eHealth innovation

Scaling up eHealth facilitated personalised health services: Developing a European roadmap for sustained eHealth Innovation

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Chronic disease management / care integration: lessons learnt

Deliverable 1.2

Work package 1: Chronic disease management for an ageing population

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Abstract (for dissemination)	This document presents insights from the case study analysis work in eHealth innovation with a view to provide recommendations to integrated care decision makers.
Keywords	Chronic disease management, integrated care, clinical pathways, European Innovation Partnership

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1 Introduction

A rising incidence of chronic diseases and the ageing of the European population make a new approach to delivering health and social care necessary. The Europe 2020 strategy, composed of seven flagship initiatives, attempts to respond to the overall social and economic challenge of boosting Europe's growth in times of crisis. Health and social care topics are covered in the flagship initiative "Innovation Union"[1] through the European Innovation Partnership on Active and Healthy Ageing (EIP AHA).

EIP AHA is addressing questions of integrated care through the B3 Action Group. The concept of integrated care is typically understood as the collaboration of health and social care services, but this term can also imply directly involving patients and includes co-ordinated care. The headline objective of the Specific Action B3 is to reduce avoidable/unnecessary hospitalisation of older people with chronic conditions, through the effective implementation of integrated care programmes and chronic disease management models. Examples of this kind are also documented in the case studies included within this deliverable.

In order to support the work in this Action Group, the present deliverable provides an overview of chronic disease management and integrated care approaches, with a focus on concrete experience from implementation. It concludes with a set of recommendations for policy and decision-makers.

This deliverable begins with a high level conceptual summary of chronic disease management approaches, followed by a review of integrated care concepts. These are then illustrated with a number of examples from national initiatives to promote care integration, with the support of information technology (eHealth solutions). A number of aspects are singled out as particularly important for successful implementation of integrated care projects: these are for example appropriate user identification, procurement approaches, organisational models and change management. All these themes are illustrated with examples from case studies that were analysed for this deliverable.

The final chapter of this document proposes a number of lessons learnt. These are understood as abstractions from the previously analysed empirical evidence. Key enablers and challenges are grouped according to a matrix of ICT components which support integrated care.

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[1] See http://ec.europa.eu/research/innovation-union/index_en.cfm

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2 Chronic disease management

The burden of chronic diseases to the healthcare systems of the industrialised nations' healthcare system is well known. Non-communicable diseases (NCDs) – mainly cancers, cardiovascular diseases, diabetes, and chronic respiratory diseases – are responsible for about two-thirds of deaths worldwide. The impact of conditions such as chronic heart failure on Western economies due to prolonged absence from work and disability can be measured in billions of euros.[2] The current design of most Western healthcare systems is focusing on a reactive treatment of acute diseases and is often ill-equipped to address the complex factors leading to the onset and slow development of chronic diseases.

Chronic disease management in this context is an attempt to provide a more encompassing response to the needs of patients suffering from a chronic condition. This is exemplified in different ways across Europe through attempts to establish for example gate-keeping role for the General Practitioner or to support the establishment of joint doctors' offices which allow the patient to see different specialists in one go. This is particularly important for conditions such as Diabetes, which affects different organ systems of the patient and where "small" incidents such as an infection of the foot can have serious consequences.

It follows from the above, that chronic disease management and the term integrated care, which is the subject of the deliverable, are intimately linked. This chapter begins with an introduction to the management of chronic diseases and how the role of the patient in this context changes from a passive recipient of care to a shaper of his/her own care and health outcomes. The role of ICT tools in this process is dealt with in the second section of this chapter and will be further elaborated on in the following chapter as part of integrated care process facilitation.

2.1 Approaches and models

Due to the slow, gradual development of chronic conditions, it is useful to visualize (as in the Figure below) the different health states that a citizen can be in. This leads to a simple transition model of patients in healthcare with at least four pools of patients and corresponding transitions from healthy, to borderline and ill (modified from Meglic et al[3]). The right pointing arrows represent the population pools and disease process whereas the interventions are shown through the left pointing arrows and the circular arrow.

FIGURE 1: POPULATION POOLS, DISEASE PROCESS AND INTERVENTIONS

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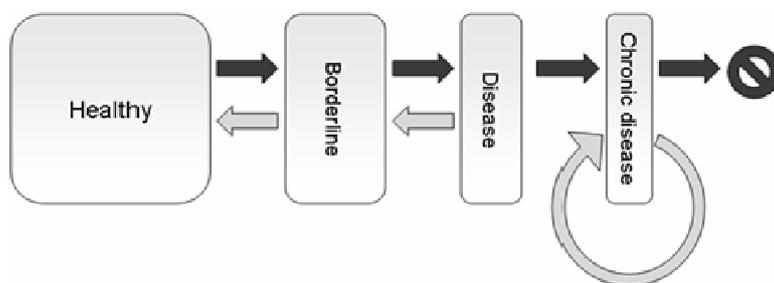
[2] Harvard School of Public Health and WEF (2011) The global economic burden of NCDs, available at http://www3.weforum.org/docs/WEF_Harvard_HE_GlobalEconomicBurdenNonCommunicableDiseases_2011.pdf

[3] Meglic, M. and A. Brodnik (2010). Electronic Environments for Integrated Care Management Case of Depression Treatment. Ubiquitous Health and Medical Informatics: The Ubiquity 2.0 Trend and Beyond, IGI Global: 390-411.

The great challenge of patients with developed risk factors (second pool from the left) is the potential of their transition into an irreversible cycle of chronic illness - a particular challenge both for patients as well as for the healthcare system.

Once the patient has reached the cycle of chronic illness, this condition can only be managed as opposed to reversed, as is suggested by the other stages. Management, due to the incurable nature of chronic illness, is at the heart of chronic disease care. The share of "management" that the patient himself has to deliver compared with the management responsibilities of the healthcare provider (organisation) is currently being debated. It has been suggested by Levich that patient self-management should be the core of all chronic disease management.[4] By placing the patient as a leader of their own health within a supportive team of healthcare professionals, bodily functioning, health outcomes and quality of life can be maintained or improved. For such an approach to remain inclusive to all patient profiles, different levels of patient engagement (ranging from a passively engaged patient to a fully empowered patient making informed decisions) need to be supported by these models.

In order to achieve this, an effective health management programme with educational and supportive interventions should be installed in order to empower the patient to manage their health. The Chronic Care Model (CCM) developed by Wagner et Al at the MacColl Institute, see Figure below, suggests that productive interactions between informed, activated patients and a prepared, proactive practice team will produce improved outcomes. However, to create these optimal actors certain elements need to be in place in the health system and wider community. A key ICT-based solution is one of these elements: "clinical information systems", that allow healthcare professionals to search patient history, track patient progress and document outcomes and goals.

FIGURE 2: THE CHRONIC CARE MODEL DEVELOPED BY WAGNER ET AL[5]

The Chronic Care Model

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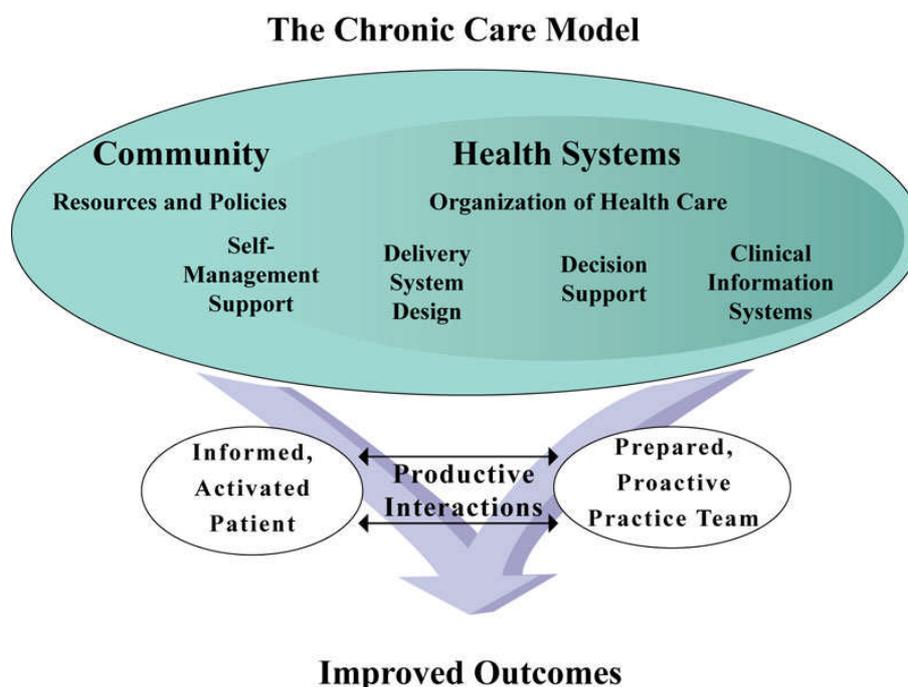
[4] Levich, R. B. (2006). Self management in chronic illness. Chronic disease management. J. Nuovo, Springer.

[5] Taken from: http://www.improvingchroniccare.org/index.php?p=The_Chronic_Care_Model&s=2 , Accessed 01/02/2013

Goldstein, DePue and Kazura suggest that clinical information systems such as pre-visit health-risk appraisal instruments, questionnaires, or interactive computer-based systems can be used in further ways to improve outcomes. Such ICT-based solutions provide swift means of aiding the tailoring of patient education and counselling interventions. Additionally, the use of patient assessments prompts clinicians and patients to address issues of self-management during consultations. Assessments and action plans also support the patient as they serve as prompts and reminders towards achieving goals.[6] If these tools are available electronically such as via a patient accessible electronic health record or portal, particularly one that can deploy reminders, the chance of such reminders being misplaced or forgotten about decreases and thus the action plan or assessment is more effective.

Lorik et al.'s eight components for an effective self-management programme aligns with the required input elements of CCM: self-management support, delivery system design, decision support and clinical information systems. Three of the recommended components pertain directly to ICT-based solutions[7]:

1. Remote management capabilities (telephone, email, home monitoring)
2. Case management with remote communication based in the team office
3. An electronic medical record to ensure continuity and integration of care

These tools provide a means for communication with the disease management team; between patients and healthcare professionals as well as between professionals. The communication possibilities presented by such ICT-based solutions as an integrated (shared) EHR are essential for team delivered care. The need for a team-based approach has been made apparent by Graf, Bloom et al.[8] who point out that no single physician can manage all activities required and that a multi-disciplinary team with redesigned workflows are required. Graf et al argue that it is only once these elements are in place that ICT-based solutions can be used as support tools.

Chronic disease management is made further complicated by the existence of multimorbidity which effectively multiplies the issues associated with a single chronic disease: "Patients with multimorbidity are more likely to die prematurely than those with single conditions, be admitted to hospital, and have longer hospital stays. They have poorer quality of life, have loss of physical functioning, and are more likely to experience depression and to be receiving multiple drugs with consequent difficulties with adherence".[9] Unfortunately, multimorbidity "is the norm rather than the exception in primary care patients and will become more prevalent as populations age".[10] Currently, 49% of European women and 39% of European men aged above 50 years suffer from more than 2 concomitant chronic diseases[11]. The prevalence of co-existing chronic diseases means that the effectiveness of single disease focused solutions are limited. Rather, integrated care models which combine services from across the sector to build a personalised solution are required. Managing the combining of these services into a

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[6] Goldstein M. G., D. J., Kazura A. N (2009). Models of Provider-Patient Interaction and Shared Decision Making. The Handbook of Health Behavior Change. O. J. K. Shumaker S. A., Riekert K. A. . New York, Springer.

[7] Lorig K., H. L. K., Sobel H., Laurent D., González V., Minor M. (2000). Living a Healthy Life with Chronic Conditions: Self Management of Heart Disease, Arthritis, Diabetes, Asthma, Bronchitis, Emphysema, and Others. . Palo Alto, Boll Publishing.

[8] Graf, T. R., F. J. Bloom, Jr., et al. (2012). "Value-based reengineering: twenty-first century chronic care models." Prim Care 39(2): 221-240.

[9] Smith, S. M., H. Soubhi, et al. (2012). "Managing patients with multimorbidity: systematic review of interventions in primary care and community settings." BMJ 345: e5205.

[10] Mercer, S. W., S. M. Smith, et al. (2009). "Multimorbidity in primary care: developing the research agenda." Fam Pract 26(2): 79-80.

[11] HEIDI WIKI. Health in Europe: Information and Data Interface. Elderly. [Online]. Available: https://webgate.ec.europa.eu/sanco/heidi/index.php/Heidi/Population_group-specific_health/Elderly#Data_sources [Accessed 12/01/2013].

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personal patient pathway necessitates the previously described provision of dedicated healthcare teams with redesigned workflows and ICT support.

ICT solutions such as EHRs can be used to: provide timely and accurate information, allow supportive and educational interventions for patients' self-management of their health, monitor a patients' progress, assess a patient's needs and provide a point of contact to other team members. It is perhaps this last point which is most important. In order for a patient to become an active and effective member of their own disease management team access to the reassurance and encouragement of healthcare staff, particularly in the early stages, is as essential as any other element. Once the patient has gained confidence and experience in managing their health they will rely on this less. This idea is elaborated by (Hibbard, Stockard et al. 2004)[12] who pointed out that activation is developmental in nature: first a patient must believe in the importance of their role, then obtain the confidence and knowledge to take action, thirdly they must take action and finally maintain the lifestyle changes of these actions even under stress.

This brings us back to CCM where an informed, activated patient is a core component. This is backed up by recent studies which found that "patient activation-- or having the knowledge, skills and confidence to manage one's health, to be related to health-related outcomes."[13]

2.2 Support for ICT-based chronic disease management

European policy makers are increasingly recognising the significance of chronic disease management and the important role ICT can play in supporting it. The Portorož Declaration adopted on 7 May 2008 at the EU eHealth 2008 conference committed EU member states to providing all of Europe's citizens with smarter health environments through people-centred eHealth initiatives. When describing the next steps for achieving this goal the need to plan to deploy telemedicine and innovative ICT tools for chronic disease management was identified as the first crucial area[14].

Action on this declaration is already evident across Europe. For example, in Ireland a policy on the prevention and management of chronic disease has been launched. This policy describes best practice which aligns with many of the aspects identified in the section above, including: "The use of information systems and registers to plan and evaluate care for individuals with chronic disease"[15].

Disease management programmes (DMPs) which focus on specific diseases, use co-ordinated care elements from across the delivery system and include the use of ICT as a support tool have been developed across Europe, including Germany, the UK, the Netherlands, France, Sweden and Denmark[16]. Across Europe a number of small-scale pilot studies on integrated care have also taken place using evidence-based medicine, supported by electronic protocols and clinical pathways. A more detailed review of the activities regarding integrated care on regional and national level across Europe is provided in chapter 4.

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[12] Hibbard, J. H., J. Stockard, et al. (2004). "Development of the Patient Activation Measure (PAM): conceptualizing and measuring activation in patients and consumers." Health Serv Res 39(4 Pt 1): 1005-1026.

