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Strategic Intelligence Monitor on Personal Health Systems Phase 3 (SIMPHS3)

*DREAMING (Spain)
Case Study Report*

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Abstract

DREAMING (ElDeRly-friEndly Alarm handling and MonitoriNG) was a large-scale pilot project that took place in 6 sites over a period of around 4 years, starting in 2008. It aimed to demonstrate new services that could help elderly people live independently in their home environment as long for as their physical and mental conditions allow. The technologies deployed were a combination of health and environmental monitoring systems. The data collected was processed by a decision support system and handled by a call centre. None of the 6 DREAMING sites developed further or integrated the services into the package of health and social care benefits offered to the population covered. Nevertheless, the innovation Unit of Barbastro Health Care Area (Spain) relied on the lessons and experiences from DREAMING and previous projects to design and test the implementation of telemonitoring services with a stronger integrated care approach.

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Preface

The Strategic Intelligence Monitor on Personal Health Systems (SIMPHS) research started in 2009 with the analysis of the market for Remote Patient Monitoring and Treatment (RMT) within Personal Health Systems (PHS). This approach was complemented in a second phase (SIMPHS2) with the analysis of the demand side, focusing on needs, demands and experiences made with PHS by healthcare producing units (e.g. hospitals, primary care centres), healthcare professionals, healthcare authorities and patients amongst others.

Building on the lessons learnt from SIMPHS2 as well as on the European Innovation Partnership on Active and Healthy Ageing initiative, SIMPHS3 aims to explore the factors that lead to successful deployment of integrated care and independent living, and define best operational practices and guidelines for further deployment in Europe. This case study report is one of a series of case studies developed to achieve these objectives.

The outcomes of SIMPHS2 are presented in a series of public reports discussing the role of governance, innovation and impact assessment in enabling integrated care deployment. In addition, through the qualitative analysis of 27 Telehealth, Telecare and Integrated Care projects implemented across 20 regions in eight European countries investigated in SIMPHS2, eight facilitators have been identified, based on Suter's ten key principles for successful health systems integration.

The eight main facilitators identified among these as necessary for successful deployment and adoption of telehealth, telecare and integrated care in European regions are:

- Reorganisation of services,
- Patient focus,
- Governance mechanisms,
- Interoperable information systems,
- Policy commitment,
- Engaged professionals,
- National investments and funding programmes, and
- Incentives and financing.

These eight facilitators have guided the analysis of the cases studied in SIMPHS3 and a graphical representation with arrows whose length represents the relative importance of each facilitator is presented in each case study.

In addition to the above facilitators analysed in each case report, a specific section is dedicated to the analysis of care integration. It should be noted that the definition of vertical and horizontal integration used in this research is taken from the scientific literature in the field of integrated care¹ and differs from the one mentioned in the European Innovation Partnership on Active and Healthy Ageing Strategic Implementation Plan². We define horizontal integration as the situation where similar organisations/units at the same level join together (e.g. two hospitals) and vertical integration as the combination of different organizations/units at different level (e.g. hospital and primary care).

¹ Kodner, D. (2009). All together now A conceptual Exploration of Integrated Care.

² http://ec.europa.eu/research/innovation-union/pdf/active-healthy-ageing/steering-group/operational_plan.pdf (page 27).

Table of Contents

ACKNOWLEDGMENTS.....	1
CASE OUTLOOK.....	5
1. BACKGROUND.....	6
1.1 SPANISH SOCIAL AND HEALTH CARE SERVICES.....	6
1.2 THE INNOVATION UNIT OF THE BARBASTRO HEALTHCARE AREA, SPAIN	8
1.2.1 BARBASTRO HEALTHCARE AREA.....	8
1.2.2 EXPERIENCES AND PROJECTS OF THE INNOVATION UNIT	10
1.3 THE DREAMING PROJECT	12
2. LESSONS AND FINDINGS FROM THE DREAMING PROJECT.....	14
2.1 DIMENSIONS OF INTEGRATION.....	14
2.2 IMPACT.....	15
2.3 LESSONS.....	16
3. THE BARBASTRO INNOVATION UNIT: INTEGRATED CARE ANALYSIS	17
3.1 DIMENSIONS.....	17
3.2 IMPACT.....	17
3.3 DRIVERS AND BARRIERS	19
3.4 ORGANISATION, HEALTH PROFESSIONALS AND PATIENTS.....	20
3.5 INFORMATION AND COMMUNICATION TECHNOLOGIES	21
3.6 GOVERNANCE.....	22
3.7 ORGANISATIONAL PROCESSES	22
3.8 REIMBURSEMENT MODEL AND ECONOMIC FLOW	23
4. TRANSFERABILITY	23
5. CONCLUSIONS	25
REFERENCES	27

List of Figures

Figure 1:	Spanish National Health System characterisation.....	7
Figure 2:	Financial flows across the Spanish NHS.....	8
Figure 3:	Aragon region and Barbastro Healthcare Area	9
Figure 4:	Innovation Unit eHealth projects.....	11
Figure 5:	DREAMING technology.....	21
Figure 6:	SMARTCARE Early discharge care pathway.....	23
Figure 7:	Facilitators of the Innovation Unit's projects and experiences	26

List of Tables

Table 1:	Specific goals of the Innovation Unit.....	10
Table 2:	Innovation Unit projects with an integrated care dimension	12
Table 3:	Total Cost PITES project	18

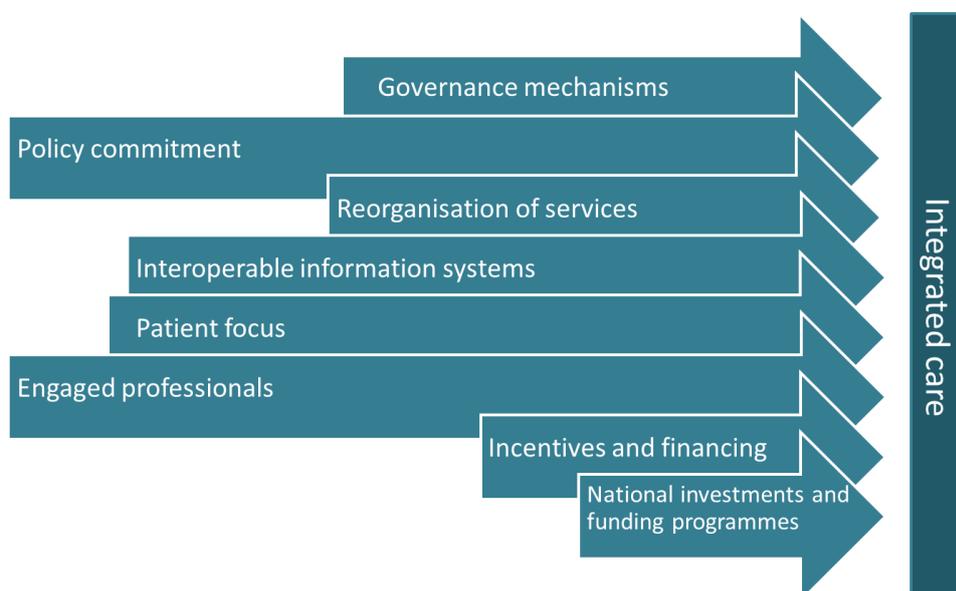
Case Outlook

DREAMING was a large scale pilot project which aimed to demonstrate new services that could help elderly people to continue to live independently in their home environment as long as their physical and mental conditions allowed. However, the DREAMING project was not a clear case of integration of health or social services in the sense that care responsibilities were not coordinated between different health and social types of care, or between providers of different primary and specialised levels of healthcare. Nevertheless, there was some service and information coordination between healthcare levels and with social care through the management of monitoring data and alarms by a call/contact centre.

