Publication III
Local public authorities handbook
for testing, validating and implementing
smart care service models

Interreg
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1. Smart Care service models as an answer to challenges in health and care systems

1.1. Current challenges in health and care systems

Higher life expectancy and, thus, more, but not necessarily more healthy years of life, often associated with a tendency to lead an unhealthy lifestyle (nutrition, smoking and alcohol consumption, being overweight, too little exercise, loneliness, etc.) put a strain on the health and care systems. This results in a longer time span of demanded health and care services and a rising number of so called "civilization diseases" such as digestive and metabolic disorders, colds, tooth decay, neuroses and circulatory disorders, but also certain kinds of cancer and myopia as well as psychological or psychiatric disorders such as depression, anxiety disorders and eating disorders. Although digitally supported trends for self-optimization often promote (sometimes only supposedly) healthier lifestyles, these mostly do not prevail and can eventually lead to mental health problems.

Against this background of increasing demand, health care includes all facilities that maintain, promote and restore the health of the population and prevent diseases. Generally, European health systems strive to improve the health of individuals or certain groups in defined areas and also work to strengthen health-promoting structures - in doing so, they are generally well functioning in comparison to other parts of the world.

Nevertheless, European health systems are also suffering in several areas. In the Danube Region, or across Europe, there are a number of problems varying over the individual countries (cf. country-specific health profile). At the same time, there are common challenges that all countries are facing.

One structural challenge when engaging with the topic of health is the fact that it cannot be contained in one single governance area but is also closely connected to other areas of public policy(e.g., social sector, education, employment, culture, etc.). As of yet, there is too little interconnection and cooperation among the sectors to tackle health and care challenges in a more holistic approach.

More information about the individual health systems of European countries can be found in the following country-specific health profiles (provided by the European Commission, except Bosnia and Herzegovina[1]) – here listed for project D-CARE partner countries: Austria, Bulgaria, Czech Republic, Germany, Hungary, Romania and Slovenia as well as Bosnia and Herzegovina. The State of Health in the EU's Country Health Profiles provide a concise and policy-relevant overview of health and health systems in the EU/European Economic Area. The analyses emphasize the particular characteristics and challenges in each country against a backdrop of cross-country comparisons.

Three crucial factors can be identified as the most limiting factors in the health and care systems in Europe:

Financial limitations

Funding and budgetary constraints are the number one challenge in achieving not only the needed health and care organization's innovation and transformation goals - especially after the pandemic - but also the implementation of basic medical care. Around the world, this can be attributed to the increasing demand for healthcare and care services caused by various factors including expanding and aging populations and an increase in chronic diseases, as well as the effects of the pandemic (e.g. collapsing systems due to overwhelming workload and bad conditions).

Availability of a skilled workforce

To guarantee basic health and care services and to support the needed transformation to meet current challenges a skilled workforce is quintessential. The basic provision of personnel in health and care services and the further qualification of the existing personnel is a great barrier to overcome. Especially after the pandemic, many care persons quit their jobs due to exhaustion and bad working conditions in hospitals and other health and care facilities. Besides the general need for personnel in this sector, attracting new talents, specifically for innovation and transformation purposes, ranks high in the challenges for health and care systems.

Implementation of new technologies

The recent pandemic has accelerated the use of new technologies (including telemedicine and telehealth). But implementing new technologies is not an easy process. There are many competing solutions and options on the market and it can be difficult to assess which option will best suit an organization's specific needs. Many decision-makers not only find it hard to choose the optimal solution but also find the practical matters of implementing new technology (software and hardware) challenging and often miss accompanying services for better performance. Since it is not just about deciding to introduce new technologies into daily processes, but also about dealing with them and breaking new ground. Thus training and practice as well as the general enhancement of digital literacies are needed to make new technologies a success for all target groups from end-users to staff.

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[1] https://health.ec.europa.eu/state-health-eu/country-health-profiles_de retrieval date 2022.09.02

1.2. What are smart care models?

To comprehensively tackle those interconnected challenges, smart care models provide appropriate solutions. Smart care models are innovative, integrative smart care and smart health solutions that respond to the challenges and demand of the respective inquirer of the solution in order to facilitate, support and optimize processes in health and care and make them more efficient.

Ideally, they are developed in co-creation processes involving all stakeholders from the quadruple helix environment to meet the real demand and even present integrated solutions of already existing elements.

They are usually digital solutions or solutions involving digital elements or data. Precisely, they can also be digitally supported analogue solutions that refer to learning, training and organization etc. of processes in health and care.

1.3. Smart care models as a response to current challenges

Smart care models provide different answers to the above listed challenges in health and care systems. These responses draw on the integrated use of digital means and innovative technology which allow to use existing resources more efficiently and even generate new resources that can complement existing care capabilities. Additionally, smart care models take an integrated approach to health and care, thus, considering the entire system with all its involved stakeholders leading to models that are fit and implementable in the given context. In doing so, they both generate and build on networks between actors from all quadruple helix branches; in this way, they enhance cooperation and ensure solutions which are tailored to user and caregivers' needs, have functioning business models and are compatible with existing smart care policy.

