more monitors that are available in community the better, especially as there is reduced footfall at GP practices, pharmacies, workplace BP monitoring. COVID has also acted as a catalyst for spread to specialist hospital structures e.g. stroke, cardiology and renal care teams.
Functioning	The patient is provided with a validated blood pressure monitor that is approved for home use by the British and Irish Hypertension Society and is asked to use their own mobile phone to send the blood pressure readings via text to a platform. The blood pressure monitor and texts are free of charge to the participant. Patients, together with the clinician can specify the time of day to receive text reminders, day of the week and how often. GP practice staff can then access a web browser to review patient readings, alerts and send additional texts to advise of follow-ups or decisions on treatment. Interventions can include diagnosis of hypertension and commencement of treatment, medication titration and changes to medication. Individual practice processes vary in terms of the monitoring and follow-up process.

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	Patient readings can also be pulled via an open API from the system via NHS National Services Scotland (NSS) and formulated into a patient report which is integrated into the GP interface. The most innovative aspects of the solution are its simplicity and the ability to generate reports directly into the GP clinical care team. Data access is limited to those working within the NHS who are all bound by patient confidentiality. Staff involved in rolling out the solution are employed by the NHS and can access pseudonymised individual data and aggregate data. Some staff involved in implementation also have non-anonymised access to assist with trouble shooting. The main challenges encountered with scale-up and spread was staff culture. Adoption varied due to reluctance to adopt change and the perception that the technology as more work in some areas and practices. In Scotland, GPs are contracted by the NHS to provide care so each individual practice can decide what technology to adopt. While the Government provided strategic leadership, practical uptake requires positive attitude to change and correct conditions to allow this. Additionally, staff turnover and GPs retiring were challenging. Sometimes staff turnover/movement was beneficial to technology uptake when changes in practice managers/nurses resulted in staff who had previous experience of the technology and were keen to implement it in their new workplace. The negative impact of staff turnover resulted in limited capacity for change in some practices.
Economic Sustainability	The primary financial outlay consisted of licences, text messages and blood pressure monitors. Blood pressure monitors were purchased via a national Scottish procurement mechanism which achieved economy of scale. Pre-COVID a proportion of blood pressure monitors were recycled if not used or needed, this does not happen anymore. There is uncertainty over the long-term funding of the BP monitors. There was an attempt to make the monitors available via prescription, however, this was very complex and difficult to achieve. The current digital solution involves a fixed cost basic licence and text message bundles that must be purchased as add-ons. People who use the technology most require more text messages, and this invokes a higher cost. There are no easy housekeeping mechanisms, so each GP practice need to be monitored if they are sending out daily text messages to patients who are not replying thus causing a high cost with no return. In future, there will be a move away from text messaging as more people become familiar with the use of Apps and online solutions, however, texts and even touch button phones will continue to be necessary to ensure accessibility. There are plans to move to a new nationally procured solution this will help with scale and affordability. Boards who are partners in scale-up blood pressure apply for Government funding and provide matched funding through resources. It is too early to tell how the solution has affected the cost of care. There is early data to indicate that the intervention is cost neutral in terms of prescribing costs. There is an increase in prescribed medication due an increase in diagnoses and titrating this to optimum level. Reductions in medication have been observed where people stop smoking/lose weight/start exercising thereby controlling their hypertension through diet and lifestyle measures.

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	It is too early to tell whether there is an impact on secondary disease e.g., stroke, heart attacks etc. and this will likely be offset against the rise in obesity. There is a need for larger numbers of participants to participate in telemonitoring over a longer period of time. If blood pressure control can be improved nationally, it is estimated that within 5 years there would be a 15% decrease in stroke and a 10% decrease in heart disease. Data has shown an average reduction in GP face-to-face appointments by 4-5 appointments for each person diagnosed and titrated. This saving is realised at the diagnosis and medication titration stage where patients may have previously been asked to have a weekly BP check at their GP practice, however, this is not seen in longer term monitoring of patients when they would typically be seen in practice once a year. Nevertheless, annual appointments are now more meaningful as patients and clinicians can get a much clearer view of blood pressure over time.
SOLUTION EVALUATION	
Actual use and evaluation of the outcomes	Detailed evaluation of scale-up programme to date is reported in 'Towards Scaling Up Home and Mobile Health Monitoring 2015-2018. An evaluation of the outcomes achieved by Year 3 and progress towards scale-up spread and sustainability. The primary methodology employed was Contribution Analysis which examined a variety of qualitative and quantitative evidence. The outcomes in for the scale-up included the number of patients initiating remote monitoring, number adhering to treatment/coaching programme, shorter waiting times, reduced face to face contact and less travel time/cost. The actual use of remote monitoring was measured using the number of participants recruited and their continued use of the solution. The next phase of scale-up evaluation is currently on-going and will use the NASSS framework to evaluate the success of remote monitoring. This evaluation and other research articles (Prof. Brian McKinstry et al.) have provided the evidence to influence the programme for Government. This has led to further investment and future procurement of a new national solution.
Expectations (Description and evaluation of the degree of objective's achievement)	There is considerable evidence that remote monitoring has supported more patients to self-manage their health, condition control has improved, face-to face contacts have been optimised and access to services has improved. Initial expectations were exceeded and the current target of initiating 20,000 patients over 2 years is expected to be met despite delays due to local issues with information governance, integration problems, project support and difficulties with staffing. Initial uptake started fast and then naturally slowed, however, COVID has caused a marked increase in uptake and interest. There has been a COVID-related increased roll-out in boards previously well established, and in new areas that were previously reluctant to adopt the technology. Remote monitoring has helped to reduce footfall in GP practices and maintain infection control. There were 2000 monitors provided in the Lanarkshire region alone since April (this was previously a 2-year target) and this has been replicated in other board areas.

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Further development of the solution	There is a current focus on chronic disease management in primary care and some acute pathways. The main goal is to provide the solution to a larger proportion of the population. During the COVID pandemic, the digital solution was adapted for COVID symptom monitoring. Recently, the health boards identified priority areas to investigate remote monitoring for recovery post-COVID, these included: respiratory (COPD, asthma); pre-operative assessment; heart failure; IBS; under nutrition; renal; cancer services. The current solution does not provide the patient with an overview of their BP over time; this is only available through the clinician web browser. This specification will be required for any new, nationally procured solution. There is further development planned for remote monitoring of new disease areas and development of remote monitoring for some specialised care (hospital) services. It is likely that a new nationally procured solution will be implemented in future.
RECOMMENDATIONS	
Lesson Learned	Be adaptable, new solution are required and technology advances. Do not make assumptions about the ability of patients from their age. You cannot simply digitise an old process; it requires pathway redesign.
Recommendations	Start simple Take stakeholders along with you, especially GP practice staff. Foster a culture of innovation, you need people to be willing to change processes and think about things differently. Work to achieve a minimal viable product.
References	Scottish Government (2019) Beating High blood Pressure: Scotland's Silent Killer, available at https://www.chss.org.uk/chss-campaigns-policy-projects-for-longer-stronger-lives/cross-party-group-inquiry-into-high-blood-pressure-in-scotland/ accessed 22/10/2020. Alexander, H (2018) Towards Scaling Up Home and Mobile Health Monitoring 2015-2018. An evaluation of the outcomes achieved by Year 3 and progress towards scale-up spread and sustainability, available at https://tec.scot/wp-content/uploads/2019/08/TEC-Programme-National-HMHM-Evaluation-Full-Report-November-2018.pdf accessed 22/10/2020

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ID	Case 02
Name of the initiative/solution	Attend Anywhere/Near Me
Country	Scotland
Region	UK
Responsible organisation	Scottish Government
Contact person	Hazel Archer
Role in the organisation	Head of Near Me programme within Digital Health & Care Directorate 17 years of experience
Website	www.tec.scot/nearme
Keywords	Video conferencing, Near Me, Attend Anywhere,
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	Historically, video conferencing was carried out where the cost/benefit analysis indicated high patient need with an associated high travel risk e.g., patients with unstable disease states that may not be fit to travel to other locations. There was also a desire to support people with complex needs in their own homes e.g., patients with Motor Neurone Disease. Additionally, there are many remote areas in Scotland where accessing health and care services is challenging and video conferencing is used to connect patients with specialist services. Video conferencing has evolved from large video conferencing systems through a variety of iterations that have resulted more recently in a browser-based solution which is cheaper, more accessible and more reliable than its predecessors. Gradual progression of technology and a chance encounter with the developer of Attend Anywhere identified this platform as the first scalable solution for video conferencing that could be used by patients in their own homes. The key features involved patients being able to click on a weblink to gain access to a virtual waiting area and from there connect with a clinician in a way that fitted the clinical workflow. This in-bound, person centric, workflow was key to enable service users to join a waiting room and for the healthcare professional to connect subsequently, in a way that mimics how patients physically attend appointments. Near Me is the video consulting service that uses the Attend Anywhere platform. The Near Me service branding was identified as important to gain patient trust and also to maintain a consistent brand in case the underlying technology needed to be changed in future. An initial national licence for Attend Anywhere was procured in 2016 with capacity for ~50 waiting room units for a year. This new service and technology were provided free of charge to clinicians and replaced previously adopted technology for any interested early adopters. Licences were procured by the Scottish Government. The small-scale start up required significant investment to set up the infrastructure and pathways, this work was unfunded initially. There was extensive progress in Highlands (remote area) where Near Me was initially used to conduct pharmacy reviews. Based on this success Near Me went on to gain funding from Scottish Government for Health Boards who were interested in setting up their video conferencing services. Organic growth continued via word-of-mouth, conferences, events, meetings. Increasing uptake throughout the year which enabled contract extension.

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	In February 2020 Attend Anywhere/Near Me was active in all territorial Boards in Scotland. It supported 1200-1500 consultations per month spread over a wide range of clinical specialities. At this time, the plan was to aim for 3000 consultations per month by March 2021 but then the COVID pandemic struck and by October 2020 there was ~17000 consultations occurring via Near Me each week. COVID accelerated technology adoption as clinicians welcomed a solution that enabled them to see patients and continue providing the health and care services.
Target group and care ecosystem involved	The main beneficiaries of the solution are health service users including, patients, caregivers and health care professionals. Evaluation revealed that video consultations were most readily implemented for routine monitoring of stable, chronic conditions. The use of video conferencing was also influenced by patient suitability e.g., condition, ability to use the system and low digital literacy. At the start of the COVID pandemic a decision was made to focus on key health priorities e.g., haematology, oncology, maternity, paediatrics, mental health, respiratory, immunosuppressed individuals and General Practice. Expansion of video consulting to social care teams has been identified as an area for further development. The Attend Anywhere platform was procured as an 'off the shelf product' however, stakeholders are involved in designing their local services by working with patient groups. Additionally, a public consultation has fed into platform development and improved accessibility. Recent improvements included a new colour scheme which is better for people with visual impairments, updated language and a new patient information leaflet which is better for disability access. A UK user group with representation from Scotland, England and Wales for Attend Anywhere was established to discuss issues, priorities and further development.
Functioning	To use Attend Anywhere you require; • Laptop/iPhone or iPad/Android phone or tablet • Web browser • Camera • Speakers • Microphone • Internet connection Further details of the technical specifications are listed here: https://www.vc.scot.nhs.uk/attendanywhere0/video-calls-technical-detail/ Pre-COVID there were three main types of functionality i) Hub-home where a clinician connects from clinic to a patient at home ii) Dyadic hub-spoke where a clinician in a specialist 'hub' connects to a patient in a remote 'spoke' health centre without an additional staff member present iii) Triadic hub-spoke where a clinician in a specialist 'hub' connects to a patient in a remote 'spoke' health centre with an additional healthcare professional present. Post-COVID – the majority of use occurred via clinicians connecting with patients in their own home. Depending on the individual situation of each service user, the success of video conferencing varied due to the fact that you cannot control the home environment especially with regards to privacy and internet connection.

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	In terms of data flow, video conferencing is an encrypted call. At the start of a video consultation the patient name, phone number, date of birth is entered and remains visible during the call. Once the call has ended no personal identifiable information from the patient is stored. The security, data protection and information governance surrounding Attend Anywhere has been agreed at a National level and was reasonably straightforward as the system had been designed with patients in mind. The system security policy was signed off through the National Security Group. The most innovative aspect of the solution is the in-bound, patient centric workflow. This allows patients to be allocated to a personal waiting room and connect with a clinician when they are available. The key reason for under performance of the solution in some clinical areas was due to poorly thought through processes. Changing the delivery of services e.g., maternity services require a process mapping stage which can be complex. A quality improvement approach was adopted and guidance notes were produced and made available across Scotland. Technical aspects e.g., firewalls, integration issues, poor quality camera or laptop are relatively easy to fix with appropriate technical support and finance.
Economic Sustainability	There is national procurement of licences for access to the Attend Anywhere platform, these are procured by the Scottish Government. The current contract was due to end in September 2020 this was renegotiated in March 2020 to extend duration and increase capacity due to COVID. When COVID hit, a lot of services were suspended so staff had capacity to develop new methods of continuing services e.g., Attend Anywhere. There is no specific economic evaluation of the impact and cost-effectiveness of the Attend Anywhere solution. There has been preliminary work to identify potential cost effectiveness gains in relation to improved access to specialist services, reduced travel (patient and clinician), improved access for people living in remote areas, up-skilling of staff, reductions in hospital admissions and reduced length of inpatient stays. It was reported that people like video conferencing as they don't need to take time off work or travel long distances. Additionally, it is important to note that the benefit of video conferencing during the COVID pandemic allowed clinicians to see patients who might not have otherwise been reviewed due to infection control measures put in place.
SOLUTION EVALUATION	
Actual use and evaluation of the outcomes (Max 200 words)	The actual use of the solution is monitored via review of the number of consultations. A consultation is defined as a call between service provider and waiting room attendee that lasts more than 2 minutes. This provides an accurate estimation of use by removing test calls etc. An initial evaluation report of Attend Anywhere was completed before the COVID-19 outbreak and can be reviewed here: https://www.gov.scot/publications/evaluation-attend-anywhere-near-video-consulting-service-scotland-2019-20-main-report/ This details a mixed method evaluation which was mainly qualitative in nature and guided by the NASSS theoretical model. A subsequent report has been commissioned to provide a COVID-response evaluation. User experience surveys representing ~10% of all consultations in 2019 indicated that 97% patients would use video consulting again.