[13] Greene, J. and J. H. Hibbard (2012). "Why does patient activation matter? An examination of the relationships between patient activation and health-related outcomes." J Gen Intern Med 27(5): 520-526.

[14] See: http://www.ehealth2008.si/index.php?id=26&mid=25

[15] Department of Health and Children of Ireland A Policy Framework for the Management of Chronic Diseases.

[16] Nolte, E., C. Knai, et al. (2009). Managing chronic conditions: Experience in eight countries Copenhagen, WHO European Observatory on Health Systems and Policies. 15.

> However, the challenge facing DMPs is that they often target one specific chronic disease, whereas in reality the likelihood of a person suffering from a chronic disease to be subject to the complications of additional chronic diseases is relatively high "with an estimated two thirds of those who have reached pensionable age having at least two chronic conditions"[17].
>
> Therefore, when addressing chronic diseases a wider (multimorbidity) approach is required encompassing different areas of the health and social care systems.
>
> Thus the response from many countries is to invest in *integrating care models which facilitate integration of services across systems*.

3   State of play in integrated care

Integrated care takes different meanings according to the context in which it is used. This section will present examples of attempts to structure the concept and delimit it from other concepts such as coordinated care or linked care. In a second step, this chapter briefly summarizes the role of ICT applications in the delivery of integrated care. In a final subsection, the role of integrated care pathways as formal representations of care processes are described.

3.1   Conceptual delimitation and policy background

There are different perspectives on integrated care and the processes that are required to achieve it. This section reviews both the policy motivation to implement integrated care against the background of chronically ill patients as well as the conceptual elements in the discussion on integrated care.

A policy brief on integrated care and telehealth published by the World Health Organization puts the problem as follows: "Demographic change, rising incidence of chronic disease and unmet needs for more personalised care are trends that demand a new, integrated approach to health and social care. Professionals must work across sectors as a team with common goals and resources to deliver a coordinated response to each citizen's care requirements. Advanced information and communications technology gives a major new opportunity to realise care integration, superseding today's chain of disjointed responses to discrete threats to health."[18] Put more succinctly in the words of Nolte and McKee[19]: "Chronic illness requires complex models of care, involving collaboration among professions and institutions that have traditionally been separate."

A useful way of representing the complexity involved in achieving integrated care is proposed by Meglic et al.[20] They propose a distinction between three perspectives on care processes:
   a)   based on the completeness of the process and the extent of involved providers: the correct sequence of individual clinical decisions made by each of the involved professionals;
   b)   the timely synchronization of several health care professionals within a single health care provider;
   c)   and the synchronization of various health care providers.

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[17] Ibid.

[18] Stroetmann, K. A., L. Kubitschke, et al. (2010). How can telehealth help in the provision of integrated care? Health systems and policy analysis. Copenhagen, World Health Organisation.

[19] Nolte, E. and M. McKee (2008). Caring for people with chronic conditions. . A health system perspective. Berkshire, Open University Press.

[20] Meglic, M. and A. Brodnik (2010). Electronic Environments for Integrated Care Management Case of Depression Treatment. Ubiquitous Health and Medical Informatics: The Ubiquity 2.0 Trend and Beyond, IGI Global: 390-411.

In clinical terms these three perspectives could be named: clinical decision process, clinical pathway and integrated care process, respectively (see Figure below where HC: health care; CD: clinical decision).

FIGURE 3: THREE DIMENSIONS OF THE CARE PROCESS
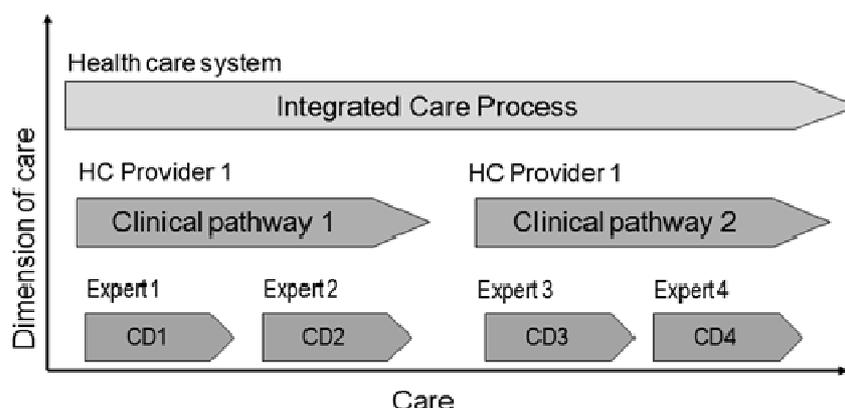
This short introductory remark reveals the key components of the integrated care discussion:

- care needs to be provided for chronic disease patients
- this care requires coordination between medical experts of different disciplines
- both the clinical and the social sector must collaborate
- this collaboration requires common goals and resources
- and must be centered on the patient involving him/her actively in care

Regarding the last point, Minkman, Vermeulen and colleagues use the term "client-centredness" to describe integrated care activities. The patient is never only a patient, but also a client who has rights and responsibilities.[21] Engaging the patient and ensuring his active participation in the care process is a crucial element of integrated care.[22]

Implicit in the above is also the assumption that care activities will have to be thought of on both the individual organisational and systems level. Such a view is proposed by Minkman and Kluwer in the following table (own visualisation)[23]:

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[21] Minkman, M. M., R. P. Vermeulen, et al. (2011). "The implementation of integrated care: the empirical validation of the Development Model for Integrated care." BMC Health Serv Res 11: 177.

[22] Suter, E., N. D. Oelke, et al. (2009). "Ten key principles for successful health systems integration." Healthc Q 13 Spec No: 16-23.

[23] Minkman, M. M. N. and D. Kluwer (2011). Developing Integrated Care. Towards a development model for integrated care. Marijenkampen, Justus en Wim Bottenheft.

TABLE 1: DIMENSIONS OF INTEGRATED CARE AND ACTIVITIES

Care level	Focus	Activities
Individual	Single patient	Care routing, healthcare professional coordination, patient needs assessment[24]
Organisational	Health professionals	Administration, resource mobilisation
Service	Group of patients with similar disease	Care pathway organisation, care monitoring, results evaluation
Healthcare system	Framework	Financing, legislation, CME

The above mentioned needs assessment takes place on the individual level of the patient. The coordination between healthcare professionals is agreed at this level.

Each healthcare provider organisation is then resourcing the activities of its own healthcare professionals. On the service level, the care pathway organisation is organised and results of the care are monitored. An evaluation of other aspects might also take place. The healthcare system determines the legal rules applicable to the (new) care arrangements; it also determines the financing modalities and other relevant aspects such as continuing medical education (CME).

So far in the discussion, a focus was put on the coordination activities that are required to deliver meaningful care for chronic conditions. Coordination activities are however only a first step. Integrated care can be visualised on a continuum of efforts to link and coordinate care, as illustrated by the Figure below. In this illustration, integrated care is on the "right end" of the continuum and involves multidisciplinary teams, common records and pooling of funds.

This level of integration ideally responds to patients with high (or complex) needs. In contrast, the left end of the continuum would only seek to ensure that doctors in the primary care sector are informed through discharge letters of patients that are leaving the hospital. Such coordination between two different care settings is only a basic prerequisite and does not yet include any form of agreement on a care plan. The right end (integration of care) would eventually provide a "one stop shop" response to the health needs of the patient: care would be delivered in one or many settings through one entry point by an agreed set of health- and social care professionals coordinating their work. This idea of different degrees of care delivery integration is illustrated by (Leutz 1999) in the following graph:

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[24] Even though formally carried out on the level of the patient, the described activities are not always focusing on the patient

FIGURE 4: USER NEEDS AND LEVELS OF CARE INTEGRATION
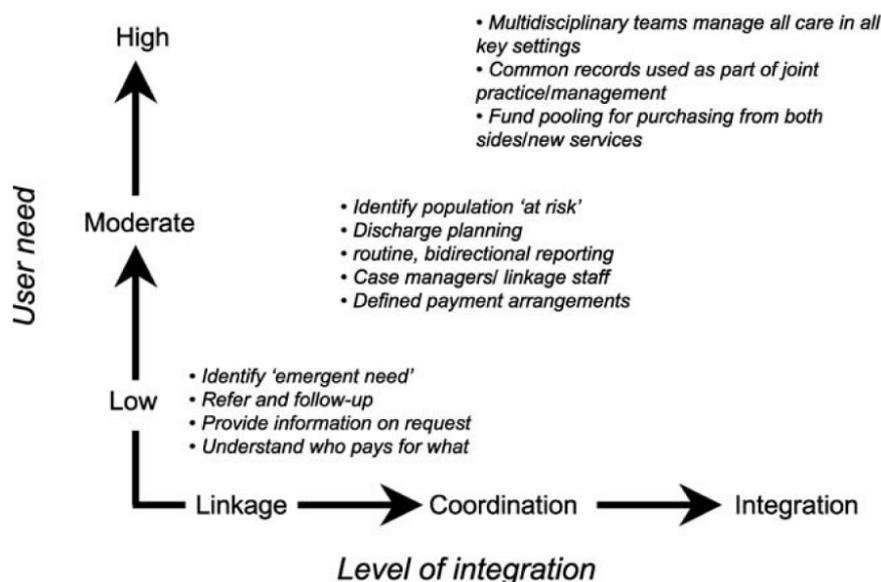
Source: Leutz (1999)[25]

Lloyd and Wait provide another typology of integrated care models which partly echoes the concepts already presented above.[26] They distinguish between the following dimensions of integrated care:

- Shared information among professionals from different sectors

   This model uses greater sharing of patient information among health and social care professionals to facilitate the treatment of patients in a coordinated fashion, minimise data storage costs, and reduce problems that result from separate information systems.

- Standardised communication protocols and formats

   Defined communication protocols and formats are used to improve communication between health and social care professionals, and facilitate a more seamless and integrated care process.

- Single assessment processes incorporating multi-disciplinary assessment

   This involves a single, multi-disciplinary assessment of users' needs for health and social care. Single assessment processes reduce the number of assessments that a patient undergoes, and provide a central point of information from which to coordinate care.

- Defined pathways of care

   This model uses clearly defined multi-disciplinary pathways of care incorporating both health and social care.

- Single access points to care

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[25] Leutz, W. N. (1999). "Five laws for integrating medical and social services: lessons from the United States and the United Kingdom." Milbank Q 77(1): 77-110, iv-v.

[26] Lloyd, J. and S. Wait (2011). Integrated care: a guide for policy-makers. London, Alliance for Health and the Future.

These five elements are in fact characteristic of a care approach based on clinical pathways. A formal definition of a clinical pathway is proposed in section 3.4 below. It is worth noting that the five elements build upon each other to culminate in defined pathways of care. But these must rely on prior infrastructure, shared goals and a joint needs assessment.

This model seeks to reduce the number of 'access-points' at which users receive care, ideally to a single access point, so as to reduce the number of professionals and organisations that patients have to deal with. Such a single point of access model may in the future be supported by software solutions that point the user to the relevant contacts in each care-seeking situation.

3.2   The role of eHealth in facilitating integrated care and self-care

The previous section on the components of integrated care has shown clearly that there is a coordination and communication need that can realistically only be met by modern ICT tools. This section presents the rationale for and the potential of the use of eHealth services to achieve integrated care. Ultimately, the use of these ICT tools needs to be embedded in a revised healthcare delivery process and can only be sustained with joint commitment of all relevant stakeholders.

The seamless sharing of information across the continuum of care is one of ten key principles for successful health systems integration.[27] Care communication and the sequencing of events (as outlined in the contribution by Meglic above) are also requirements that call for ICT support (see also Mijke, Rijken and Dixon)[28]. Rijken and colleagues identify electronic medical records as key elements of a self-care management approach to chronic disease. Indeed, as the WHO brief on telehealth and integrated care puts it: "ICT applications, or eHealth, can enable patient data to be safely shared, clinical pathways and service delivery processes to be coordinated, knowledge to be generated from structured data, and results to be merged into an evolving standard of care provided jointly by (…) health and social care services."[29]

The role of ICT services in the provision of integrated care *(examples)*

✓   sharing of clinical data across organizations

✓   definition of clinical pathways

✓   knowledge generation

✓   quality assurance

✓   framework for data standardisation

Central to this new approach of offering services responding to needs in a person-centred manner are supportive infrastructural arrangements (like shared EHRs), which enable care information management.

ICT is also supporting the provision of continuous quality control and through the integration of multiple care professionals in the care process; it also offers personalised health service delivery. A patient with multiple complex conditions will potentially receive better and more personalised care if the healthcare professionals required and involved in his care can share information in real time.

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[27] Suter E. et al (2009), op.cit.Suter, E., N. D. Oelke, et al. (2009). "Ten key principles for successful health systems integration." Healthc Q 13 Spec No: 16-23.

[28] Mieke Rijken, M. J., Monique and H. a. A. Dixon (2008). Supporting self-management. Caring for people with chronic conditions. E. Nolte and M. McKee: 117-142.

[29] Stroetmann, K. A., L. Kubitschke, et al. (2010). How can telehealth help in the provision of integrated care? Health systems and policy analysis. Copenhagen, World Health Organisation.

A further step is the use of Personal Health Systems (PHS)[30] (see Figure 5 for examples of personal devices and data exchange in PHS-based care services), understood as a system of personal technical devices which collect and communicate healthcare data of the patient such as blood sugar levels, blood pressure, body weight or similar, and respective solutions and services provided to the customer (patient, citizen). On the basis of such systems it is possible to offer interventions such as telemonitoring, telephone services or tele-consultation. This adds substantial benefits to existing ICT services by supporting relationships and enhancing the dialogue between different health and/or social care providers.[31]

FIGURE 5: EXAMPLES OF PERSONAL DEVICES AND PHS BASED CARE SERVICES
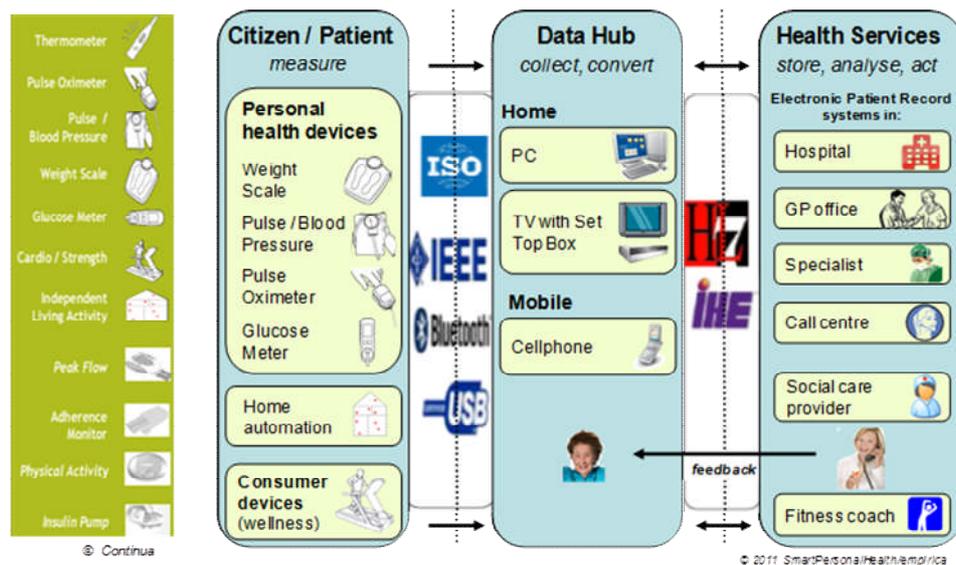
With the help of messaging systems which exchange structured data between computer systems, notifications about a patient's hospital admission and discharge can be transmitted to local authorities, primary care doctors and relevant home care providers leading to a better coordination of health and care services.

