



## C3-Cloud

“A Federated Collaborative Care Cure Cloud Architecture for Addressing the Needs of Multi-morbidity and Managing Poly-pharmacy”

**PRIORITY Objective H2020-PHC-25-2015 - Advanced ICT systems and services for integrated care**

### D4.2 New Organisational Models for Improved Delivery of Integrated Care

*Work Package:* WP4

*Due Date:* 30 April 2017

*Actual Submission Date:* 29 April 2017

*Project Dates:* Project Start Date: 01 May 2016  
Project End Date: 30 April 2020  
Project Duration: 48 months

*Deliverable Leader:* OSAKIDETZA

Project funded by the European Commission within the Horizon 2020 Programme (2014-2020)		
Dissemination Level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	
EU-RES	Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)	
EU-CON	Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)	
EU-SEC	Classified Information: SECRET UE (Commission Decision 2005/444/EC)	

**Document History:**

<b>Version</b>	<b>Date</b>	<b>Changes</b>	<b>From</b>	<b>Review</b>
V0.1	08/03/2017	Initial document	OSAKIDETZA, KG	WP4
V0.2	10/03/2017	Extended version with inputs from Osaqidetza in section 5	OSAKIDETZA, KG	OSAKIDETZA, KG
V0.3	21/03/2017	Extended version in sections 2, 3 and 4	OSAKIDETZA, KG	OSAKIDETZA, KG
V0.4	27/03/2017	Extended version in sections 2, 3 and 4 and with inputs from RJH and SWFT in section 5	RJH, SWFT, OSAKIDETZA, KG	RJH, SWFT, OSAKIDETZA, KG
V0.5	31/03/2017	Extended version with inputs from OSAKIDETZA on section 6	OSAKIDETZA, KG	OSAKIDETZA, KG
V0.6	12/04/2017	Extended version with sections 2, 3 and 4 completed, with the review of RJH and SWFT on section 5 and with the inputs from RJH, SWFT and OSAKIDETZA on section 6	RJH, SWFT, OSAKIDETZA, KG OSAKIDETZA	RJH, SWFT, OSAKIDETZA, KG
V0.7	24/04/2017	Inputs and comments from RJH, SWFT, OSAKIDETZA and SRDC.	RJH, SWFT, OSAKIDETZA, KG SRDC	OSAKIDETZA, KG
V0.8	26/04/2017	Inputs from OSAKIDETZA and Kronikgune	OSAKIDETZA and KG	OSAKIDETZA, KG
V0.9	28/04/2017	Updates suggested by internal review (SRDC and WARWICK).	SRDC, WARWICK	OSAKIDETZA, KG
V1.0	29/04/2017	Final document reviewed and ready for submission	WARWICK	

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## EXECUTIVE SUMMARY

The overall aim of this deliverable is to identify and propose the organisational model changes, which enable the delivery of patient-centred care supporting interactions of multi-disciplinary health and social care professionals, patients and informal carers, as well as patient empowerment and active involvement. They have to be easily adaptive to varying contexts, according to the three pilot sites. The resulting new organisational models will be practiced in proof-of-concept prototypes in the three pilot regions. The work has been performed at the project's three pilot sites in Sweden, UK and Spain, by means of the collaborations of local multidisciplinary team members and patients. The deliverable has had the broader contributions from all beneficiaries of the C3-CLOUD consortium.

Following a current and associated literature review, two innovative tools have been developed in order to describe the current organizational models in the pilot sites. The tools are two questionnaires: the "System Factor" and the "Care Coordination Profiles" Questionnaires. The latter describes the care coordination components, including actors, activities performed and communication channels. The former analyses the system requirements, focusing on promoting and inhibiting factors for system integration and care coordination.

The description of the organizational models in the three pilot sites has enabled their analyses, highlighting the singularities of each site. This has allowed identifying the Proof of concept prototypes requirements for testing the C3-CLOUD High Level Components (HLC). The proof of concept prototypes include: (i) the description of the new organizational model in each pilot site in the new C3-CLOUD scenario, (ii) the key factors at system level and the main internal coordination elements and (iii) the relation between actors, activities and C3-CLOUD HLC functionalities.