Response 1: Using the power of digitalization

Artificial Intelligence (AI), telehealth, and robotics are all examples of digital technologies that are promising to help alleviate growing resource pressures while maintaining a high quality of care for patients and older adults in health and care environments. A larger number of staff in health and care needs to be familiarized with much more basic digital solutions first in order to meet all potentials. That is also a question of which generation the target group - no matter if professional health or care person or end-user - belongs to. Robust and customizable IT data infrastructure, sufficient training and inclusive engagement of the workforce in the development and optimization of these systems are critical factors when it comes to the adoption and adaptation of new digital tools and new ways of working. This applies, of course, also to end-users who depend on parallel services that provide support concerning digital literacy which is the basic requirement for patients to make use of digital solutions.

Response 2: Build strong partnerships (Smart Care Labs)

As the world experiences a rapid advancement of technologies that are transforming all industry sectors, it becomes evident that the highly developed skills and expertise needed to solve today's challenges are no longer found in just one place.

Thus, new partners and alliances can lead to better performance in health and care, greater efficiency and new ideas in order to perform better. In the context of smart care labs, actors from all four helix branches (academia, governance, businesses, users/civil society) with connection to the health and care system come together to foster the scouting, validation and implementation of smart care models, support the scaling up of smart care and digital capabilities and create new and attractive business as well as employment contexts.

The labs bundle expertise, experimentation space and knowledge as well as hardware resources which creates synergy effects for all actors involved as well as society at large. Best practice examples of such networks exist in all branches, first and foremost, ICT, but social sectors as well.

Response 3: Taking an integrated/holistic approach

Taking an integrated, respectively holistic approach means bringing all relevant stakeholders in health and care together, as mentioned above, to pursue the common goal of the provision of improved health and care services. It is important to take the entire system's perspective into account to achieve a change that affects the whole ecosystem and integrates existing services and solutions with new innovative services that e.g. coordinate existing analogue services/resources better through the use of digital technologies. In this context, of course, as elaborated above, using the power of digitalization is crucial. Even more so, ensuring digital inclusion will more and more become a decisive factor of safeguarding social inclusion for all citizens in Europe. This implies not only access to ICT, ensuring infrastructure and affordability but also enabling digital literacy of all citizens to be able to use services and to reduce the digital divide in general as all countries expand their offer of digital services. This leads to the necessity of training to develop skills, give confidence and motivation. At the same time it is essential to realize that the design of technological services and hardware needs to be improved. Solutions that are commonly developed in co-creation processes by suppliers, users, professionals, agents etc. e.g. with design thinking methods are more likely to create benefits for users and suppliers because they meet the demand and cater to business as well as policy considerations. Important in this context is also to make sure to keep basic services in analogue format because there will be a certain group that will deny digital services and digital support for various reasons. Taking an integrative approach means to foster beneficial transformations while respecting the entire system's perspective and, thus, not let any groups fall out of access to health and care services.

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2. Role of local public authorities in health care provision

2.1. Role of local public authorities in health and care infrastructure

Local public authorities have a formal responsibility to steer towards sustainability of communities in general, hence, towards a sustainable health and care system. The level of their impact can vary from being the main regulatory instance and main source of financing for some public services to merely acting as an intermediary with the national government.

One way or another, early understanding of their role is crucial. Each local politician and public servant dealing with health care provision should acquire a profound understanding of their role and potential impact to health and care infrastructure in the local community. Once political focus is set to achieve sustainability and greater welfare of citizens and older citizens, it should be clear that the XXI century is offering a vast number of innovative, smart and easy solutions for the issues that a local community is facing. Additionally, local public authorities also need to know how to recognize and prioritize issues.

The smart and digital trend needs to be used to achieve sustainability. Otherwise, commercial interests can gain disproportionate ground in shaping smart care service models, which will not necessarily result in a sustainable health and care system. This is maybe best achieved through initiatives which rely on the quadruple helix approach.

2.2. Facilitators, networkers and hinge between national and regional levels

Aside from setting the regulatory framework, local public authorities can take on a number of roles in the process of scouting and implementing smart care services. They can be the main facilitator of a sustainable health and care system on the local level. In order to play that role successfully there are series of actions that can/should be taken:

- city officials and administrative staff learn about the topic and implement educational programs to train the population about the health system, healthcare and wellbeing,
- promotion of a sustainable health system and dedicated promotional and awareness raising campaigns implemented,
- direct policy towards sustainability adopted
- local actions aligned with potentials and capacities of the local community,
- mechanisms of stakeholder engagement used,
- cross sectional approaches respected – quadruple helix and NGO sector involvement
- Nationally or third-party funded projects are being acquired, supported and implemented to develop pilot and model services

As an example, in Bosnia and Herzegovina each city or municipality administration is appointing a Health Board which is entitled to actively participate in the creation of planning documents for health and the achievement of defined goals at the level of primary health care.