Ultimately, just a comprehensive eHealth strategy can unfold the full potential of telehealth in order to cope better with growing demands of an aging society challenging health care systems."[32]

3.3   ICT support for care integration and coordination

Healthcare and social care are important elements for supporting older people to live safely and well at home, and there is evidence that care service provision is better enabled and improved by ICT solutions. Despite initial developments towards a better integration of health care and social care practices, today's health care and social care systems are still far away from being integrated due to their systemic silo structures. Different professional cultures (academic vs. non-academic training required) and different funding schemes have contributed to these silos.

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[30] Stroetmann, V., Thiel R, et al. (2011). Understanding the Role of Device Level Interoperability in Promoting Health - Lessons Learned from the SmartPersonalHealth Project.. Yearb Med Inform. 2011;6(1):87-91

[31] Stroetmann, V. et al. (2011). Enabling smart integrated care: Recommendations for fostering greater interoperability of personal health systems. SmartPersonalHealth report. Luxembourg: Office for Official Publications of the European Communities

[32] Ibid.

The potential of ICT-enabled forms of support such as telecare and telehealth could be exploited in a radically more effective way if they were more systematically embedded within a 'whole systems' approach to health and social care. This whole systems approach implies the bringing together of different services, organisations, and parts of care provision, notably the health and social care services that are traditionally separated.

What are the technical requirements to achieve a whole systems approach to care delivery? The following table[33] lists the main components of a comprehensive digital infrastructure supporting integrated delivery of care by care providers in different agencies including voluntary organisations, informal carers and self-care action. The components are grouped according to two major types of activities:

  a) Data sharing and coordination

  b) Real-time communication

The data-sharing and coordination ICT building blocks deal with all aspects related to health and clinical data exchange between the care providers and the structured delivery of services along a patient pathway. These therefore include as components an integrated care record or another form of shared EHR. A workflow engine[34] and joint scheduling are examples of coordination tools between carers and finally, a number of monitoring services exist that can collect health and lifestyle data from the patient.

Next to this data sharing and coordination part, real-time communication building blocks are also necessary to set-up an integrated care delivery service. The communication components have an inter-agency dimension in so far as they allow different care providers to communicate and to hold joint "case-conferences". On the other hand, they also have a "joint-response" dimension, if they allow local care providers to raise ad hoc requests which require a joint-response.

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[33] Developed in the context of the CIP PSP large scale Pilot SmartCare which aims developing and piloting ICT supported integrated care services in 10 European regions

[34] A workflow engine can be defined as "a software application that manages and executes modeled computer processes. It is a key component in workflow technology and typically makes use of a database server. A workflow engine interprets events, such as documents submitted to a server or due dates expiring, and acts on them according to defined computer processes. The actions may be anything from saving the document in a document management system to issuing new work by sending an e-mail to users or escalating overdue work items to management. A workflow engine facilitates the flow of information, tasks, and events. Workflow engines may also be referred to as a Workflow Orchestration Engines." (source: http://en.wikipedia.org/wiki/Workflow_engine)

TABLE 2: ICT SUPPORT FOR CARE INTEGRATION AND COORDINATION

	ICT based integration building blocks	Optional components
Data sharing and coordination	1) Integrated data access for care providers in different agencies and informal carers	Integrated Care Record
		Sharing clinical, scheduling, monitoring information
		Shared EHR / Access to subsets of EHR
		Input from health and social care actors / interfaces to different ICT tools
		Web-based portal
		Integration of vital sign / health monitoring data into care planning and management processes
	2) Design and execution of pre-planned care pathways enabling temporal coordination between provision steps taken by care providers in different agencies, informal carers and cared for people	Workflow engines Charting tools for IC pathways design
		Joint/shared scheduling, daily schedulers Shared care plans Team coordination support
		Training delivery/learning pathways/plans for professional and/or patient self-care training support tools
	3) Access to the home: home-based systems (Telemonitoring and/or Telecare TM/TC) by care providers in different agencies and informal carers	Vital parameter monitoring
		Patient's daily symptom questions
		Alerts, prompts, reminders configuration and handling/ protocols and escalation procedures
		Reports, protocols
		Passive and/or active alarms
		Automated self-care and (older people wellness and informal carers) promotional/ educational/ training/ planning tools
		Life-style/behaviour monitoring
		Physical training & coaching programmes/tools
		Access to other services to address social isolation, information sources, connections to community activities
		Development of service standards, e.g. response times
		Integration of data into care planning and management processes
		Home safety monitoring (gas, temperature, light, doors, windows, etc.)
		Device administration; remote device tracking, maintenance and updates
Real-time & patient communication	4) Real-time communication between care providers in different agencies and informal carers, e.g. support to case conferences, and older people	IP-based screen sharing
		Videoconferencing (VC)
		Telecare service communication with informal or formal carers for care coordination and management
	5) Joint response to ad hoc requests by care providers in different agencies and informal carers	Call / Contact Centre, Triage
		Web-based portal
		Centralised and flexible role-, patient- and user-administration
		Links with emergency services e.g. ambulance

Source: SmartCare/empirica

The above table will be revisited later in this report, in section 5.8, in order to identify key enablers, success factors and challenges alongside the ICT building blocks that are necessary to achieve integrated care.

The current maturity of each of the listed components differs and makes it all the more important for local initiatives or regions to carefully define what the desired changes in the care delivery process are and how best to achieve them. The following chapter will look at examples of care integration efforts derived from case studies and identify critical learning points.

3.4   Care pathways as precondition for integration

A crucial precondition for ICT support to care is the ability to formalise content and sequence of care and the actors involved in it. Care pathways can be understood as formal representations of how different care service providers interact to deliver care to a specified patient (population). Based on an international consensus meeting in Slovenia (December 2005) the E-P-A[35] defined a care pathway as:

"a methodology for the mutual decision making and organization of care for a well-defined group of patients during a well-defined period.

Defining characteristics of care pathways include:

- *An explicit statement of the goals and key elements of care based on evidence, best practice, and patient expectations;*

- *The facilitation of the communication, coordination of roles, and sequencing the activities of the multidisciplinary care team, patients and their relatives;*

- *The documentation, monitoring, and evaluation of variances and outcomes; and*

- *The identification of the appropriate resources."*

An increasing number of healthcare pathways are multi-site, including e.g. a hospital and GP(s).

Integration of pathways for older people requires a grouping of patients with a similar needs profile or set of symptoms. Achieving this is not an end in itself but intended to reduce unnecessary variations in care and outcomes, supporting the development of efficient care partnerships and empower older people and their carers. In this regard, recent evidence clearly suggests that a merely technology-driven integration approach is most likely to fail.

For instance a recent review of a 16 pilots of integrated care in the UK revealed that "*values and professional attitudes were of great importance to the success of pilots, with shared values, a collective communicated vision, and efforts to achieve widespread staff engagement cited as strong facilitating factors. Where key staff groups were not engaged (e.g., GPs), it was difficult to make progress. It was much easier to make progress where staff could see clear benefits that would result from the changes proposed and where they felt involved in the development of new services*".[36]

In sum, care pathways are a precondition for integrated care, but what is also needed is (a) an understanding of the purpose, process and role of care pathways, (b) the way in which care pathways need to be grouped to facilitate integration, and (c) the vision, values and

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[35] E-P-A stands for European Pathway Association, see http://www.e-p-a.org/clinical---care-pathways/index.html

[36] RAND Europe and E. Y. LLP (2012). National Evaluation of the Department of Health's Integrated Care Pilots, Prepared for the Department of Health., p. IX

involvement of professional staff that is needed to make a care pathway approach acceptable to the various professions and occupations involved in health and social care.

4   Embedding ICT in a sustainable approach to integrated care

It takes more than merely IT tools to change healthcare processes as was pointed out in the conclusion of the preceding chapter. It is possible to represent critical elements of a successful approach to integrated care along a number of topics. The following examples of regional approaches to integration and coordination of care all rely on a number of changes that go beyond of the mere deployment of ICT solutions. A sustainable approach to integrated care, i.e. an approach which fits into the existing care landscape in a given system and which receives continuous funding beyond piloting stage, needs to address a number of topics.

 In line with the topics identified in the EIP Action Group B3 on integrated care, these areas of change can be arranged into eight categories. The order reflects the priorities assigned to the topics by the B3 group:
1. Organisational Models
2. Change Management
3. Workforce Development, Education and Training
4. Risk Stratification
5. Care Pathway Implementation
6. Patient Empowerment
7. EHRs / ICT /Teleservices
8. Finance, Funding, Value Creation and Procurement.

Organisational models refer to the formal set-up of a care coordination or care integration effort by the healthcare and/or social care-providing organisations involved.[37] Increasingly, there are examples of coordination, amalgamation and value-chain connections being made among different organisations. For example, the German legislation on integrated care described in 4.1.1 further below explicitly allowed external management organisations to become party to integrated care contracts between a health insurer and, for example, a group of GPs. This provision allowed a professional management approach towards the billing and IT support aspects of an integrated care effort.

Change management in an organisational sense requires transparency in communication between healthcare managers and healthcare professionals. In fact, it often requires a culture change in order to overcome cultural differences between different disciplines or different sectors (such as health and social care).

Workforce development aspects are closely related to the challenge of change management. Only sufficiently trained staff can lead changes in care processes supported by IT.

Topics 5-7 regarding care pathways, patient empowerment and the role of EHRs have been dealt with in previous sections in chapter 3. The following case studies are testimony to the crucial role of these technologies for integrated care and patient empowerment.

Risk stratification is important for the proper identification of the types of patients that will benefit most from an integrated care approach. The HerzAs project, described further below, relied on detailed studies of the patient population of a German health insurer prior to deciding on the type of eHealth solution to adopt for the care of heart failure patients.

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[37] Because of the different degrees of integration in the following examples and the discussions in section 3.1, both care coordination and care integration are mentioned.

Another recurring challenge is the financing and budgeting of care services that span boundaries of various occupational or organisational sectors that were previous separated, such as health and social care, or simply services that rely on new ICT tools. Section 4.2.3 below addresses how smart procurement can create value.

The following sections provide selected examples of how national, regional and local initiatives are addressing some of these challenges.

4.1   Examples of efforts towards integrated care

This sub-section presents both the political reforms that have taken place to make possible more integrated care delivery and the concrete examples of local and regional initiatives that can already be described.

4.1.1   Policy approaches to integrated care

The example of the English NHS, the French and German social health insurance system as well as regional initiatives in Italy show that the political awareness for the importance of integrated care is growing.

4.1.1.1   Integrated care in the NHS

In the NHS England, a report by the King's Fund[38] identifies a number of examples of locally restricted integrated care initiatives in the NHS England. Care for the elderly in the town of Torbay for example is delivered through integrated teams of health and social care staff, first established on a pilot basis in 2004 and since extended throughout the area. Each team serves a locality of between 25,000 and 40,000 people and is aligned with the general practices in the locality. Budgets are pooled and used flexibly by teams who are able to arrange and fund services to meet the specific needs of older people. A major priority has been to increase spending on intermediate care services that enable older people to be supported at home and help avoid inappropriate hospital admissions. Further examples can be found in a care pathway project for stroke, covering the entire city of London or innovative Diabetes care in Bolton, where general practitioners and hospital specialists jointly work together to improve the patient experience.

However, there are still important challenges regarding wider deployment of integrated care services in the NHS. These are linked to organizational issues such as differences in employment contracts, financing models and risk seeking culture which continue to separate health and social care services.

A fundamental challenge within the NHS is the underdeveloped capacity of the trusts to act as smart buyers and exercise their purchasing power to further integrated care. On the specificities of procuring advanced integrated care solutions, please consult section 4.2.3 below.

4.1.1.2   France: the GP controlled coordinated care pathway

French efforts to achieve better coordination of care across sectors were first formulated in the 2004 law on the reform of health insurance (loi sur la réforme de l'assurance maladie). It introduced the concept of "médecin traitant", a gate-keeping general practitioner, to be chosen by every citizen covered through social health insurance.[39] The reform puts the general

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[38] Nick Goodwin, Judith Smith, et al. (2011). Integrated care for patients and populations: Improving outcomes by working together. Report to the NHS Future Forum. London, King's Fund and Nuffield Trust: 20.

[39] Assurance Maladie. (2009, 29.12.2009). "Comprendre la réforme de l'Assurance Maladie."   Retrieved 21.03., 2012, from http://www.ameli.fr/l-assurance-maladie/connaitre-l-assurance-maladie/missions-et-organisation/la-reforme-de-l-assurance-

practitioner at the centre of the care pathway. Together with other healthcare specialists consulted by the patient, he or she maintains a care protocol ("protocol de soins") and is in particular responsible for guiding those patients with long term conditions under the long term care regime ("affectation de longue durée"). This implies keeping a record of all encounters and pointing the patient to the relevant specialist. Every citizen is free to change the designated gatekeeper GP and is also free to continue choosing care providers outside the new care pathway model.

4.1.1.3 Integrierte Versorgung (integrated care) in Germany

Germany's healthcare system of statutory health insurance which covers 90% of the population coexists with a small private health insurance system which cares for specific professional groups (e.g. civil servants) and self-employed citizens.