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# 1. INTRODUCTION

## 1.1. Purpose

The purpose of this deliverable is to identify the main organizational characteristics required for C3-CLOUD High Level Components (HLC) to be able to be displayed and work consistently across different organizational settings and population groups, accordingly to the C3-CLOUD care delivery model. The aim is to define organizational prototypes in each of the three C3-CLOUD Pilot sites (RJH, SWFT and Basque Country) in which the Project High Level Components can be tested.

In Section 2, we discuss the methodology followed in the deliverable in order to describe the organizational models of the three pilot sites, propose changes required to ensure the adequate operation of C3-CLOUD High Level Components and define the Proof of Concept prototypes. Key elements in successful care integration and coordination have been identified and a draft framework for integrated care organizational models analysis has been produced

In Section 3, we present the state of the art of integrated care organization models. This includes the description and analyses of integrated care models, by means of literature review and analyses of the existing organisational models for integrated care in Europe (in particular for Germany, Netherlands, Sweden, England and Spain) and the rest of the World (USA).

In Section 4, we define a descriptive and analytical framework to assess Integrated Care for Organizational Models in the Pilot Sites. In concrete, two tools tackling both System Context level and Service and Care Coordination dimensions (“System Factor” and “Care Coordination Profiles” questionnaires, respectively), have been developed in order to identify those features that have to be implemented to provide coordinated care using individual care plans.

In Section 5, the organizational models in the three Pilot sites (RJH, SWFT and Basque Country) are described and analysed. For each pilot site, we describe the current organizational model at service level, scoring the main promoting and inhibiting factors and the main care coordination elements.

Finally, in Section 6, we describe the C3-CLOUD organisational models that will be practiced in proof-of-concept prototypes in the three pilot regions (RJH, SWFT and Basque Country).

## 1.2. Context

Chronic diseases are responsible for over half of the burden of disease in the world and over three quarters in most industrialized countries. Non-communicable diseases (NCD) have potentially serious socioeconomic consequences, through increasing individual and household impoverishment and hindering social and economic development. NCDs create a significant burden on health systems and a growing economic burden on country economies<sup>1</sup>. People who have chronic diseases need a long-term response coordinated by different health professionals, especially if multiple disorders occur in parallel. Evidence based care for many chronic illnesses requires increasingly complicated drug regimens, on-going support of self-management, and close monitoring.<sup>2</sup> Between 2000 and 2002, the typical Medicare beneficiary saw a median of two primary care physicians and five specialists each year, in addition to accessing diagnostic, pharmacy, and other services. Patients with several chronic conditions may visit up to 16 physicians in a year.<sup>3</sup>

Healthcare providers are not usually responsible for all the service delivery inputs that constitute a care package. Nor do they have any direct control over the lifestyles of individuals or the activities of other organizations that precipitate healthcare demand. What counts from the user perspective is the total quality of life package in which, for instance, financial income, home comfort, safety and healthcare services combine to form a coherent whole.<sup>4</sup> Patient care has changed from individual

consultation to differentiated multi-professional teamwork involving many health care providers. A high degree of differentiation requires a high degree of integration to shift away from fragmentation.

To address the needs of patients with chronic diseases, many countries have experimented with integrated care models in an attempt to overcome the known shortcomings of treatment by different providers in an episodic manner.<sup>5</sup> The long-term nature of many non-communicable diseases demands a comprehensive health system response that brings together a trained workforce with appropriate skills, affordable technologies, reliable supplies of medicines, referral systems and empowerment of people for self-care, all, over a sustained period of time.<sup>6</sup>

Wagner and colleagues defined the “Model for Effective Chronic Illness Care”<sup>7</sup>. The basic premise of this model is that “effective chronic illness care requires an appropriately organized delivery system linked with complementary community resources available outside the organization” and is sustained by productive interactions between multidisciplinary primary care teams and “activated patients.”<sup>8</sup> Wagner Chronic Care Model identified six essential elements for good chronic care: community resources and policies, health care organization, self-management support, delivery system design, decision support, and clinical information systems. The World Health Organization has promulgated the chronic care model and it combines many of the components of good chronic care into a single model. It emphasizes community involvement, teamwork, and other attributes. It has served as a reference model for many experiences to care for chronic patients around the world.