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Expectations (Description and evaluation of the degree of objective's achievement)	Attend Anywhere has met and exceeded all expectations on the usage of the solution. As detailed previously, at the start of 2020 the plan was to increase video consultations to 3000 consultations per month by March 2021, however, in October 2020 there was ~17000 consultations occurring each week. There has been continual growth in the use of Attend Anywhere throughout 2020 and there has been no reductions in use as lockdown has eased.
Further development of the solution	A national Attend Anywhere team is in place to develop guidance, perform trouble shooting and look after platform contracts. Future expansion is planned for urgent care, social care, care homes and other public sector organisations (e.g., local authorities, fire and rescue). As detailed above, a UK user group for Attend Anywhere has been established to discuss issues, priorities, further development and this has representation from Scotland, England and Wales who each have licences for the platform.
RECOMMENDATIONS	
Lesson Learned	• Need right product at the start • Take a person-centred approach to ensure video calling is right for that person/disease state and that there is a back-up plan in place for every consultation. • The technology needs to be supported by dissemination, resources to redesign processes, support within the local health board and staff training. • Implement Quality Improvement methodology.
Recommendation	Technology • Ensure you get the right tool for the job which fits with your workflow. • Keep it simple. Staff • Peer to peer dissemination among clinicians was successful at bringing clinicians on board. • Develop guidance with clinicians and obtain sign off from national societies e.g., Royal College of General Practitioners, to ensure clinicians are more secure using it. • Strong leadership within health boards. Change management • Take a structured quality improvement approach: identifying key initial users, co-design, data gathering, analysis, review, creating guidance and dissemination of learning.

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ID	Case 03
Name of the initiative/solution	medGuide
Country	Cyprus
Region	Nicosia
Responsible organisation	Materia Group: Care, Nursing, Rehabilitation
Contact person	Marina Polycarpou
Role in the organisation	Managing Director (19 years of experience)
Website	https://www.materia.com.cy/eu-projects/medguide-3/
Keywords	Cognitive Impairments, Dementia, Medication
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	MedGuide was a European research project that provides an innovative approach to support seniors with dementia with their medication adherence through smart pillboxes and social networking. The objectives were to help seniors with mild cognitive impairments living at home by: • Providing insight into the actual needs of elders with dementia (based on input from the sensor, the network of informal caregivers, and contextual data from IoT devices). • Providing insight into actual medication use, side effects, and adherence. • Providing support for improving the care and medication adherence through direct reminders and personalised roadmaps leveraging informal caregivers' network. The program was co-funded by the Active and Assisted Living Research and Development Programme and co-financed by the European Union and the National Agencies of Cyprus, Netherlands, and Norway. It was developed between 2017 and 2020.
Target group and care ecosystem involved	The solution was developed to help people with mild cognitive impairment remember taking their medications and remembering to take the right dosage. MedGuide aimed to meet the need to deal with polypharmacy and its adverse health and financial impact on individuals. MedGuide is a digital platform that brings together informal caregivers, medical professionals, pharmacists, and seniors with dementia. The platform collects information from the local care network (senior, family, informal caregivers) through self-reporting and sensor data collection. The self-reports and sensors report physical activity, sleeping patterns, movement habits, nutrition and social interaction aspects, medication intake, and adherence to the prescribed therapy. The combination of the 'human perspective' and the 'sensor perspective' provides an up-to-date view of the seniors' state and needs with dementia. Furthermore, MedGuide uses big data analysis to detect changes in seniors' routines to minimise medication's side effects. Primary beneficiaries are older adults. Secondary beneficiaries are relatives, doctors, home carers, and pharmacists.

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Functioning	MedGuide has created an ecosystem of smart medication dispensers, home sensors, and digital platforms that support the platform users' specific needs through intelligent pillboxes and social networking. Machine learning translates reports, daily activities, and observations into relevant alerts on medication adherence and potentially harmful side-effects both through self-reporting and sensor data collection in the home of the seniors with dementia. As a result, MedGuide can provide insight into the actual needs of older adults with dementia. Based on the patient's combined input, informal caregivers' network, and contextual data from IoT devices. The patients' actual medication use, side effects and adherence, and support for improving the care and medication adherence through direct reminders and personalised road maps leveraging informal caregivers' network.
Economic Sustainability	The consortium succeeded very well in co-creating the MedGuide system with their end-users and releasing an entire working system, ready to be engineered before its commercialisation. It is also worth highlighting that medGuide has liaised with seven projects at the EU level considered as significant and coherent with medGuide's main aims and addressing topics focusing on dementia and cognitive diseases to gain insight and refine their analysis of the needs on the market.
SOLUTION EVALUATION	
Actual use and evaluation of the outcomes	The solution has been evaluated by several stakeholders such as doctors and pharmacists who were asked to answer open questions follow a demonstration of the solution. The outcomes have been assessed based on the number of mistakes patients were making before and after using the solution—data collected by the device itself regarding actual usage, timing, dosages, etc. After that, data was processed to reach safe conclusions. The senior participants appreciated that the platform helped them improving medication adherence, and that their caregivers could be notified in case of health deviations early on. Caregivers also stated that the platform increased their awareness on possible side-effects of polypharmacy and the importance of adhering to the medication plan. Furthermore, informal caregivers appreciated that the platform contributed to their feelings of safety and confidence during the care process. [03-BA]
Expectations (Description and evaluation of the degree of objective's achievement)	Through the medGuide services, the pharmacists aim to identify better what patients need extra attention and adjust the personal medication plans to changing needs and circumstances. When successful, the medGuide polypharmacy and self-report services can be integrated into the pharmacists' regular medication review process.
Further development of the solution	The Dutch partners of the consortium have recently started a national co-funded project with a project focused on performing a feasibility study of the polypharmacy and self-report medGuide services with a broader group of end-users at the national level and on carrying out a correlated validation study in close collaboration with the largest Dutch pharmacy chain.
RECOMMENDATION	

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Lesson Learned	The lessons learned are the following: • Taking medication as prescribed at the right time and dosage is very important. • This can be enhanced with simple technology. • Polypharmacy, a considerable problem with excellent health and financial consequences, can be prevented with a simple solution. [03-BB]
Recommendation	The importance of involving end users and other stakeholders in the design of the solution. [03-CA] Because patients with mild cognitive impairment have difficulties in providing feedback, healthy individuals should be involved that can better reflect on the technology and bring in suggestions based on prior experiences. The recommendation is to apply all actors, especially end-users, to refine the technology based on their feedback from the very beginning. The initial solution's functions brought to the end users were different, but input from end-users, relatives, and pharmacists resulted in an easy-to-use and highly practical solution.

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ID	Case 04
Name of the initiative/solution	ProACT
Country	Ireland
Region	Leinster
Responsible organisations	• NetwellCasala – www.netwellcasala.org (Pilot Site) • Trinity College Dublin (TCD) – www.tcd.ie • IBM – www.ibm.com • AIAS Bologna Onlus – www.aiasbo.it (Transferability Study Site) • Imec - www.imec.be/nl (Pilot Site) • Tyndall National Institute - www.tyndall.ie • Treelogic - www.treelogic.com • Phillips - www.philips.ie • HomeInstead - www.homeinstead.ie • AAATE – www.aaate.net • EASPD - https://www.easpd.eu • Agenzia Servizi alla Persona Città di Bologna - www.aspbologna.it
Contact person	Dr. Julie Doyle
Role in the organisation (include years of professional activity in the field)	Dr. Doyle is the director at the NetwellCASALA Research Centre on Ageing and Connected Health at Dundalk Institute of Technology, Ireland. Dr. Doyle received her phd in Human Computer Interactions in 2006 from Trinity College Dublin and has worked at the NetwellCASALA centre since 2011.
Website	http://proact2020.eu
Keywords	aging; multimorbidity; self-management; older adults; digital health; wearables; physical activity; sleep; self-reported; co-design.
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	**Background:** In 2014 Dr. Julie Doyle (NetwellCASALA) and Dr. John Dinsmore (TCD) and a colleague from IBM put together a consortium to apply for an EU-funded Horizon 2020 grant focusing on technology assisted self-managed care for older adults. The project titled ProACT (Integrated Technology Systems for ProACTive Patient Centred Care) aims to develop and evaluate an ecosystem that integrates a wide variety of new and existing technologies to improve and advance, home-based integrated care for older adults with multimorbidity, including associated co-morbidities. **Objectives:** • To develop an integrated, responsive, decision support information and communications technology and assistive technology (ICT-AT) care ecosystem to help co-ordinate and support multi/comorbid disease management (including self-management). • To implement a core suite of effective ICT-AT to track and provide personalised 'clinical and non-clinical' feedback to individuals living with multi/comorbidities that inform, educate and support health and well-being self-management. • To advance 'big data' and cloud platform integration, mining and analysis techniques to assist in the development of new models of multi/comorbidity integrated care. • To validate a behavioural change assessment 'tool kit' and framework to support the sustainability and scalability of the ProACT ecosystem.

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	• To deploy an innovative user-driven 'proof of concept' ProACT ecosystem trial in 2 EU sites (Belgium and Ireland). • To conduct an EU-wide feasibility study (including less well-developed regions) to assess the transferability of the ProACT system across member states. • To develop a clear exploitation plan and implementation strategy for intellectual property created from ProACT. This will include clear financial, business and commercial strategies for sustaining and scaling the ProACT ecosystem at EU and international levels. The plan will establish a post-programme impact committee to assess outputs up to two years post project completion. Deployment: Technology to support self-management was deployed to 120 people with multiple chronic conditions (60 in Ireland and 60 in Belgium).
Target group and care ecosystem involved	Target Group: 120 older adults (aged 65+) with multi-morbidity and up to 5 people within their care network. The group was divided equally with 60 older adults in Ireland and 60 in Belgium.
Functioning	Set Up: The ProACT project provided 120 older adults with a range of devices (an iPad, blood pressure monitor, pulse oximeter, activity/sleep tracker, glucometer, and a weighing scales) to record their health and wellbeing information. A 12-month broadband connection was also provided for those subjects that needed it and all 120 older adults were also provided with full training on how to use the study technology. Data Collection: Study participants were asked to measure key symptoms and activities related to their health and wellbeing using the measurement devices, and to answer some optional questions on the iPad. They were able to set up their care network within the application and grant different levels of access to their carers based on what information they wanted or did not want to share. They were also able to create a list of their current medications. The participants provided consent to take part in interviews with a researcher at 5 different times during the study. Interviews were held with the older adults at four time points during the trial. At the end of the trial, interviews with all stakeholders were conducted. Data Storage: Dundalk Institute of Technology built a custom data aggregator using a cloud-based storage service to store the data for analysis. Health Interventions: As well as the collection of health data, a triage system that generated an alert based on each individual's threshold for different health parameters (e.g., blood pressure readings) was also developed. Two triage nurses were recruited from a private care provider to respond to the alerts. Based on the data from the devices, the nurses instructed the participants of what actions to take e.g., book an appointment to see your doctor.
Economic Sustainability	Not Available

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SOLUTION EVALUATION	
Actual use and evaluation of the outcomes	Several instruments were used to evaluate the solution during and after the trial including quality of life measurement and anxiety measurements. Dr. Doyle noted that "the sample size is too small to read too much into the data, but quality of life did stabilise over the duration of the trial while anxiety decreased a little". Dr. Doyle refers to the trial as a proof of concept and notes one of their main goals were to examine if the technology worked, what worked and what did not work.
Expectations (Description and evaluation of the degree of objective's achievement)	Proof of the ProACT solution's success can be determined from the follow-up funding received from Irelands national healthcare system (HSE). In Ireland, historically, it has proven difficult to convince the HSE to adopt research findings into their strategic plans. The fact that the HSE has funded the ProACT solutions roll out to a much bigger population can be seen as a resounding endorsement of the solution.
Further development of the solution	After the trial, additional funding was provided by Ireland's national healthcare organisation to roll out the service locally for 2020. Other horizon 2020 funding was also recently received to examine how to integrate the ProACT solution into the health system and to look at the outcomes in more detail with a control group. More focus will also be put on hospitalisations, healthcare utilisation and cost benefit analysis. The Belgian pilot site (IMEC) was also provided funding to roll out to project to a larger population but specifically for diabetes care. The consortium leaders, Dr. Doyle and Dr. Dinsmore are currently in talks to spin the project out and scale it up early next year.
RECOMMENDATION	
Lesson Learned	The consortium aimed to have more personalisation features within the software application, but the timeframe did not allow for the detailed engagement needed with external companies to deliver those features. **Recommendation – Allow for more time and effort in contracting external companies to deliver bespoke products.** The Irish pilot group recruited 60 older adults for the project and allowed up to 5 people within their care network to be involved. This was overly ambitious as the work involved in setting up such a large care network on the software application placed a considerable strain on their resources with the result that some of the care network could have received more training and introductions to the software. This was negated by the older adult showing the care network their data on their own tablet. Also, the caregivers felt less of a need to be heavily involved in monitoring the data as the triage nurses were keeping an eye on the alerts. **Recommendation – Avoid under estimation of the resources required when dealing with larger populations external to the main subject.**
Recommendation	The ProACT trial has been very successful as a proof of concept. The funding of secondary studies is clear evidence of that. The project team were very thorough in their study design thereby ensuring they have a strong foundation upon which to upscale their solution. Elements from the trial which may be beneficial to other European projects include the use of:

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	• **Friendly Testing** – In this instance, the researchers tested the software and hardware rigorously themselves prior to involving any subjects. This allowed them to ensure that from an operational and technical standpoint, the pilot infrastructure would have few bugs and was ready to deploy. **Recommendation** – Test the product fully in-house before deployment to subjects. • **Dashboard design** – The project team had a strong background of user interface development. This allowed the team to be confident that the user interface experience of the software application was intuitive for those who may not have used health technology prior to the trial. **Recommendation –** Ensure an experienced team of UX developers is available to provide input into the aesthetics and flow of the software.

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ID	Case 05
Name of the initiative/solution	CleverCogs
Country	Scotland
Region	Aberdeen, Dundee, Edinburgh, Glasgow
Responsible organisation	Blackwood Homes and Care
Contact person	Angela Currie
Role in the organisation (include years of professional activity in the field)	Angela Currie is Operations Director at the Blackwood Group and has worked in the organisation for over 5 years. Previously Angela was Managing Director of Scotland's Housing Network.
Website	www.blackwoodgroup.org.uk
Keywords	aging; multimorbidity; self-management; adults; digital health; self-reported; co-design; touchscreen device; software; independence
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	**Background:** Blackwood is a housing and care provider specialising in homes and care services for people with disabilities in Scotland. It has over 1,500 social housing tenants, just over 400 care at-home customers, 60 residential care home residents and 17 night support service customers. Around 70% of the people Blackwood serves need some form of care and support need. While Blackwood predominantly works with those with a physical disability, its customers also include older people and people with a learning disability. In 2015, Blackwood Homes and Care (Blackwood) began the development and implementation of CleverCogs, a bespoke digital care and support system. Blackwood's aim via CleverCogs is to provide services that improve the quality of life, choice and independence of their customers, in particular to increase digital participation in adults in receipt of care and support packages, and to enable increased use of Technology Enabled Care in service delivery. **Objectives:** • Increased digital participation • Increased time spend on meaningful activities • Improved self-management of health condition • Improved mental well-being • Reduced social isolation • Improved independence • Efficiency savings • Improved quality of care and support package
Target group and care ecosystem involved	Blackwood offers care and support to individuals with physical disabilities, mental health issues, sensory impairment and learning disabilities. They also have highly specialist skills in supporting adults with Multiple Sclerosis, Dementia and Huntington's disease. In the pilot study, 107 Blackwood customers with complex needs received the Clevercogs system.