Within Germany's system of statutory health insurance, the period starting in 2004 has seen important legal reforms to allow healthcare providers and payers to set-up models of integrated care. The modernization act for statutory health insurance (GKV Modernisierungsgesetz) of 2003 enabled health insurers and healthcare providers to agree on so-called "selective" contracts that co-existed within the national framework contracts. The term "selective contract" underlines the deviation from the mandatory national framework contract which obliges every health insurance provider to contract with all healthcare professionals and hospitals which have an accreditation under the statutory health insurance system. Through the establishment of selective contracts, the objective of integrated care could therefore be pursued in parallel to the regular provision of healthcare.[40]

In the period between 2004 and 2008, health insurers were allowed to use an earmarked part of their budget to subsidize models of integrated care. Parties to such contracts could be health insurer(s), healthcare professionals, hospitals, social care institutions and management companies. The evaluation report of this period (required by the modernization act) identified the following key trends for integrated care[41]:

* 75% of all health insurers (representing approximately 95% patients) agreed integrated care contracts

* 6500 contracts were signed at the end of 2008, a majority of them open-ended

* The objective of most contracts was sectoral coordination for chronic conditions (such as palliative care) and outpatient surgical procedure contracts (for hip replacements)

* An additional important number of contracts were signed for diseases of the circulatory and nervous system

4.1.1.4 Italy: a regional approach to integrated care

The Health Telematic Network in Lombardy, Italy, provides high quality specialised telecardiology services to patients with complex conditions: chronic heart disease, those waiting for heart transplants or other types of cardiac surgery, and those who need multidisciplinary care management at home. Patients' electrocardiogram data is transferred to a call centre and monitored by nurses who may pass on the data to a team of cardiologists throughout Lombardy. The network has improved cardiology services and facilitated better use of resources through the more rapid integration of second opinions for primary care doctors,

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maladie/comprendre-la-reforme-de-l-8217-assurance-maladie.php.; also: Service-Public-fr. (2010, 13.07.2010). "Parcours de soins coordonnés." Retrieved 22.03, 2012, from http://vosdroits.service-public.fr/F10870.xhtml

[40] Kassenärztliche Bundesvereinigung. (2010, 23.03.2010). "Vertragsmöglichkeiten: Integrierte Versorgung." Retrieved 21.03., 2012, from http://www.kbv.de/koop/8777.html

[41] Grothaus, F.-J. (2009). Entwicklung der integrierten Versorgung in der Bundesrepublik Deutschland 2004 - 2008, Gemeinsame Registrierungsstelle zur Unterstützung der Umsetzung des § 140d SGB V.

the use of home telenursing and call centre services for hospitals. Benefits for patients and carers include: 35% reduction in hospital inpatient admissions; 12% fewer outpatient visits for hospital care that is no longer needed; a reduction of 15 days in waiting times for the beginning or modification of therapy for 14% of patients; reduced travel time and out of pocket costs for patients and their family carers.[42]

> ✓ The examples of activities show a **large variety of models** of CDM and integrated care supported by ICT solutions.
>
> ✓ The amount of **coordination and communication work** at different levels of the healthcare system to achieve integrated care make the **use of modern ICT-enabled services inevitable**.
>
> ✓ eHealth tools and services (such as an Electronic Health Record) are key pillars of success.
>
> ✓ However, they need to be **embedded in revised organisational models** and new funding schemes in order to be sustainable.

4.1.2 Examples of chronic disease focused solutions and integrated care approaches

This section presents selected examples of both chronic disease focused solutions and integrated care approaches at regional, national and/or international level. The information on these cases has been collected by the eHealth Innovation partners using a case study template (see Annex II), from the partners' knowledge of running projects and initiatives and from the literature.

4.1.2.1 Regional, national and international examples of chronic disease focused solutions

The **Diabetiva®-programme** targets high-risk diabetes type 2 patients with complications of the small and large blood vessels in the federal states Mecklenburg-Vorpommern, Saxony-Anhalt, Lower Saxony and Thuringia in Germany. The patients use a blood sugar measuring device to regularly transmit blood sugar values to the Personal Healthcare Telemedicine Service (PHTS) via the internet. When data deviates from the regular values, the patient is contacted immediately to assess and possibly reassure him/her, to ensure compliance with treatment and, if necessary, to initiate a healthcare intervention. The measurements are documented in separate electronic patient files which are available to the treating physician online, enabling the physician to get improved and close-meshed data on blood sugar, which is necessary for prompt medical reaction and possible therapy-modifications. The aim of the project is to optimise management of blood sugar, increase safety and reduce the risk of further complications. This has economic as well as health benefits.[43]

In Scotland the **Tele-pulmonary rehabilitation (tele-PR)** project aimed to enable more people suffering with COPD to access self management support services and be empowered to self manage their condition.

The key objectives for the project were[44]:

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[42] Bernocchi, P., S. Scalvini, et al. (2012). "Healthcare continuity from hospital to territory in Lombardy: TELEMACO project." Am J Manag Care 18(3): e101-108.

[43] Beck, L., C. E. Wanscher, et al. (2012). "Examples of Good Practice Use of ICT in Healthcare and its Potential Transferability."

[44] Scottish Centre for Telehealth and Telecare. (2012). "Remote Pulmonary Rehabilitation ", from http://www.sctt.scot.nhs.uk/?page_id=761.

- Improved patient access to information, support and resources, leading to better management of long-term lung disease
- Improved health, well-being and empowerment of COPD patients.
- Increased physical fitness through the pulmonary rehabilitation and maintenance classes.
- Reduced exacerbations and anxiety.
- Improved quality of life and greater independence.
- Reduced social isolation through peer support.
- Fewer emergency admissions to hospital through improved access to information and advice.
- Strengthening a self management model of tele-rehabilitation which can be applied to other long term conditions

The Tele-PR project included 5 health board areas in Scotland – NHS Lothian (East and Mid Lothian), Dumfries and Galloway, Western Isles, Borders and Tayside. The original project in Tayside utilised pre-existing room based video conferencing equipment. However, for most pulmonary rehabilitation teams this equipment was not available. Computer based digital video conferencing software delivers video conferencing through laptops and high definition cameras to link two sites together. This method of video conferencing allows the delivery of pulmonary rehabilitation remotely from a wide range of locations, and at a lower cost. It allows one physiotherapist to supervise two concurrent training classes in two different locations thereby reducing staff and patient travel time and improving potential throughput by up to 33%.

CORDIVA is an eHealth heart failure programme utilising telemonitoring solutions provided by the Gesellschaft für Patientenhilfe DGP mbH for patients in Germany. It currently takes care of about 10,000 patients. CORDIVA reduces both all-cause hospitalisation rates and total medical expenditure when compared to usual care. The big savings are in the reduction of readmissions to hospital.

The **Patient Briefcase**[45] provides home-based care to chronic COPD patients in Denmark, Norway and the UK. The Patient Briefcase can be combined with various kinds of medico technical equipment such as Spiro meter, EKG, Heart Monitor, Weight Scale, Blood Pressure Measurement, and Blood Analyzer, which can be read and remotely controlled by the person in charge of the treatment. The patient and doctor can see and talk to each other, in real time, via a built-in screen and microphone. The Briefcase aims to reduce the need for hospitalisation by using home-based care and encourage better self-management. In The Region of Southern Denmark 1062 COPD-patients have been treated in their own home with the COPD Briefcase which corresponds to 10005 acute telemedicine treatments. In Norway 194 patients have received 1783 treatments, and in England 19 patients have received 70 treatments.

The "HerzAs" project, a service directed at heart failure patients, the sponsor AOK Nordwest, a German health insurer, used all available in-house data on patients to determine who would benefit most from a combination of telemonitoring and call-centre support in the management of his/her chronic condition. After careful analysis of the data (using detailed cost data), AOK decided to offer the HerzAs service to heart failure patients with a past admission to hospital and a high risk of re-admission.

eCare[46] project is a logical continuation of **eDepression** project, in which a successful approach to patient engagement and coordinated care management was demonstrated in a clinical trial on patients with depressive disorder in Slovenia. Recognised care models (coordinated care model, stepped care, etc.) were implemented by introducing a new role -

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[45] See: http://www.medisat.dk/portals/0/files/products/patientbriefcase_uk.pdf
[46] https://eoskrba.pint.upr.si/

care managers - and a supportive ICT platform to connect the patient with the care team and guide the care process. Clinical effectiveness (improved therapy adherence and improved treatment outcome) as well as cost-effectiveness were demonstrated[47][48]. In eCare project (co-funded by Ministries of Health and Technology) the platform has been made fully interoperable (HL7, IHE, OpenEHR etc.) and made generic to support other chronic diseases. The eCare electronic health record is shared between the patient and the care teams and every profile has distinct tasks to perform based on the optimal process of care with reminder systems in place for deviations. Currently clinical trials for diabetes, asthma, weight loss and sports exercise are underway with approximately 300 patients involved. An indication of the potential of this platform can also be noted - a private company has already developed a commercial service[49] based on published study results.

4.1.2.2 Examples from European projects

The **RENEWING HEALTH**[50] Project implemented large scale telemedicine solutions for 7,000 patients with diabetes, COPD or chronic heart failure across Europe. The solutions included coaching and monitoring. Results from the study are due at the end of 2013. The thorough evaluation of the RENEWING HEALTH services is based largely on the MAST model for the assessment of telemedicine services. The effect of the services is tested by a randomised trial with a multidimensional evaluation of clinical outcomes, improved health related quality of life, impact on the organisation(s) involved, effectiveness and cost-efficiency and acceptability by patients and health professionals. Three of the RENEWING HEALTH pilots have been presented to eHealth Innovation during workshops. The respective case study descriptions are included in Annex II. These include:

- *Remote Monitoring and Health Coaching* in **South Karelia, Finland**: The service aims for the improvement of the health situation of chronically ill patients that suffer either from diabetes or heart failure. The personal role of the patient for the improvement of his own health status is encouraged and supported by a dedicated health coach.

- *Prescribed Healthcare* - an example of clinic-specific services integrated into the National Patient Portal "My Healthcare Contacts" in **Norrbotten, Sweden**: the aim is to preserve the active role of the patient in managing a chronic condition (diabetes or heart failure) or even prevent illness onset in the case of the existence of risk factors. Prescribed Healthcare makes it possible for elderly people to remain in good health at older ages. The guiding principle is to replace or complement e.g. a drug prescription by a comprehensive support programme that comprises instructions from healthcare staff, visualisation of preventive health data and medical diagnosis measurements, medication reminders and other elements. The personal role of the patient in the improvement of his own health status is thereby encouraged.

- *Few Touch Application* - services extending a diabetes diary application in **Tromsø, North Norway**: Diabetic individuals use a mobile phone with a diabetes diary application, a self-help tool that allows e.g. food habit record-keeping, blood glucose data management and physical activity record-keeping. RENEWING HEALTH studies

[47] Meglic M, Furlan M, Kuzmanic M, Kozel D, Baraga D, Kuhar I, Kosir B, Iljaz R, Novak Sarotar B, Dernovsek MZ, Marusic A, Eysenbach G, Brodnik A. Feasibility of an eHealth Service to Support Collaborative Depression Care: Results of a Pilot Study. J Med Internet Res 2010;12(5):e63. doi: 10.2196/jmir.1510

[48] Naveršnik K, Mrhar A. Telemedicine and e-Health. February 2013, 19(2): 110-116. doi:10.1089/tmj.2012.0081.

[49] rxactive.com

[50] http://www.renewinghealth.eu/

the effects of using the service in combination with supervision by health professionals (with or without additional health counselling).

The **PALANTE**[51] project seeks to empower patients so they are able to make informed decisions about their health, take an active role in their care and collaborate effectively with their healthcare team through the use of information and communication technologies. All the pilots address the issue of the patient's secure access to their own health information. Additionally, five of these pilots deal with integrated chronic disease management support for patient empowerment, including comprehensive self-learning, education and monitoring systems that will be validated for diabetes, chronic heart failure, severe arthritis and respiratory diseases.

The **SUSTAINS**[52] project comprises a rich portfolio of services based on giving citizens online access to their Electronic Health Records (EHR). The services proposed have been distilled from the experience of regions which have already pioneered such access. The SUSTAINS services will target three major healthcare issues: patient empowerment, quality of care and efficiency and economy

Regional and local examples of integrated care approaches *(planned)*

Initiatives aiming at implementing integrated care focusing mostly on elderly and frail person with chronic diseases such as heart failure, diabetes or arthrosis can be found throughout Europe. These pilots are highly divergent in their approaches, number of users and progress made. This section offers an overview of the variety of initiatives spread over Europe (at different scales and implementation levels).

The following four regions are currently preparing to pilot jointly integrated care solutions in the context of the CIP PSP large scale Pilot **SmartCare**:

Italy (IT) - Friuli-Venezia-Giulia

The Italian province of Friuli-Venezia-Giulia offers integrated care, based upon the local primary health care service developed for many years by the health care districts, which are responsible for all types of out-of-hospital care, in particular home and residential care for elderly people.

Activities of the existing call centre are about to be connected to an integrated care platform to deliver timely responses to citizens in need of care. Patients suffering from diseases, such as heart failure, COPD and diabetes, coupled with high risk of isolation and social exclusion represent the key target group. The services will be driven by nurses and doctors (GPs and doctors of the districts) with many years of experience in running programs devoted to the improvement of home care services for these patients. The objective of the integrated care platform to be implemented in the course of the pilot is to allow sharing of clinical data and monitoring of clinical conditions of patients through data collected from telemonitoring devices. This would allow healthcare to be constantly adapted to changing clinical parameters and to detect emergency situations promptly. Special attention will be paid to emergency cases, and the platform will benefit from the activity of the existing contact centre for prompt intervention. In order to achieve fully integrated care, the home-based social services, which are provided by the municipalities, will be systematically involved.

Thus, besides routine activities to prevent risks, on-going social assistance will be provided. Finally, volunteers and citizens associations will be involved as users of devices and platform in order to improve the contribution of informal care.

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[51] http://www.palante-project.eu/
[52] See: http://sustainsproject.eu/project-overview/

Scotland (UK) – NHS24 Scotland

Patients in Scotland will benefit from joined-up care, enabled by ICT, to allow staff across agencies to collaborate for integrated care delivery. At the basis of this innovation is an integrated record linking out of hours & emergency care. This is supplemented with a wide range of telemonitoring tools such as remote vital sign monitoring and home safety monitoring tools. An elderly patient, living on his own, is thus able to continue living in his familiar environment. The lifestyle and behaviour of older people are monitored and services are provided which allow them to access information on community activities; an effective means to prevent social isolation. Staff from health and social services communicate via videoconferencing and screen sharing tools to coordinate a patient's care. The data collected through these activities are fed back to improve care planning and management processes. Service standards are developed jointly by health and social care professionals to further improve care and reduce response times.

Spain (ES) - Aragon

The autonomous community of Aragon has established an advanced ICT infrastructure for providing care to chronic patients. At the core of the infrastructure is a telemonitoring platform linked to a call centre. The telemonitoring platform collects patient status information sent from the home and generates clinical alarms (medium and urgent types) according to the health status of the patient, and the personalized value range registered for each patient. These alarms are flagged to healthcare staff at call centre. The specialized care nurses and doctors evaluate the alarms through the monitoring web portal and, if necessary, start the attention processes that the patient may need in collaboration with the health and social providers, either through the visit of the social organizations and volunteers, or transferring him to primary care, the GP, or sending an ambulance in the case of emergency. All these entities coordinate to provide an integrate care to patients.