### 1.3. Approach and Scope

C3-CLOUD project, based on an ICT infrastructure, will enable the delivery of multimorbid patient (multiple chronic conditions)-centred and coordinated care, supporting interactions of a multidisciplinary team (MDT) including patients and caregivers.

In this Deliverable, a review of the existing organisational models for integrated care in Europe and the rest of the World has been performed.

An organizational model defines an organization through its framework, including communications, duties and resource allocations. It defines how activities, such as task allocation, coordination and supervision, are directed toward the achievement of organizational aims<sup>910</sup>.

An analysis of the organisational models in the three C3-CLOUD regions has been made and changes, which enable the delivery of patient-centred care, are proposed. Supporting interactions of multidisciplinary health and social care professionals, patients and informal carers, as well as patient empowerment and active involvement have been assessed. Proof-of-concept prototypes to be practiced in the three pilot regions have been proposed.

The changes proposed in the Proof of Concept Prototypes for each Pilot Site will feed Tasks 4.3, and WP8, which will describe in detail what actions are going to be done to implement the suggested changes to deploy the Pilot phase of the Project.

### 1.4. Abbreviations and Acronyms

Abbreviation/ acronym	Definition
AC	Autonomous Community
ACO	Accountable Care Organizations

Abbreviation/ acronym	Definition
AHQR	Agency for Healthcare Research and Quality
CCS	Care Coordination Service
CDA	Certified Design Associate
CERT	Community Emergency Response Team
CHD	Coronary Heart Disease
COPD	Chronic Obstructive Pulmonary Disease
CVD	Cardiovascular Disease
DAM	Domain Analysis Model
D2A	Discharge to Assess
ECR	Electronic Clinical Record
EHR	Electronic Health Record
EPR	Electronic Patient Record
F2F	Face to Face
FHIR	Fast Healthcare Interoperability Resources
IHE	Integrating the Healthcare Enterprise
IT	Information Technology
HL7	Health Level Seven
HLC	High Level Components
HMO	Health Maintenance Organizations
ICP	Integrated Care Plan
LCC	Longitudinal Care Coordination
LCP	Longitudinal Care Planning
LTC	Long term conditions
MSO	Management Services Organizations
MDT	Multidisciplinary team
ONC	Office of National Coordinator
PAR	Pilot Application Requirements
PC	Primary Care
PCC	Patient Care Coordination
PCP	Primary Care Physicians
PHO	Physician-Hospital Organizations
POC	Point of Care

Abbreviation/ acronym	Definition
PPOC	Patient Plan Of Care
QALY	Quality-adjusted Life Year
QIPP	Quality, Innovation, Productivity and Prevention
RJH	Region Jämtland Härjedalen
SFM	Service Functional Model
SNS	Sistema Nacional Salud
SWFT	South Warwickshire NHS Foundation Trust
UML	Unified Modelling Language
VA	The Veterans Health Administration

## 2. METHODOLOGY

The methodology aims to explore and communicate propositions about the design of the Organizations and the context in which the High Level Components will be used. It is a process that involves pilot site professionals in the data collection, interpretation, creation, testing, and refining of the proposals. Working Teams in the Pilot Sites have included healthcare professionals and managers, Information Technology (IT) professionals and other stakeholders. They have contributed with ideas about the analysis approach and tools, the current organizational models in the three Pilot Sites and the proposed prototypes.

### 2.1. Elicitation of Information

A literature review was performed. Key elements in successful care integration and coordination have been elicited and a draft framework for integrated care organizational models analysis has been produced.