The board further supports the health institutions and health workers, as well as enables the direct participation of citizens in expressing health needs. The law states that the members of the Health Board are city council members and representatives of stakeholders at local level. In reality, about 20% of members are external stakeholders and the remaining 80% are city councilors. Parallely, small and medium size enterprises, when advocating their interests, are using a mechanism called Council for Economy formed by a local government. Businessmen form 90% of the membership of this council. A similar mechanism could for example be used for the health and care sector in order to involve representatives of all types of health and care providers at the local level along with the NGO sector and end users.

In 2015, the United States Agency for International Development (USAID) outlined a 5-step engagement pyramid that helps engage: "all relevant stakeholders—across gender, age, race and ethnic groups, socioeconomic status, health and disability status, and location—in the decision-making process."

Here are those five steps:

- Inform – Ensure that all stakeholders are informed and educated about your goals and processes from the outset and then regularly updated as the journey continues.
- Consult – Listen to the thoughts, concerns, and stakeholder feedback and then act upon them when it's wise to do so.
- Involve – Coordinate with stakeholders to ensure that their concerns and advice are reflected in your processes and decision-making.
- Collaborate – Work with stakeholders to find solutions to problems.
- Empower – Include stakeholders in the decision-making process.

Communication of stakeholders and decision makers in all sectors and all levels of government is being improved worldwide. Formal bodies (such as mentioned Health Board) can be complemented by innovative mechanisms (living labs and similar concepts) in order to increase stakeholder involvement and achieve related benefits: knowledge, efficiency of decision making, savings, risk management and account-ability.

In this way, local public authorities can successfully attract stakeholders from various societal fields, connect them with each other and act as the enabling framework for networks in smart health and care. As such, they perform all five essential functions to engage stakeholdes cocreatively in the decision making process and, thus, ensure good and effective outcomes on the implementation level.

Lastly, local public authorities can embody the hinge between national and local care systems and regulations. They can both take local challenges or interests to national policy making level as well as implement national policy in a way that is useful for the local level. They deliver mutual feedback on needs and impact of policies. For their regional stakeholders they can look for or generate funding opportunities on local as well as national level and disseminate best practices and lessons learned in their region an beyond.

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3. Building the basis

The following chapters will lead through the process of scouting, validation and implementation of smart care services. At each step, the focus lies on the role that local public authorities may or may not play and where they can fruitfully collaborate with other stakeholders. If you are interested in the process of scouting smart care services in more detail please see our publication "Scouting Smart Care services".

The first chapter will focus on preparing the ground for a successful scouting and implementation process. That means that the challenge, goals and objectives have to be defined, a network of relevant stakeholders has to be built and involved and a framework for the process needs to be elaborated. Each of these steps will now be looked at in more detail.

3.1. Defining and quantifying local challenges

The Pandemia drastically changed care systems for older adults in the Danube region. Hungarian figures for example show that the number of older people living in older adult homes has been decreasing, (however, the main reason of this is the high disease rate due to covid). At the same time, the importance of home care has been increasing.

A major challenge in older adult care is the high age average of workers in this field (above 50). This indicates that the already existing shortage of skilled care givers will drastically increase in the next few years.

In several Danube countries especially, hospice departments of hospitals are full, and the waiting list is extremely long. Several people must even stop working to take care of their relatives. Therefore, there is an extensive need for ambulant and stationary care capacities for older adults.

In many countries of the Danube region older adults care has path dependent structure. High quality and technically advanced solutions are available for those who are better informed and are in a better financial position. This adds an sociodemographic inequality dimension to the already tense overall situation.

Some of these challenges (e.g. training young generation, creating central/regional information pools) must be answered by public administration, some have to be further developed by the market.

Local public authorities are playing a crucial role in defining and quantifying local challenges (some of which please find above).

As a mediator between national authorities and national public health policy on the one hand and individual local citizens on the other their feedback on which challenges are most pressing as well as the provision of regional data is essential for the adequate design of governance programmes and interventions. As the local executive, it is their responsibility to then implement national or regional policy while at the same time observing its effects and outcomes and feeding those back to regional or national authorities.

It might for example be the case that implemented solutions offer adequate answers to some challenges, however, they have to be used in a more efficient way.

Local public authorities are therefore in the position to effectively map local needs together with other local stakeholders. The collection of qualitative and quantitative data on these needs and challenges then builds the basis for targeted public health policy and ensures a continous feedback cycle between the implementation/ outcome level and the design/conceptualisation level.

3.2. Connecting the right stakeholders

Local public authorities mostly have a broad network of local stakeholders who they can approach and involve for different endeavors. In order to build a network of actors who are relevant and appropriate to successfully scout and implement smart care services the first question to be asked is:

Who are the main (relevant) stakeholders in older adult care?