The innovation Unit of the Barbastro Healthcare Area (BHCA), Aragon, Spain, one of the participants in DREAMING, relied on the lessons and experiences from this and previous projects to design and test the implementation of telemonitoring services with a stronger integrated care approach. BHCA is one of the 8 healthcare areas in Aragon and is responsible for the public health care services in the Eastern half of the Spanish province of Huesca, providing services to a population of 110,000 inhabitants.

In subsequent projects developed by the Innovation Unit, social care actors were given a more prominent role in the provision of telemonitoring services (PITES, SMARTCARE), which underlines the integrated care aspect of these initiatives. This aspect is most reinforced in the SMARTCARE project where patient's care (health and social) plans are defined jointly by the different types of care (i.e. by health and social care organisations). Finding an adequate business case and model for this type of telemonitoring services that would allow their deployment in the healthcare area and in the Aragonese Healthcare system is one of the main drivers of the Innovation Unit's activities in this field.

The lessons that can be drawn from these experiences are that strong leadership is needed, and professionals should be involved from the beginning to allow them to take joint responsibility and ownership of the projects. In addition, the technology to be used should be adapted to the context, users and existing systems. The barriers to overcome are related to the lack of managerial flexibility and the inadequacy of the standard evaluation methodologies for these types of projects. The following figure sketches the main integrated care facilitators.



1. Background

1.1 Spanish social and health care services.

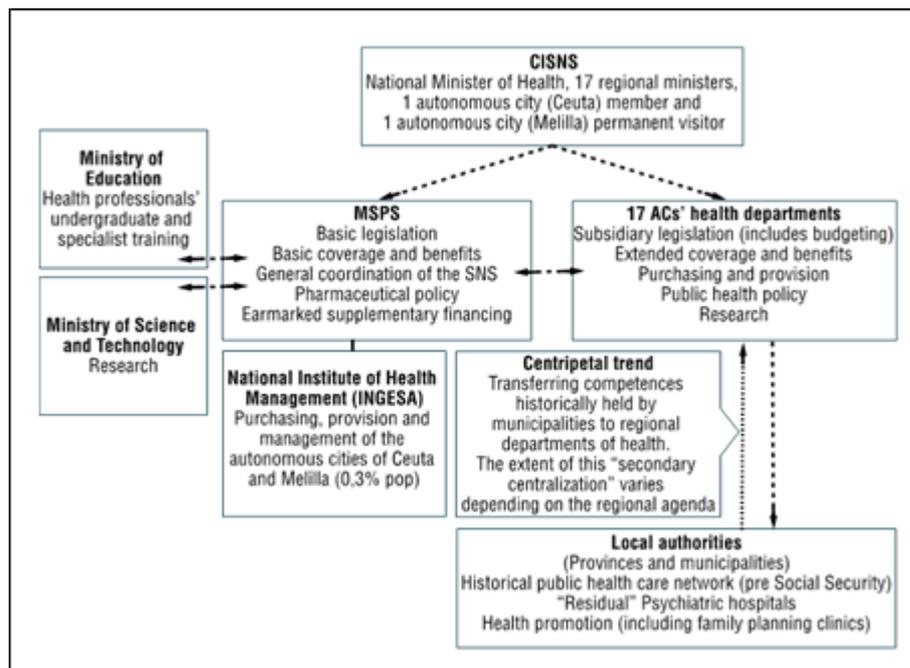
The Spanish Constitution of 1978 established the right to health protection and healthcare for all citizens. The Ministry of Health, Social Services and Equality (2012) have defined the following substantive principles and criteria that enable the exercise of this right:

- Public funding, universal coverage and free healthcare services at the time of use.
- Defined rights and duties for citizens and public authorities.
- Political devolution of healthcare to the autonomous regions.
- Provision of comprehensive healthcare, striving to attain high levels of quality duly evaluated and controlled.
- Integration of different public structures and health services under the National Health System.

Spain has a statutory national health system (SNS), which is characterised by universal coverage and is funded by taxes. Services are largely provided free of charge at delivery, though most pharmaceuticals prescribed to people aged under 65 require a co-payment of about 40% of the price. Private voluntary insurance plays only a minor role in the Spanish health system. The services provided are mainly complementary to the services provided under the statutory health system, and usually imply reduced waiting times for specialised care or access to services that are limited within the benefits package of the SNS. The political control of the Spanish health system rests with the regional governments (Comunidades Autónomas). There are 17 regional health ministries across Spain, in charge of primary jurisdiction over the organisation and delivery of health services within their respective regions. In its most typical form, a regional health system of an autonomous community is composed of a regional ministry (Consejería de Salud) which is responsible for the general definition of health policies and the regulation of health care and its planning, and a regional health service in charge of the provision of services. The regional ministry organises and structures the health services in the region and typically two executive organisations provide primary care and specialist care respectively.

However, it has become very frequent for regional health systems to integrate primary and specialist care under a single management structure. A single primary care team (PCT), allocated to a patient and not freely chosen, takes the role of gatekeeper for access to services, as access to specialist care largely depends on prior referral from the GP. As a means of improving waiting list management, some specialised care delivery is contracted out to private hospitals, but around 40% of all hospitals in Spain belong to the SNS. Most of the public health expenditure in Spain is financed through general taxation (>94%), supplemented by contributions from payroll tax and employers contribution, as well as the mutual funds for civil servants.

Figure 1: Spanish National Health System characterisation

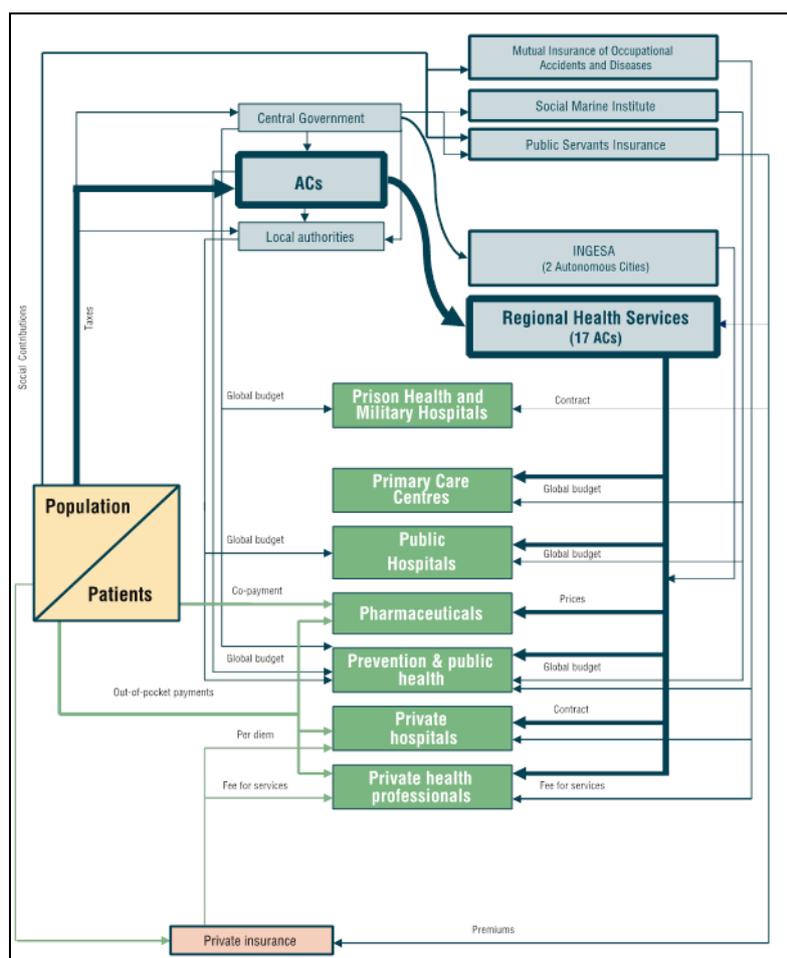


Source: García-Armesto et al (2010)

Public health expenditure relates mainly to both in-and out-patient specialist care (54%), primary health care (16%), pharmaceuticals (19.8%), and prevention measures and general public health (1.4%). The regional governments administer the largest share of the public health resources, with the central government and the municipalities accounting for a resource allocation of only about 3% and 1.25%, respectively. The primary care network is completely public. Care professionals work in multidisciplinary teams comprised of GPs, nurses, social workers, or paediatricians who are linked to laboratories or diagnose centres.