### 2.2. Description of Current Organisational Models

Current Pilot site organizational model descriptions include the following information:

1. General information on Pilot sites healthcare system's characteristics: key researchers in Pilot sites have provided, completed, reviewed and updated the health care description.
2. "Promoting and inhibiting factors at the system level" section. A semi-structured Likert type questionnaire has been produced ("System Factor Questionnaire") based on the literature findings. To complete it, each Pilot site research team organized a small working group composed at least by one GP, one hospital specialist, one nurse from Primary Care (PC) and another hospital nurse, a manager and a patient. They were asked to agree on the score for each of the items in the questionnaire. There was one completed by consensus questionnaire for each Pilot site. Results are displayed in a graphical way (spider diagrams).
3. Care Coordination in each Pilot site.
  - a. A Draft Template was produced, to allow identifying actors involved in multimorbid patient care, the activities they perform and the connection with other actor, including the communication channels used. The template was based on Pilot Applications Requirements (PAR) from deliverable D8.1, use cases from D3.2, Agency for Healthcare Research and Quality (AHRQ)<sup>11</sup> and Fast Healthcare Interoperability Resources (FHIR)<sup>12</sup> work. It was discussed with Basque Expert Clinicians and validated with Swedish and UK-based clinicians ("Care Coordination Profiles Questionnaire").
  - b. Key Informers in each Pilot Site involving GPs, Nurses, Specialists, Social workers and Patients among others, completed the "Care Coordination Profiles Questionnaire".
  - c. The data collected have been summarized and analysed using UML class and use cases diagrams and statistical descriptive analysis.
  - d. UML and BPMN modeling tool (Modelio Open Source)<sup>13</sup> have been used, so that a standard language was determined. The source of the information has been the Excel questionnaire fulfilled by each Pilot Site. The objective of the diagrams realized with

Modelio is to show the relationships between actors, and the activities they perform. Structural Modeling and Behavioral Modeling have been used to depict the diagrams.

- Class Diagrams that show the actors (Classes) involved and the activities they carry out, distributed by settings (Abstract Classes). The relationship between them is shown through the link with the Abstract Class “setting”. The four Abstract Classes – “settings” are linked, showing the way that the actors from different settings can work together.
  - Some use cases showing for each activity, the actors involved in each of them and the tasks related to the activity. This is shown by a number, assigned to each task, in an information box next to each actor. The link between each actor and the (main) activity does not necessarily mean that the actors perform the activity together, but just that they all take part in it.
- e. A quantitative analysis has also been carried out:
- Analysing interactions between actors. Actors were selected one by one and checked whom they interacted with. Next, interactions were examined in a “Personal communication matrix”, distinguishing unidirectional and bidirectional interactions. Activities and tasks carried out by the actors were also analysed, collecting this information in “Activities and tasks performed by each Actor” matrix.
  - Matrix showing actors communication and bar diagrams with information on communication channels by actor and by activity were built. The use of communication channels per actor was described in pie diagrams. A summary of the total number of interactions performed per channel was depicted as bar diagrams.
4. Proof of Concept Prototypes for each Pilot Site have been defined. They include:
- a. A narrative description of the new organizational model in each pilot site, in the new C3-CLOUD scenario, including the main System Promoting and Inhibitor Factors for Integrated Care;
  - b. The main Internal coordination elements: interpersonal communication matrix and activities performed by each actor in the C3-CLOUD scenario;
  - c. The relation between actors, activities and C3-CLOUD HLC functionalities, drawn as Mind Maps<sup>14</sup>.

## 2.3. Defining New Organisational models

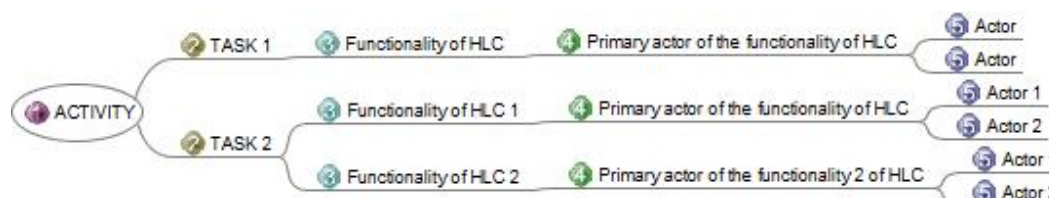
Each Pilot Site reviewed the care coordination and system factors. In light of the C3-CLOUD scenario, they proposed the changes required and drew the characteristics of the Prototypes (Description, coordination elements and Mind Maps). Templates were provided with the information with the instructions on how to proceed.