- older adults
- care homes for older adults (owners, controlling authority)
- Medical personnel (care homes, hospitals, practices)
- the so-called sandwich generation: those who have been taking care of their kids but already have to deal with the growing problems of their aging parents
- (In many cases) unqualified or underqualified attendants taking care of older adults, not in care homes but especially ambulant care in people's homes
- public authorities: As mentioned in Chapter III/1, the care (health) sector is influenced by several other policies (social, education, employment) or institutions (civil societies, churches), therefore public authorities should involve responsible persons from these sectors as well
- service/technology providers
- investors
- Universities, vocational schools

Among these stakeholders, local public authorities are in a good position to take the lead in creating connections among various players. By experience,and taking into account their other types of workload , we cannot expect them to be the innovation engine of the process. However, they can prepare the ground for a co-creative innovation process. Local public authorities have two main advantages in this endeavour: they have a varied knowledge on the sector and hold connection with a broad range of stakeholders.

The first step in setting up a network should be the establishment of a regular forum where all stakeholders are invited. This forum could be initiated with an onsite event where stakeholders can present their challenges, needs and requirements to each other and the local public authority. The platform can also be a space for scouting innovations for predefined needs, e.g. by the local public authority or finetuning smart care business models. To ensure the operability of the platform, communication channels and protocols have to be established.

To this end, it would be optimal to have a central/regional digital and physical information, experimentation and validation platform connecting all stakeholders in elderly care. This would function as a local knowledge hub following the model of living labs.

3.3. Setting up the framework

I. Structure for testing or validating a smart care service model

The main goal of the prototype testing is to gather feedback from the target audience and modify the prototype according to the results of the testing phase. Local public authorities can assist in seeting up a structure for testing and valdidating smart care service models throug the provision of expertise, acting as a networker (see chapter above) or providing testing spaces and potentially funding.

To illustrate this chapter, we made use of the testing experiences of D-Care during testing and validating AmigoBox's and AmigoApp's main functionalities under real conditions with older people and their relatives in Hungary. Local public authorities may consider this as a guideline.

The structure for a testing and validation process should comprise the following steps:

●   Define the target user groups

When selecting the target audience, the focus of the testing phase must not be too wide, it must be clearly described. Local public authorities can assist in determining suitable target test groups by drawing on their knowledge of the challenge as well as the relations they have with a broad scale of relevant stakeholders. In the Hungarian case OSSI selected two testing groups in Hungary: one in older adult homes, the others living at home.

The selection of the target group is the preparatory step for testing, it must be fit to the solution's target impact and suitable for the participation in a user testing/validation – considerations must for example be taken as to ethical suitability, and cognitive or physical impairments impacting on the aptness to participate in a pilot project

- **Setting up the process framework**

  Once the target group is defined the general framework of stakeholders to be involved in the process needs to be set up. This includes defining which actors need to be involved as well as in which context or institution the testing is going to be carried out and drawing up a time plan for the process including milestones and feedback and assessment procedures. Depending on the expertise of a local public authority they can advise on the setup of the general structure out of past experience or even set up a structure themselves. The latter might be done in the context of a regional innovation programme which can also receive financial support from public funds.

- **Selecting testing methods**

  A major distinction of testing techniques is qualitative and quantitative testing. The benefits and disadvantages of the respective methodologies can best be assessed by researchers working in the field. The set up of the methodology can best be performed by members of research institutions and think tanks whose expertise lies in collecting and assessing data of various kinds. Local public authorities can thus mostly assist through involving relevant scientists in this step. In the case of AMIGOBOX both quantitative data was gathered (number of messages, number of video calls) as well as the quality of communication was monitored.

  The methodology will further define how and in which setting, e.g. onsite or online etc. the data is collected.

- **Evaluating results, modifying prototype if necessary**

  Evaluation of the results must be continuous during both the wrap-up and the regular-use phases. Here, again, local publica authorities will likely take an advisory or facilitatory role. The collection of data and the evaluation thereof will most fruitfully be done by researchers in cooperation with test users, solution developers and potential investors.

- **Scalability**

  Once results have been evaluated, we must consider the scalability of the smart care model. Scalability refers to the ability of an organization (or a system, such as a computer network) to perform well under an increased or expanding workload. A system that scales well will be able to maintain or increase its level of performance even as it is tested under larger operational demands. Local public authorities can articulate the scope of demand for a certain smart care model as well as the regualtory requirements to be met. In this way, they can contribute to assessing and/or increasing the scalability of a certain solution.

  Throughout the testing/validation process local public authorities can and should take a surveilling role and ensure that the above-mentioned steps are taken. They may assign a competent expert team to support the process from the beginning.

II. Timeframe

A successful piloting and validation process needs a realistic timeframe taking into consideration best practices and characteristics of each model. Decisions on setting up the timeframe and allowing modifications hereof should be taken involving all actors engaged in the structural planning of the process. Local public authorities can give their input on a realistic timeframe, potentially articulate requirements of funding programmes if those are to be implemented and support in monitoring the realisation of the agreed timeframe throughout the process.