Figure 2 sketches the financial flows across the Spanish NHS. The allocation formula is based on a per capita criterion, weighted by population structure, dispersion, extension and insularity of the territory.

Figure 2: Financial flows across the Spanish NHS



Source: García-Armesto et al (2010)

1.2 The Innovation Unit of the Barbastro Healthcare Area, Spain

1.2.1 Barbastro Healthcare Area

The Aragon Government, through the Aragonese Healthcare Service (Servicio Aragonés de Salud - SALUD) is responsible for the delivery of health services in the Autonomous Community of Aragon. This region is situated in the Northeast of Spain and has a population of 1,331,943 inhabitants, 20.6% of whom are over 65. The Barbastro Healthcare Area (BHCA) is one of the 8 healthcare areas in Aragon and is responsible for the public health care services in the Eastern half of the Spanish province of Huesca, one of the three regions in which the Aragon region is administratively divided. The population covered by the BHCA is around 110,000 inhabitants, in a geographical area of 7,500 km². This means that the population is quite dispersed, with one of the lowest population density (13.75 inhabitants/km²) in Spain and in the European Union as a whole. Furthermore, the Northeastern part of the area includes part of the Pyrenees, with remote towns and villages which, depending on the weather, are sometimes difficult to reach (Figure 3).

Figure 3: Aragon region and Barbastro Healthcare Area



The services provided by BHCA comprise all healthcare assistance levels: primary care, specialised care, long-term care and mental care, and the territory is divided into fifteen geographic areas called “zonas de salud” (“health care zones”). This division is mainly for the purpose of organising and providing primary care, and there is a health care centre offering primary care in each of the “zonas de salud”. In primary care, there are 136 General Practitioners’ offices spread around all the health care zones. Specialised care is provided by an acute care Hospital (160 beds) located in the city of Barbastro and two outpatient centres.

BHCA endorses the objectives defined by the Servicio Aragonés de Salud (SALUD), namely;

- To provide comprehensive healthcare to all citizens,
- To guarantee access to care services,
- To promote healthy lifestyles,
- To offer preventive care,
- To maintain patients’ autonomy and social inclusion,

BHCA further highlights the following strategic action lines in order to pursue the above objectives:

- Telemedicine:
 - Remote consultation between healthcare professionals,
 - Telehealth between patients and specialised care professionals,
 - Remote monitoring.
- Preventive care and health promotion
- Patients’ safety: radio frequency identification
- e-learning programmes
- Use of expert tools for decision-making support

1.2.2 Experiences and projects of the Innovation Unit

The Innovation unit of the BHCA was created in 2002. As a consequence of the completion of the devolution of healthcare responsibilities from the Spanish central government to the Regional Governments, Aragon had just taken full responsibility for the planning and provision of healthcare for citizens living in its territory. At that point, the healthcare areas were created, and for the first time, the levels of primary and specialised care were integrated under the same management. The management of the BHCA then decided to create the Innovation Unit initially to integrate primary and specialised care health information systems. The aim was to make the system more sustainable through innovative processes and new tools which allow more efficient healthcare provision. Since then, the goals of the unit have evolved and currently, the main purpose of the unit is defined as follows: “... drive ICT utilization within the Aragonese Health Service (Salud), with the main objectives of increasing knowledge management, empowering working networks among its professionals, moving forward through excellence in the provided services and contributing to its own sustainability”. The detailed goals and objectives specified (Table 1) focus not only on the BHCA but also on the whole public healthcare system of Aragon.

Table 1: Specific goals of the Innovation Unit

- To align the e-Health innovation process with the **SALUD guidelines, strategies and priorities**.
- To promote e-Health innovation in SALUD through **re-engineering healthcare processes**, by using ICTs as a tool to foster the development of more sustainable services and to lead to excellence.
- **To lead e-Health product and service design** at a regional, national and international level, positioning Aragon on the international map of e-Health innovation.
- To facilitate a **quick innovation transfer** to SALUD centres and their professionals, in order to improve the quality of the healthcare services provided to citizens.
- To make the most of existing **know-how and experience** by working with strategic alliances. To take into account working with different partners' internal organisation needs.
- To ease the **alignment of educational investigation** with healthcare needs and to drive ICT companies to increase their competitive advantage.
- To ensure the application of **ethical, deontological and legal** principles within the biomedical innovation context.
- To disseminate scientific results obtained from the innovation process and spread the knowledge about the goals that have been met.
- To facilitate the creation of an **economically viable system** at a local and regional level. To act as a breeding ground for ideas and as a business incubator for companies that will produce new services and processes. These new services and processes will be exploited by the whole organization and will be marketed at the national and international level.
- **To secure external financial resources** and to have **management autonomy** for the e-Health innovation process. To set up a legal entity to gather external resources beyond public funding with grants

Source: Adapted from the Innovation Unit webpage.

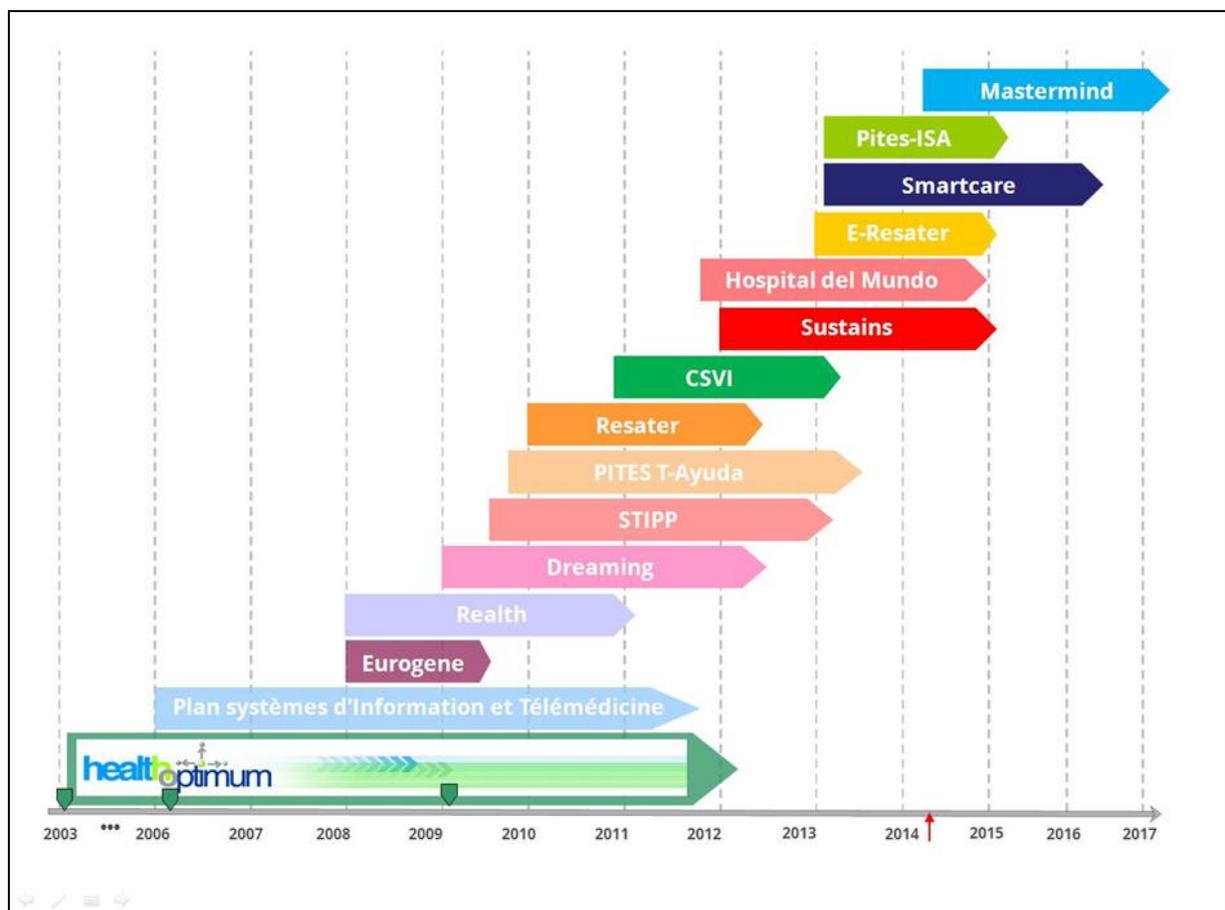
In order to achieve these goals, the unit applied the following working methodology:

- processes were divided into (sequential) milestones,
- strategic alliances were established,
- new services or processes were tested and validated in “controlled” contexts,
- the validated services and processes (if successful) were deployed within the organisation.

In this process, the first milestone highlighted as a key aspect for the success of the unit was the systematisation of basic telemedicine services like teleconsultation between specialists and GPs, and Telehealth between specialists and patients. The specific services developed and deployed across Aragon were Tele-retinography, Tele-dermatology and Teleictus. The other two important milestones were telemonitoring services for chronic patients, integrating telecare from the social care side and preventive monitoring of vital signs from the healthcare side, and third generation services, which leverage ICT deployment to empower patients and to develop virtual hospitals.

This working methodology has been applied through the participation and involvement of the unit in several projects, funded by European and Spanish research programmes. Figure 4 shows the different projects in chronological order while Table 2 gives a very brief description of those related to the field of integrated care.

Figure 4: Innovation Unit eHealth projects



Source: Adapted from the Innovation Unit webpage.

Table 2: Innovation Unit projects with an integrated care dimension

2003	HEALTH OPTIMUM: Information systems and telemedicine planning. The aim was to provide a general ICT framework to SALUD for providing telemedicine services (tele-consultations between professionals, virtual referral, tele-laboratory and tele-care.).
2007/8	ISPAMAT, REALTH: Systems for improved teleconsultations and telemonitoring.
2008	DREAMING, CSVI, RESATER, STIPP: ICT platforms for patients with chronic conditions
2010	PITES: To involve social care providers in the care continuum through the transfer of healthcare responsibilities
2011	SUSTAINS: Patient empowerment by online access to EHR services.
2013	SMARTCARE: Integrated care through the coordination of key stakeholders.
2014	MASTERMIND: Evaluate the impact of the extension of cCBT services (computerised Cognitive Conductual Therapy) for adults with depression.

Source: Adapted from the Innovation Unit webpage.

The experience and the reputation gained by the BHCA Innovation Unit at national and international level has allowed the unit to position itself as the key stakeholder in the field of innovation through ICT in the Aragon healthcare system. Indeed, this reputation extends further to other care fields as shown by the current participation of members of the unit in the design of the Aragon's integrated social and health care plan.

1.3 The DREAMING project

DREAMING (ElDeRly-friEndly Alarm handling and MonitorING) was a large-scale pilot project which aimed to demonstrate new services to help elderly people to continue living independently in their home environment as long as their physical and mental conditions allowed. It was funded partially (around 50% of the cost) by the European Commission under the Information and Communication Technologies Policy Support Programme with a total cost of €5.66 million.

The project which started in April 2008 lasted a little more than 4 years, with services trialled in six pilot sites: Denmark (Langeland), Estonia (Tallinn), Germany (Berlin), Italy (Trieste), Spain (Aragon) and Sweden (Heby). Patients included in these Randomised Controlled Trials (RCTs) were followed for a period of 24 months.

The core objectives of the project were to:

- Enable elderly people with chronic conditions to keep on living in their own homes safely, until their physical and mental conditions required a different type of care (i.e. elderly or nursing home).
- Provide them with an effective and user-friendly way of being in contact with family and friends.
- Improve the quality of the health and social care provided to this population by increasing the appropriateness and the timeliness of interventions.
- Reduce, or at least contain, health and social care expenditure as a consequence of better control of patients' conditions and a more efficient use of resources.

The services put in place under the DREAMING project were a combination of health and environmental monitoring systems, together with a videoconferencing system. Monitoring data were processed by a decision support system handled by contact/call centre. The specific technologies deployed were:

- Wireless detectors of movement, smoke, gas, water leak detectors, etc. which would detect situations in the house or flat which would require assistance
- A special cellular phone for older people with features such as integrated panic button, integrated fall detector, medication reminder, and positioning systems based on GPS.
- A specifically-designed videoconferencing system to be used by older people, incorporated in the TV set.
- A set of self-operated health monitoring medical devices. For each participant, these devices varied according to their specific health conditions and could include weight scale, pulse and blood pressure monitor, glucometer, asthma monitor, 1-lead ECG monitor, 1-12 lead ECG monitor and pulse/oximeter monitor. For each individual there was a personalised schedule for taking these vital parameters, adapted to the specific needs of the individual.

Environmental and health data were sent to the contact centre for further processing by the decision support system. If vital signs measurements were out of a pre-defined range (that could be individualised for each patient), or if environmental recordings were inconsistent, the system generated alarms and alerts. Depending on the protocols in place, an alarm would trigger some automatic action (e.g. a text message) handled by the contact centre which decided upon the adequate action and dispatched the appropriate resources (fire brigade, ambulance, GP on duty, nurse, social worker, etc.). The above information together with the monitoring and environmental data were accessible to professionals and users through a web-based portal

2. Lessons and findings from the DREAMING project

2.1 Dimensions of integration

The participants enrolled in the DREAMING sites were individuals older than 65 years suffering from at least one of the following chronic conditions; hearth failure, diabetes mellitus, cerebrovascular accident and chronic obstructive pulmonary disease. In addition, they could not be included in the project if they were dependent on others for activities of daily living or if they suffered from dementia. These criteria implied that the services were targeted at an older population with some health problems but not severe enough to prevent the individuals from living alone.

Services and structures put in place under the DREAMING project did not constitute a clear case of integration of health or social services in the sense that care responsibilities were not coordinated between different (health and social) types of care or between providers of different (primary and specialised) levels of healthcare. Nevertheless, there was some service and information coordination between healthcare levels and with social care through the management of monitoring data and alarms by the call centre.

Furthermore, DREAMING impacted on the way care was delivered to chronic patients by modifying the roles of professionals, patients and carers. The project caused the modification of workflows, competencies, contacts, communications, etc. in the whole care process. The new services put in place under the DREAMING project therefore had an impact on several types of care, health and social care, though they were not a consequence of formal or informal integration of services between or within these levels.

The DREAMING services influenced two key aspects of the care processes of individuals in a simultaneous and complementary way:

1) **Changes in the role of actors.** Measuring their own vital signs made patients take a more active role in their health care. The DREAMING technology allowed them to follow and review their history of clinical parameter measures, thus reinforcing the self-care aspect of the services. This patient (or carers) empowerment provoked a cascade of changes in the roles of the (other) key actors involved in the patient's care pathway. Nursing staff did not have to measure physiological parameters as often anymore and GPs did not have to continuously assess these measurements, freeing time for them to carry out other tasks. Therefore, GPs and nurses (and specialists) changed their care approach as a consequence of these changes in roles. In addition, the DREAMING services implied that all visits to the healthcare services were, in theory, justified since patients were screened by the nurse at the call centre. This implied that the origin of the demand for services was mostly objective rather than subjective, with the related impact on the use of (primary) healthcare services.