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Functioning	CleverCogs is delivered via a handheld touchscreen device (tablet). The device can be positioned anywhere but generally it is attached to a wall with a big extendable arm. Clevercogs is based on software from a Dutch company (Soft Orange) and Blackwood used this software to develop a bespoke package for its customers. The 'Cogs' represent aspects such as lifestyle, home automation, safety, health, wellbeing, and entertainment. The aim of CleverCogs is to provide services that improve the quality of life, choice and independence of their customers, in particular to increase digital participation in adults in receipt of care and support packages, and to enable increased use of Technology Enabled Care in service delivery. A key feature of CleverCogs is that it can provide an option of 'simplified access' to the internet, for those who have either never used the internet or who do not have the technology, skills, confidence or ability to do so independently at home. The 'simplified internet access' product includes online entertainment, online health information and social media. The aim is that these features increase digital participation amongst a group who are some of the most digitally excluded, as well as increasing the amount of time customers spend on meaningful activity, which will in turn have positive impacts on wellbeing, social engagement, and the self-management of health conditions. CleverCogs also has the potential to support the delivery of Technology Enabled Care, through features such as automated medication prompts and automated appointment prompts for the customers, and automated handover notes for care staff and an alarm facility with care homes and Night Support Service. The system also has an epilepsy monitor, a falls monitor, a calendar function, an alarm function as well as a separate function called "Ask for it" which allows the customer to alert the care staff that they need something but it is not an emergency. The data the system produces is available to the management team across the Blackwood business. It is used in a number of formats but the biggest gain from the data is in providing information for each individuals person centred care plan. The data is also used to see what functions are most popular so future plans on prioritising one features upgrade over another can be made.
Economic Sustainability	The development and deployment of CleverCogs is largely funded by Blackwood as part of its own capital investment. The cost to Blackwood's customers is included as part of their rent or care package. The initiative benefited from two start-up grants from the Scottish Government and SCVO, which contributed to project management costs to roll out the system, some of the capital costs and digital skills training for tenants and carers. There is no ongoing government funding.
SOLUTION EVALUATION	
Actual use and evaluation of the outcomes	Clevercogs was evaluated by Carnegie Trust UK in 2018. The main evaluation tool was a survey of customers, which was carried out before installation of CleverCogs (baseline) and a minimum of three months post-installation (follow up). There were two additional tools used: a staff survey, and a time and motion study. Five Blackwood pilot sites were chosen: Edinburgh, Ayr, Glasgow, Aberdeen and Dundee. These were chosen to ensure a good spread of locations and types of customer. The outcomes assessed were the objectives set by the Blackwood group. <u>Outcome 1. Increased digital participation</u>

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	Before the introduction of CleverCogs, 33% of customers were current internet users (23/70 customers). At the follow up survey, this figure had risen significantly to 79% (55/70) customers. When asked if the way they use the internet had changed since having CleverCogs 74% of customers (26 of the 35 customers who responded) said that their internet use had changed. All but one of these 26 customers reported that this change was due, at least in part, to CleverCogs, and 19 reported that most or all of it was due to CleverCogs. Outcome 2. Increased time spend on meaningful activities CleverCogs users were asked whether there had been a change in the amount of time they were spending on their hobbies. 36% of respondents (20/50 customers) reported that they were spending more time on their hobbies, however 34 customers reported no change and one reported spending less time on hobbies. Outcome 3. Improved self-management of health condition There was an increase in customers regularly accessing health information online (at least once weekly) – from 11 customers to 25 customers. An increased number of customers also reported finding the health information useful, from 10 customers to 19 customers. Outcome 4. Improved mental wellbeing Before the introduction of CleverCogs the average life satisfaction of the customer group was 6.7, which rose to 7.6 at follow up to match the national average for Scotland. The largest increase in life satisfaction was in the 55 to 64 year old age group, where life satisfaction rose from 6.6 to 8.3. Customers reported decreased feelings of boredom after the introduction of CleverCogs; before 18 out of 29 customers reported feeling bored some or all of the time, however after CleverCogs was introduced this decreased to 8 customers. Outcome 5. Reduced social isolation Not enough data was available to make a judgement. Outcome 6. Improved independence The timescale of the evaluation was not long enough to assess whether customers were able to remain living independently in the community for longer because of CleverCogs. Outcome 7. Efficiency savings The findings indicated that staff using CleverCogs saved approximately five minutes on average per visit in time spent on administrative tasks. Outcome 8. Improved quality of care and support package The ability of CleverCogs to support the delivery of Technology Enabled Care, through features such as automated medication prompts and automated appointment prompts for customers, aims to improve the quality of their care and support package. However, there was no data available on use of these features by customers at follow up. The report from Carnegie Trust UK, states that the value per user that comes online and receives all of the associated benefits via CleverCogs is in the region of £1,457 per annum. There are also financial benefits to Blackwood from efficiencies, which the report conservatively estimates at £157,000 per year.

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Expectations (Description and evaluation of the degree of objective's achievement)	The Clevercogs system has clearly benefited the lifes of Blackwood's customers. Interviews with the users of the system clearly shows their enthusiasm for the solution. It is also a credit to the organisation that they have put such a large amount of their capital to such an innovative solution.
Further development of the solution	Blackwood are this month (December 2020), applying for a further large grant to expand CleverCogs to local community neighbourhoods. Grant details are not available at present as the bids are currently being received.
RECOMMENDATIONS	
Lesson Learned	• The rollout of Clevercogs was initially challenging for Blackwood. They reported that the pace of implementation was slower than anticipated and more resources were needed to be put in place to address this. • Blackwood believes that the personalised approach – formal and informal information and familiarisation sessions – was key in building confidence in the innovations. In addition, it found that inviting customers, family, and staff along to sessions enabling people to ask questions, and to have hands on sessions, worked well. • The employment of specialised digital champions to train the customers in the use of the system is key for rolling out technology to users who are not familiar with digital devices.
Recommendation	• Resource use needs to be calculated as accurately as possible for the rollout phase of a project. Not having the correct resource allocation can easily stall a project before it gets off the ground. • It is important to bring the user on the journey with you. It is not enough to build a product and not involve the user at the different stages of the products life cycle. • Having dedicated staff for training and handling queries on technology is important. Formal Carers often are not capable of teaching individuals about technology even if they use technology themselves daily.

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ID	Case 06
Name of the initiative/solution	Gesundes Kinzigtal (Healthy Kinzigtal)
Country	Germany
Region	Baden-Württemberg
Responsible organisation	Optimedis AG
Contact person	Dr. Helmut Hildebrandt
Role in the organisation (include years of professional activity in the field)	Chairman of the Board of OptiMedis (Germany) He has more than 30 years of experiences in the healthcare arena. He worked for leading hospitals, sickness funds, health insurances, physician networks, pharmaceutical and biomedical companies, ministries, and many others.
Website	OptiMedis AG, International website | Gesundes Kinzigtal (gesundes-kinzigtal.de), Current and Previous Evaluation Studies » Evaluation of GESUNDES KINZIGTAL Integrated Care (ekiv.org); INTEGRAL | PMV (pmvforschungsgruppe.de)
Keywords	Health care management company, regional integrated care system, Healthy Kinzigtal (Gesundes Kinzigtal), rural area
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	Kinzigtal is located in the rural area of the Black Forest in south-western Germany. The 'Gesundes Kinzigtal GmbH´ runs a comprehensive population-based integrated care program which started in 2005 and serves for the entire Kinzigtal population, regardless of disease or age. The organisation is a joint venture of a health sciences-based management company and an interdisciplinary physician and psychotherapist network. Gesundes Kinzigtal has a triple aim concept: improving the health of the population in the defined area, organising patient-centered health care processes in a way that patients perceive them as positive (patient satisfaction), and at the same time reducing the per capita costs of care. The primary goal of this program is to improve patients' overall health status and increase their quality of life and thus to reduce interventions that would be necessary without the improved health status. The key elements of the care management and preventive care programs are: individual treatment plans and goal-setting agreements between doctor and patient; self-management support and shared decision-making; as well as patient-centred care and system-wide electronic patient record.
Target group and care ecosystem involved	The health care services of Gesundes Kinzigtal are provided for the entire population of the Kinzigtal region who are insured by the AOK and LKK sickness funds (almost half of 69.000 inhabitants of Kinzigtal). People have the opportunity to select a free membership in the Gesundes Kinzigtal GmbH. The status of being a member emphasises the participatory aspect of the program so that each member feels encouraged to be actively involved in the decision-making processes. Gesundes Kinzigtal works in collaboration with general practitioners, doctors, hospitals, health insurance funds and pharmaceutical and medical industry provider to integrate (full-service) health care solutions in the area. It analyses healthcare data and performs independent, data-based real-life care research and makes the results available for the integrated provision of healthcare services.

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Functioning	Gesundes Kinzigtal subscribes to Berwick's triple aim of improving the experience of care, improving the health of populations, and reducing per capita costs of health care (Berwick, 2008). It means achieving this thanks to three pathways: implementing processes of integrated care; monitoring results with dedicated healthcare research; and, last but not least, supporting innovation development. The Gesundes Kinzigtal participants provide consent for providers to have electronic access to all relevant diagnoses and treatment information. The providers of Gesundes Kinzigtal have access to timely, actionable data tracked and publicised through external and internal evaluations. The electronic health records database, patient survey data, and a business intelligence system are the basis for internal evaluations. The business intelligence system is fed by data of two sickness funds. Available data are e.g., about sick leave, diagnoses and services in ambulatory care, hospital stays and nursing care/long-term care as well as prescription data for office-based physicians. Gesundes Kinzigtal uses the metrics to assess system-wide performance and provide the digital solutions "Health Services Cockpit" for general practitioners. The quarterly performance feedback reports contain detailed data on the provider's performance compared to other providers within and outside the Gesundes Kinzigtal network. It also gives detailed information for each indicator, case, participant, or service level. Overall, Gesundes Kinzigtal conducts system-wide performance checks and detects opportunities to improve access, quality, efficiency, and patient experience.
Economic Sustainability	Gesundes Kinzigtal works in collaboration with more than 260 organisations and institutions which are physician practices, hospitals, nursing homes, chemists, local municipalities, as well as local small and medium sized enterprises. EHRs were deployed among GPs and are made available to more and more providers. Based on these records, and besides the traditional fee-for-service system e.g., for medical practices, Gesundes Kinzigtal offers additional reimbursement for service providers that stimulate value, such as time spent with a patient to set goals or physical training in long term care to prevent falls. Moreover, Gesundes Kinzigtal has a unique revenue structure. Two-thirds of the organisation are owned by the local physician's network MQNK so that service providers also receive a share of the company's profit through a shareholder arrangement and have an impact on the decision-making process. The organisation does not charge a fee for the service model but keeps a share of realised saving (= difference between health care costs of AOK and LKK insurees before Gesundes Kinzigtal started and after Gesundes Kinzigtal was established and the difference between the general cost trend in Germany).
SOLUTION EVALUATION	

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Actual use and evaluation of the outcomes	The "project" Healthy Kinzigtal (Gesundes Kinzigtal) became a company Gesundes Kinzigtal GmbH. In addition to Gesundes Kinzigtal GmbH itself, which is responsible as a management company for integrated care and as a service provider for the network of physicians, the Health Academy, Healthy Companies and gesund+aktiv (fitness center) have emerged as departments or companies in the past ten years. Healthy Kinzigtal also encompasses a Digital & Health Innovation Centre that assesses digital and innovative solutions for the provision of healthcare services in the region. This assessment is done in 3 phases reviewing quality (I); policing the solutions (II); and scaling them (III).
	Gesundes Kinzigtal, together with the University of Freiburg and the two associated sickness funds contracted the independent scientific review agency EKIV (Evaluations- Koordinierungsstelle Integrierte Versorgung) for coordinating further result evaluations by research institutions.
	• Accompanying evaluations with different modules are:
	  ○ The AGil study: Active health promotion in the elderly
	  ○ Evaluation Module I: Shared Decision-Making (SDM)
	  ○ Module II: Identification and Reduction of Over-, Under- and Misuse of Health Services (OUM) - Evaluation through an Analysis of Health Insurers' Administrative Data
	  ○ Module IV: Coaching of Gesundes Kinzigtal executives (sub-module IV-1) and process evaluation from providers' perspective (sub-module IV-2)
	  ○ GeKiM study - Gesundes Kinzigtal Member Survey

Expectations (Description and evaluation of the degree of objective's achievement)	INTEGRAL - 10-Year Evaluation of Integrated Care Healthy Kinzigtal by PMV Forschungsgruppe The quality of care of the Integrated Care Gesundes Kinzigtal (IVGK) - an example of population-based Integrated Care - is to be comprehensively evaluated in comparison to standard care in Kinzigtal over a period of 10 years. Previous studies showed that a more cost-effective care through the Integrated Care of Healthy Kinzigtal compared to standard care in Kinzigtal was achieved. But it has to be admitted that the quality of care so far has only be evaluated in the start-up phase of Gesundes Kinzigtal which revealed that the quality of care is higher than in other areas in Baden-Württemberg. Further studies will show how it will develop in the long term under everyday conditions. For this reason, the quality of integrated care in Gesundes Kinzigtal is now to be comprehensively evaluated in comparison to standard care over a period of 10 years. Results are expected to be published in July 2021. • INTEGRAL - Report A: Indicator-specific analyses • INTEGRAL - Report B: Summary of indicator specific main results • INTEGRAL - Report C: Overall evidence • INTEGRAL - Report D: Trend acceleration and deceleration Geraedts, M., Mehl, C., Schmitz, J., Siegel, A., Graf, E., Stelzer, D., (...) Schubert, I. (2020). Development of an indicator set for the evaluation of the population-based integrated healthcare model 'Gesundes Kinzigtal' (Healthy Kinzigtal) - Zeitschrift für Evidenz, Fortbildung und Qualität im Gesundheitswesen (zefq-journal.com), Volume 150, p.54-64, DOI: https://doi.org/10.1016/j.zefq.2020.04.001

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Further development of the solution	• The health kiosk in Hamburg Billstedt/Horn – implementation of the model "Gesundes Kinzigtal" in an urban region Design of a patient-oriented, cross-sectoral health network for two socially disadvantaged city districts of Hamburg • Gesundes Werra-Meißner-Kreis Qualification of people from health-related professions in the field of individual health counselling and promotion as "health guides" for insured persons.
RECOMMENDATIONS	
Lesson Learned	• There must be a market for the developed solution so that an IT company does a massive investment, organises properly the maintenance of the developed software, and support it with appropriate resources. This was basically not achieved at Gesundes Kinzigtal. Parallel to Gesundes Kinzital, there were not enough initiatives in Germany that would have created a sufficient market for it. Therefore, small solutions were always developed with project funds, but they were not sufficient in themselves to adequately reflect the complexity that we have in the health care system. • The great success of Healthy Kinzigtal has been to gather data and structure e.g., health prevention measures on that evidence; this method did improve health outcomes significantly and cut health spending. However, the effort to create a basic digital structure is incommensurable; resistance to adopt EHR system took more than 5 years in Gesundes Kinzigtal • After public tenders, there were several cooperations with smaller companies, each of them managed to find partial solutions, but in the end the last optimisation was missing. • There were quarterly updates of the hospital information systems, which raised doubts whether this, in combination with the developed software in Gesundes Kinzigtal, could lead to a standstill of the medical practice. Even if this was not related, non-functioning was attributed to it. There is nothing a physician would resent more than a possible standstill in the process flow (because their stressful daily workload).
Recommendation	• Leadership: strong (regional) network of partners taking the lead in the implementation of IC solutions • The development of a market for the target solution must be considered and planned during time of funding. • Get in contact with other initiatives to expand your ecosystem and rise the probability to have a proper market for the developed innovative integrated care solution. • Focus on patient-centred view: Patient owns data and may grant permission to other institutions, care givers or family – create an "open note" structure. • If there is no market, companies will not put enough effort into the maintenance of IT systems in the long run. • In addition to planning for the introduction of integrated care, we must also think about implementation planning. This must be prepared at national level with vigorous commitment. The introduction of a paragraph in the Social Code is not enough for this.