The length of the testing period depends on the product /service. Within the D-CARE project, testing periods varied from country to country. In Hungary, from the first meeting with the testing team the whole process took about 4 months. Since in the first two months the most suitable testing audience was being selected, the real testing phase was about 2 months (with mid-term feedback in half-time). Even these two months could be divided into warm-up period and regular use period. To the contrary, in Germany, the piloting phase lasted five months starting in August and running all through December; this exceeded the offical project timeframe but was based on a mutual agreement between the care institutions and the solution providers.

III. Funding

Maybe among all tasks of local public authorities with regards to smart care modeling, providing funding or access to funding schemes and opportunities is the one where they can play a crucial role. They are aware of regional/national/EU funds and they are eligible for such subsidies.

The options to be considered are:

- financing by European funds e.g. Interreg, Horizon
- financing by national funds. In many countries of the Danube region, development of health care and social care sectors are financed in huge percentages by indirect European Union funds.
- for upscaling of the technology or market expansion promising projects can get access to venture capital. This, however, is not be the task of local public authorities.

Already before the testing/validation process local public authorities should

- calculate the financial needs of the smart care model
- map national, regional or European funding schemes
- map private funding facilities
- start negotiations with stakeholders about financing.

They can set up various scenarios for financing opportunities, examining advantages and disadvantages of each potential solution.

IV. Objectives of the testing/validation

- Local public authorities have to clearly define the general and specific objectives of the testing/validation process.
- The general goal of any prototype testing is to gather feedback from the target audience and modify the prototype according to the pros and cons of the testing phase.
- A more detailed description can be found above.
- Local public authorities have to determine specific goals according to the type of smart care model. It goes without saying that the involvement of other stakeholders e.g. developers of the digital tool is a requirement.

In the Hungarian case, for example, our specific objective was to answer the following four questions:

1. Do our interaction concepts sufficiently address the needs of elderly people?
2. Is the AmigoBox accepted by elderly people to communicate with their relatives?
3. Is the AmigoApp accepted by relatives to communicate with the elderly?
4. Can the AmigoBox increase the duration and amount of communication between the elderly and relatives?

In setting up secific goals and objectives for a piloting/validation phase, it may proove useful to define clearly measurable (quanitfiable and non-quantifiable) goals. Taking into account the original characteristics of the service or product as well as the timeframe and resources for the testing phase are equally important to define goals.

V. Sustainability

Sustainability in smart care models has different aspects. First, a model needs to create value for all stakeholders which can then have sustainable impacts or initiate a sustainable process.

A sustainable model helps describing, analyzing, managing, and communicating

1. the sustainable value proposition of the model to its customers, and all other stakeholders,
2. how it creates and delivers this value,
3. and how it captures economic value while maintaining natural, social, and economic capital beyond its organizational boundaries.

A smart care model is therefore sustainable if

- It is commercially profitable.
- It uses resources that it can utilize for the long term
- It gives back: a truly sustainable model is one that gives as much as it takes. This concept is called the cyclical borrow-use-return model. Bob Willard, expert and author on quantifiable sustainability strategies, contrasts this with the current "linear take-make-waste model" that so many modern businesses are built upon, which he states is "culpable for contributing to [this world's] unsustainability."

To account for the sustainability of a smart care service model, the following questions have to be asked:

- Why does the model have to be developed??
- What problem is it solving?
- How is it going to improve the world, environment and society?
- What impacts (intended and non-intended) does it have on the environment and society?

Steps towards sustainability:

- Plan out your resource usage.
- Consider alternative forms of company ownership.
- Engage your customers.
- Distribute responsibilities clearly.
- Allow for sufficient time for a sustainable structure to evolve.

What can block the establishment of a sustainable model?

1. **Innovation meetings are held, but ideas are not developed further.**

Many good ideas arise when founders or leaders get together at a workshop or meeting, but to be implemented, they must be further developed and a plan of action drafted.

2. **Ideas are not implemented.**

The second issue founders face is that the plans for change are simply never implemented. This could be because it seems too difficult to change the status quo, or because the users, employees or secondary engaged persons aren't yet convinced of the need for a different model.

3. **The implemented business models fail in the market.**

Two of the most common reasons businesses fail to move toward sustainability are the wrong mindset and a reluctance to dedicate resources to change. To address these, find your allies – those who believe sustainability is important for the bottom line and for the larger world – and connect with them.

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4. Testing and validating smart care service models

4.1. Develop and select fitting smart care service models

As described in chapter 1, developing and selecting smart care service models that suit the needs of specific countries, regions and/or groups is no easy task, since there are a number of problems varying over the individual countries across the Danube region or across Europe. Aside from that, there are a number of common challenges such as the demographic change, financial limitations, the implementation of new technologies and the availability of a skilled workforce (or lack thereof). Thus, it is helpful to develop a country/region specific health profile to assess the specific needs of the country/region/group and determine which challenge(s) need to be tackled first, before developing and selecting new smart care service models.