2) **Data availability.** All the care decisions taken were better informed as they were based on more relevant data points, both from a clinical and social care perspective. For instance, a hospital admission could be avoided for a given patient because his or her disease was better monitored as a consequence of better handling by himself/herself or by the healthcare services. Another example is the quicker response from the contact centre to a patient with high blood pressure because this information was automatically sent to the Salud Information Systems, handled by the DREAMING Help Decision Support Systems and received and validated by a Healthcare Professional at the Contact Centre who made the decision about what actions should be taken.

There is one component in the DREAMING services that can be seen as directly facilitating integrated care: the application that allowed actors from different levels of healthcare to

review patients' monitoring data. Nevertheless, decisions were taken mostly independently by each of these levels and the sharing of information between healthcare providers was not a distinctive feature of DREAMING as it had been established in some of the sites before the implementation of DREAMING.

In conclusion, the key to achieving better care for patients in DREAMING was not the integration of services but the collection of additional and more precise data which, at the same time, induced a change in the roles of the key actors in the care processes.

2.2 Impact

The main primary outcome chosen to evaluate the impact of the DREAMING services was the change in the results of the Short Form Health Survey (SF36) questionnaire scores. This instrument assesses health-related quality of life (HRQoL), the improvement of which was a major DREAMING objective. Changes in the levels of anxiety and depression were also assessed through the Hospital Anxiety and Depression scale (HADS). The impact on other secondary clinical outcomes such as hospitalisations and length-of-stay as well as use of healthcare services (GPs, specialists, ER) was also considered. Two further dimensions considered were user satisfaction, focussing on their satisfaction with the DREAMING equipment installed, and the economic impact. The values in these indicators for the 138 patients who received the DREAMING services were compared to those of 137 similar patients who formed the control group when possible.

Clinical and health-related quality of life impact:

- A positive effect was found on the mental health of patients, measured through changes in depression scores on the HADS scale and in the mental health component of the SF-36.
- There was no impact on the physical aspect of the SF36 HRQoL, or on related clinical events such as hospital admissions, and consultations with specialists and GPs.
- The incidence of falls was higher among patients who received DREAMING services. The project researchers attributed this finding to monitoring bias.

User satisfaction:

- The service or component most popular among patients was the monitoring (health and environmental) equipment. Carers, however, gave the portal higher satisfaction scores. Patients highlighted the increased sense of security that DREAMING services provided to them as a positive aspect.

Economic impact:

- This analysis was carried out separately for each site of the project because of differences in unit costs and healthcare systems. The costs considered were only the direct health and social care costs and installations costs for the DREAMING group.
- The results show that in three of the sites (Denmark, Germany and Italy) the cost per participant over the trial period was lower in the DREAMING group.
- Two resources were key for the differences found between the DREAMING groups, the control groups and the sites. First, hospitalisation costs were higher for the participants in the DREAMING group in all but one site (Italy). These higher costs

were compensated in two sites (Denmark and Germany) by lower costs in home care (visits by nurses and/or social workers) in the DREAMING group.

2.3 Lessons

The 6 different sites where the DREAMING services were trialled shared some common experiences and findings in relation to key factors for a successful implementation of health and social care services that are supported by technology:

- **Strong leadership** and **organisational buy-in** are requisites for success. At management and medical levels, the services or project should be led by professionals with a sound reputation in their fields. This generates the required trust from colleagues and decision makers for the project to be developed without additional obstacles. In addition, and complementary to this strong leadership, all the organisations involved should embrace the projects, understanding their objectives and motivations.
- The **key actors** - professionals, patients and carers - should be **involved** in the project from the beginning. In the case of professionals, the objective is to prevent them from seeing the technology as a threat to their job security or something that could impact negatively on their workload. For patients and carers, the aim is to overcome the resistance of individuals to technology, which could be especially significant among old people. A good communication plan, for both professionals and users, is seen as the key to achieving this objective.
- **Training** is another crucial element for a successful experience. Patients are given a new role in their own care so they need good training in the use of technology, complemented with health education. In the case of professionals, the changes in workflows and competences in the care of individuals need to be explained, understood, and most importantly, accepted. Furthermore, professionals need to be trained both in the technology they need to use and the one to be used by patients/carers in order to be able to help them.
- The **technology** to be used should be **adapted to the context**, the systems already in place and the users (both patients and staff). In the case of the patients, their cognitive and physical limitations should be given a prominent weight in the decision about the type of technology to be adopted. The user-friendliness and reliability of technology is therefore a key aspect and the handling of technical problems should be planned in advance, ideally with a single point of contact for technical problems. The acceptance of the technology by patients and carers could be improved if it is presented and explained by someone familiar to them (GP, nursing staff). Another issue that needs adequate advance planning is how to adapt existing technology to the probable technological changes that will take place over the lifetime of the services.
- Finally, these services involve and impact on both healthcare and social care systems. This could cause problems that could be avoided or at least alleviated through organisational or funding **integration** between care levels. However, in cases where the political and management responsibility for these two fields are separate, it could be a barrier for the correct management of the services. In addition, it might affect economic sustainability or the business case of the services if savings and costs are not evenly spread between the two levels of care.

3. The Barbastro Innovation Unit: Integrated care analysis

3.1 Dimensions

The experiences and projects developed by the Barbastro Innovation Unit are, in principle, directed at all the population covered by the public healthcare system in the Barbastro Healthcare area. Nevertheless, the unit's projects which have focussed on delivering integrated care have targeted the elderly population suffering from chronic diseases. In these projects, services are provided to elderly individuals living in their homes, with and without the need for assistance in daily activities, and to those who are institutionalised in care and nursing home settings. The services implemented generally take two complementary approaches to their (care) goals: they focus on detecting new health problems early and preventing existing problems from getting worse, together with trying to improve the quality of care for chronic patients.

Fostering an integrated approach to the care of individuals has been one of the Unit's goals ever since its first projects on specialised and primary care. These projects also had the complementary objective of developing a basic common technological framework that would allow the development of further services. In these first projects, there were cases of partial integration e.g. tele-counselling involving specialists for patients managed by primary care, or tele-counselling between specialists.

The introduction of elements of social care increased the breadth of integration of these projects, particularly in telemonitoring services (DREAMING, PITES, SMARTCARE). In these services, a common contact/call centre handles the health and social care data. In addition, social care organisations, both public and private, are involved in developing and providing services. For instance, in the SMARTCARE project, Red Cross volunteers are in charge of visiting patients' homes with a portable telemonitoring system that registers health and care data (the same role was assigned to these volunteers in the PITES project). Again in the SMARTCARE project, social care organisations can identify patients who are eligible for the services. SMARTCARE provides the clearest example of integration between different types of care as patients' (health and social) care plans are defined jointly by a committee composed of primary, specialised and social care representatives. Plans to incorporate further key actors like pharmacists in the provision of care reinforce the integrated care aspect of the initiative.

Most of the Unit's projects that have an integrated care component arose out of relationships among different organisations (organisational integration) and/or collaborations between professionals and providers across organisations (professional integrations). Only SMARTCARE can be defined as a case of partial service integration, given the coordination of care achieved by the common care plans. In relation to the degree of integration, the Unit's projects can be defined as cases of medium-level integration because inter-organisational mechanisms are in place, but service responsibilities and funding remain with each organisation.

3.2 Impact

The main objectives of the Unit's projects are to improve the quality of care received by the population and to impact positively on the sustainability of public health and social care systems. The improvements to the quality of care are achieved, theoretically, through constant monitoring and processing of health data, which keeps chronic patients more stable and early diagnoses of new health problems. The changing roles of professionals (more skilled) and patients (more empowered) also have a positive impact on the care

received. This improved care leads to a reduction in the costs of services. In addition, the use of some care services (e.g. GP visits) were reduced as a consequence of the demand being objective (based on monitoring data and filtered by a call centre) and not subjective (based on patient's initiative).