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ID	Case 07
Name of the initiative/solution	Healthy Wirral
Country	England
Region	Wirral Peninsula
Responsible organisation	Wirral Community Health and Care NHS Foundation Trust
Contact person	Paul Charnley
Role in the organisation (include years of professional activity in the field)	Digital lead for Cheshire and Merseyside Health and Care Partners which consists of is 22 LHS organisations and 9 local authority councils. Part time work at the Wirral mostly on the topic of digital wide systems for support healthcare.
Website	https://www.wirralccg.nhs.uk/healthy-wirral/ Plans, Publications and Reports - Wirral CCG Wirral Annual Report 19/20 (wirralccg.nhs.uk) CCG Model Constitution (wirralccg.nhs.uk)
Keywords	Place based care, integrated care, Cerner healthy intent platform
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	**Background:** Around 2015/16 the NHS is a countrywide initiative introduced what they call Vanguard communities of different shapes. Almost counter what had been a previous governmental restructuring of the NHS into an internal market which led to organisations competing rather than collaborating. So, the idea of the new care models was to find ways in which communities could be brought together to work across their boundaries, to deliver care rather than each of them. **Problem**: - Not only ageing population but also deprivation and ill health - Major health inequalities - Up to 11 years difference in life expectancy within the region **Aim**: - tackle inequalities; identify those at high risk by using electronic patient data - helping people stay independent and maintain a good quality of life **Overall goal:** - managing population health and patients better **Solution:** - Place based care: classic care + healthcare tailored around communities and local neighbourhood - 9 neighbourhoods have been established across Wirral, each serving a population of between 30.000-50.000 people - Each neighbourhood has a local team made up of GP practices, mental health, social care, community and voluntary services à teams share responsibilities - Introduction of Cerner Healthy Intent Platform **Deployment**: - Solution is well accepted - Frontline staff has been involved in the development

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Target group and care ecosystem involved	- Primary care, hospitals, wider community care (GPs, social care, mental healthcare, community and voluntary services) - Wirral: about 1/3 of a million in a relatively small geographic space, there is all sorts of mix of population, so it is a kind of mini laboratory for the UK in terms of the mix of the population - Project started with the consultation of population to find out what was important for them. - Viewpoint was wellbeing rather than sickness and care. Delivery in hospitals was a clear theme as well as one of the things they wanted to also understand how fragmented we looked and how many times they must tell the story to different individuals. - While there is still a concern about sharing and confidentiality, it is the very small minority of patients that seem to be concerned about that to the point where they opt out of sharing their information but essentially wanting to be reassured that everyone knows who needs to know about their issues about their desires there. - 2% opt out rate from our 300,000 people - The intent was always to be transparent and the solution would cover the whole of the population
Functioning	- Electronic patient record = Wirral Care Record - Taking vital signs & results are instantly accessible throughout the hospital and the community (e.g. GPs, health visitors) - Data gathered by doctors and nurses can be used to pinpoint health trends à making care more preventative - Free flow of information between primary, secondary, and other areas of care - 3-6 months process to bring all the GPSs on merging it with all the other data that we owned (51 general practices) - It is the patient's choice whether their data was shared or not - Healthy intent platform has a whole series of algorithms that are not entirely artificial intelligence, but it is machine learning - Data that you get from individual organisations is not coded the same, is not structured the same, but the way in which the algorithms work to map them across mappings from the different local codes that might be used into a single semantically meaningful code, consistent set of tables. Analytics is a very invisible but important process.
Economic Sustainability	- Aim: improving efficiency and closing the health divide for patients - The Cerner Healthy Intent Platform was the only promising solution at that time, but the owner has a market edge so that the solutions is more expensive. In the meanwhile, there are same product at a competitive price on the market. - But overall, in terms of time saved compared with previous practices where somebody would have to ring up a practice and ask what medications this patient is on and therefore occupying the time of both the hospital person and primary care person. - Although there are costs per person per year for the Cerner solution, estimations show over £1,000,000 worth of savings in

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	terms of clinical time released for other things because personnel are not involved in rather wasteful chasing of data.
SOLUTION EVALUATION	
Actual use and evaluation of the outcomes	- Blueprints regarding the evaluation of the project Healthy Wirral are stored at the GDE Community at the NHS Future Collaboration Platform - Project Healthy Wirral was funded in part by a national program of funding; requirement was to nominate key indicators for evaluation - Overall evaluation report done by Edinburgh University - Benefit reports are also on the blueprint sites - Did study regarding the question "Who did some software evaluation with clinicians at the start?" baselining what stakeholders expected to get from this new solution. - Things change over time; there is no real evaluation but consistent communication regarding the running of the system embedded in the way the organisations work. - After 2-3 years running the solution, it is still too early to assess outcome based in terms of health outcomes. It is very difficult to do that kind of blind trial of its effectiveness versus having it versus not having it. - Since funding finished no further evaluation reports were done but it might be worth doing it again.
Expectations (Description and evaluation of the degree of objective's achievement)	**Objectives of NHS Wirral CCG** - Empower the people of Wirral to improve their physical health, mental health and well being - Reduce health inequalities across the Wirral - Adopt a health and wellbeing approach in the way services are both commissioned and provided - Commission and contract services that can; - Demonstrate improved person centered outcomes - Are high quality and seamless for the patients - Are safe and sustainable - Are evidence based - Demonstrate value for money NHS Wirral Clinical Commissioning Group (CCG) commits to continue to improve health and reduce disease by working with patients, public and partners, tackling health inequalities and helping people to take care of themselves. Every GP practice on Wirral is a member of the Clinical Commissioning Group (CCG).
Further development of the solution	- Standards which were developed in Healthy Wirral will be replicated in Merseyside where seven of the councils use the same IT system as Wirral. - However, even though two councils use the same system, it was discovered that they used different code sets, concepts they workflows and processes.

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	- You would assume it is much simpler than it actually is, but it is a very complicated area which is also linked to a lot of quite complicated financial arrangements. The way organisations use their IT has a lot to do with what they pay for on each council commission. - Services from different civil organisations proving to be a lot more difficult to do across more councils because they are not as similar as hospitals are similar to each other.
RECOMMENDATION	
Lesson Learned	- Social care, non-medical care in people's homes, in care homes and in nursing homes is dealt with by the local councils (none of the chest bodies). The different cultures, the different datasets, the different collection methods, even the citizen identifier approach was stuff that were entirely underestimated and took much longer than expected. - Leaving data behind because it only applies in one place or another. It is possible to interrogate across two sets of data, but not to match all the social care data inside of the health data yet, until we understand it better. For example, the record about falls assessment is different in each of the councils, so that it needs probably over several years, a coming together of the data sets in these assessments is achieved.
Recommendation	- Create a body that creates new standards Due to the partner network, it was possible to set new standards for the next NHS reform - Build a platform with different pillars: 1. Share information of health record of individual patient in real time on a health information exchange platform 2. Platform that supports analytics including population health management 3. Platform is the connection to citizen; try to create an open standard layer which talks back to operational system

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ID	Case 08
Name of the initiative/solution	Patient data management and reporting system
Country	Spain
Region	Mallorca
Responsible organisation	Clinica Humana
Contact person	Karina Ojanguren
Role in the organisation	Director
Website	https://www.clinicahumana.es/
Keywords	Medical home care, Patient management,
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	Clinica Humana is a private health care provider with more than 10 years of experience in supporting patients with chronic conditions at home. It provides long term medical care from a holistic (integrated) perspective. It currently caters for the daily medical needs of over 575 patients on the island of Mallorca. Its team is composed of different health professionals (e.g., nurses (8), GP's (4), physiotherapists (7), psychologist (1), odontologist (1), formal care worker (1). The solution was developed to systematically collect and share patient data among the team members, and, in very occasional cases with other health professionals from outside the organisation. The availability of constantly updated data allows the team members to better define and monitor treatment and patient care. The idea to develop such a system was born within the organisation and was initially outsourced to some ICT consultants and developers who developed it from scratch. Later one of the consultants became a staff member. Clinica Humana is continuously further developing the software, including also automatic patient data collection applications. The objectives of the use of the patient management software are to increase the quality of care by more efficient real time data sharing, thus avoiding communication errors, timely interventions, such as change of medication, hospitalisation. The services of Clinica Humana are activated either by private hospitals or directly by patients and their families, and in most cases paid for by insurance companies or by the patients themselves. The private and the public health care sector are rather separated in Spain with the public health care system refraining from paying for services delivered by private health care providers.
Target group and care ecosystem involved	The target group of the software are the health professionals working for Clinica Humana and their patients, many of them living at home with chronic conditions such as diabetes, heart failure, dementia, etc. and their informal caregivers. Although the Clinica Humana team works independently there are established contacts with private hospitals, medical specialists and social services of the municipalities. These external resources are activated on an "as needs" basis. For example, in case of worsening conditions, surgery, social problems. In the software these external activations are annotated but data are as a rule not shared, only in exceptional cases. Contacts with informal caregivers are frequent and

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	all connected health professionals can provide up dated information about the condition and treatment and care plan of the patients.
Functioning	The solution can be accessed anywhere via password protected, secured SSL internet with a standard browser. Health professionals at Clinica Humana have access to the clinical data. Administration personnel has access to personal data, including invoicing. Insurance companies have access to hospitalisation event data of their clients. A mobile App (ROSA) is being developed to give patients access to their clinical data. Data is usually introduced at the time of the visit. The health professional has specific fields to fill and can upload files & pictures. There is also a section to visualise evolution of numerical clinical data. Any insertion is registered along with the user, date, and time. No GPS data for staff position is monitored. If the visit is related to an acute event and a hospitalisation is prevented with the intervention, this fact is annotated in specific fields. The hospitalisation metric is the feature that gives the highest business value, as it can be directly related to cost savings. Health professionals can also register and assign tasks to one another, which include future visits. This feature is the most useful in terms of daily operations, as it facilitates asynchronous communication remotely. The tasks are prioritised and labelled with pending/finished. Hardware and Software is standard. The coding language of the system is based on PHP and the data is stored in a MySql database. The web interface is coded with HTML, Javascript and CSS. ROSA is a hybrid App interconnected with Dialogflow (chatbot), Firebase (Chat), Vonage (videocall) through json and webhook. 4G or optical fibre is needed for videocall, ADSL or 3G suffice for the rest. The solution has the servers in Spain and data falls under Spanish legislation. Clinica Humana has ISO9001 certificate for several activities, including 'remote management of patients. The main weakness of the solution is its access from rural areas, where internet signal may be poor. In terms of operations, the main bottleneck is the translation of assigned tasks to real presential visits, as this process has to be compatible with availability and geographical zones. Currently, this step is done manually.
Economic Sustainability	The model of delivering medical care to chronic patients at home with the use of technology to manage the care has proven to be economically very viable. The company recently took over another private care providing company, substantially increasing the number of patients but taking over only approximately 50% of the staff. The average saving on staff costs by using technology in the care model compared to those that do not, is estimated by the director in -45%. As the prices of care interventions are negotiated with the insurance companies and are fixed for a longer period, efficiency gains using technology for communication and better and quicker responses to patients, immediately turn into a higher profit margin. The model of the "virtual hospital" also saves money to the insurance companies that have started to look at the model as a cheaper well working alternative to hospitalisation. This has put some pressure on the relationships with the private hospitals that are relying for their income on the insurance companies as well. "We have now more patients in our virtual hospital than 2 private hospitals."

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	The case of Clinica Humana shows that the adoption of technology in care not only changes the ecosystem model of stakeholders involved in care, but also the business model underlying the provision of care. By investing in technology supported quality care Clinica Humana has reached higher outcomes and has become for specific cases a valid alternative to more expensive hospital care. Clinica Humana describes itself as "case managers" in health care, with high levels of expertise on the management of chronic conditions. By knowing the patient and collecting systematically data the team is able to anticipate changing care need and avoid hospitalisation if not needed. After an initial investment in the development of technology, the technology related costs (maintenance, further development, communication, devices, etc.) are now approximately 1% of overall budget. This is a stable percentage.
SOLUTION EVALUATION	
Actual use and evaluation of the outcomes	The solution is informally and on an ad hoc basis evaluated by the patients. Staff has regular meetings during which also the functioning of the solution is discussed. Metrics have been built-in that allow to calculate the time dedicated to the different operational services and thus to compare these, with the use of financial indicators, with costs in case of hospitalisation. This has resulted in data sets that are of interest for the insurance companies that have direct access to the date of the different patients they pay for. Staff members have easily accepted the system and use it without difficulties or needs of training. Technology in this case has been adapted to the organisation and not the other way around. The technology has evolved with the clinic. It was initially tailored to the needs to the clinic but is now evolving with the organisation in a harmonious way.
Expectations (Description and evaluation of the degree of objective's achievement)	The management team of Clinica Humana has believed in the role of technology in making care better and economically viable. "We are still alive as a company because we understand that technology is the key investment." Doubts were related to the reliability of the technology compare to memorising data on paper or in the personal memory of staff, but those doubts have been overcome. Although insurance companies increasingly see the added value of the Humana method, it remains a challenge to convince them fully that the quality of care compare to that delivered in the traditional way is not suffering by the use of technology. "It is difficult to convince them that this is the way to go." Staff, on the other hand, had no difficulties in accepting and using the system.
Further development of the solution	The company's ambition is to turn Clinica Humana in a "virtual hospital", with doctors and nurses in different cities in Spain that care for their patients but that are managed centrally from Mallorca and rely on the Clinica Humana central data processing software. According to Karina the time is ripe and there is a "wind of change". Also, insurance companies are insisting on expanding the Humana method to other regions. Next steps in the development of the technology are the real time monitoring of patients with the use of sensors in the environment. This should allow for the collection of use amounts of data that can be used for

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	predictive models and preventive interventions. This should further increase the efficiency and effectiveness of patient treatment.
RECOMMENDATION	
Lesson Learned	The main lesson learned by the team of Clinica Humana is that technology can allow older citizens with chronic conditions to remain in their home environment and to have better lives, whilst not renouncing to high quality medical care and support. It is important to build that trust relation between patient and healthcare professionals, notwithstanding the use of technology. In other words, technology cannot substitute that relationship, but it can facilitate it and make care more effective and efficient. Nurses from different Universities are trained in Clinca Humana. “The main lesson is that becoming older doesn’t mean that you need to have a bad life”, according to Karina. “Thanks to technology we can multiply our outcomes.”
Recommendation	Adopting technology in care models is the way to go! The medical field is particularly suited for introducing technology in the communication between health care professionals and patients because the roles are well defined and not challenged by the technology uptake. Regarding to transfer of solutions to another context the recommendation is to do that step by step. It is important to have a good overview of the political, cultural and care context, the way care has been delivered so far. What might work in one place might not work well in another. The solution is trying out deployment on a small scale. The learn to assess the factors to consider in that context, such as the patient needs and expectations, the competitors, etc. According to Karina technology transfer is possible, “health is health”, but it is important to understand the contextual differences, to transform and adapt the solution to the different requirements. It is further important to understand the moment, to move on, “you can’t stop this new way of living”, but it is important to have attention for the context readiness.