This system will be enhanced with tools that allow the management and coordination of social and healthcare actions provided by each actor, and integrating it with the existing infrastructure that social organizations and health providers have. The overall care provided is adapted to the needs profile of citizens, which may vary. From the point of view of healthcare staff, they have an IT infrastructure that allows collaboration among professionals. They are provided with an intranet that gives web access to all departmental applications and report repositories, access to data integrated on care health records and also collaboration environments with tools such as videoconferences systems. At the same time, social care provider organizations are provided with the so-called "assistance centres" to collect and manage the assistance acts provided by the organizations. The SmartCare platform will enrich the current systems with mechanisms to centralize the social and health care services provided. It will also deploy new services for social organizations, patients' associations, healthcare professionals and citizens through the implementation of care pathways that enable the actions of every carer to be co-ordinated.

Denmark (DK) - Region of Southern Denmark

In South Denmark (RSD) an integrated care internet portal for heart failure care was implemented in late 2012. These heart failure services will be expanded to other disease groups such as COPD, diabetes or cancer rehabilitation. Integrated care service delivery processes between GPs, hospitals and municipal care organisations are currently supported by an integrated care record system and will be further expanded by a common integrated ICT infrastructure.

Hospital staff, municipal staff and GPs use the infrastructure in this cross-sector treatment by sharing central information across systems. If care requirements are more complex, e.g. with patients suffering from several chronic conditions, additional lifestyle related recommendations might be implemented with the support of the community services. With the deployment of a

fully functional integrated care platform, a typical Danish citizen suffering from one or several chronic conditions will benefit from important changes in their encounter with the GP. At the same time, the GP would have access to sophisticated decision-support tools, supporting him in the delivery of evidence-based care. At the start of every encounter, the GP and the patient would, together, review a digital patient plan, elaborated at the beginning of the treatment relationship. This plan is the common tool for cooperation between patient and GP, containing jointly determined treatment goals and an overview of all past and upcoming appointments. A GP with a diabetic patient would be in a position to consult patient-reported outcomes from a home monitoring or vital sign monitoring system, responses to nurse administered well-being questionnaires etc. Problems such as appropriate foot or eye care could be detected early, with target values for blood glucose level and possibly dietary habits managed together. With reference to the patient plan, progress would be visible instantly, as well as any deviation from the plan, thus making self-care the responsibility of the patient in the centre. Combined with decision-support tools and an aggregation of results on the population level of the community in which the GP works, treatment would always be based on official guidelines.

The quality of the treatment delivered could be assessed against a larger set of patient data. The envisaged mobile application for the Danish healthcare platform will allow role-based access to the data held on the platform.

Eastern European *plans* for integrated care

In the framework of the **SmartCare** large scale pilot on integrated care solutions, the importance of knowledge and experience sharing with Eastern European countries is clearly acknowledged. The two pilot site candidates Kraljevo (Serbia) and Northwest Croatia are actively seeking to advance their existing plans for integrated care with the help of ICT solutions.

Kraljevo (Serbia): *planned activities*

From 2005 to the present Government of the Republic of Serbia has produced a number of strategic documents related to the improvement of social and health care, and strategic development on society and recommendations for building portals eGoverment in all state and local departments of governments.

All documents are highlighted for vulnerable population groups, as well as main directions of activities aimed at improving health and quality of life. In connection with the appearance of ageing, health care and quality of life for people over 65 has a special place in National Health Policy.

Effects of good practice in health and social care for older people can be present through several important principles of treatment, in appropriate areas of activity:

- involvement of older person in all forms of decision-making about their illness and future health care
- promote good health and healthy living habits in elderly
- take action to prevent disease
- reducing functional ability
- promoting independence of living
- support the elderly in their homes
- the introduction and use of new ICT technologies to improve Health care of elderly and more efficient of health and social services
- general purpose: maintaining and improving health and quality of life for older citizen by providing health and social care services and quality

To preserve and improve the health status and, in general, the position of older citizen, it is essential to the health and social services sector - both in the state and the non-profit and private sector – to be better integrated and coordinated.

Northwest Croatia (Croatia): *planned activities*

The Croatian Ministry of Health and Social Welfare considers eHealth as an enabler to higher quality of healthcare delivery, health services made available to all citizens and better utilization of resources. The introduced Healthcare Networking Information System in Croatia represents a comprehensive solution designed for the integration of healthcare processes, information management and business workflows for healthcare organizations, enterprises and delivery systems. It is developed as a modular, secure, and open communication platform that efficiently synergizes common enterprise integration services with healthcare specific application components. To date some 2.400 primary healthcare teams in all 20 counties and in the City of Zagreb have been networked. Northwest Croatia's priority is an advanced IT nursing system, which integrates hospital care and post-hospital patronage activities as well as home care of the patients. The IT nursing system follows all the aspects of the hospital care of the patient, as well as it integrates the communication between the primary care doctor, patronage nurse and home care teams. This is achieved by following the highly structured process of nurse care monitoring the patient in the hospital, informing all relevant health care subjects upon his dismissal from the hospital, and creating all the necessary conditions for the follow-up care by using patronage and home care teams.

By standardizing nursing procedures on the regional level through workshops and pilot programs, existing IT nursing system could be significantly improved to the level of providing standardized healthcare in all EU countries participating in the pilot program. After translating the software through its existing multilingual support already built in the system, evaluation could be performed and this improved IT system could be installed in the hospital systems for further evaluation of all improvements resulting from its usage. Implementation of such advanced IT systems based on "cloud" technology, significantly decreases total costs of investment for the healthcare institution, since the only crucial asset is internet bandwidth.

Examples of telehealth initiatives in Eastern Europe

Remote ECG in Poland[53]

In 2006 Telemedycyna Polska S.A. (Inc.) started implementing the "Zadbaj o swoje serce" project ("Take care of your heart"), whose goal is to facilitate remote access to specialists for ECG examinations and cardiologic consultations.

Within the project the „Kardiotele" solution was launched in cooperation with the Silesian Center for Heart Disease in Zabrze. Kardiotele works by patients using ECG apparatus at home, they stick the electrodes to their body and then call the Kardiotele service. The doctor on duty greets the patient who turns the apparatus on and put it to the telephone receiver. The doctor may observe the records of the patient's heart workings on the monitor of the computer which has Kardiotele system installed. Having read the ECG results, the doctor asks the patient about their ailments and recommends further treatment. If the ECG result is alarming, the doctor will call an ambulance and forwards to the controller all the information about the patient's disease, medications and current health status. The doctor in the ambulance receives the information and the ECG results, which therefore facilitates the assistance provided.

Telemedycyna Polska S.A. hopes that the Take care of your heart project will continue to be rolled out across Poland although there is currently no financial governmental support available, other sponsors have been found.

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[53] See: http://www.telemedycynapolska.pl/en/index.php

Virtual Cardiologist, Silesia, Poland

The Silesian Center for Heart Disease in Zabrze has also been involved in the deployment of a virtual cardiologist web application which is used to promote healthy behavior in heart disease and high blood pressure patients. It has an interactive diagnosis function whereby the patient inputs such as body mass index (BMI) age, and level of activity from which the risk of coronary heart disease is estimated.

Proseniis project, Hungary

Proseniis was a 3-year research and development program, started in 2008 with the support of the Hungarian Government. The project, led by GE Healthcare, included participants of the Hungarian healthcare business such as Meditech Ltd. and MEDNET 2000 Ltd., in cooperation with Pannon University (Veszprém, Hungary), the University of Arts and Sciences of Szeged and the Óbuda University. The goal of the project was to provide an individualized and integrated system for telemonitoring and nursing assistance for elderly people suffering primarily from neurological diseases (like stroke, Alzheimer's, Parkinson's, dementia) .

The proposed system monitored physical activity and other life signs in the patient's environment. With the help of remote controlled telemonitoring, nurses could follow any changes in patients' life signs; check if medication has been administered; be notified if there are deviations from usual levels, warn of a potential fall, sickness or other emergency.[54] Plans for further development are not yet known.

Teleconsult, Bulgaria

Teleconsult is a software solution implemented remotely in two hospitals – Areoclinic in Sofia and Municipal Hospital in Svoge. The Teleconsult system allows electronic medical files to be transferred between the hospitals so as to allow medical practitioners to engage in diagnostic activities without being in the same physical location as the patient. This remote diagnosis is also aided by audio and video streaming through specialized software with individual virtual rooms, locked and password protected meetings.[55]

MOJE Ambulance, Czech Republic

MOJE Ambulance is an online service which facilitates online consultations between patients in remote locations and their doctors using Skype.[56]

Alongside these examples of integration between health and social care, additional regional approaches to integrated care for independent living have been deployed across Europe in the framework of the **CommonWell** and **INDEPENDENT** projects.[57]

CommonWell (Common Platform Services for Ageing Well in Europe, 2008-2012) is an EC sponsored project that has developed and piloted integrated care at four sites in Europe, namely:

- better emergency care through telecare integration in Andalucia, Spain;
- managed hospital admission for care clients in Bielefeld, Germany;
- early Intervention and Telehealth for COPD Patients in Milton Keynes, England;
- integrated support for heart failure patients in Veldhoven, Netherlands.

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[54] See: http://www.proseniis.com/

[55] See: http://eprints.nbu.bg/662/1/TELECONSULT_%E2%80%93_ONE_TELEMEDICAL_SOLUTION_IN_BULGARIA.pdfMOJE

[56] See: http://www.mojeambulance.cz/Stranky/poradna/telemedicina.aspx

[57] See www.commonwell.eu; www.independent-project.eu

All four sites are now operational and have identified lessons that particularly apply to the design of services for citizens aged over 65. CommonWell has published guidelines that consider the perspectives of the client, care providers, care organisations and technology. Their recommendations include, for example, that clients should be consulted and involved in the design of services, that elderly people may need extra encouragement, training and ongoing support to use new technologies, and that an individualised and flexible service approach is essential. It was recognised that care should not target individual conditions but all of the conditions an individual has.

INDEPENDENT develops and pilots an integrated set of ICT-enabled services dealing with a range of threats to independent living common to older people. Through innovative usage of ICT, current "silos" in service delivery are broken up to allow for cooperation across relevant care sectors and participation of family members. The pilot sites and their solutions are described in the following paragraphs.

Dublin, Ireland

The INDEPENDENT project in Dublin is built around the collaboration of two separate entities, Emergency Response LTD (ERL), and the Alzheimer Society of Ireland (ASI). The latter is a voluntary (non-profit) organisation providing frontline services as well as information, support and advice services to people with dementia and their carers. Emergency Response is a private company providing telecare services to older people with dementia and their carers.

The INDEPENDENT service supports collaboration between both parties by providing a case management tool that enables ERL operators to collate all the information and actions related to an incoming call. Care coordinators at ASI will benefit from close-to-real time information about the condition of users and an improved reporting tool to support the reassessment process. Care teams in ASI can see exactly where and when the client is using the telecare, allowing advanced care planning as changing care needs are evident, safety issues are highlighted and therefore care planning is adapted accordingly.

Geldrop, the Netherlands

In Geldrop, the INDEPENDENT pilot involves the collaboration of four different parties in the support of older people suffering from COPD, namely physiotherapists at TopSupport, pulmonology specialists at St. Anna Hospital, social carers and family carers.

With a view to enabling COPD patients to better live with their condition, the various parties involved in the overall care process utilise the INDEPENDENT digital infrastructure to coordinate their activities in a more timely and accurate manner than has hitherto been possible. Amongst other things, this involves the utilisation of an Electronic Health Record System, as well as COPD patients carrying out exercises in their own homes whilst being remotely supervised by a physiotherapist. A video system enables direct communication between them and a wearable device enables remote monitoring of physical activity.

Hull, United Kingdom

The INDEPENDENT pilot in Hull is for older people living in sheltered or private homes.

The sheltered homes have a version of Tunstall's "MyClinic" Multi-User Device. This is a touch-screen computer linked to blood pressure monitors, pulse oximeters and weighing scales. It also has an 'interview' facility where people answer questions about their health and wellbeing and a link to a site providing information about locally available services. The data is stored on the MUD but is also accessed by social and healthcare providers.

For private home dwellers the Hull telemonitoring service has been enhanced, a social function has been added to the health related Philips Motiva system. Relatives of participating patients and voluntary workers can be linked to it so they can better support the user. This

provides the opportunity of measuring whether all visits made by healthcare staff are necessary or if some could be made by carers.

Milton Keynes, United Kingdom

The Milton Keynes INDEPENDENT service draws on collaborative work from four parties, CarersMK, ConnectMK, Milton Keynes Council and Adepteq.

Using a Carers support network maintained by CarersMK, it provides "informal care" for older people. The service provides refurbished PCs or laptops with web cams and renders access to a purpose built system "Connecti" via a web browser, developed by Adepteq. Informal carers and people in need of care can track, monitor and request support or simply have video supported conversations with CarersMK, friends, family and others to reduce their isolation.

The service also highlights where earlier interventions and support may be required.

The INDEPENDENT digital infrastructure widens the scope for information advice and guidance from informal care organisations, introduces service efficiencies and allows carers to better manage their caring responsibilities. ConnectMK provides the refurbished PC's (ex-Council equipment) and technical support. Milton Keynes Council hosts the service in its data centres.

Malaga, Spain

In Málaga, the INDEPENDENT service revolves around the closer integration of the services provided by ASSDA with the services provided by Salud Responde. ASSDA is a public organisation responsible for the provision of social care and independent living services, and operates one of the largest telecare service centres in Europe. Salud Responde is a public organisation which provides several health services throughout the province of Andalusia.

Current social support services provided by ASSDA are improved through better integration of and coordination with existing services provided by the health authorities (Salud Responde).

To this end, the INDEPENDENT digital support infrastructure enables sharing of client data and joint call handling in case of requests by clients and informal carers concerning both social care and healthcare needs.

Trikala, Greece

The INDEPENDENT pilot in Trikala responds to the need for closer collaboration of the municipality's care delivery organisations DEKA and KAPI in supporting informal carers and those for whom they care.

In particular, the digital infrastructure is utilised for supporting cooperation of community services and family carers of older people with mild cognitive impairment or mild depression. Joint access to extended electronic care records supports easier coordination of service delivery rendering them more integrated, productive and cost-effective.

In addition, the digital infrastructure enables specialist psychological counselling to be remotely delivered to informal carers, helping them to better care for their relatives and cope with any problems that may occur in this context. Prior to INDEPENDENT no formal interfacing existed between community care services and informal carers.

4.2   Selected aspects of integrated care activities

Having reviewed policy approaches and regional examples of integrated care delivery, this section now consolidates results from the analysis of case study evidence regarding important aspects of integrated care projects. The proper user identification and recruitment, consideration for procurement and organisational change and workforce development are key aspects that have played a role in the successful deployment of the described solutions.

4.2.1 Identifying and recruiting appropriate users

One of the fundamental problems with eHealth programmes is the lack of a structural assessment of the patient's resources, motivation, preferences and ability to use for example eHealth applications and remote monitoring devices as part of their daily self-care. Instead of personalising care a one-size-fits-all approach is applied based on monitoring of prognostically relevant clinical parameters in order to detect timely a deterioration of a particular disease. This approach results in a skewed interpretation of data focussing on pathological signs of a particular disease. The patient's own overall (often including several diseases) interpretation of deterioration and the coping strategies in relation to this are ignored[58].