These impacts have not been confirmed by the data available so far. Analysis of the projects DREAMING and PITES show that patients who received the new services did not achieve better results in health-related quality of life, a proxy for quality of care, measured through the SF36 questionnaire. In DREAMING patients, a positive effect was found on their mental health, measured by changes in the mental health component of the SF-36. Furthermore, these patients' satisfaction with the services is high. For them, the main benefits were the feeling of security given by being monitored and the reduction in visits to health care centres. Both health care staff and third sector volunteers (in the case of the PITES project) express their satisfaction with the service implemented. The former group points to improvement of the quality of care and more control over chronic diseases, while the latter highlights the possibility of providing new care for the elderly. In relation to the quality of care, some health conditions could be diagnosed early thanks to the analysis of the monitoring data collected.

In relation to the impact of these projects on the sustainability of health and social care systems, the data available do not confirm the expected reduction in costs among patients receiving the new services compared to a control group. For instance, in the PITES project the economic analysis found similar healthcare costs per patient in both groups but when service costs are included (technology, consumables and dedicated staff) the costs in the group receiving the service are 16% higher (Table 3). An alternative analysis considered the use of healthcare services only after patients had been filtered by the call centre, thus excluding from the analysis the costs of healthcare visits, which took place on the initiative of the patient. In this case, the costs per patient in the group receiving the services were 36% lower than in the control group ("Best scenario" column in Table 3 below).

Table 3: Total cost PITES project

Total costs	Intervention group	Control group	Best scenario (referred alarms)
Service Costs	€23,683.85	€0.00	€23,683.85
Healthcare Costs	€141,433.39	€141,787.95	€67,709.62
Total Costs	€165,117.24	€141,787.95	€91,393.47
Service Cost per patient	€789.45	€0.00	€789.46
Healthcare cost per patient	€4,714.45	€4,726.27	€2,256.99
Total Cost per patient/year	€5,503.91	€4,726.27	€3,046.45

Source: Coll et al 2013

Despite the lack of impact on the total use of resources, some observed trends point towards a possible positive effect on costs in the future. For example, unplanned care demands could be reduced, and a higher share of care demands could be handled by primary care, rather than specialised care.

The lack of confirmed positive results is attributed partly to the methodology used to evaluate the service: Randomised Controlled Trials (RCT). Specifically, the small samples (around 30-40 patients per group) and the short follow-up periods (12-24 months) are considered inadequate for this type of services. The characteristics of the patients (elderly suffering chronic conditions) require larger samples to avoid decompensation between groups as a consequence of the probable worsening of the health of just a few patients.

The analysis could include the positive effects of the preventive aspects of the services on the use of healthcare services if there were longer follow-up periods. Furthermore, some of the clinical indicators used might not reflect the positive impact of changes of roles triggered by the new services.

3.3 Drivers and barriers

The key drivers of the experiences and projects developed by the Innovation Unit are:

- **Technology focus:** the technological solutions have been developed and implemented with a view to using them in future projects. They are based on systems already in place and allow easy scaling up.
- **Health system focus:** The solutions implemented are responses to demands from the whole (Aragonese) healthcare system not only from the Barbastro healthcare area where they are implemented/trialled. This fact reinforces the unofficial status of the Unit as the Aragonese “living lab” in health technologies.
- **Reputation:** The Unit's sound academic reputation was acquired and is currently being reinforced by its participation in international and national projects. This reputation provides the unit with credibility when it suggests new idea and services and, at the same time, its participation in multisite projects allows a quicker learning process.
- **Management support** to the Unit's activities.
- **Involvement of all actors**

In relation to health and social care professionals involved in the Unit's projects, the following have been key in ensuring success:

- Clinical leaders in their fields have been involved.
- Professionals involved play an active role in the projects, taking joint responsibility and ownership, including of the results.
- By rotating the participation of healthcare “zones” (a subdivision of the healthcare area), a maximum number of professionals are involved in projects and pilots carried out by the Unit at any one time, which contributes to raising awareness and interest in projects.
- As a result, despite the lack of an incentive framework, participation in innovative projects is a motivation in itself.
- **Training and collaboration:**
 - Training on the use of technology is offered to health professionals and users (patients, informal carers, and volunteers). Professionals are also trained to show patients or informal carers how the devices work.
 - These training programmes help build the necessary trust between patients and professionals and at the same time increase the confidence of the former in the technology. Confidence is a key means of achieving one of the main objectives of the services piloted by the Unit: the empowerment of patients in their health and social care.

- Close collaborations with the key stakeholders are developed, especially with those belonging to the social care sector.
- Finally, the Unit takes a sequential approach to the **definition and design of the project and the related services**. Lessons, findings and barriers identified in all the previous experiences and projects are incorporated explicitly when designing the next experiment. At the end of each project, clinical and organisational findings are evaluated by the Unit, together with the medical management of the area and lessons learned.

Several barriers have prevented further deployment of some of the services trialled in the Unit's projects, so results did not always match expectations:

- **Evaluation method:** As mentioned before, the standard methodology of evaluation, RCT, is not considered suitable for this type of services. The fact that results and benefits of the new services are not adequately measured and recorded in this framework has a very negative impact on the definition of viable business models. This becomes clear when looking at the additional costs of these services
- **Organisational structure:** The limited managerial and financial flexibility of the Unit as a consequence of being integrated in a big public organisation has some negative impact on the management of the projects.
- **Duplication of service:** In some of the projects, depending on their focus, both the new and the old way of providing services coexisted for a transition period and this led to higher use of care resources. More specifically, in terms of visits to GPs appointments were made on the initiative of the patients or the informal carers (subjective demand) and also as a result of the telemonitoring data and the systems of alarms (objective demand). Nevertheless, once professionals and patients adapt to the new care process, this duplication in the use of services disappears.

3.4 Organisation, health professionals and patients

As described earlier, the Aragon Government through the Aragonese Healthcare Service (Servicio Aragonés de Salud - SALUD) is responsible for the delivery of health services in the Autonomous Community of Aragon. For management purposes, the Aragon region is divided into healthcare areas, Barbastro being one of them, integrating specialised and primary care (together with mental health and long-term care) but not social care. The responsibility of the provision of social care lies mostly with the Aragonese Social Services Institute (Instituto Aragonés de Servicios Sociales), although other public institutions such as city councils are involved in social care services provision as well, together with private providers. Nevertheless, at a higher organisational level, both types of care within the Aragon Government are under the responsibility of the same Department (comparable to a regional ministry) that is in charge of healthcare, social welfare and family issues.

As primary care and specialised care are under the same management (BHCA) and as a result of previous projects and initiatives, these care levels currently share the same ICT infrastructure including a network, databases, applications and intranet. The Innovation Unit of the BHCA is not attached to any specific level of care but provides services for the whole area.