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ID	Case 09
Name of the initiative/solution	FrailSafe
Country	Cyprus
Region	Nicosia
Responsible organisation	Materia Group: Care, Nursing, Rehabilitation
Contact person	Marina Polycarpou
Role in the organisation	Managing Director (19 years of experience)
Website	https://www.materia.com.cy/eu-projects/frailsafe/
Keywords	Frailty, Materia, Rehabilitation, Frailty scale
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	FrailSafe started in January 2016. It understands frailty and its relation to other health conditions by developing a set of measures and tools, together with recommendations to reduce its onset. To achieve these objectives, FrailSafe combines state of the art information technologies and data mining techniques with high-level expertise in the field of health and aging. FrailSafe's objectives are divided into Medical (MOs) and Technological objectives (TOs). Medical Objectives are related to the identification of quantitative and qualitative measures of frailty and the associated co-morbidities. The MOs of the project are summarised in the following points: 1. Better understand frailty and develop measures to define it 2. Use of measures to predict short and long-term outcome 3. Real-life tools development for assessment support 4. Provision of a model to facilitate the testing of interventions 5. Creation of "prevent-frailty" evidence-based recommendations 6. Ensure safety and acceptability The Project's Technological Objectives are: 1. Design and development of hardware components (ambient and wearable sensors, body node coordinator (e.g., smartphone) 2. Design and development of efficient signal processing algorithms. 3. Development of a self-adaptive virtual patient model offering optimal services for managing frailty. 4. Development of general monitoring and management infrastructure. 5. Development of new methods for offline management, fusion, and multimodal and advanced technological data analysis. 6. Development of real-time data management and data mining methods effectively makes decisions assessing frailty levels, detecting frailty risks, and triggering alarms in emergencies. 7. Investigation of processing time, storage and communication trade-offs for real-time analysis. 8. Development of a dynamically synthesised, personalised and highly innovative Augmented Reality game. 9. Extensive testing of the FrailSafe integrated system in several validation scenarios while ensuring compliance with ethics standards.

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Target group and care ecosystem involved	The solution was under a Horizon project, which began in 2016 and ended in 2019. Universities, University clinics, and IT departments were involved in designing the solution and implementing the project. More specifically, the following organisations took part: University of Patras (Coordinator), Smartex (Italy), Brainstorm Multimedia (Spain), AGE Platform Europe (Belgium), CERTH/ITI (Greece), Materia Group – AgeCare Cyprus Ltd (Cyprus), Gruppo SIGLA SRL (Italy), Hypertech S.A. (Greece), University Hospital of Nancy and INSERM U1116 Nancy (Greece). FrailSafe's final conference took place at the European Institute of Innovation & Technology (EIT) house in Brussels on April 3rd, 2019. It brought together researchers, industry, policymakers, health professionals, and end-users to showcase the results and benefits of the EU-funded project. The primary beneficiaries are older adults, and the secondary are relatives.
Functioning	The older adult's frailty is assessed through this solution. Real-time alerts are activated and provided that the older adult's consent, relatives, carers, and doctors are alerted and may intervene. An emergency call is also activated depending on the case. In addition to these alerts, older adults can further use the solution by engaging with a series of interactive games that address various aspects of potential frailty such as reflexes, posture, balance, orientation, etc. A follow-up measurement of frailty and evaluation is followed to see if there are any changes/ improvements in their frailty status. Frailty assessment and monitoring are done through traditional clinical assessment and devices and technologies, such as Smart Garment; Indoor/outdoor monitoring and localisation; Virtual Augmented Reality /Serious games and formal clinical evaluations. The developed system collects and analyses data from different domains, including physiological, cognitive, behavioural, social, enabling the system to estimate the frailty level of a person. It generates a virtual patient model (VPM) that reflects a person's current health status and suggests personalised frailty preventive interventions. Alongside this process, health care professionals can visualise their patients' health data through the EU FrailSafe Platform and take actions if deemed necessary. Health professionals and older individuals themselves and their authorised family members can view their data through the Platform's dashboard and therefore monitor different parameters of their health.
Economic Sustainability	There is a detailed market plan. The decision is not to present it as a medical device but as a lifestyle assistance solution. The solution will also not be available for sales because, considering all components, it will be too expensive to buy. The solution will be available for rent as it aims to be used for short-term diagnosis and intervention. There is a detailed report on the impact of the solution on the costs of care. For example, a broken hip and hip replacement are that x amount plus any other expenses for the patient and lost work for any informal carers. As a result, the savings from the early diagnosis of imbalance and the improvement through solution's intervention are calculated. The cost has increased mostly because of the staff training. However, it has also increased revenue because more people are interested in using it. Therefore, the solution is profit-centered.
SOLUTION EVALUATION	

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Actual use and evaluation of the outcomes	The solution was evaluated through the pilot phase, whereby healthcare professionals, insurance companies, and ethics experts provided their feedback. During the pilot phase, there was a demonstration of the solution, and all evaluators answered specific questionnaires, which mainly consisted of open questions. Three countries and 20 evaluators from each country participated in the evaluation of the solution. Also, IT experts peer-reviewed the solution. There are also public data, that are available on the project's website.
Expectations (Description and evaluation of the degree of objective's achievement)	Expectations have been met because the solution provides integrated care in the way it was conceptualised. FrailSafe project studies all domains of frailty and creates new measures of assessments leading to a model that can better understand, detect, predict, delay, or even revert frailty. Plans were made to devise a comprehensive clinical assessment, real-life sensing and intervention platform developed, to provide a digital patient model of frailty, sensitive to dynamic parameters. Recommendations provided to delay frailty, and all this through a safe, discreet, acceptable system and cost-effective system.
Further development of the solution	The solution will be scaled up, and it is going to be presented in the market as lifestyle assistance and not as a medical device.
RECOMMENDATIONS	
Lesson Learned	Cocreation with the end-users is the primary learning lesson from this project, and it has worked well. There was a close collaboration with the developers, and staff now are appreciating technology much more as they see how tech solutions can provide integrated care, prevention, and at the same time intervention. Technology can allow for monitoring conditions over time, revealing early symptoms of frailty. The result is beneficial for detecting patterns and associations between clinical indicators and frailty states and in the analysis of multidimensional time series towards revealing associations between signals and symptoms connected to the frailty syndrome.
Recommendation	N.r.

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ID	Case 10
Name of the initiative/solution	VideoVisit® HOME is a remote home care video service targeted specially to home care and rehabilitation
Country	Finland
Region	Helsinki-Uusimaa
Responsible organisation	City of Espoo, Social and health care, Services for Elderly
Contact person	Mika Fiskari
Role in the organisation	Medical Engineering Specialist 7 Years of professional activity in the field: 7 years Project manager during launching
Website	https://www.videovisitglobal.com/videovisit-home/ https://www.espoo.fi/en-US/Elderly
Keywords	on-line video, remote home care service, remote therapy, family members
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	The City of Espoo is the second biggest municipality in Finland. Municipalities in Finland are responsible for providing their residents statutory basic services including a) health care, such as basic health care and specialised medical care and b) social welfare, such as child welfare, care of the elderly and services for people with disabilities. Demand for senior home care increases all the time due to ageing of the population. The City of Espoo has decided to emphasise Home Care instead of Supported or Service housing in order to cut rising costs. The need for virtual care services emerged from Espoo's home care department where a limited amount of home care service resources could not meet the need of the growing number of home care clients. The main emphasis is on resource optimisation in a scenario in which demand for home care services increases all the time without the possibility to add staff. Home care services are provided based on an assessment of the need for the service, and the person must meet the criteria for Home Care customership. There are over 2500 customers that use home care provided by the City of Espoo. In remote care there are about 170 customers and the plan is to increase the number by 20/month. Remote care provides 10% of weekly services provided by Espoo home care. During the pandemic, many customers have wanted to shift from actual visits by care providers to remote care. Remote home care using VideoVisit Home was introduced to Home Care services in 2018. The VideoVisit® Home platform allows remote caregivers to provide face-to-face support and companionship to the clients in their independent living at home. With VideoVisit® Home clients can receive healthcare services via video. **VideoVisit enables:** • Remote home care visits • Personal tele-rehabilitation • Group-based tele-rehabilitation • Social support remotely • Automatic reminders

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	• Communication with family members and group sessions up to 8 customers Timeline: In late 2016 the Espoo social and health care management team decided to acquire and deploy Municipal procurement for VideoVisit. The contract was signed in 2017. The same year the experimentation and pilot started. In 2018 the 1st customers started to use the system. Purchasing was done through a company that is owned by multiple municipalities, not directly by City of Espoo. The decision to pick-up this specific solution for an already understood need was based on experiences of other municipalities (incl. Helsinki) that already used VideoVisit.
Target group and care ecosystem involved	The main beneficiaries are older people living at home with Home Care services provided by Espoo. Others involved are: -Remote home care centralised unit in Espoo -Espoo City Home Care (all 5 regional Espoo home care districts) -Remote home therapy (some customers remote most at the premises) -Espoo municipal hospitals providing services for elderly: a) geriatric policlinic and therapy services (e.g., speech therapy), b) transition to home service from hospital. -Informal caregivers (e.g., family members, friends – up to 5 can be given the right to call using VideoVisit). -Social workers (managers of care plans). Home rehabilitation: • All new customers have a rehabilitation service plan based on integrated care and with or without home care. • Goals and methods are agreed. What are goals for any given service? • A number of reliable indicators describing functional capacity and the need for care are used to help assess the need for services. The key metric is the Resident Assessment Instrument, RAI, which provides information on the customer's physical, mental, cognitive and social functioning, as well as coping with daily tasks in his or her own living environment. • Lightest services are preferred in the first place, including remote services. • With home care services there is continuous assessment during home visits and through remote visits. • Moreover, every 6 months the customer's care and service plan is updated based on RAI estimate.

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Functioning	Technical description: • Customer living at home receives a tablet with 4G-connection and VideoVisit® HOME license. • The tablet is on constant 24/7 monitoring, which allows fast reaction to possible technical issues. Also, automatic software updates can be done remotely. • Service is provided from work computer connection (chrome / ie.). • Relatives can be in touch using an application (android / ios based) • There is secured data connection. • There is an enforced connection so customer cannot switch it off. • Home care can open video connection without customer's action (Consent provided in advance) for security reasons in order to check customer's condition. Top Virtual Care call categories are: • Taking medicine under observation • Reminder to take a medicine • Reminder for dining time • Following dining • Drug supervision • Confirming medicine taken • Wellbeing check • Daily support • Psyche follow-up • Hygiene • Therapy sessions • Connection with family members No alarm based on data, if there is no connection to the device or to the customer then there is check by visit. No data collected from connection on customers.
Economic Sustainability	City of Espoo pays for the system cost. Customers pay the normal price for home care based on service time. Savings for the city are bigger than the overall costs. A different unit within the City Administration collects the payments so it is difficult to make exact calculations. Cost efficiency compared to normal home care visit 50% per visit. Hourly price level is not different but there are more visits / hour compared to normal home care. Main target originally from Espoo's point of view was that remote visit is 50% cheaper than actual physical visit by nurse. This target has been achieved but during introduction phase, economic benefits are not that clear and therefore management must foresee enough resources for introduction of the technology and understanding of the long-term benefits. Personnel cost is the biggest by far also in remote care compared to technological expenses. (The solution provider informs that in other cases virtual care has proven to be up to 85% more cost efficient than traditional physical home care and that there are over 60 virtual visits per nurse in one work shift).
SOLUTION EVALUATION	

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Actual use and evaluation of the outcomes	In the beginning, there were resources for introduction and meeting (new) customers but in a later phase less, so that slowed down the expanding of the customer base. When the number of customers increases new devices are needed – which takes time. Management understands that during the introduction phase the cost benefit is not obvious as the experience is too small scale (not enough customers). – but it is not easy to point out that with more personnel introduction would be speedier and it would increase number of customers faster. Solution supports integrated care and enables more cooperation between various service providers within the municipality. Group sessions max 8 people has been felt really useful by seniors. Video connection as such is not innovative but rather simple technology.
Expectations (Description and evaluation of the degree of objective's achievement)	The need for virtual care from city of Espoo's home care department was clear. Ever growing number of clients and limited amount of home care resources available made remote home care use of VideoVisit very interesting. There was a need to provide more time and attention to those home care clients whose condition demanded more care. From customers' point of view the most recognised needs were: having same nurse for every visit (easier with remote care), more flexible visiting times, more sense of privacy for those people who don't feel at ease when a new person visits you at your home.
Further development of the solution	The use solution will be scaled up in Espoo. Also, wider use outside Home Care services is promoted. More focus will be shifted on virtual rehabilitation. Client base will shift from mostly elderly clients towards clients from all age groups and backgrounds. Coordination between different service providers is being developed (remote home care and remote rehabilitation). The goal is that 94 per cent of Espoo residents over the age of 75 will live at their own home so in order to stay sustainable remote care is promoted. Home care visits growth was very strong in 2019 (+ 16%). For the coming years in order to curb growth, some targeted measures - such as virtual care and increasing the proportion of client working time of the workday - will help to manage the growth. Plan is to include serviced offered by the third sector so there would more use of the solution. There are possibilities to include other solutions to this to follow customer's condition (sensors, other gadgets – but before that there is a need to have same operational system/platform in order not to have too many platforms – this would be difficult from a service provider's point of view.
RECOMMENDATIONS	
Lesson Learned	Better involvement of stakeholders in your organisation including management and different departments and municipality service districts when introducing solution. Taking more time and more discussion with stakeholders when "selling" the solution. VideoVisit as such is just a technological enabler as a solution. - important is to create processes

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	There was a recognised need to have a technical solution like this in order to provide remote care, but it does not need to be exactly this solution though. Biggest obstacle for scaling up is quality of 4G networks. (Still) Much fewer temporary staff is needed when using remote home care solution.
Recommendations	Longer introduction period. Have a mandate as high as possible in your organisation when purchasing new solution. Having clear goals so it makes easier to operate if there are quantitative goals that is very useful. Check where elsewhere solution has been used in order to have information on what is possible so you can set realistic goals. Prioritise personnel who is interested in new technology when applying solution.