Future eHealth solutions should be able to remotely monitor certain chronic diseases, but also be based on a collaborative and comprehensive assessment of patients´ as well as health professions´ interpretation of the health problem being addressed. Patients can then play an active and co-creating role in their own healthcare.[59] Sources of data from patients for a more personalized approach to risk stratification could for example be narrative reports about their burden and distress due to chronic diseases in a narrative form. These reports contain further valuable information such as uncertainty in illness, anxiety, self-rated health, functional status, for example their ability to perform activities of daily living and mobility, and self-efficacy.

The above mentioned "HerzAs" project is an example for selection of patients most likely to benefit from telemonitoring based on a careful analysis of all data available to the insurance company.

4.2.2 The critical relevance of organisational issues

Addressing organizational issues is critical to the success of any integrated care initiative. These include – among others - appropriate organisational models, change management approaches, workforce development and training, patient empowerment, etc.

Organisational models for successful integrated care delivery are highly dependent on the context of the healthcare system in which they operate.

Change management through continuous user involvement is critical in order to succeed. In the case of the Uppsala county council EHR implementation project, an electronic issue tracking system was implemented whereby users could register their issue and then monitor its progress along the reporting pathway until it was resolved. Such a way of involving end-users of the EHR in its deployment phase has increased acceptance of the solution.

Patient empowerment is an explicit objective of integrated care programs. However, the design of the integrated care services is often guided primarily by technicians and medical staff. It seems to make perfect sense to choose this approach in order to increase acceptance with healthcare professionals. However, in order to encourage patients to sign-up for or make use of an integrated service offer, particularly if it involves devices at the patient's home, patient involvement in the design and introduction of integrated care services is crucial.

In the already quoted report by the NHS Futures Forum on Integration, a key barrier to the successful deployment of integrated solutions is identified as a "lack of attention to issues of culture, staff engagement, behaviour and training to deliver change."

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[58] Sanders, C., A. Rogers, et al. (2012). "Exploring barriers to participation and adoption of telehealth and telecare within the Whole System Demonstrator trial: a qualitative study." BMC Health Serv Res 12: 220.

[59] Swedberg, K., A. Wolf, et al. (2011). "Telemonitoring in patients with heart failure." N Engl J Med 364(11): 1078; author reply 1079-1080.; the term co-creation designates a situation in which patients change their lifestyle towards a more healthy one, based on information and data made available to them. As a result, they contribute to and "co-create" their own health.

In the case of the Northern Norway EHR implementation project, workforce development and training encompassed not only technical but also legal training on the specificities of the procurement regulations.

The HerzAs telemonitoring project for heart failure patients was driven by an insurance company, the key player in the negotiation of innovation care contracts in the German healthcare system. In that same healthcare system, an association of doctors in Solingen who pushed forward an information exchange solution between the secondary and primary care sectors of the city relied entirely on their ability to mobilize fellow doctors for the vision of seamless information exchange. The Solimed company that was established to deal with the hardware changes and the change management aspects had to struggle in order to find insurance companies that were willing to contract and reimburse services. This shows that although doctors in the German healthcare system can be a force for change and have a strong institutional position, the initiative by insurance companies, backed up by the data they have, can achieve more, faster.

4.2.3 Good practice in procurement of eHealth solutions

The motivation to invest in a new eHealth solution is generally instigated by a desire or a need to improve service provision and therefore patient experience. The case material received by eHealth innovation illustrates that a different approach to healthcare delivery processes needs to be adopted in conjunction with the procurement of technology. This transformation will not be successful if it is only taken on by a portion of the service provision chain. Rather, all stakeholders have to be prepared to embrace a change to healthcare culture. eHealth investments should be understood as strategic change management projects. This was the approach taken in Northern Norway for the procurement of a region-wide EHR system. (see case summary in Annex I).

Various parts of the service chain provision are important. These include the healthcare professionals, the design of the entire service to include the opinions of these professionals, their training and education – especially their legal and informatics' knowledge, and – last but not least – the extent to which influence can be expected on the supply chain. These issues are all explored systematically here.

An important component of the service provision chain is **healthcare professionals**: they are best placed to promote the advantages of the eHealth solution and ensure its success. However, new eHealth solutions can produce negative reactions in some healthcare professionals, particularly when the solutions provide patients with greater autonomy and thus alter the patient-professional relationship. Communication is one means of getting these and other stakeholders on board until the solution is implemented and can provide proof of its advantages. Another solution, used by the Newham Whole System Demonstrator (WSD) site in the UK, is to include health professionals as part of the leadership team. Alternatively, the use of discussion forums where healthcare professionals concerns can be expressed and taken into consideration when designing the system has proved successful in other eHealth procurements.

The inclusion of healthcare professionals and other users' opinions is also important when facing the challenge of embedding the solution within service delivery. Embedding the solution is important to ensure maximum benefit realisation. In order for proper integration of the solution within the service the **procurement of an eHealth solution should be planned as part of a redesign of the whole service**. When redesigning of a service is carried out with user involvement it ensures all relevant features are included and that the system is intuitive to use. As a result the users are more familiar with the system and recognise (through "buy-in") that they have had a stake in its development. They may therefore be more willing, consciously or unconsciously, to use the new system or service. Ultimately, if users do not accept the solution and utilisation is hampered then this equates to a loss in investment.

Another argument for user involvement is that imposed change is less likely to be effective, whereas if you work with users to develop the solution they can understand why it is being implemented and will accept it more quickly and easily. This sense of involvement can be reinforced by clear and honest feedback to users about what is possible and what the time frame is. Giving feedback on what happened to a user's proposal also gives reassurance to the user that their views are being considered. In Uppsala, Sweden this was achieved, when developing the county-wide EHR, by implementing an electronic issue tracking system whereby users could register their issue and then monitor its progress along the reporting pathway until it was resolved.

As eHealth procurement is an innovative field there is **a gap between skills and knowledge**. In order to bridge this gap the personnel involved in the procurement process must be specially selected. Different methods of handling this selection are evident. Three solutions are highlighted here; they reflect external hiring, building a diverse team, or involvement of people with the widest possible skills sets.

Solutions include the hiring of external specialists as happened in Northern Ireland for procurement of telemonitoring solutions; or the **formation of diverse team with flexible skills sets** as took place in Trikala, Greece for the procurement of telemonitoring and telecare solutions; or the involvement of all members of an organisation in the procurement process as was the case for the Solimed EHR procurement whereby all doctors in the network, hospital management staff and external advisors were involved meaning a large variety of experience could be gained from.

Support for this innovative field can also be achieved by embedding procurement for specific eHealth services in a wider eHealth strategy, be it on the level of a region or a country. This creates standardised investment paths with which to speed up the process. Such was the case for the procurement of Catalonia's PACS where specific funding pathways and procurement procedures were in place for such services.

Successful eHealth solution procurement requires a forward-thinking style of procurement for associated developing technologies. This includes planning beyond the immediate investment so as to be able to share infrastructure in the future or to be able to add on extra services. Another means is to use flexible contract models which include plans for later service expansion. For example, when procuring the national telemonitoring solution in Northern Ireland additional future services with specified costs were included in service contracts. Such planning makes the current investment more efficient and introduces cost savings.

Good planning is essential for successful procurement of eHealth solutions. One example of excellent preparation is the procurement of the HerzAs service which makes use of telemedical support in care provision for heart failure patients in Germany. Firstly, a **thorough assessment of the need for the service** was undertaken. Then the service's purpose and functionality were refined through piloting. This refinement was coupled with a **cost-benefit analysis** which provided reliable evidence that the service could increase the quality of care while simultaneously controlling costs. This is a desirable outcome for all parties.

Such preparations were only made possible through the availability of all necessary data and the support of a dedicated and flexible project team with **appropriate legal and informatics knowledge**. The inclusion of legal expertise at such an early stage in the project was advantageous as it guaranteed the compliance of all work with regulation. Plans could also be developed with the reassurance that they were legally compliant.

The development of clear requirements for HerzAs was another aid to the smooth running of the procurement process as it meant that vendors were able to appropriately respond to needs. From past experience it was known that data requirements and data quality assurance are a time consuming affair. Therefore, time was assigned for these tasks and close coordination with the IT department was facilitated.

The **requirement development process is one means by which procurers can exert influence on the supply chain** and match the influence of suppliers, and thus achieve a balanced procurement. Estonia did this through applying standards and uniting the purchasing power of the healthcare market when investing in their EHR and Estonian National Health Information System (ENHIS). In Northern Norway and Northern Ireland the approach was similar to HerzAs: feedback was provided to bidders and extensive specifications employed in conjunction with negotiations; this tactic ensured that influence shifted to the procurers and thus ensures a better final offer.

5 Learning from experience with chronic disease management and integrated care implementation

This chapter summarizes the key learning points from the reviewed case study evidence and provides integrated care policy-makers with recommendations regarding the most important aspects in the planning and implementation process of an integrated care solution.

Overall eight points are made. They include that fact that there is no feasible single solution; the patient must be at the centre of the process; a shared vision and solid leadership must be present; the various cultural or organisational differences must be understood; the staff must be prepared, ahead of time, for change; a "smart procurement" approach must be developed; the effects on the patient need to be measured; and making an informed choice about the actual ICT is crucial.

5.1 There is no "one-size-fits-all" solution

> *"While much of the wider literature focuses on 'models' of integrated care, we found that Integrated Care Pilots (ICPs) developed and implemented a loose collection of 'integrating activities' based on local circumstances."*
>
> *National Evaluation of the Department of Health's Integrated Care Pilots*

A first reassuring lesson from the diversity of case studies analysed is that no standard recipe exists to design an integrated care solution which fits all possible integration needs at the local and regional levels.

Diversity can be observed along a number of dimensions:

- Direction of integration: whether this is degree of integration horizontal (across health and social care boundaries) or vertical
- Depth of integration: which can range from the exchange of discharge information (simple) to shared access to full clinical and social care records (complex)
- Scope of integration: population (wide) vs. specific disease focus (limited).

The wide variety in the existing examples of solutions concern at least three other specific areas. These exist at somewhat different levels and in very different domains. They are the degree of formalisation of integration efforts; the technology focus; and the role of additional carers that supplement existing care processes. For example, the telemonitoring of health data may involve the use of a call centre staffed with specialised nurses or, indeed, as in the case of **Medgate** in Basel, Switzerland, qualified clinicians.

The challenge for policy makers is thus to be aware of the wide range of possibilities that exist to coordinate and integrate care, and what might be the most appropriate fit for their own circumstances. An integration initiative should then create processes that focus on the improvement of the care delivered to patients.

5.2   Concentrate processes around the patient

"Integration is only valuable insofar as it improves experience and outcomes for the individual. It is not a virtue in its own right, but one important aspect of the quality of care."

NHS Future Forum, report on integration

"Integrate around the patient, not the system. Integration is not about structures, organisations or pathways – it is about better outcomes for patients."

NHS Future Forum, report on integration

A successfully integrated care service must address the needs of patients. To understand what these needs are, it may be worthwhile to involve the patients themselves in the design of a new service process.

Questions that will arise in this process are:

- What is the current process of delivering care to patients?
- Who is involved and how will this change in the integration process?
- Will patients accept new contact persons or contact points?
- What kind of data do we need from patients, if we don't already collect it?

This approach stands in contrast to healthcare professional-driven projects, the value of which does not always translate into tangible outcomes for patients.

5.3   Ensure a shared vision and strategic leadership

Prior to investment in a new ICT infrastructure or applications, successful integrated care projects should develop a shared vision about desirable changes to the existing care processes and the intended outcomes for service users.

The development of such a shared vision presupposes a clear understanding of the status quo and a shared agreement that the current circumstances need to change. This can only be achieved through the involvement of all the relevant participants in the care delivery system.

Obtaining political leadership implies that an agreed approach is kept on the agenda, backed up by sufficient funding.

5.4   Understand and address cultural differences in service provision

The different professional cultures of healthcare and social care workers, coupled with differences in budgeting, are repeatedly cited as key challenges. The cooperation between both sectors can only work effectively if underpinned by a shared understanding of the added value of new processes and the responsibility of each party in them.

In particular, a culture of sharing of data and information should be fostered. It is indeed crucial to understand which types of data are worth sharing because they make a difference to the care experience of the patient.

5.5   Prepare (care) staff for change

"It was much easier to make progress where staff could see clear benefits that would result from the changes proposed and where they felt involved in the development of new services."

NHS Future Forum, report on integration

A new care process requires the active participation of all carers to work effectively. The introduction of technology-supported tools often results in an initial loss of productivity due to the need to provide parallel organisational structures and devoting time to training.

A successful change management process can be measured in the reduction of time spent on these unavoidable activities. If change is to be accepted, it will also need to be reflected in revised reimbursement systems, which may reward the use of ICT through higher salaries.

5.6 Adopt a "smart procurement" approach

Key lessons learnt from the procurement experience of integrated care solutions can be summarised in the three following guidelines.

- Understand the market before publishing a call for tender
- Define requirements in collaboration with technology providers
- Consider the legal and organisational ramifications of technology.

These points make the involvement of legal experts critical in the process of procuring an innovative technology (or other) solution. Experience also shows that new technology will never fully replace existing systems. An approach to the legacy hard- and software that has previously been used is therefore also important. Doing so in a sustainable manner can reap important benefits for the local community.

5.7 Measure the effects for the patient

> *"You can only improve what you measure. The Department of Health should urgently support the development of a new generation of patient reported experience measures that evaluate patients' experiences across whole journeys of care, and within and between services."*
>
> *NHS Future Forum, report on integration*

In line with a patient-centred approach to the development of integrated care services, a measurement and evaluation approach should be adopted which focuses on the effects of the new services on the patient. Because effects may include such aspects as increased self-reliance and reduced stress and anxiety, the benefits may only materialise in the long-run. Evaluation at regular intervals is therefore important.

The following table lists key enablers for successful care integration. The points made in this section (in particular in below Table) derive from experience made in the English NHS system, which have undergone a thorough evaluation.[60] They can be grouped into policy and organisational issues. The predominance of organisational issues is an important lesson in itself. It reinforces the earlier observation that technology solutions have to be embedded in modified organisational models.

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[60] See RAND Europe and E. Y. LLP (2012). National Evaluation of the Department of Health's Integrated Care Pilots, Prepared for the Department of Health.