- The description of the C3-CLOUD care coordination describing settings, actors, activities and interactions.
- The “System promoting and inhibitor factors for integrated care” in a C3-CLOUD scenario.
- “Personal intercommunication” matrix figure: Is any link missing? Is the directionality correct? Are there new bidirectional communication links?
- “Activities and tasks performed by each Actor” matrix: Is any activity and/or task missing?

- “Activities-HLC functionalities-actors” Mind Maps: Three Mind Maps (referred to the activities “Involving other stakeholders”; “Patient empowerment” and “Care plan drafting”) linking by means of associating activities, tasks and actors of the care team member, to the specific functionalities of C3-CLOUD High Level Components (as summarized in deliverable D3.2) are drafted: Any actor missing?.

A Mind Map is a diagram used to visually organize, structure and classify elements hierarchically showing the relationships between them. In C3-CLOUD we will use the Mind Maps to describe the organizational models supporting the HLC implementation. The Mind Maps depict the information collected in the questionnaire related to the current organizational model of each site, as it is shown in Figure 1. In order to link the elements of the organizational model and the C3-CLOUD components, actors, activities and tasks have been associated to the specific functionalities and primary actors of HLC, as summarized in “D3.2 Requirements Specification of the C3-Cloud Architecture”. They are presented in the Mind Map diagram as nodes. Those primary actors are defined in D3.2 section 3 description of use cases. Activities (node 1), tasks (node 2) and actors (node 5) have been associated to the specific functionalities of HLC (node 3). Each functionality is linked to a primary actor (node 4) who can be a system user and/or a human user actor (called “care team member”). Care team members or actors (node 5) have been associated to the specific functionalities of HLC (node 3), based on the current organization and on the new C3-CLOUD communication and activities requirements described in the above sections.

The diagrams depict the composition of the care teams (node 5) in three activities that will be drastically influenced by the C3-CLOUD project: Involving other stakeholders, Patient empowerment and Care plan drafting.



**Figure 1.** Basic elements included in the Mind Maps used to describe the organizational models supporting the High Level Components implementation

Work groups were provided with three draft Mind Maps. They reviewed and completed them according to the C3-CLOUD Scenario, making special emphasis on the composition of the care teams (node 5).

The patient-centred design of the project implies a strong involvement of the patient in many of the activities related to the Development and the Delivery of the Personalized Care Plans, participating actively in the corresponding process as a key contributor, but not as the real performer. According to DoA, High Level Components related to Personalized Care Plans will be used and managed by the multidisciplinary care team (MDT) members (although the patients can be active agents while establishing their health concerns or goals, the professionals are the only ones to perform on the platform), and Patient Empowerment Platform is restricted in their use to patients and caregivers.



Taking into account the collaborative and coordinated approach of C3-CLOUD project, the level of involvement of the participation of the different stakeholders in the activities and tasks shows a broad spectrum, ranging from sharing information to being the one to have the responsibility on decision-making.

### 3. ORGANIZATIONAL MODELS

#### 3.1. Integrated care

The fragmented organization of healthcare delivery is inappropriate for multimorbid patients, who account for the highest share of preventable hospitalisations and are responsible for most healthcare expenditure.<sup>15</sup> An enormously high degree of specialization (differentiation) but low levels of integration characterize health care systems. Since differentiation is a source of their great strength, it is the level of integration that shall have to be increased to improve care delivery. Specific innovations have been tested in Europe and in the USA towards increased coordination of care. However, consideration must also be given on how the overall organization of health services could facilitate or impede improvement in coordinating care.