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ID	Case 11
Name of the initiative/solution	SNS+PROXIMIDADE | +PROXIMIDADE@ULSM | HS.REGISTER
Country	Portugal
Region	North Region / Metropolitan Area of Porto Municipalities of Matosinhos, Vila do Conde and Póvoa do Varzim
Responsible organisation	Administration Council, Supervisory Board and Statutory Auditor
Contact person	Administration Council of ULSM **President**: Prof. Doutor António Taveira Gomes | **Clinical Director**: Dra. Ana Veloso | **Nurse Director**: Dr. Renato Barros | **Members**: Dr. Carlos Mouta; Dra. Catarina Diogo; Dra. Beatriz Duarte | **Director of Neurology Service**: Dr. Vitor Tendim Cruz.
Role in the organisation	Administration Council of ULSM (2017 – 2020) Resolution of the Council of Minister N.º 106/2017 - 6 July 2017 Resolution of the Council of Minister N.º 23/2019 - 17 January 2019
Website	http://www.ulsm.min-saude.pt
Keywords	Healthcare at-home; Telemedicine; Data analysis and connection.
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	ULSM is a first Portuguese health organisation that adopted a model of Local Unit for Health (translation of ULS). Under this organic and clinic model, the Mission of ULSM is to identify health needs from targeted population, to provide a global, integrated and personalised healthcare for all ages and life course, in time, and to create a strong connection between professionals and patients. According to its Administration Council, nowadays, ULSM's Mission is, more and more, empowering (deploying) by eHealth solutions already available, especially those that will make easy the relationship between patient and healthcare systems and professionals, integrate all clinical data and make possible data internalisation (all information is available in all moments, in all places, for all patients). Under this integrated care model, two solutions are being adopted by ULSM for approaching patients with several chronic diseases and healthcare delivery: "SNS+PROXIMIDADE" and "+PROXIMIDADE@ULSM". These solutions are providing healthcare in-home through remote monitoring and medical appointments (follow-ups), and presential visits by nurses. While "SNS+PROXIMIDADE" is under a National Strategy for Modernisation of National Health System (titled "People-centred Changing") and one of their actions is to provide in-home healthcare by a multidisciplinary teams, "+PROXIMIDADE@ULSM" is an innovation project funded by European and Portuguese funds (FEDER; Portugal 2020) that promotes information systems and technologies for enhancing monitoring and provision of care to chronic patients, with new security mechanisms regarding health data and professionals' access. The "HS. REGISTER" is a single data repository (IHE-ATNA - Audit Trail and Node Authentication) that allows registering and auditing complex events from different sources of information (HL7, SysLog, Log4J). Through this solution, ULSM will have a better performance regarding to legal obligations aligned with the GDPR and best security practices; problems' tracking and analysis; processes' centralisation, standardisation and audit; traceability of data integrity; data manipulation (e.g., statistical scanning of site traffic);

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	and management and business indicators (feeds BI systems in Real-time). This project is, now, being implemented by a consortium composed by a start-up, "HealthSystem", and University of Porto, which is being funded by European and Portuguese funds (FEDER; Portugal 2020).
Target group and care ecosystem involved	ULSM is composed by three levels of healthcare delivery: • Primary Care Units: Familiar Health Units (11 units); Personalised Healthcare Units (3 units); Community Healthcare Units (4 units). • Hospital Healthcare (1 unit). • Continuous and Integrated Healthcare (2 units). • Other healthcare services: Public Healthcare Unit (1 unit); Urgent Situations Consultation (1 unit); Pneumology Diagnostic Centre (1 unit); Clinical Trials Centre (1 unit); Ambulatory Services; Urgency Services; and Medical Specialisations. Together, these organisations have a targeted population of around 320.000 persons, from three municipalities of Portuguese North Region (Matosinhos, Vila do Conde and Póvoa do Varzim). According to the National Institute of Statistic, from 2011 to 2019, this territory has decreased its population (around 1000 persons), and, at the same time, the ageing process has advanced (from 49.650 to 64.856 older individuals). Between 2018 and 2019, the ULSM's patients had been increased 1,2% (around 180.000 patients, and 98,4% has familiar doctor), by following trends: decrease Maternity Healthcare (-5,4%), Familiar Planning Consultation (-4,7%), and Medical Specialisations Appointments (-5,5%); in contrast, increase Adult Healthcare (+1,8%), Childhood Healthcare (+3,2%) and Medical Appointments in-home (+4%). By the way, the eHealth solutions under analysis should support all patients, but with an especial focus on patients with multimorbidity and more than one chronic disease, often older individuals (more than 65 years old).
Functioning	"SNS+PROXIMIDADE" is being deployed through following integrated actions: i) Diagnosis the urgency services for understanding who the targeted population are and what are their needs and interests, and why they do not use the primary care first; ii) Re-organise urgency services and their teams; iii) Connecting ULSM with Social Sector (e.g. nursing homes) and pharmacies for improve accessibility to healthcare delivery; iv) Implementing an Individual Care Plan for patients who have several healthcare needs (including a pharmacologic plan), a Telemedicine and Remote Monitoring , in-home medical visits; v) Call Centre for a Social Sector; vi) Dissemination activities for improve the health literacy; vii) and Training for professionals. The project "+PROXIMIDADE@ULSM" aims to improve the healthcare delivery in-home for patients with chronic diseases (provided by "SNS+PROXIMIDADE"), by three innovative actions: i) re-engineering Data Centre for improving quality and feasibility of information available about patients and healthcare delivery; ii) implementing remote monitoring measures for bringing forward needs from patients with chronic diseases; and iii) enhancing security measures at digital and technological platforms, according Data Protection, Legal and Ethical regulations. This project is now deploying by a consortium composed by, on the one hand, ULSM that provides a concept, a model, a platform and a dashboard, and on the other hand, by National Health System that provides a technological device. The "HS.REGISTER" is a Single Data Repository for auditing and traceability of information, by an aggregation of heterogeneous events (logs) from

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	multiple sources, such as, for example, Information Systems, Network Systems and Infrastructures, among others. Its implementation makes possible to manage the main events, permanently (e.g., surgeries' plan, resources, and flow; urgency's flow; pharmacy's reception, storing, picking, restore; logistic as whole), under a strong security system that launches alarms if private information (from patients) is accessed.
Economic Sustainability	ULSM has no specific information about impact of those solutions for economic sustainability. Instead, ULSM Administration Council shared its own Sustainability Report and underlined the three Strategic Axes for deploying eHealth solutions at ULSM: i) to increase autonomy at ICT services for deploying eHealth solutions that improve healthcare delivery; ii) to ensure that all eHealth solutions will really work for improving the quality of the healthcare delivery, which means it's mandatory eHealth solutions allow a highest quality of services and delivery; iii) to provide permanent technical support and training for all professionals, in order to allow the real impact / rentability of eHealth solutions. This Report explain how "SNS+PROXIMIDADE" (and "+PROXIMIDADE@ULSM") is economic sustainable: the project promotes, on the one hand, the integration of healthcare pathway which has success for on-time response and better results; on the other hand, the active participation of patients in their own healthcare. Moreover, the economic sustainability is also dependent from European Funds, Private and Public Sponsors and Consortiums for innovation in healthcare.
SOLUTION EVALUATION	
Actual use and evaluation of the outcomes	• Deploying Global Telemonitoring Program (large-scale telemonitoring for patients, especially whom with chronic diseases). • Designing a remote monitoring system person-based (not disease-based): the user is part of the healthcare delivery and organisation. • Improving connectivity between all levels of healthcare (primary care, hospitalisations, diagnosis): anytime, any professional will be able to access information about the patient and at different levels of healthcare (where he is circulating within the system, but also in-home). • Avoiding hospitalisations and other unnecessary healthcare consumption (e.g., drugs, tests, appointments, prescriptions, etc.). • Reducing healthcare fragmentation, repetition, and waste. • Improving efficiency, effectivity, feasibility of all healthcare delivery. • Anticipating healthcare delivery. • Increasing patients' guidance, orientation, and health literacy. • Implementing systems based on Big Data technologies that allows generate and analyse a large and different amount of data (e.g., clinical, social, administrative). • Implementing tools that allows an in-depth study of the patient's clinical process, based on a large-scale database that allows a retrospective analysis of clinical processes of users in all levels of healthcare system (10 years). • Piloting a comprehensive and longitudinal approach of monitoring patients and healthcare, for understanding of future challenges and issues.

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	These outcomes are being evaluated by two ways. First, by tools that are used to evaluate ULSM as a whole (Accountability, Sustainability, Governance, External / Internal Audits, Patients or Clients' inquiries, others). Each tool generates reports that are available on ULSM website to public consultation. In this regard, ULSM is certified by ISO 9001: 2015, having even been the first health institution to be certified according to this standard. Second, by mandatory indicators from financing funds (FEDER; Portugal 2020) or sponsors. Regarding the last way, often the indicators are regarding the effective solutions' implementation and the number of patients beneficiated.
Expectations (Description and evaluation of the degree of objective's achievement)	For the ULSM Administration Council, these solutions should work to improve efficiency, efficacy, security, and data protection of the USLM integrated care services, namely registration, diagnosis, monitoring, clinic evaluation and anticipate. The key-expectation is to achieve a model better prepared to deliver healthcare until the end and starting from the beginning, adopted a personalised and tailored approaches, especially for older individuals who are the biggest 'consumers' of healthcare systems. Moreover, they approach healthcare and patients, without repetitions and fragmentation. The pathway should start on primary care – which, often, is enough to solve problems – and, if it is necessary, goes further to medical specialisations, hospitalisations or others. This care pathway has no repetitions, fragmentations, waste of time, etc. Especially regarding those solutions, while "SNS+PROXIMIDADE" is already an approach and set of actions adopted by ULSM from 2017/2018 and it is being improved by a digital and technical transformation, the other solutions are being piloted yet.
Further development of the solution	ULSM has as Vision "To be a model for other ULS" in Portugal. Thereby, the further development is always to pilot innovation before other ULS and to create recommendations for them. Moreover, the implementation of these solutions aims to create the conditions for "Further development of" integrated care model from ULSM. In other words, the informatisation and digitalisation of data and information, on the one hand, and the patients' and professionals' socialisation with digital and technical devices and solution, on the other hand, are crucial steps to further develop a complete digital and technological healthcare delivery and system, based on a model of integrated care person-centred, and efficiency, effective, sustainable, and humanised.
RECOMMENDATION	
Lesson Learned	• To enhance patients' access to clinical data with security and comfort. • To increase patients' participation on own healthcare. • To increase the patient's trust on healthcare and their professionals. • To support healthcare professionals with feasibility data. • To improve the professionals' knowledge about patients. • To priorate healthcare decisions with feasibility and integrity. • To reduce fragmentations and repetitions, and their human and financial costs. • To have permanent data from patients (and not only accumulated knowledge or professional experience). • To improve the knowledge about diseases and their processes and life cycles in population.

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	• To promote patients' dignity and individual care plans. • To provide healthcare delivery fit to patients' health status and not only patient's perceptions. • To approach healthcare delivery to patients' social conditions. • To allow short cycles of healthcare delivery. • To know patient's social conditions that can or cannot improve the healthcare delivery in-home. • To replace healthcare delivery from Central Organisation (Central Hospital) to local healthcare units.
Recommendation	• Promote health for local citizens, and not only to care the illness or the patient. • Adopt an individual care plan monitored by eHealth solutions. • Full integration between all levels of healthcare system (Hospital; Primary Care; Diagnosis), especially in areas of great complexity (e.g., ageing). • Vertical integration, daily and permanently. • Define a local Healthcare Letter" to know the health of the population, the most prevalent diseases and risks, planning more efficiently the intervention of the various levels care. • Connect healthcare and Smart Cities. • Connect healthcare, happiness and well-being. • Connect healthcare, resilience, societies and cultures, art and spirituality.

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ID	Case 12
Name of the initiative/solution	LOCS
Country	Spain
Region	València
Responsible organisation	Las Naves (Innovation Centre of València City Hall)
Contact person	Elena Rocher
Role in the organisation	Health Program Officer 5 years in the Health sector, 8 years in innovation.
Website	https://www.lasnaves.com, https://activagevalencia.eu
Keywords	Independent living of the elderly. 24/7 unobtrusive daily activity monitoring, active healthy ageing, AHA
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	Las Naves is a public entity with 37 employees belonging to the City Hall of València, which promotes innovation for an urban society under the framework of Missions València 2030 (https://www.missionsvalencia.eu/social-urban-innovation/) and focusing on the quality of life of their people. Their projects fall within the following "agreed city models": Healthy City, Shared City, Entrepreneur City and Sustainable City. They are involved in 55 projects. Regarding Health, the areas of importance are: health equity among districts in all stages of life, longevity and active ageing, increase healthy habits and decrease of child obesity. They are currently involved in 4 health, European projects. Las Naves participated in the European project **Activage** (www.activageproject.eu, grant agreement No 732679), with the main objective of carrying out large-scale, real-life deployments of tools that give *peace of mind* and, consequently, improves quality of life, to the members of the social unit composed of the older person and the functional caregiver. **Goal**: "To create a balance between the needs of the informal caregivers and the level of autonomy of older people by providing information about older daily activity both inside and outside home". **Means/Technology**: indoor and outdoor daily activity monitoring of older people. Many older people usually have chronic conditions, reduced mobility and early-stage dementia and live or stay alone for long times. In most cases there are functional caregivers (usually a family member) who live with or visit them regularly. The chances of incidents, such as falls or disease decompensations, make the caregivers feel unease while they are not with their older person. In addition, older people usually like their independence, and do not like or 'feel bad' worrying their caregivers. *Older people usually say "my son/daughter is working all day and don't have time; I don't want to be a burden to them".* Technologies in the market to monitor daily activity 1) are not flexible enough to adapt to the older person/caregiver needs (e.g. they don't allow the caregiver to define alerts that adapt to the lifestyle of the older person), 2) they lack outdoor capabilities, 3) they have data transparency concerns and, furthermore, 4) they present some technical issues such as the need of Wi-Fi connection or interoperability barriers. Within Activage, Las Naves deployed the solution LOCS (a 24/7 indoor and outdoor monitoring system) in real-life settings, starting in January 2018.