TABLE 3: ENABLERS FOR INTEGRATED CARE IN DIFFERENT AREAS

Main area	Enablers identified
Policy	• A shared vision of the case for change between GPs, local authorities, and other partners
Policy	• Strong, courageous and persevering leadership, particularly from local professionals • Strong commissioners prepared to follow through on a vision to integrate around the needs of patients • Strong leadership at Physician and other Health Care professional Board level to drive the change in profile responsibilities and role changes (not always favourable), health care system level clinical guidelines.
Strategy	• Organizational leadership within payer organizations to introduce reimbursement based on novel (risk sharing, outcome driven) business models
Organisational	• Involvement of service users in the design of new services
Organisational	• Sufficient time spent building relationships, developing a shared culture and governance between organisations
Organisational	• Alignment of governance procedures, staff management and training • Leadership investment in supporting behavioural change and shared ambitions within providers
Organisational	• Using flexible funding models and innovating around existing incentives • Joint procurement of services between health and social care based on shared vision and budgets (this is easiest in an NHS type healthcare system where payer and provider are in principal the same, but it should also be a goal for social health insurance systems)
Organisational	• Responsiveness to feedback of frontline staff
Organisational	• Anticipation and mitigation of side effects of service changes, such as initial 'double-running' of services

5.8 Make informed choices about ICT: enablers, success factors and key challenges

Enablers and challenges can also be identified with regard to the key ICT building blocks that are needed to achieve integrated care. The following Table 4 focuses on these aspects.

Key enablers that are identifiable across the different building blocks are mainly two. They are the growing maturity of IT standards and care pathway tools. It is noteworthy that, despite the subject of this table being about ICT building blocks, the predominant critical success factors and challenges are not technical. Rather, organisational and cultural issues are predominant.

TABLE 4: ICT BASED INTEGRATION BUILDING BLOCKS: ENABLERS, SUCCESS FACTORS AND KEY CHALLENGES

ICT based integration building blocks		Components (some optional)	Enablers	Critical success factors	Challenges
Data sharing and coordination	Integrated data access for care providers in different agencies and informal carers	Integrated Care Record	• Generally good national communications infrastructures connecting healthcare settings • Relatively mature interoperability standards for electronic health records, and terminology • Most countries have or are establishing healthcare provider directory services and authentication / authorization services • Growing sophistication of EHR systems and proportion of personal health information held electronically	• Need to fund, develop and deploy standards based interfaces between existing legacy systems • National patient identifier is probably a prerequisite to large scale integration • Need to foster a culture in which record sharing is accepted and welcomed amongst professionals	• Relatively immature ICT infrastructures in social care • Lack of social care provider directory services • The present generation of interoperability standards have been designed to represent health data and might not be ideally suited to social care data • Ad hoc connectivity to patients, dependent upon home broadband etc.
		Sharing clinical, scheduling, monitoring information		• Need to foster a culture in which record sharing is accepted and welcomed amongst professionals • Opportunity to establish tele-health connections between primary and tertiary care centres, for mentoring and specialist "outreach" services • Need to develop shared care pathway systems to enable co-ordination of care between settings • Need to invest in enriching many existing care pathways to incorporate social care services and patient self care components • Co-operative monitoring and escalation pathways need to be agreed, including issues of ownership and professional responsibility	• Most applications that operationalise care pathways are care setting specific • Scheduling systems are usually care setting specific, with almost no connectivity between health and social care scheduling

		Shared EHR / Access to subsets of EHR	• Relatively mature interoperability standards for electronic health records, and terminology • Standards for clinical models that can be used to precisely define sub-sets of an EHR	• Ensure EHRs are consistently populated (EHR architectures, applications, user education) • All professionals will need education to understand what kinds of information are most useful to share with other colleagues • Define access permissions to enable need to know access whilst assuring patients of appropriate protection of privacy	• Different terminology and documentation practices between health and social care • Relative lack of familiarity of reading and using records between health and social care • Most health records are not patient-friendly (social care records too?)
		Input from health and social care actors / interfaces to different ICT tools	• (As for Integrated care record)	• (As for Integrated care record)	• (As for Integrated care record)
		Web-based portal	• Good maturity of web portal technologies, low cost of implementation • Increasingly high quality portable devices (smart phones, tablets)can be used to access Web portals while mobile	• Need to deliver value to patients and healthy citizens who use portals (learn from failures of online personal health record systems) • Need to help care professionals to be comfortable with patients having direct access to their health information (e.g. to test results)	• A portal implies a single (Web) access to a coherent set of information and knowledge services, but many of the services underpinning portals are in fact fragmented and not interoperable
		Integration of vital sign / health monitoring data into care planning and management processes	• Increasing availability of high quality and very convenient wearable devices for monitoring • Device interoperability standards becoming more widely adopted, permitting multi-device integration with EHRs	• Dedicated remote monitoring services (surveillance and escalation) need to be formalised and budgeted for, since routine assimilation of these tasks by existing services usually does not succeed • Care responsibility and legal liability need to be formalised	• Cost of devices is rarely factored into reimbursement budgets and policies • User training (patients and care providers) is not often budgeted for, nor are time and facilities provisioned

Design and execution of pre-planned care pathways enabling temporal <u>coordination</u> between provision steps taken by care providers in different agencies, informal carers and cared for people	Workflow engines Charting tools for IC pathways design	• Tools to design collaborative (integrated care) workflows are becoming more sophisticated	• Need to acquire the right skills and the right level of stakeholder buy in to design high quality and practical multi-professional pathways • Will need to work out how best to engage patients, families, informal carers and voluntary sector within integrated care pathways • May need to develop applications to implement cross-boundary care pathways: cost and time implications	• Interoperability standards for care pathways not yet very mature: this area needs investment
	Joint/shared scheduling, daily schedulers Shared care plans Team coordination support	• Tools for virtual care team collaboration are emerging and getting better (often learning from social networking platforms)	• Significant training needs to adapt care professionals to use electronic collaboration tools • Protected time needed for electronic collaboration: needs to be factored into workloads and possibly into reimbursements or incentives • Successful adoption might need substantial investment in portable devices (e.g. tablets)	• Best practice and experience of successful use is still emerging – all adopters might initially be pioneers • Professionals from different backgrounds will take time to learn to value and respect each other's skills and judgements, and therefore to properly collaborate
	Training delivery/learning pathways / plans for professional and/or patient self-care training support tools	• Online educational and training tools now quite mature • Access via portable devices will facilitate flexible learning and just in time learning	• Suitable content development will need investment and commitment • Protected time needed for e-learning needs to be factored into workloads and possibly into reimbursements or incentives	
Access to the home: <u>home-based systems</u> (Telemonitoring and/or Telecare TM/TC) by care providers in different agencies and informal carers	Vital parameter monitoring	• Increasing availability of high quality and very convenient wearable devices for monitoring • Device interoperability standards becoming more widely adopted, permitting multi-device integration with EHRs	• Dedicated remote monitoring services (surveillance and escalation) need to be formalised and budgeted for, since routine assimilation of these tasks by existing services usually does not succeed • Care responsibility and legal liability need to be formalised	• Cost of devices is rarely factored into reimbursement budgets and policies • User training (patients and care providers) is not often budgeted for, nor are time and facilities provisioned

		Patient's daily symptom questions	• Increasingly user friendly applications (desktop, mobile device) to capture information from patients • Good experience from Pharma on Patient Reported Outcomes (PROMs)	• Important to motivate patients to complete information daily: the applications need to deliver value back to patients e.g. feedback, social network contacts, direct clinician feedback • Patients need to feel their data are being taken seriously and meaningfully used by care professionals	
		Alerts, prompts, reminders configuration and handling Protocols and escalation procedures		• Dedicated remote monitoring services (surveillance and escalation) need to be formalised and budgeted for, since routine assimilation of these tasks by existing services usually does not succeed • Care responsibility and legal liability need to be formalised • Audit and governance processes are essential and must be established and well run	
		Passive and/or active alarms		• (As for Alerts, prompts…)	
		Automated self-care and (older people wellness and informal carers) promotional/ educational/ training/ planning tools	• Very usable mobile devices and tablet computers, suitable even for those who are not particularly computer literate • Rapidly expanding market of very low cost Apps that support lifestyle management and health education • Challenge of ensuring the right output quality of apps • Low cost of developing dedicated Apps for particular communities • eHealth tools offer potential to create social networks (support groups, encouragement groups) to link people with common care plan goals to mutually motivate	• Will still need to invest in care provider teams who can support a distributed online community who are largely self-caring • Many care professional need training in how to support self-care (they only know how to deliver care) • Dedicated educational resources usually need to be developed for minority populations (e.g. ethnic minority groups, rare diseases) and this will need investment • Wellness information will be relevant to healthy individuals who are not patients, for whom registration processes and the issuing of unique identifiers may need special procedures and systems (eID systems)	• More research and understanding is needed on the privacy issues relating to online social networks that are part of care provision • More research and understanding is needed on how best to moderate and to professional support online social networks, including managing patient confidentiality and professional accountability • Balance needs to be found between promoting healthy lifestyles and allowing people the freedom for personal choice: needs more research

		Life-style/behaviour monitoring	• (As for Automated self-care…)	• (As for Automated self-care…)	• (As for Automated self-care…)
		Physical training & coaching programmes/tools	• As for Automated self-care… plus • Experience already growing of combining home monitoring equipment (e.g. smart weighing scales) and Apps to support individuals in self care and health promotion	• As for Automated self-care… plus • Investment is needed in health coaching services and in training care professionals to be coaches	• As for Automated self-care… plus • Evidence of cost effectiveness is still emerging, benefits may be some years downstream – needs long term financial planning
		Access to other services to address social isolation, information sources, connections to community activities	• eHealth tools offer potential to create social networks (support groups, encouragement groups) to link people with common care plan goals to mutually motivate	• Will still need to invest in care provider teams who can support an online community by interacting online, moderating and advising when more concrete care is needed (care escalation)	• More research and understanding is needed on the privacy issues relating to online social networks that are part of care provision • More research and understanding is needed on how best to moderate and to professional support online social networks, including managing patient confidentiality and professional accountability
		Development of Service Standards, e.g. response times		• Very robust governance processes are needed to ensure that tele-services are maintained to a high standard and safe, since the subject of care is not present in person to represent their concerns or to prompt action • Standard operating procedures, monitoring and audit, escalation and prompt investigation of safety issues must all be put in place • The costs for governance must be factored into the budgets of integrated care and tele-services	
		Integration of data into care planning and management processes	• (As for Integrated care record and Workflow engines…)	• (As for Integrated care record and Workflow engines…)	• (As for Integrated care record and Workflow engines…)

		Home safety monitoring (gas, temperature, light, doors, windows, etc.)	• As for Vital parameter monitoring	• As for Vital parameter monitoring, plus: • Capital budgets may be needed for home adaptation was well as device installation	• As for Vital parameter monitoring
		Device administration; remote device tracking, maintenance and updates		• Service contracts need to be in place and funded • A regular calibration and servicing arrangement must be established for remote and patient held devices • Training for staff and patients will be required, including refreshers and induction training for new staff • Buffer capacity is needed through extra devices to replace those that fail QA processes • Experience shows that a single responsible body for a geographical area helps with planning and governance	
		IP-based screen sharing	• Screen sharing applications are readily available, of low cost and becoming easy to use • Reliable connections between care organisations readily enables virtual team meetings	• Use of screen sharing with patients (e.g. for one to one or small group education) may require investments in home broadband support and home ICT • Robust information security and information governance measures need to be designed and implemented	
Real-time communication	Real-time <u>communication</u> between care providers in different agencies and informal carers, e.g. support to case conferences, and older people	Videoconferencing (VC)	• Videoconferencing facilities are often built in to modern desktops, laptops and tablets • VC applications are of low costs and are increasingly easy to use • Reliable connections between care settings enables virtual meetings and tele-consultations • Early adopters of tele-health services that use videoconferencing find them to be well accepted and liked by patients and care professionals	• Protected time is needed for video-consultation: needs to be factored into workloads • Good practice in documenting the outcomes of a tele-consultation need to be agreed and adopted, including care planning decisions and responsible actors • Legal responsibility for judgements and decisions made via tele-health facilities need to be formalised • The time and resource implications of tele-health services need to be factored into reimbursement models	• Evidence still needs to be accumulated on the cost benefit of videoconference (tele-consultation) for clinical care

		Telecare service communication with informal or formal carers for care coordination and management	• (As for Videoconferencing)	• (As for Videoconferencing)	• (As for Videoconferencing)
		Call / Contact Centre, Triage		• Formalised ICT, organisational and personnel infrastructures are needed to provide safe, risk managed and responsive triage or escalation in integrated care and telecare scenarios • Investment is vital in the development of triage and escalation protocols, staff training and governance processes	
	Joint response to ad hoc requests by care providers in different agencies and informal carers	Web-based portal		• Web portals are one example channel whereby patients and healthy individuals might provide data about themselves that indicates that a prompt or emergency care intervention is appropriate • Triage, escalation and care co-ordination protocols and infrastructures need to be capable of being triggered independently of the channel providing the trigger (remote device, web portal, telephone call, direct contact with a care provider etc.)	

| | | Centralised and flexible role-, patient- and user-administration | | • eID services and directories are needed for health professionals, social care professionals, patients and healthy citizens
• Authorisation to integrated care functions and services (including providing access to care workers from other collaborating organisations) needs to be agreed, formalised, and operationalised through information security components
• Access control frameworks need to be developed and implemented that enable staff to access relevant portions of a virtually integrated care record
• Patients as individuals and as society need to be engaged in the decisions about sharing personal health and social care information across integrated care teams
• Role assignment and revocation needs to take into account the high mobility and turnover of staff in some care settings | • Many legacy systems have relatively limited security and access control facilities that might not be able to scale to the needs of virtual, evolving integrated care teams per patient |
| | | Links with emergency services e.g. ambulance | | • Ambulance, paramedic and other rapid response services need to be incorporated within the ICT infrastructures, care planning protocols, access controls, documentation practices, training, accountability and co-ordination arrangements established for integrated care | |

Annex I: Overview of selected case studies[61]

Name of the eHealth project	Target users	Care setting or focus	Target condition	Role of eHealth application and expected outcomes	Key success factors, evaluation results / lessons learnt
Solimed EHR	Patients of doctors in the Solimed network, Solingen, Germany	Hospital, GP and office-based specialist focus		Allowing information exchange between office-based specialists in the Solimed network and hospitals in Solingen	**(1)** Initiative led by a network of healthcare professionals **(2)** Reimbursement model allows for more transparency on the more costly points in the treatment course. Doctors able to better steer the treatment
Telemonitoring Northern Ireland	Residents of Northern Ireland with long term conditions or who have suffered a stroke	Home and patient focused	Initially heart disease, diabetes and respiratory diseases as well as patients who have suffered a stroke	The processing of patient referrals. The collection of accurate and reliable monitoring data. A triage service which validates monitoring data and provides patient advice where appropriate and/the escalation of their care to the local response team as appropriate.	**(1)** Thorough service design **(2)** Flexible service model allows additional service to be added later **(3)** Security provided to patients and carers through the triage service.
Municipality of Trikala Telemonitoring	Residents of Trikala with long term conditions	Home and patient focused	Chronic Heart Failure, Chronic Asthma or COPD, Arrhythmias and Hypertension	Individual citizens are equipped with light-weight handheld devices to record their vital signs at home which are then transferred (via the teleHealth center) to the municipality hospital and private physicians via the internet or GPRS for review and feedback by doctors.	**(1)** Thorough testing with and training of staff and patients **(2)** Part of an overarching strategy of telecare and telehealth **(3)** Sensitive adaption of patient environment **(4)** Multi-disciplined team
HerzAs - Telemonitoring of heart failure patients, Germany	HF patients who have had one prior hospital admission and are now coached and telemonitored to cope with their disease and prevent re-admission.	Home focus	Heart failure	Bluetooth body balance with integrated questionnaire module, data is shared with a remote monitoring centre in order to prevent patient readmission to hospital	**(1)** Carefully selected service provider **(2)**integration of legal aspects from the start **(3)**short decision and reporting intervals at AOK NordWest

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[61] For further examples of and more information on initiatives and pilots please also see section 4 in this document.