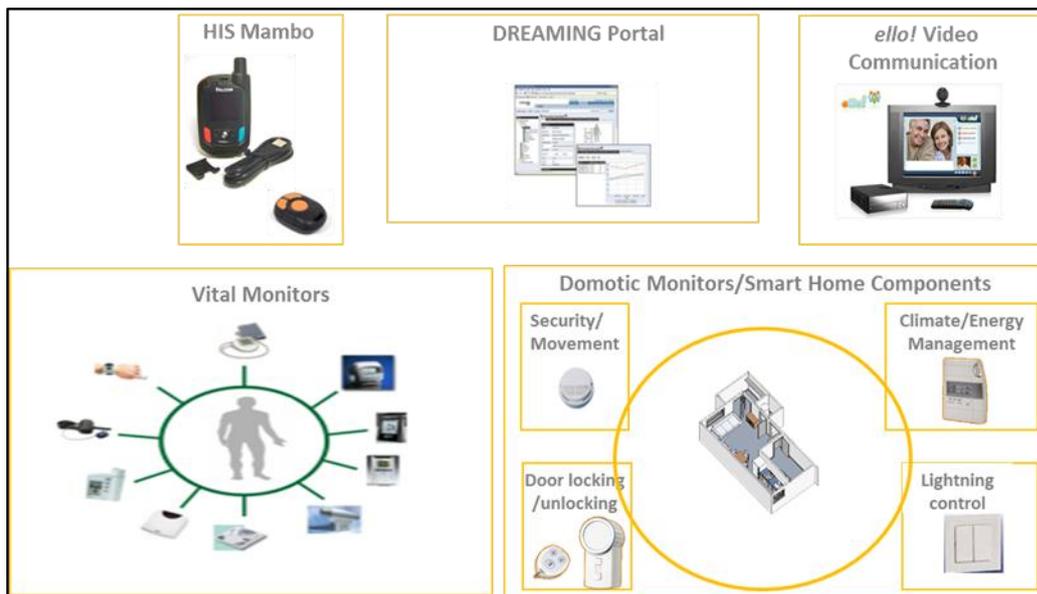
In the field of social services, besides the public provider, other key stakeholders play a role in the services developed by the Unit. The Spanish Red Cross provides several services to the elderly population targeted by some of the Unit's projects and its volunteers played a key role in the implementation of the PITES and SMARTCARE projects. Another third sector organisation which played a role in the projects is an association of relatives of Alzheimer's patients (AFEDAB, Asociación de Familiares de Enfermos de Alzheimer de Barbastro). This association is an active participant in the SMARTCARE project as it has a monitoring kit in its offices which informal carers use to register patient data. There are plans to replicate this model with other actors such as pharmacies, patients associations, etc.

Finally patients are key actors as well. In some cases, they are in charge of registering their own health data as the kits are installed in their homes. The new services give patients, except those with a cognitive impairment, a more active role in their own care.

3.5 Information and Communication Technologies

Technological solutions implemented in the different projects have evolved and adapted according to each of the projects' needs and to the lessons learned from previous experiences. In the first telemonitoring project which had a limited integrated approach (the DREAMING project), the technological component was formed by several devices installed at the patients' homes as described in Section 1.3. In brief, they were environmental and health monitoring devices, a mobile alarm and a videoconferencing system. Data recorded by some of these devices was sent to and processed by a specific system and updated in a specific portal (Figure 5). The health and social alarms generated by the system were handled by a call centre available 24/7 and managed by nursing staff and an Emergency Room doctor.

Figure 5: DREAMING technology



Source: d'Angelantonio, M. & Oates, J. (2013),

The technology used in DREAMING was modified and adapted in later projects. Only vital (health) monitoring systems were retained together with the data processing system and the call centre. However, the experience of the DREAMING project showed that the number

of alarms generated did not require a call centre available 24/7 as they took place mostly when data was being registered during the day.

Furthermore, in the PITES project, telemonitoring devices were not installed or held at the patients' homes. Instead, the third sector (Red Cross) volunteers were trained in the use of these devices and they were given portable telemonitoring kits which they used to register data when they visited patients at their homes. This allowed saving on equipment costs.

In the SMARTCARE project, a mixed approach has been taken with regard to the use and deployment of technology. Telemonitoring data can be obtained from devices held by patients, by Red-Cross volunteers at the patient's home or through a telemonitoring kit installed at the offices of the association of relatives of Alzheimer's patients and handled by informal carers. The other technological components of the SMARTCARE project are the specific Web portal and the shared information database which make up the collaboration platform and whose major aim is the sharing of information to create joint care plans. The Web Portal allows access to a care plan, an agenda and an activity register for each patient included in the project. The database contains pieces of information from both healthcare and social care information systems which allows more integrated services to be provided more efficiently, and with higher quality (minimum shared data set).

3.6 Governance

No specific governance structure has been established for the projects and pilots implemented by the Unit. Instead, strategic partnerships and collaborations are being developed with relevant actors within the healthcare sector and with social services stakeholders. In the case of primary care, close collaboration with GPs is achieved through the involvement of different professionals in each of the projects. Another example is an agreement established with specialised care through which some of their resources (nurses) are assigned to work in the Unit's projects (e.g. in the call centre). A collaborative environment has been built with organisations such as the Red Cross and AFEDAB fostering their involvement in the projects. An important factor in setting up such collaboration mechanisms, especially those within the healthcare system, has been the strong support of the management of the healthcare area to the Unit's activities.

3.7 Organisational processes

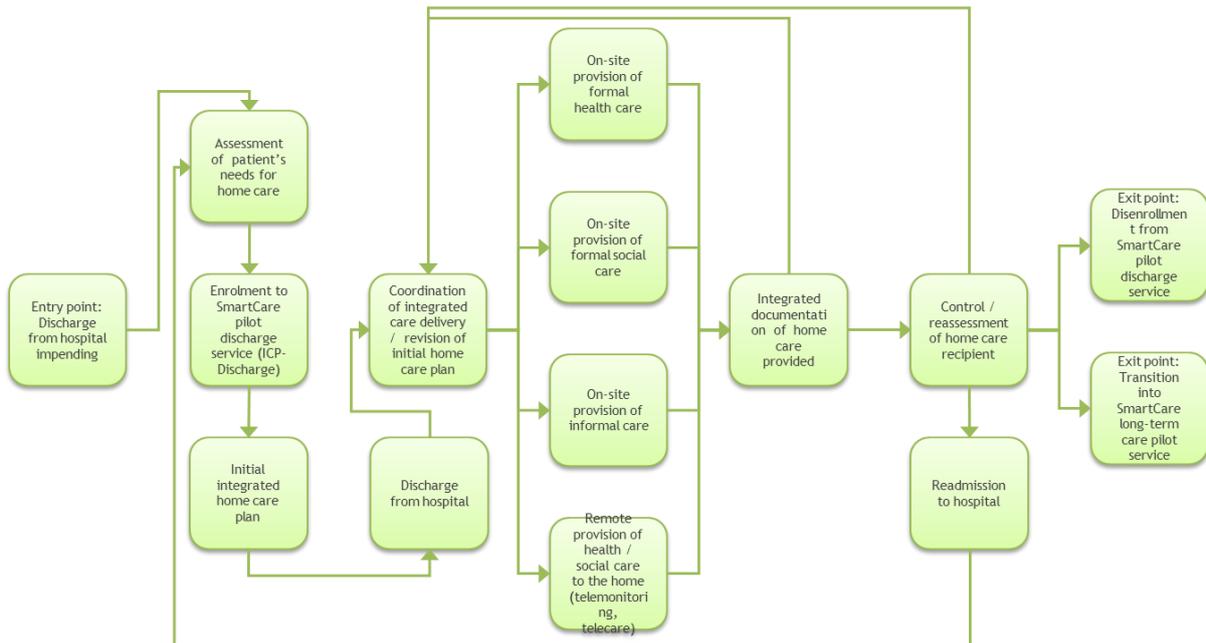
The different projects and services implemented share some organisational features. Nevertheless, the organisational processes of the SMARTCARE project are described below in detail as this service has the strongest integrated care component.

A patient can be included in the services piloted in the SMARTCARE project through two different pathways: the long-term care and the early discharge pathways.

- **Early discharge:** is oriented towards patients who can benefit from an early hospital discharge assisted by technology and social care services. These patients have health and social care needs, though they should be medically stable. Any healthcare professional can refer patients to SMARTCARE services and social workers who work for the Aragonese Healthcare Service evaluate their social care needs (Figure 6).
- **Long-term care:** Primary care professionals (GP or nursing staff) or social care providers identify these patients. The evaluation of their health and social care

needs and therefore of whether they fulfil the criteria to receive the SMARTCARE services are carried out by these same professionals.