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	The solution derives from a previous pilot undertaken in 2015-2016 by MYSPHERA (technology provider of LOCS) and Iniciativa Social Integral (care service provider of LOCS) with 20 installations involving sensors (presence and door) and mobile apps for visualisation of collected data. LOCS indoor variant has been deployed in 545 homes, comprising 547 older people (who spent >4h alone) and 1071 informal caregivers; outdoor variant has been deployed in 123 older people and 221 informal caregivers. The technical deployment of LOCS included 545 gateways, 2725 room (presence, door, humidity and temperature) and door sensors, 109 smartphones and 1295 user interface devices. The deployment was conceived as a large-scale, real-life setting pilot to validate LOCS before commercialisation, both in terms of social effectivity and business model. The pilot officially ended at the end of June, but the service was extended 3 months in full mode and later until the end of 2020 but only taking care of technical incidences (in-kind contribution of MYSPHERA).
Target group and care ecosystem involved	The main target group of the solution are the older people and their informal caregivers in the cases where the older person stays along for long times (defined as >4h a day). The current socio-demographic profiles of users are: · Older people: 86-years old on average, 88.4% female and 80% with primary education. · Caregivers: 56-years old on average, 57.6% female and 27.5% with higher education. Although not used in the pilot, the solution also provides an interface for the service providers to 1) allow management of users; 2) control of the hardware infrastructure (battery level, proper functioning of sensors and alerts); 3) monitor the collected activity data; and 4) manage the alert system. This interface was developed together with 3 care service providers (Atenzia, Gesmed and Iniciativa Social Integral) to match their future needs in organising interventions of health professionals or social workers. During the pilot, other actors were involved in an indirect manner on particular cases. For example, from humidity and temperature sensors, older people with clear evidence of suffering from 'energy poverty' were derived to the social services of the city.

Functioning	*Indoor setting*
	The collection of data in LOCS is done totally unobtrusively in the indoor setting. Data capture is done by the following sensor devices provided by MYSPHERA:
	• Room sensors that:
	  ○ detect presence;
	  ○ measure humidity;
	  ○ and measure temperature.
	• Door sensors that register opening and closing events.
	At home, data is transferred to a cloud infrastructure (FIWARE, https://www.fiware.org) through a tablet which acts as gateway (SIM card). Connection between the sensors and the tablet (Android) is established with Bluetooth. All devices and necessary hardware and software infrastructure is provided by MYSPHERA.
	Outdoor setting

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	In the outdoor setting, a GPS tracker (MYSPHERA) is installed in the smartphone (Android, iOS) of older people. This is the only device in the solution which is not fully unobtrusive to the older people, as they need to remember to bring the phone with them. The GPS tracker uses the smartphone as gateway. The solution does not include the smartphone. *Other function in the pilot scenario* Although not formally integrated within LOCS, the service was expanded in the pilot with a fall detector (Samsung, deployed only in 7 participants) and cognitive games (FÍLOS, SIGLA group, www.grupposigla.it) installed in the tablet. The informal caregiver interacts with the solution through and application (app) which runs on smartphones and tablets (Android). They can visualise data on the daily activity of their older relatives 24/7 collected by the sensors and set up alerts. The definition of alerts is very flexible and fully configurable by the caregiver (for example, time in rooms, activity of doors, visit of social places like the supermarket and perimetral distance from home). There is an interface for the service provider with a dashboard to visualise data, an alert system manager and indicators about the functioning of the devices (battery and proper functioning). During the pilot, service providers only made use of the last option.
Economic Sustainability	The solution is not already in the market. However, several business models have been designed using pilot outcomes. Their prices are based on three factors: 1. Renting of the monitoring kit (indoor -4 room sensors, 1 door sensor-, 1 tablet and 1 SIM card; outdoor -GPS tracker-; or both) and the fee for the use of the cloud infrastructure (SaaS). 2. Fragility of the older person. 3. Level of the social intervention needs based on the availability of the informal caregiver. In cases where there is no informal caregiver, the client is expected to be the public social services. 4. Other factors may influence the cost and price, such as the need of more devices (e.g. pet detection or more room sensors). The commercial deployment of the solution can be executed with or without a care service provider. However, the former offers a higher-added-value, and even more if the provider belongs to the health sector. This option is the one recommended and the commercialisation of which will start soon (January 2021). Detected highest economic barrier is the cost of the equipment. Under a renting model, indoor package is estimated to be at 299 Euros, plus 5 Euros for installation (considering technician as a permanent staff of the service provider). In the pilot, surveys revealed that 60% of participants (informal caregivers) would pay for the service. The higher the fragility of the older person, the higher the will to contract the service.
SOLUTION EVALUATION	
Actual use and evaluation of the outcomes	The real-life pilot was evaluated with several quantitative and qualitative metrics addressed to both older people and caregivers. 3738 quantitative questionnaires at baseline and end of pilot were carried out to evaluate: • global self-perception + local questionnaires (824 elderly + 1191 carers); • EQ -5D (586);

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	• Carer QoL 7D (750); • and UTAUT (387). In addition, follow-up phone calls were made every 4 months to evaluate the usefulness of the solution.
Expectations (Description and evaluation of the degree of objective's achievement)	The outcomes from questionnaires regarding the usefulness of the solutions: 1. Rated the solution with 4.7/5 in usefulness. Caregivers in around 300 of the homes were using the app several times a week (5-6 times a week on average). 2. Regarding the provision of useful information, 92% of the caregivers rated the solution between 8 to 10 (out of 10). 3. 60% of the caregivers would pay for it (particularly those with the more fragile older people), and only 17.4% of them not desiring paying for the service. An example, although tragic, of the usefulness of the solution is the episode of a caregiver detecting inactivity of its older relative and finding out his/her death afterwards. Analysis of the outcomes identified the key aspects for acceptance as: 1. The generation of useful information for caregivers. 2. The elude of digital divide of older people (older people are passive users of the technology). 3. An easy-to-use app. The impact on caregivers was determined as: 1. A higher perceived QoL (7.55/10). 2. Reduction of care costs and time allocated to care tasks (11.11% spent less time in care in the homes of the elderly). 3. A more controlled level of concern for older relatives even in Covid-19 times. In general, reached conclusions stated a higher level of autonomy of older people in their own environments, high levels of satisfaction by all users (8.77/10), willing to pay by caregivers and, interestingly, a higher level of use of the technology by women (around 75% of all uses) in spite of apparent gender balance during the pilot.
Further development of the solution	After the end of the pilot (end of 2020 with the extension), and because of the positive outcomes, commercialisation is the next step. In addition to the business-to-customer commercialisation plans by the care service providers involved in the piloting (Atenzia, Gesmed and Iniciativa Social Integral, to start commercialisation in the private sector in January 2021), first steps have been taken for a public procurement in 2021 of innovative technologies in AHA by the city social services. The potential beneficiaries of the solution will be people in the current waiting list for teleassistance, although there is a process ongoing to define the target population properly. The process is currently allocating funds for the pre-consultation and tender process (funding applied to the Valencian Innovation Agency, AVI).
RECOMMENDATIONS	
Lesson Learned	Several lessons were learned during deployment in the real-life pilot. • The main one is that older people/caregivers are willing to use this type of technologies. They are in real need of more *peace of mind* in their daily co-living. • Another important lesson learned is the relevance of optimising the installation process, including the red tape. In LOCS pilot, it had to be optimised as the initial times prevented full deployment. An

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	important aspect was training the technicians, including how to interact with the older person (who usually feel alone and take the change to establish long conversation).
	• Changes in providers can lead to readjustments of process. As an example, the change of battery providers reduced their life from 1 year to 9 months.
	• The involvement of older people in this type of digital technologies raises their e-literacy. When smartphones were given to older people without this type of devices (also tablets for those using cognitive games), they ended up using apps external to LOCS, such as WhatsApp.
	• In the beginning, the deployment tried to involve health professionals and several barriers that prevented their incorporation were found:
	  ○ Authorisations and interoperability could be considered technical issues with a relatively easy solution.
	  ○ Incorporation of data into their electronic health record and the use of this data without an official approval of the potential triggered interventions were higher barriers.
	• Service providers were mostly interested in selling the commercial service to the public social services. There was much discussion to push them to create added-value in business-to-costumer services.
	• The cost of the equipment is still considered a barrier for a commercial implementation. How it is implemented in the business model (for example, renting) is still and open discussion.
	• LOCS allows easy interoperability with external modules. However, caution has to be considered when incorporating new external components. The real stage of development and validation, together with provided added value to end users, have to be carefully analysed before integration. In the pilot, an open call was articulated to incorporate cognitive games and a module for physical exercises. In addition, a fall detector used in another pilot of the Activage project was also incorporated. While the cognitive games and the fall detector were successfully integrated, the physical exercise module turn out to be a technology in a very early stage of development.
	It's worth noting here that the deployment of the indoor solution was more successful than the outdoor one due to the profile of participants. Most older people in the pilot barely went out.

Recommendations	One important recommendation is that in large-scale deployments, physical installation of the solution has to be well designed. It is recommended that paper work (such as contract and consent signatures) is collected separate to the installation (as different technical profiles are needed) . Furthermore, every staff member should be trained in dealing with older people, including the fact that their function is not providing them with company. Regarding the business model for service including social assistance, a public-private co-payment model seems to match very well the commercial deployment. Due to the cost of the equipment, the older person/caregiver could pay the rent of the equipment while the public

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	system would take care of the cost for the social services. However, currently, in Spain, co-payment models are not well accepted. Finally, it is also recommended that technologies consider the fact that there may be situations when the person will be without presential assistance for a long period of time. For example, this is happening now with COVID-19-related confinements.

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ID	Case 13
Name of the initiative/solution	Post-Stroke Care Platform
Country	Estonia
Region	North Estonia
Responsible organisation	North Estonia Medical Centre (NEMC)
Contact person	Triin Naudi
Role in the organisation	Project Manager for Integrated Post-Stroke Treatment Pathway
Website	https://www.regionaalhaigla.ee/en
Keywords	Stroke, Integrated Care Pathways, Hospital, Health care, Social care, Government, Electronic Health Record
DESCRIPTION OF THE SOLUTION	
Background, objectives and deployment	The idea to test the post-stroke platform came from the nation-wide Estonian Health Insurance Fund (EHIF, Eesti Haigekassa) as part of the Stroke Patient Pathway Pilot. The main task of EHIF is to organise national health insurance to provide citisens with access to necessary healthcare services, medicines, medical equipment, and cash benefits. Every year, approximately 4000 to 5000 people suffer from stroke in Estonia. However, once discharged from the stroke unit, many patients lack information and support, as well as guidance while their health and social needs are multiple. In order to tackle these issues, the EHIF gave four Estonian hospitals some funding to pilot various solutions and find the best method to overcome these barriers. One of these four hospitals was the NEMC whose idea was to create an online platform to better support post-stroke patents in their pathway out of the hospital and back to their communities and homes. The hypothesis was that by supporting the information sharing between all professionals involved, these patients could recover better and therefore reduce the health and social care burden in the long run. Especially since stroke patients tend to have a high expected burden and long-term impact on costs for care. In case of success, the EHIF would take the necessary steps to integrate a similar functionality/platform into the existing nation-wide health information system. The NEMC is a leading medical innovation hub with staff having the right mindset for innovation and permanently looking at ways to improve healthcare and the patients' quality of life. Where this mindset traditionally has focussed on medical procedures and intervention techniques, in recent years there is increasing attention for integrated care solutions. In other words, the motivation to pilot innovative solutions was already there but lacked the necessary funding. A barrier that was overcome when the EHIF announced the additional funding round through the Stroke Patient Pathway Pilot. The Post-Stroke Care Platform was built on a commercial software for sales management of the Estonian multinational company Pipedrive whose software was adapted to the needs of the care professionals. This adaption was informed by the project team and the requirements of the health care professionals of the hospital. Also, training was developed and delivered to the professionals involved. In 2020 piloting started involving real patients and their care professionals.

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	The project is not to be considered a standalone experience, but rather a further step in the journey into digitalisation of health care in the NEMC and Estonia in general.
Target group and care ecosystem involved	The main user groups are health and social care professionals, in particular the NEMC nurses, health professionals in regional hospitals and local health care centres, municipality social workers, and the patients' general practitioners (GP's). Different access levels are defined, depending on the patient's location in the care pathway. Family member and the patients themselves are currently unable to access the platform as this would require building an additional interface separate from the professionals view. However, giving them access will most likely be part of the nation-wide platform, if the pilot proves successful.
Functioning	Post-Stroke Care Platform brings together the patient's stroke nurse and the GP, a social worker from the local municipality, and people from the patient's regional hospital in order to (1) facilitate the exchange of data between different parties along the treatment pathway and (2) ensure the smooth transition from the acute care center (NEMC) back to that patient's day-to-day environment. The platform presents the patient journey in different phases or steps based on a timeline and distinguishes between different locations: Acute Care, Rehabilitation, Regional Hospitals, Home, Care Home and "Elsewhere". As soon as a heath care professional logs into the system, he/she can immediately see where the patient is located. When clicking on the name of the patient, all the information about the person and his or her condition becomes available. The different professionals involved communicate with each other by planning "tasks" and activities that involve others, such as the stroke nurse planning a visit with the GP. Once done, the task is included in the patient record which thus becomes a sort of an archive holding all relevant documentation and steps concerning the patient journey. At this stage, the stroke nurse, the GP and other relevant professionals have access to this data. Ideally also the family members, but that would require an additional interface, more training to make sure they know how to use the software, how to correctly interpret the data and not make wrong use of the system by increasing unnecessarily the workload of the professionals involved. "The goal behind the platform is to try to enable the integrated system to work, to provide that integrated care framework to the patients, even if they do not see it, but they feel that they have a support network that actually communicates with each other."