To assess the needs and develop the country/region specific health profile, it is advised to enlist the help of stakeholders and take their perspectives into account. Health and care does not only fall under the administration of a single entity, but is shaped by a multitude of stakeholders across various fields (e.g. politics, insurances, academia, social sector, enterprises, end users). The support of the aforementioned groups is indispensable for the testing, validation and subsequent roll-out of smart care service models, thus, it is advised to include them in the process as early as possible. Local public authorities can act particularly well as networkers and facilitators between the different groups since they have connections to a wide range of stakeholders in the region and do hold enough influence to draw interest and attention for collaborations.

4.2. Choose testing partners/institutions

Ideally, potential testing partners/institutions (e.g. hospitals, care homes, care services) should already be on board from the beginning and involved in the planning of the testing as well as the selection of the smart care service model to be developed/tested. While choosing testing partners/institutions, it is important to assess the possibility of their involvement beforehand, clarifying questions such as:

- Are there any concerns that need to be addressed before the testing can take place (moral, legal, insurances)?
- Are there any concerns from the persons involved in the testing (patients, relatives, care takers) that need to be addressed?
- How many resources is the potential testing partner/institution able/willing to dedicate to the project (time, finances, personnel)?

It is advised to clarify these questions early on to plan the testing in a realistic manner and ensure that things will run smoothly, since it can take a considerable amount of time to clear the concerns. Local authorities can support the process by helping to identify potential testing partners/institutions and introducing them to the project consortium.

4.3. Set up monitoring and evaluation measures

Monitoring is the systematic and routine collection of information during the testing process for the following main purposes:

- To learn from experiences and improve the smart care service model;
- To have internal and external accountability of the resources used and the results obtained;
- To make informed decisions on the future;

Information gathered during the monitoring process provides the basis for the evaluative analysis. Evaluations should help to draw conclusions about five main aspects of the tested smart care service model:

- relevance
- effectiveness
- efficiency
- impact
- sustainability

Monitoring is a periodically recurring task already beginning in the planning stage of testing that allows results, processes and experiences to be documented and used as a basis to steer decision-making and learning processes. Thus, it is important to develop a Monitoring and Evaluation plan before beginning any testing activities so that there is a clear framework for what questions need to be answered, which indicators need to be tracked, how data will be collected and how the monitoring data will be analyzed in the evaluation.

Ideally, an M&E plan should be developed by a research team or professionals with research experience, with inputs from stakeholders who are involved with designing and implementing the smart care service model. It is advised to outsource this to actors from research/academia.

4.4. Conduct testing or validation phase

Testing and validation is a key component in designing, finalizing and launching a smart care service model. The testing serves the main purpose of measuring the effectiveness of the smart care service model and detect any issues with usability, business model or functionality, with the aim of improving the product, user acceptance and overall user experience. This is best done by monitoring how representative users interact with the product in a realistic setting. The following five steps can be used as a guideline to set up your testing process:

Step 1: Defining Testing Objectives

Start by clearly outlining your user testing goals and objectives. What is it you want to test and what answers do you expect to obtain? Make sure to define your testing objectives beforehand and maintain consistency. Local authorities can contribute to this process by providing insight from a political angle.

Step 2: Choose a Testing Method

Once the testing goals and objectives have been decided, it is necessary to define indicators for tracking progress toward those goals and choose the most adequate testing method. Ideally, the testing method should be decided by a research team or professionals with research experience, with inputs from testing partners/institutions.

Step 3: Find Representative Users

When recruiting users for testing, make sure you have established clear selection criteria. In that way you assure to select people for the testing phase who match your target user profile. Testing partners/institutions can help you in finding suitable persons for testing.

Step 4: Set Up and Conduct the Testing

It is necessary to establish the possible scope and setting of testing in close cooperation with stakeholders before any testing activity takes place. It is also advised to set up an M&E plan. In addition to test participants, experienced facilitators are needed to guide the test and see to everything running smoothly. Local authorities should support finding suitable participants and/or facilitators by disseminating any information and active networking.

Step 5: Analyze the Findings

Use the information collected through monitoring during the testing process, evaluating the findings to improve the product, identifying possible issues, and determining the best course of action for the future. The role of local authorities herein would be to present the findings to political actors on other levels (regional, national, international) and to promote any actions that need to be taken on a political level.

4.5. Defining follow-up measures/next steps/iterations

Once the testing data has been collected and evaluated, it is necessary for them to be compiled for both internal review and external reporting, to help staff improve the smart care service model, inform stakeholders of the progress and success of testing, and move the project goal forward. Local authorities can help by defining which actions need to be taken on political level, advocate the project on other political levels and connect project partners to relevant political actors.