Service integration is a variety of managerial and operational changes to health systems that bring together inputs, delivery, management, and organizations of particular service functions, in order to provide clients with a continuum of preventative and curative services, according to their needs over time and across different levels of the health system.<sup>16</sup> Several terms have been used in different health systems across the world to denote integrated care. These include, amongst others, managed care; shared care; continuity of care; case management, patient-centred care; transitional care, and integrated delivery systems.<sup>17</sup> The UK government uses the definition of integration as coordinated and personalised care, putting at its centre the individual around whom services should be organised, to be adopted and delivered by all localities through health, social care and other services sharing new or different ways of joint working.<sup>18</sup>

Integration may be pursued at macro, meso and micro levels. The *macro level* is one at which providers seek to deliver integrated care to the populations that they serve. It covers three elements: the health plan (or commissioner to use UK terminology); the physicians who provide outpatient care and have admitting rights; and the hospitals that deliver inpatient care. The *meso level* is one at which providers seek to deliver integrated care for a particular care group or populations with the same disease or conditions, through the redesign of care pathways and other approaches, such as disease management programmes, chains of care and managed clinical networks. The *micro level* is one at which providers seek to deliver integrated care for individual service users and their carers through care co-ordination, care planning, use of technology and other approaches.<sup>19</sup>

Further distinction can be made of horizontal and vertical integration. *Horizontal integration* occurs when two or more organisations or services delivering care at a similar level come together. Examples include mergers of acute hospitals as well as the formation of organisations such as care trusts that bring together health and social care. Hospitals' rationales for horizontal combinations aim for a mixture of efficiency goals (prepare for capitation, reduce excess capacity, strengthen financial position) and access goals (expand the delivery network).<sup>20</sup> This is also applied to integration between health care and social services.<sup>21</sup>

*Vertical integration* occurs when two or more organisations or services delivering care at different levels come together. It is the process of extending the scope of an organisation's activities by moving up or down the 'value chain'. Examples include mergers of acute hospitals and community health services, and tertiary care providers working with secondary care providers. There are three routes towards integrated services:

- Hospitals expanding outwards and downwards;
- Primary care expanding outwards and upwards;
- Through the formation of new organisations of healthcare delivery.

Leutz proposed an ‘integration framework’ that described three levels of integration<sup>22</sup>:

- Linkage: operates through the separate structures of existing health and social services systems, with organizations retaining their own service responsibilities, funding and eligibility criteria, and operational rules.
- Coordination: as linkage but involves additional explicit structures and processes, such as routinely shared information, discharge planning and case managers, to coordinate care across the various sectors.
- Full integration: the integrated organization/system assumes responsibility for all services, resources and funding, which may be subsumed in one managed structure or through contractual agreements between different organizations.

Real integrated organizations manifest a unity of control and direction that allows them to focus all of the energies of their subunits on the same goals and strategies. There is a single mission statement, unified ownership, a single hierarchy of authority, and a single bottom line. Organizational integration in itself may be insufficient to overcome fragmentation of care. Evidence indicates that organisational integration may occur without corresponding clinical and service integration. Real integrated systems suffer from two weaknesses: incentive attenuation and influence costs. The structures that were put in place to integrate different providers often failed to fundamentally alter the manner in which physicians practiced medicine and collaborated with other health care professionals.<sup>23</sup> Influence costs are defined as the effects of internal struggles for control over resources by the various incumbent constituencies, both managers and non-managerial workers.

The advantages of virtual integration in networks, through contractual relations and market bargaining, lie in the potential for autonomous adaptation to changing environmental circumstances.<sup>24</sup> However, health services tend to be complex, exhibit marked information asymmetries between commissioners and providers, involve the exercise of professional discretion, require lengthy training to deliver, frequently rest on long-term relationships between patients and professionals, and, for some services, are subject to problems of local monopoly. They are difficult to define in clear contractual terms.<sup>25</sup>

At every interface, firms confront a trade-off between the advantages of coordinated adaptation through vertical integration and the advantages of autonomous adaptation through contractual networks.<sup>26</sup> To be an appropriate strategy, the advantages of reduced uncertainty and improved economies of scope and scale must be greater than the increased costs of co-ordination and the loss of flexibility delivered by outsourcing parts of the process.<sup>27</sup>

### **3.2. Care Coordination**

Coordination is the orderly arrangement of individual and group efforts to provide unity of action in the pursuit of a common goal. Care coordination is a means to help achieve care goals: it aims to meet patient needs and preferences and to facilitate delivery of high-quality, high-value care.<sup>28</sup> The Institute of Medicine defined Care Coordination as “To establish and support a continuous healing relationship, enabled by an integrated clinical environment and characterized by the proactive delivery of evidence-based care and follow-up. Clinical integration is further defined as the extent to which patient care services are coordinated across people, functions, activities and sites over time to maximize the value of services delivered to patients.