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	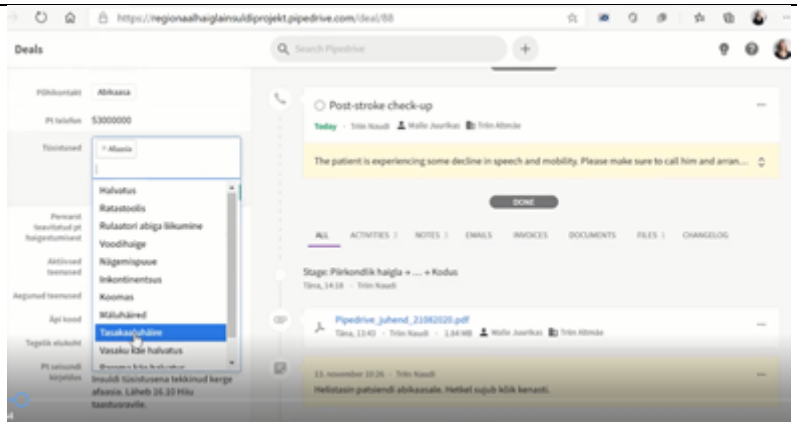 Fig. 1. On the Post-Stroke Platform for each patient different health issues can be reported and services and tasks can be planned and managed. Once at home normally the care worker of the municipality and the GP are the main referents, and they are on the platform as well. Who has access to which data is centrally configured and depends on the location of the patient and the type of information needs the professionals might have. Estonia has a national electronic health record system that contains medical records. The platform does not replicate that information but tries to integrate it with other functions and data that are currently not included in the national electronic health record. The stroke nurses are the actual case managers. They introduce the integrated care pathway to the patient and make sure that those that need to be connected are on the platform and trained in its use. A lot of relevant information about the patient is exchanged, for example between the social care worker, who is informed about the situation at home and the related constraints, such as environmental barriers, etc., and the GP. Evaluation questionnaires can be uploaded as well, for example about the functional performance of the patient in different contexts.
Economic Sustainability	There are no precise data yet of the impact of the platform and the new way of working on the total cost for care or the savings. Calculating this will be difficult as it goes between sectors and savings will very likely only be obtained in the long run. Nevertheless, if this project is successful, the EHIF, together with other governmental institutions will consider including the platform, or one similar to its functionality, in its nationwide services. To make it available to everyone in the whole country would require an investment both technology and training. The vision is that the solution would be integrated with the electronic health record, and that the government would pay for the development of such a nationwide system and the training of the workforce. Health and Social Care belong to the same Ministry of Social Affairs under the Estonian government, which facilitates the required policy approach to integration. Funding for health and social care are therefore linked but come through different funding streams.
SOLUTION EVALUATION	
Actual use and evaluation of the outcomes (Max 200 words)	At the moment 64 patients are registered on the platform. 5 of them are on the platform with their entire care network. These numbers will rise further to 100 patients registered and monitored, among which 15 with

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their entire care network. They will be supported for more than a year. In 2022 the platform will be evaluated in detail.

The evaluation will happen through patient-reported experience measures (as in whether they felt more supported throughout their recovery) and through patent-reported outcome measures as outlined in the ICHOM standard set, which is already used by the hospital to assess how the patients are doing and how has their wellbeing changed over the course of 12 months post-diagnosis. The ICHOM Standard Set for Stroke includes the outcomes that matter most to patients having a stroke.

Fig. 2 The ICHOM Standard Set for Stroke Patients

If all the factors line up well, the EHIF will further invest in the development and scaling up of the platform. “Not to have a fancy additional platform, but to make care more effective and efficient. This could facilitate, for example, the faster reintegrating of the patients in working life, or reducing the burden of care for informal carers”.

A systematic evaluation of user satisfaction is foreseen in different moments in the project and with different questionnaires. At this stage feedback has been obtained informally. The stakeholders involved generally consider the innovation “useful” and express “gratitude” to the case managers (in daily contact with the patients) and the team implementing the solution for having that support system that usually is not there. People would leave the hospital and would have to figure out all the next steps by themselves. “Having that support framework managed via the platform and the involvement of the case manager is what makes patients grateful.”

Also, from the side of the implementation team, the feedback has been positive so far. According to Naudi, the platform is not only facilitating the development of integrated care pathways but is actually creating them. It has helped the various actors in the care pathway to perceive the care pathway as a single “intervention” and not as a disconnected chain of interventions where each professional covers their own separate part

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	independently from other key stakeholders. Especially between health and social care. "The platform beautifully changes the perspective of integrated care pathway in which patient's view of the journey becomes central to all stakeholders. Each health and social care professional was already aware of the need of seeing this as "one journey" even before we started piloting this solution, but nobody actually took charge in the process of changing it. That role is now filled by the case managers and the platform."
Expectations (Description and evaluation of the degree of objective's achievement)	The first feedback from the healthcare professionals and the patients is very positive, which means that the solution is responding to the expectations, or is even doing better than expected. Although there are some difficulties related to the management of the transition, and so far nothing has been done at this scale in Estonia, the implementation is a success, according to Naudi. Also, the expectation of the project team has been met without big surprises. Interesting is that although the staff had to change a piece of their work, or were asked to do things different, only one GP was not interested, saying that due to COVID-19 pandemic she didn't want to take up further responsibilities. All others were onboard and collaborative. "*It has not been difficult to convince people for intersectoral collaboration.*" At the conceptualisation stage there were some more conservative doctors who didn't see the point of doing this. They were quite sceptical, as they have years of experience with stroke patients and know how hard it is to create meaningful change in their recovery process due to their condition. Now this attitude has changed and Naudi don't sense the resistance to change as much anymore. The hospital's top management and board were all very much in favour of participating in this pilot as they perceived the value of it. According to Naudi this was very important in being able to go through the whole process in such a large institution.
Further development of the solution	The first aim is to make sure that the system is working well and leading to the expected results. The next step would be to integrate it in the Electronic Health Record. That is the ultimate goal but it would require the evidence to convince the government that the platform actually provides added value – also from the financial aspect. From a technical point of view this would probably require redeveloping it completely in order to solve interoperability issues. However, Naudi is hopeful that the national government has interest in doing this. The EHIF is currently developing another project on the management of integrated care, which is no longer diagnosis specific but focuses on telemedicine. According to Naudi, the fact that a diagnosis specific approach could lead to a multitude of apps that would overcomplicate the process compared to an integrated information and management system is probably one of the lessons learned by the EHIF. At this stage integrated care in Estonia is not part of the legal framework but is definitely the vision of the way forward. At this stage there will be investments to be made, both in training to obtain the required attitude change and in ICT. An open question is whether the value system and the technological solutions would be so natural and intuitive that central case managers are no longer needed. At this stage they still are, according to Naudi.

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	One thing that is felt as a need at this moment is direct access to the platform for patient and families. *"Some sort of access that would require a separate interface."* Also, interoperability with existing data networks in the hospital would bring a lot of benefits for this kind of solutions, but that would have taken a lot of additional resources at this stage.
RECOMMENDATIONS	
Lesson Learned	For Naudi it is maybe too early to say which lessons are learned in the process of adopting the platform in everyday practice. More time is needed to outline specific lessons.
Recommendation	The importance of a small-scale personal approach in training staff. Especially working with older staff members, it is important to provide guidance and training in small groups and slowly make people confident. The importance both top management support and the outsider perspective. It is sometimes easier for a project manager from outside the organisation to see the full potential for change than for someone from inside the organisation. Changing processes from inside can be challenging if people are already used to "the way things are", although having more experience with the organisational dynamic can also be a benefit in terms of pre-existing contacts and ideas, according to Naudi. The importance of having a strong support from the IT department in the organisation in crucial in dealing with digital innovation. The importance of having people in the organisation that intuitively become the drivers of change - sometimes because they are the main beneficiaries, or because they perceive the positive impact the most.

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Annex 3 List of factors retrieved from the case reports

Definitions

Service delivery models broadly define the way services are delivered.

Service flows describe in detail the various steps in the service delivery process.

Care pathways are a way of setting out a process of best practice to be followed in the treatment of a patient or client with a particular condition or with needs.

The **Concept Solution**, for the scope of this tool, is the theoretical ideation of an improvement in integrated care delivery based on the adoption of person-centred technology.

CONCEPTUALISATION

Needs and target groups
The beneficiary group is well defined
Other stakeholders are well defined
The needs and interests of the beneficiary group are well defined across the care domains (health, social, education, etc.)
The needs and interests of the other stakeholder groups are well defined
The relationships between the stakeholding groups are well defined
The relationship between the needs of the different stakeholding groups are well defined
There is a clear understanding of the beneficiaries´ environment

Policy
Integrated care is part of wider policy frameworks (e.g., national or regional level)
Integrated care is part of sector specific policies (e.g., health, social, education, technology)
Financial support for integrated care is made available by the public sector
Political support for integrated care is made explicit by administrators
Personal data protection, harmonisation and interoperability is a policy priority
Standardisation is a policy priority

Values, vision, and goals
The involvement of all relevant stakeholders is a priority
All relevant stakeholders will be connected by the solution
The goals of the technology enabled intervention are clearly defined
The goals of the technology adoption process are clearly defined
The concept solution is part of existing care pathways
The concept solution will change existing care pathways
The concept solution is person-centred
The concept solution connects all relevant stakeholders
The concept solution's benefits are clearly defined (e.g., prevention, effectiveness treatment, efficiency care provision, quality of life etc.),
The concept solution will respond to different needs (e.g., better health, active ageing, preventive medicine, research in development of care needs, etc.)

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There is a clear understanding of the expected benefits that the solution will bring
The concept solution incorporates the beneficiaries´ perspective
The concept solution is as simple as possible
The concept solution is adaptable to changing conditions (e.g., policy, needs, beneficiary groups, technology, etc.)
The concept solution does not entirely substitute human intervention
The concept solution will improve the quality of life of the beneficiaries
The concept solution is functional to the care process
The concept solution will make care delivery easier (e.g., remote areas)
The concept solution will make care delivery faster
The concept solution will make care more efficient
The concept solution challenges existing roles and responsibilities
The concept solution is scalable (e.g., increasing number of people using the solution)
The concept solution is transferable (e.g., to other organisations, regions, target groups)
The concept solution is discussed and peer reviewed by different experts and stakeholders

CONTEXTUALISATION

Care pathway and service flow (re)design
Existing care pathways are designed to be "integrated"
Existing care pathways are well designed and formalised
The concept solution fits into one or more existing care pathways
Existing care pathways will have to be modified to embed the concept solution
The concept solution allows for designing new care pathways
The concept solution fits into an existing service delivery model
The concept solution fits into an existing service flow
The technology embedding service flow is well designed and roles and responsibilities are clear
The technology embedding service flow is easy to understand and straightforward
The technology embedding service flow meets the expectations and needs of the beneficiaries
The technology embedding service flow allows to collect relevant data
The technology embedding service flow is sufficiently flexible to meet the needs of individual beneficiaries
The technology embedding service flow supports continuity in care
The concept solution has been discussed with all stakeholders
The concept solution has been designed together with beneficiaries
The concept solution fits in the organisational model of the responsible organisation
Sufficient time has been taken to review the concept solution and to elaborate alternatives
The concept solution has been approved by the higher level managers

Health system
The solution is compatible with practices in the existing health and care system
The solution is considered desirable by all stakeholders
The solution connects different professional groups and settings
Economic sustainability

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The solution is considered desirable by all stakeholders
Existing similar experiences have been identified and analysed
An economic impact of the solution implementation is made
A cost-benefit analysis of the implementation of the solution has been made
The business model foresees in public and private funding
The "market"-size is clear and there is insight in the development of the demand
Ecosystem enlargement has been considered to increase the economic sustainability
The market size justifies the expected investment
Funding for the solution implementation will come from different sources
Public funding is permanent or long-term
The solution will generate financial resources (e.g., create direct income through sales of services)
Whether end users are willing to pay for the services received has been assessed
Whether insurance companies are willing to pay for the services has been assessed
Venture capital is involved in the implementation of the solution
The costs of involving external companies have been budgeted
The costs of procurement, deployment, maintenance, and user support have been budgeted
Sufficient time has been allocated for the implementation process
The size of the implementation programme will lead to economy of scale
The solution implementation will result in cost savings on the long term
The solution implementation will lead to an increase in the efficiency of care delivery
The solution will make the care pathway more effective but also more expensive
The solution will be scalable and transferable to other sectors or regions
Additional income can be expected from selling of knowhow, software, services

IMPLEMENTATION

Implementation process management
The solution is open and expandable
There is experience with the technology in similar contexts and evidence of its effectiveness
The solution will be piloted before full deployment
In case pilots are successful the service can be deployed without interruption
Monitoring and evaluation tools are in place
A quality improvement strategy and tools are developed and in place
Technical problem shooting is guaranteed for as long as needed
Communication about the implementation process is provided
The organisation is open to innovation
The management is committed to the implementation
The effort related to the deployment "on site" is well understood
Training for users and staff is foreseen
All stakeholders (incl. users and staff) are informed and "on board"
Early adopters and innovators in the organisation are identified and recognised
All processes are discussed, well detailed and described
Change management procedures are implemented
Data protection issues are sorted out
Data sets are compatible across care contexts involved

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Providers are screened, contracted, and paid
Sufficient time is allocated for deployment

Technology

Solutions are based on state of the art and mainstream technology.
Interfaces are intuitive and easy to use
Technologies and services are procured locally
Technologies are compatible with the home environment
Technologies are safe and secure
Solutions are interoperable with other technologies
Solutions are scalable to other sectors.
Technologies are already in use elsewhere
Technology should be as low cost as possible
Connectivity should be assured

Human factors
Early involvement is practiced
Attitude to innovation is stimulated
Willingness to use is ascertained
Price of the solution is fair
Expected benefits are clear
Expected outcomes are clear
Involvement of colleagues, peers is incentivised
Resistance to change is addressed
Fear for change is addressed
Digital competences are developed
Informal care networks are supportive
Informal care networks are supported
Confidence and trust have to be build up through a personalised approach
Solution design
The solution design is functional from the end-user perspective
Solution is developed and further improved with the users
Data readings are in different formats and interoperable with existing health records and practices.
Data are easy to read for users.
Solution is interoperable and scalable to other sectors. [02-R]
Data management procedures and authorisations are in place
Access to the internet is straightforward and easy
Opt-out-options are available
Remote control of user-end is enabled
The solution is highly customisable (e.g. individual care plans)
The impact of real-time data vs. non real time on doubts of users is considered
The solution is aesthetically nice
The solution provides monitoring of inactivity of users

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Communication
Communication and dissemination activities targeting all stakeholding organisations are developed
Benefits of Integrated Care are made clear to stakeholders
Information and promotional activities for population are developed

EVALUATION AND CONSOLIDATION

Outcomes
Patient health data are available and can be measured over a longer period.
Data on access to health services (GP, Hospitals) can be collected
Patient data regarding adherence to treatment/medication can be collected
Data about patient satisfaction can be collected
Patients with chronic diseases can be better monitored
Outcome regarding other performance indicators of the health and care system (e.g., waiting times, travel times and cost) can be measured

Impact
Continuity in care (COVID pandemic) can be better guaranteed
Care systems can change and be further decentralised
A positive impact on healthier lifestyle development can be expected
More people will start to monitor their condition can be expected
The demand for health care could change
The overall wellbeing of the population could change
There will be an impact on the digital skills of users
There will be more opportunities to access health information
The size of the target group could be increased
The solution can be scaled up or transferred to other groups or sectors
The organisation can develop in new directions
There will be an impact on health protocols and additional care pathways development
There will be more information on needs and use of primary care
Standards could be developed

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