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eCare / eDepression	Patients, care coordinators, doctors, other HC professionals	Patient focused	Depressive disorder, Asthma, Diabetes Mellitus II, weight loss, Physical activity	Process management with clinical and administrative reminders; information sharing; communication; patient engagement in order to provide care more cost efficiently and clinically reliable	**(1)** Due to care manager introduction works even with poor HCP adoption; **(2)** clear clinical benefit and cost-efficiency based on clinical trial **(3)** Patients satisfied with the service **(4)** Generic and interoperable platform enables localisations at low cost.
NEXES, Spain	Patients with chronic conditions	Public and private care providers (Hospital and GP focus)	Patients with chronic conditions or at risk	Linkcare platform – web-based application for management of chronic patients (available services. Health portal, call centre service, professional mobile access, patient wireless monitoring service, collaborative work service, security modules, future interoperability module) Ensures more seamless care	Lessons learnt: **(1)** Evolution from pilots to services for the programes considered in the pro **(2)** Controlled deployment, integration and validation of services **(3)** Identification of strategies suitable for the success of extensive and sustainable deployment of services
Sotiria Hospital eHealth Unit, Athens, Greece	Elderly and patients of low level of education and income with chronic conditions of Sotiria hospital (vast majority)	Patient centric services outlayed in a Hospital setting	Patients usually suffering from more than one chronic condition (co-morbidities, various degrees of disability, social isolation and depression)	Continuous monitoring of biosignals, real-time transmission of patients' vital signs, two-way real time video and audio communication, intelligent internet access for retrieval of medical information Reduction of hospital re-admissions and better quality of life	**(1)** holistic system change – integrating the mutually complementary interplays of tertiary, primary and social care sectors **(2)** chronic care management processes need to be customizable **(3)** technology only efforts are bound to fail – expertise of care management professionals will always be essential
Remote Monitoring and Health Coaching in South Karelia, Finland, part of RENEWING HeALTH	Chronically ill, mostly elderly	Patient-oriented with home focus, Personal health service focus	Diabetes mellitus Type II, CVD	Personal health services (health coaching, personal or group rehabilitation) and telemedicine and monitoring of various health parameters (blood pressure, blood glucose, body weight), data shared between professionals and patient through PHR enables patients to care care of their own health	**(1)** Designing a trial in a way professional users could switch between the monitoring system (RPM) and the EHR, **(2)** full integration will be facilitated by the integrative IT platform being developed by RENEWING HeALTH
Prescribed Healthcare, Norrbotten, Sweden, part of RENEWING HeALTH	Elderly people	Home focus, Personal health service focus	Type-II-Diabetes, heart failure	Personal health services (video messaging, pictures, documents, current medication list to support medication, registration, display of preventive health and medical diagnosis measurements, health coaching, personal or group rehabilitation), telemonitoring, measurements of health parameters; enables a more confident and healthier lifestyle	Importance of sharing only the relevant health data with patients Technical design of the platform takes into account national infrastructure and is developed as open source

The Few Touch Application (FTA), Northern Norway (part of the project RENEWING HeALTH)	Diabetes mellitus Type 2 patients: DM 2 diagnosed >3 months prior to enrolment, HbA1c (glycolysed hemoglobin) >7,0%; capability of filling in questionnaires, capability to use the devices provided and being cognitively able to participate	Personal health service focus	Diabetes mellitus Type II	Diabetes diary application (food habit registration, blood glucose data management, physical activity registration, personal goals setting, general information) data not necessarily shared with health professional (user decides to do or not to do so), health counselling via SMS based secure dialog; resulting in patient empowerment and increased quality of life	**(1)** Cooperation with GPs is challenging **(2)** health counselling works but challenging to establish close contact **(3)** telephone not very user friendly to unexperienced users **(4)** overall very positive feedback
Ecaalyx - Enhanced Complete Ambient Assisted Living Experiment (11 partners from 5 countries)	elderly with chronic condition	Personal Health System focus home focus	multiple chronic conditions of elderly	Home monitoring, continuous support, guidance, and relevant health education, resulting in stability of the condition over time and prevention of unnecessary deterioration	Not yet available
HAPPY AGEING - A Home based APProach to the Years of AGEING (7 partners)	elderly	Home focus	chronic diseases, low vision or malnutrition and dehydration	Monitoring system (Lifestyle monitor, Navigation assistant, Personal assistant) HAPPY AGEING system will integrate sensors and technologies in a whole smart system, resulting in increased independence during old age	Not yet available
Heart Cycle (several partners from 8 different countries)	Patients with heart failure and coronary artery	Personal health service focus	Heart failure and coronary artery disease	Monitoring patients, collected data as base for personalized therapies and lifestyle recommendations, sensors, decision support system, patient platform, professional platform System enables tailored treatment for heartfailure based on collected patient data	Health maintenance concept for patients with heart failure is superior to crisis prediction; Closing the patient loop empowers patients to adjust important drugs themselves
myhealthlocker™ (part of the eMPOWERMENT programme), UK	Adult mental health service users and child and adolescent mental health service users at SLaM, intention to open the use of the application to a wider population.	Personal Health System with a GP focus	Long-term conditions, recovery from illnesses	User owned electronic personal health record (PHR) as part of a connected health information ecosystem between service users, health providers and researchers, a range of self-management tools health journaling facility, appointment reminders, health and social care information, and downloadable tools and resources, Microsoft® HealthVault®, a privacy- and security-enhanced online service System results in more engaged patients	Patients' feedback suggest positive influence on patients' health experience and patients being more engaged with their care

GER 2.0, Geneva	Hospitalized Elderly patients in great Geneva area	Hospital focus	No special condition	Serious gaming application and evaluation tools used by patients and care providers to evaluate and promote cognitive competences	Not yet available
CHRONIUS	(1)People suffering from chronic diseases needing continuous medical treatment (2)chronic disease specialists	Institutonal focus/Hospital focus	Chronic diseases	Open platform for adaptation of different needs, monitoring patients (wearable solution to monitor vital, environmental and social context parameters), ontology based literature search engine for clinicians Enables continuous refinement of therapies and improves patient self-confidence	<u>Innovation on software</u>: **(1)** guidelines and standards **(2)** develop COPD an KD ontologies <u>Innovation on data analysis</u>: **(1)** sophisticate monitoring tools/new parameters <u>Final users' benefits</u>: **(1)** user-friendly interfaces **(2)** implement an adaptive customized platform **(3)** support tools
Medgate, Switzerland	2.6 million insured people	Personal health service	Acute and general health condition as well as chronic conditions	Consulting patients with acute and general health queries vis telephone, internet, videoconference, comprehensive telebiometric care programmes for chronically ill people	**(1)**win opinion leaders and gatekeepers **(2)** do not underestimate competition and opposition **(3)** build a personal network
Uppsala County EHR	All users of the public health service in Uppsala County, Sweden	Electronic Health Record connecting primary and secondary care across the county		Electronic Health Record, including various modules according to specialism and function	**(1**) Involving all healthcare professionals and administrative staff to develop solution that works in all environments **(2)** Extensive, dedicated training with users **(3)** Preparing users for change smoothes the process
TreC	All users of public health service in the Province of Trento	Patient focused		Personal Health Record, platform of online services that supports citizens in the management of their healthcare including diary functions, access to records and highlighting / note function for patients.	**(1)** Living Lab Approach for design and testing **(2)** Better organisation health documents and tracking of health status **(3)** Patient empowerment through increased knowledge / involvement in care process
Estonian National Health Information System (ENHIS).	All Estonian citizens and residents	Patient focused and healthcare institution focused		Electronic Health Record, Digital Registration, Digital Imaging and Digital Prescription. Enables information exchange: prescriptions, health records, e-consultation, virtual health check, appointment booking	**(1)** Simple to use- all services available via one log-in. Also coupled with other non-health services such as voting, tax returns etc. **(2)** Interactive: patients feel supported outside of healthcare organisation setting

FIKS	All citizens and health professionals in Northern Norway region	Hospital focused		Clinical systems for information sharing and interaction between the five trusts in the region of Northern Norway: Electronic Patient Record (EHR), Laboratory System (LAB), Electronic requisitioning from doctor's surgeries for laboratory services (ERL), Radiology Information System (RIS), Picture Archiving Communication System (PACS), Pathology Information System (Patologi)	**(1)** Standardised procedures **(2)** Long term strategic goal and planning **(3)** Culture change
interRAI	Elderly patients with chronic conditions	Both primary and hospital care	Variety of chronic diseases, incl. mental health issues	A set of standardised tools for the assessment of the severity of chronic conditions, a number of quality criteria, all available in software for use in PC, handheld applications or the web Enables care delivery based on current clinical evidence	Share the right kind of data that is most meaningful to the clinician, ensure institutional backing for the introduction of the system

Annex II: Further examples of relevant projects[62]

Name of the eHealth project	Target users	Care setting or focus	Target condition	Role of eHealth application and expected outcomes
Diabetiva ®- programme in four federal states of Germany	High-risk diabetes 2 patients	Personal health service focus	Diabetes mellitus Type II	Transmission of blood sugar values to the Personal Healthcare telemedicine Service (PHTS) via Internet, documentation in electronic patient files available to treating physician resulting in optimal management of blood sugar level and decreased complications
Tele-pulmonary rehabilitation (tele-PR) Scotland	COPD-patients	Patient focus	COPD	Tele-rehabilitation through digital video conferencing, self-management resulting in improved quality of life and greater independence
Patient briefcase Denmark, Norway, UK	Chronic COPD patients	Patient and GP focus	COPD	Set of medico technical equipment remotely controlled and read by HCP, built-in video conferencing equipment, encouraging the patient to take care of his own disease
Palante across Europe	Patients with adjoined diseases		Diabetes, chronic heart failure, severe arthritis, respiratory diseases	Patients gain secure electronic access to their health information in different eHealth services across Europe leading to patient empowerment
SUSTAINS	Different patient groups in the participating regions	Patient focus	Chronic but also acute diseases, depending on the patient	Services based on online access to EHR and a number of EHR related services such as print out of lab data, filling out of administrative (health consultation) forms, integration of data derived from home monitoring devices
Friuli-Venezia-Giulia Italy	Citizens in need of (home) care	Home care focus and personal health services	Heart failure, COPD, diabetes	Telemonitoring devices, call centre connected with integrated care platform, sharing of clinical data and monitoring clinical conditions via care platform, platform for involved volunteer and citizen associations Service is designed to reduce social exclusion and improve the situation for informal carers
NHS24 Scotland	Elderly patients living on their own	Personal health services, HCP and SCP focus		Set of Telemonitoring tools, integrated record linking out of hours and emergency care , HCP and SCP communicating via videoconferencing and shared monitors, collected data is used to improve care planning, leading to improved overall care and reduced response times
Aragon Spain	Chronic patients	Personal health services, HCP and SCP focus		Telemonitoring platform linked to a call centre, tools for management and coordination of social and healthcare actions, IT infrastructure for collaborating professionals, videoconference systems, "assistance centres" for SCPs
Region of South Denmark	Patients suffering from chronic conditions	Patient and GP focus	Heart failure, to be expanded to COPD, diabetes, cancer rehabilitation	Integrated care internet portal, integrated care record system, telemonitoring, decision-support tools for GPs Complete dataset leading to improved care delivery

[62] For further information please see section 4 in this document.

Kraljevo Serbia	Older cititzen (>65 years of age)	All primary and secondary care settings		eGovernment, ICT solutions for health care(1)Improvement of social and healthcare (2) improving health and quality of life
Northwest Croatia	All citizens	Focus on primary care, hospital care and social care after discharge from hospital		Healthcare Networking Information System, a modular, secure and open communication platform; advanced IT nursing system, use of "cloud" technology Expected to improve quality of healthcare delivery processes
CommonWell Andalucia, Spain	People in need of emergency care	Patient focus on all patients aged 65+ or patients with frailities	Emergency care	Telecare integration allows routing of emergency calls between different departments, leading to more targeted and faster responses
CommonWell Bielefeld, Germany	Care clients	Institutional focus (hospital and social care)	Hospital discharge	Managed hospital discharge to social care enables seamless transition and better quality of life of patients in need of home support
CommonWell, Milton Keyes, England	COPD patients	Patient focus	COPD	Integration of social and healthcare record, combined with a telemonitoring and social alarm system at the patients' home. Integration frees up time to serve more citizens in need
CommonWell Veldhoven, Netherlands	Heart failure patients	Patient focus	Heart failure	Medical and social care are combined using telemonitoring techniques for heart failure and a social alarm. A team of case managers monitors patients closely and can be contacted for assistance with social and medical questions. This means patients have one point of access to social and medical care.
INDEPENDENT Dublin Ireland	People with dementia and their carers	Patient and HCP focus	Dementia	Collaboration of two partners through a case management tool incl. Reporting tool to support the reassessment process; leading to more appropriate care delivery to people with dementia in line with their needs
INDEPENDENT Geldrop, Netherlands	Older COPD patients	HCP and SCP focus	COPD	EHR-system, telemonitoring, videoconference system, digital coordination infrastructure, wearable monitoring devices, leading to a better, more timely monitoring of COPD and improved quality of life
INDEPENDENT Hull, England	Older people living in sheltered or private homes	Patient, HCP and SCP focus	Frailty in old age and social care	In sheltered homes: "MyClinic" multi user device, a touch-screen computer with several monitoring tools, data is collected in a MUD available to SCP and HCP In private homes: telemonitoring service with a social function
INDEPENDENT Milton Keyes, England	People in need of care, informal carers	Informal carer focus	Frailty in old age and social care	Carers support network allowing to track, monitor and request support, video conversations; the solution allows the better management of caring responsibilities
INDEPENDENT Malaga, Spain	Informal carers, people in need of care	Informal carers, SCP and HCP focus	Frailty in old age and social care	Digital support infrastructure enables sharing of client data and joint call handling
INDEPENDENT Trikala, Greece	Informal carers, people in need of care	Informal carer focus	Mild cognitive impairment or mild depression	Digital infrastructure supporting cooperation, joint access to electronic care records, psychological counselling

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Annex IV: Case study collection template

See separate document in PDF.

Annex V: Examples of case studies

This Annex presents three case studies based on RENEWING HEALTH pilots and two case studies from the ProeHealth study.

See separate document in PDF.