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5. Implementing smart care service models

5.1. Defining a strategy for implementation

**"Change is a major part of our lives,
whether it is change in industries, technologies
or various sectors such as transportation, education,
health care or social policies"
(Cerna, 2013)**

Smart Care service models can induce major changes in the health and care sector. In this way, they provide effective responses to the major challenges the health system is facing. However, to make this possible they first must be implemented. With the implementation of new technologies, next to financial limitations and the missing availability of a skilled workforce, being one of the most limiting factors in the health and care systems in Europe, concrete strategies and policies are needed. Since passing and /or changing policies by itself does not guarantee success if they are not implemented well. Thus, in the design of policy the process of implementation, which is characterized by a multi-staged and developmental character should always be kept in mind (Cerna, 2013). Cerna points out that "even if policy implementation appears to be successful (…) there is no guarantee that success will last" (Cerna, 2013). Therefore, the sustainability of smart care implementation, the technological, social, organizational and economic factors of (electronic) health systems should always be addressed. Other important topics are quality standards for smart care technologies, (evidence based) knowledge about desired and undesired effects of smart care products or services, as well as transparency regarding data processing. Also, the goal and purpose of the technologies should be clear from the beginning.

With smart care models being multifunctional systems, setting up monitoring and evaluation measures is crucial in order to assess their impact with regards to the 'current state' in order to iterate the 'future state'. As part of the D-Care project for example, a strategy was therefore drawn up for the development and implementation of Smart Care Labs (SCL) in eight countries of the Danube region - Romania, Hungary, Czech Republic, Germany, Slovenia, Bulgaria, Austria and Bosnia and Herzegovina. This so-called 'Smart Care Labs Strategy' provides a framework for setting-up a lab, selecting and engaging quadruple helix stakeholders, methodological approaches to forming and running Smart Care Labs. Goals of these SCLs are to engage and motivate stakeholders to collaborate and to build strong eHealth and eCare ecosystems, to explore and evaluate new ideas, foster innovation, and usability of innovation in the health and care sector in the Danube region through "fit for region" smart care models. Furthermore the aim is to provide a working environment for the creation, development, prototyping of new ideas, services, products, and business models through co-creation and testing and validating the innovation in real environments with real users. D-Care furthermore set up a transnational strategy in order to serve primarily as an instrument for smart care and smart health stakeholders. The vision of this transnational strategy is to ensure compatible and integrated smart care services and e-Health for every person from the Danube Region. This will happen through effective promotion and exchange of knowledge, know-how and experience among stakeholders, fostering the development of digital technologies, improving digital skills and competences of all interested parties, and ensuring clear procedures and financial resources from public and private sources. The combination of these efforts aims to secure a successful implementation of smart care services by creating an environment that fosters a user-centered development as well as the roll out of the models from businesses, users and policy makers.

Considering "effective inter-organizational policy implementation requires building networks and (...) allows policy to be adapted based on the interaction of a policy with the local institutional setting" (Imperial, 2022), the D-Care project chose a bottom-up perspective. This gives space to initiatives emerging from the established quadruple helix multi-stakeholder mechanism (4DMC) and multilevel governance. In the first step, the transnational strategy should help policy makers, representatives from the public sector – local, regional and/or national authorities, which are responsible for conceptual and strategic documents, their development and implementation through related policies and measures. They can provide financial resources, expertise, or organizational and other support. As a result of coordination, they can benefit from faster knowledge and best practice transfer and spill-over effects. The effects support increasing awareness, acceptance of new solutions and innovations as a way to higher quality services and efficiency. This depends on the organizational and legal environment and their preferred way to ensure sustainability of the Smart Care Lab, which might be operated by innovation centers, innovation labs or other supporting structures. For the academia/research and industry/private sector, which provide knowledge or technologies, the strategy simplifies orientation in priorities of the target regions and might open the door for scaling-up solutions.

At the core of the endeavor are the clients, patients, and older adults as beneficiaries of positive results of innovation and wider implementation of Smart Care Models. The strategy's priorities, RAP measures and solutions are centered on their needs and preferences (D-Care Consortium, 2022).

Institutional providers of care services may use this strategy as an inspiration, framework for their own strategies and activities. It may serve as a gate to connect to a larger international network to share or/and adopt best practices, and to express needs and thus provide inputs for policies.

For nursing, medical staff and social care workers, individual caregivers, and various interest groups, similar effects trickle down to the individual level (D-Care Consortium, 2022). A special emphasis shall be on those institutions and individuals willing to commit themselves directly to particular actions and measures defined on a regional level. From the geographical point of view, the strategy focuses on D-Care project partners' regions. Since it is an open document, any other institution from the Danube region might join the vision and common effort (D-Care Consortium, 2022).

As the strategy's success will have a direct effect on specific communities, local public authorities are key in leading or supporting the creation of implementation strategies. They also have the power to influence, maintain, grow and improve local implementation.