Figure 6: SMARTCARE Early discharge care pathway



Source: Personal communication from JI Coll

In both pathways, a health and social care plan, including technology-assisted services, is defined by a virtual committee composed of representatives of the different levels of care (primary, specialised and social) and including a member of the Innovation Unit.

An important step prior to this process is the definition of what information is going to be shared between types of care (i.e. between health and social care organisations). First, services that can be provided in an integrated way are identified (those belonging to the basket of services from each organisation whose quality can be improved by integrated care). Depending on these services, the information required to improve the efficiency in their provision is identified. The resulting set of health and social information form the minimum data set to be shared between levels.

3.8 Reimbursement model and economic flow

The projects carried out by the Innovation Unit are research projects funded by Spanish and European institutions. Therefore, additional costs (e.g. for technology) due to the new services are covered by these funds while the costs of the provision of care (GP visits) are funded by the health and social care public budgets. Professionals involved in the projects do not receive any payment for their participation.

4. Transferability

As the DREAMING project was a multisite European project, by definition it tested how far services could be provided in different settings. However, after the trial periods, the services were not developed further nor integrated into the standard package of health and social care benefits offered to the population covered in any of the 6 sites. In the Barbastro case, the main reason stated for this was the weak business case that could be built based on

the project's economic results and health outcomes. Indeed, according to the Innovation Unit's experience, an adequate business case is seen as the strongest factor for deploying or transferring any service to the whole healthcare area or for incorporating it in the benefits offered by the Aragonese Healthcare system.

In addition to the economic case, other key requirements would need to be fulfilled. Most of them are those specified as key drivers identified from the unit's experiences (see section 3.3). Two of those can be highlighted, first the need to build and develop services on what is already in place and considering plans for scaling up in advance. Second, it is of paramount importance that professionals are involved from the beginning in such a way that they feel ownership and take responsibility for the project.

5. Conclusions

DREAMING was a large-scale independent living pilot project partly funded by the EC that took place in 6 sites over a period of around 4 years, starting in 2008. The main objectives of the DREAMING services were to provide better health and social care to elderly people with chronic conditions, allowing them to stay in their homes and offering them an easy way of being in contact with their relatives. The technologies deployed were a combination of health and environmental monitoring systems. This data was processed by a decision support system and handled by a call centre. A user-friendly videoconferencing system was also implemented to support the sociability aspect of the project's services.

In relation to the provision of integrated care, the joint handling of health and social care-related monitoring data was the most salient aspect of the project. However, care responsibilities were not coordinated between different (health and social) types of care, nor were they coordinated between providers of different (primary and specialised) levels of healthcare. Instead, DREAMING's key means of achieving better care for patients was basing care decisions on more, better quality data and, at the same time, inducing a change in the roles of key actors (professionals and patients) in the care processes .

The evaluation of the services implemented offered no clear results. Health-related quality of life was not better among those who received the services and there was no clear evidence of any impact on the costs of (health)care. Indeed, the resulting weak business model for DREAMING services was the main reason highlighted by members of the BHCA Innovation Unit (who were in charge of the project on the Spanish site) for discontinuing DREAMING services in the Aragonese Healthcare system, once the pilot was over. In fact, none of the 6 DREAMING sites further developed and integrated their services into the package of health and social care benefits offered to the population covered.

Nevertheless, the BHCA Innovation Unit relied on the lessons and experiences from the DREAMING and previous projects to design and test the implementation of telemonitoring services with a stronger integrated care approach. Specifically, the DREAMING project provided the evidence that telemonitoring services were a viable option which could have positive results in terms of clinical outcomes, quality of life and user satisfaction. At the same time, however, the business model needed to be adapted for these services to be sustainable in the long term. Furthermore, the evaluation of DREAMING highlighted the need to adapt any future evaluation method to the specificities of telemonitoring services.

In the PITES and SMARTCARE projects, social care actors were given a more prominent role in the provision of these telemonitoring services, which underlines the integrated care aspect of these initiatives. This aspect is clearest in the SMARTCARE project where patients' (health and social) care plans are defined jointly by the different organisations and types of care. Finding an adequate business case and model for this type of telemonitoring services that would allow their deployment in the healthcare area and in the Aragonese Healthcare system is one of the main drivers of the Innovation Unit activities in this field.

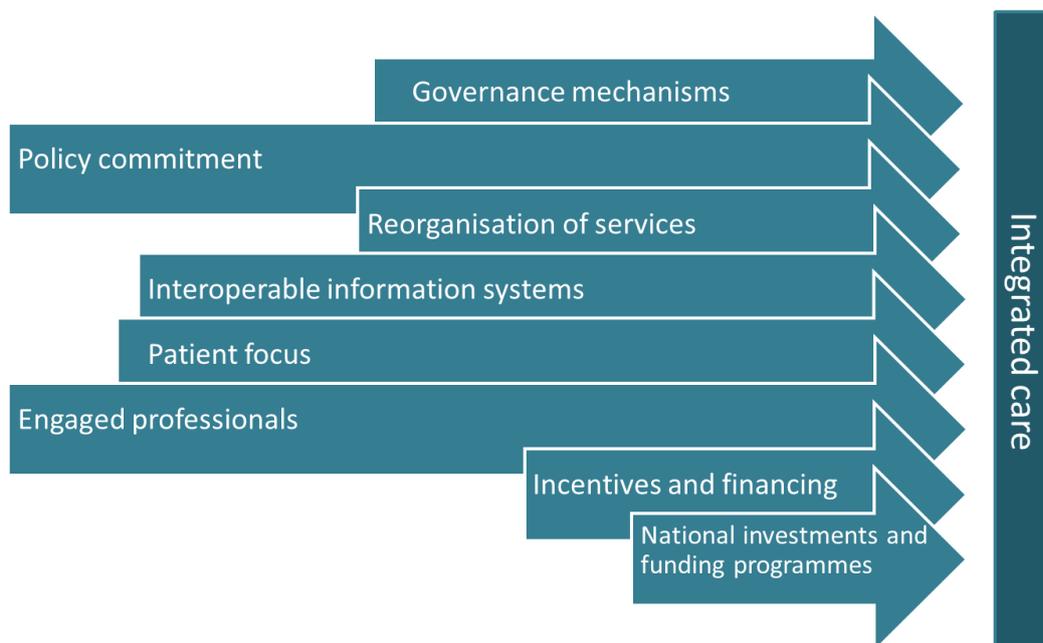
The lessons learned from the DREAMING and the BHCAs Innovation Unit experiences in relation to the design, implementation and deployment of telemonitoring services that aim to provide a better integrated care are:

- Strong leadership of the projects and organisational buy-in are pre-requisites for success.
- The key actors – professionals, patients and carers - should be involved in the project from the beginning.

- Training these key actors in the technology and in the new care roles to be adopted is another crucial element.
- New services and the related new roles for professionals and patients might generate a (transition) period of adaptation in which care provision is somehow duplicated.
- Health and care professionals should take joint responsibility and ownership of the new services and of the results.
- The technology to be used should be adapted to the context, the systems already in place and the users (both patients and staff) and it should be easy to scale up
- Lack of managerial flexibility, which can be the consequence of deploying services within a big public health and social care organisation, should be recognised and measures taken to limit its negative impact.
- The indicators and methodology to evaluate this type of services should consider all the possible health, organisational and economic benefits and set an appropriate time horizon for the evaluations.

Based on the analysis of the case and the above findings, the main facilitators of the Innovation Unit projects and experiences are ranked in Figure 7.

Figure 7: Facilitators of the Innovation Unit's projects and experiences



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