5.2. Start of the implementation on broader range

„From lighthouse project to standard care"

When it comes to the implementation of smart care models for a broader range, two key facts are crucial to consider, namely in legal and financial terms. A sound legal framework is the first fundamental part for a sustainable implementation of smart care models. Such legal frameworks include general policy as well as corresponding amendments to the relevant professional laws (e.g., physicians' law, nursing law). Beyond the legal basis, the affordability of these models is critical to their wider implementation. According to a current OECD Report (2021) on average 14,1 % of individuals aged 65 years and over live in relative income poverty. Whereby the relative poverty threshold is defined "as having an income below half the national median equivalised household disposable income" (OECD, 2021). The differences here are also considerable within the EU, ranging from 4,5% in Slovakia to 33,4% in Latvia. In Germany, Austria and Slovenia the value is about 10%, for Hungary only 5,3% (OECD, 2021).

In contrast to older adults living in risk of poverty, out-of-pocket expenditure around 15 % within the EU (% of current health expenditure) (European Union n.d.) gives an impression about the importance of affordable smart care devices and/or services. However, the described data on healthcare expenditures from the World Bank are hard to compare, since it does not show what type of health and/or care services are financially covered in a particular health system. While some services can temporarily be paid out of pocket at least by users who can afford it several solutions require investments on a larger scale that cannot only be born by users. Moreover, smart care services benefit different actors in the health and care systems for whom financial responsibilities are spread over various actors – e.g. patients vs. caregivers. Possible responses can be, on the one hand covering them through insurance payment or allowance models on the other hand. The role of public authorities in the context of "smart care models" is to foster social discourse and to establish the appropriate legal foundations fitting the respective target groups.

5.3. Best practices

Best practices serve as inspiration, guidelines and study objects for smart care service model implementation. In this way they play an important role in the roll out of smart care solutions to a broader scale of beneficiaries.

Within the project a best practice manual has been established which can be used by various stakeholders in the smart health and care field. Seven good practices have been established from various European countries targeting both individuals as well as larger societal groups. They are presented in a manual openly accessible to the public.

The following table gives a short overview over the chosen best practices.

No	Title of the Good Practice	Owner of the Good Practice	Country
1	Wiener Active and Assisted Living TestRegion – WAALTeR	UIV Urban Innovation Vienna GmbH (LP)	Austria
2	Lebensphasenhaus	University of Tübingen, Ministry of Education and Social Services Baden-Württemberg	Germany
3	National eHealth Infrastructure (EESZT)	National Directorate General for Hospitals	Hungary
4	Active Ageing Strategy / Strategija dolgozive druzbe	Ministry of Labour, Family, Social Affairs and Equal Opportunities	Slovenia
5	Simbioza BTC City Lab	Simbioza Genesis, Sopcial Enterprise	Slovenia
6	Lokaal+: future proof education programme for vocational health care students in an aging society	Summarcollege Eindhoven	Netherland
7	SMARTCARE – ICT-supported integrated care	Health Authority of Trieste	Italy

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6. Conclusion

The need for care in the Danube region is constantly increasing. Specialised care in older adult homes is only available to a small number of older people, while the number of people waiting for care is already more than half of the total number of people receiving care with no or few new places being created.

The provision of basic services (catering, home help) is a mandatory task for all municipalities. However, the capacity therefore is unevenly distributed. There are municipalities where 80% of elderly people are cared for, others where only a few percent are. There is, additionally, a lack of information: Only about a third of older people know what they would be entitled to.

The amount spent on care for older adults is factually decreasing year on year. Funding is managed on a planned basis in the budget law: the norms are not based on the actual operational costs of the benefits. If the state does not reassess its role in the care crisis, more and more older people will be left in need of care or any kind of care assistance.

While these challenges are tantamount and cut across disciplines and organisational or hierarchy levels, actors on all levels can contribute to their improvement. From the political perspective, contributions can be made both from national representatives and institutions as well as local public authorities.

Local public authorities can perform several functions within the process of validating and implementing smart care services. They can act as networkers, using their wide range of contacts to connect relevant stakeholder, sesibilize and motivate them for the topic. They can moreover assist in accessing regional, national or transnational funding opportunities. Over the entire process they can take on monitoring and supervisory tasks. Depending on personnel resources and capabilities local public authorities can get involved in several stages of the testing, validating and implementation process of smart care solutions. Not least, they can fruitfully disseminate knowledge about smart care services, act as a trustable guarantor for citizens and spread successful projects and solutions to a national level. In that way they can support the establishment of best practices which support policy change and the provision of funding opportunities which in turn again foster the implementation of smart care solutions benefiting individuals and institutions on a regional level as well as the further realisation of smart care service pilot projects. Local public authorities therefore play a pivotal role in initiating and sustaining a positive innovation spiral for smart health and care services.

Further information, especially on regional action points and existing strategies can be found in the Transnational smart care strategy and the transnational policy learning center available via the project website.

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