The 2007 AHRQ Evidence Report on care coordination identified more than 40 definitions of coordination pertaining to a diverse set of patient populations, health care scenarios, and organizational situations.<sup>29</sup> The care coordination models have to take into account:

- the health professionals knowledge and skills;
- the role definition;
- the structure of incentives;
- the resources availability;
- the communication and coordination channels;
- the existent regulations;
- raising the profile of general practitioners and nurses;
- designing care explicitly around the needs of the patient;
- the political will to carry forward these chronic care measures.<sup>30</sup>

Coordination encompasses a set of practitioner behaviours and information systems intended to bring together health services, patient needs, and streams of information to facilitate the delivery of care in accordance with the six aims set forth in the Quality Chasm report. Such coordination can be facilitated by procedures for engaging community resources, including social and public health services.”<sup>31</sup>

Successful interventions aim to improve patients' self-management, increase the effectiveness of practice teams and their interactions with patients; and have more accessible and useful clinical information are needed.<sup>32</sup> The experience of service users is influenced more by the nature of team working and the adoption of shared guidelines and policies.<sup>33</sup> Optimal collaboration and coordination between professionals in the delivery of integrated care have become essential requirements for the provision of high-quality care. Integrated clinical pathways try to ensure that the patient journey in the healthcare system achieves having the right people, doing the right things, in the right order, at the right time, in the right place, with the right outcome. Care coordination and case management programs target patients with a wide array of health conditions and risks, including multiple chronic conditions, and establish care plans that are customized to the needs of individual patients. They are at risk for large medical expenditures. Members may be identified by a health care event such as a hospitalization, series of emergency room visits, or large medical claim. They provide assistance that is tailored to the needs of individual members, including customized care planning.<sup>34</sup>

There are a number of models of how to deliver good care for chronic conditions. Care coordination depends on clinical and service integration. The most common components of integrated care programmes are self-management support and patient education, often combined with structured clinical follow-up and case management; a multidisciplinary patient care team; multidisciplinary clinical pathways and feedback, reminders, and education for professionals. The broad principle is to assign each patient a case manager or small team to assess needs, develop a care plan, organise the required care, monitor the quality of care, and maintain contact with the patient and his or her family with arrangements for follow-up care, and telephone based support and assistance.<sup>35</sup>

Disease Management (DM) has been a popular approach in the USA. It has been defined as a system of coordinated health care interventions and communications for populations with conditions in which patient self-care efforts are significant.<sup>36</sup> Traditional DM programs focus on a defined population of members with a specific health condition such as diabetes or asthma, often stratified by disease severity and clinical risk. They encourage members to follow a standard set of treatment recommendations and self-care strategies, typically using some combination of mail and telephone contact.<sup>37</sup>

The medical home concept in the USA envisions a medical practice that is based on the same concepts put forth 40 years ago by primary care advocates: first-contact care, continuity of care over time, comprehensiveness, and responsibility to coordinate care throughout the health system.<sup>38</sup> The multidisciplinary teams include condition-specific expertise, specialist nurses and/or pharmacists and self-management as an adjunct to broader interventions. The effort needed to organize a MDT should not be underestimated.

There is a range of approaches for integration at the micro level, which seek to improve care coordination for individual patients and carers. These include care planning, patient activation and coaches, virtual wards, personal budgets, IT, telehealth and telecare.<sup>39</sup> Coordination between Primary Care and Specialty Care can include Electronic Referrals without the need for a patient to see the specialist. Referral agreements outline which clinical conditions are best managed within primary care and which conditions are best referred. They specify which studies should be performed before specialty referral, and obligate the specialist to see the patient promptly, answer the questions posed by primary care, and report back to primary care in a timely fashion. Other interventions include discharge management with post-discharge support. A comprehensive discharge plan includes medications, lifestyle changes, follow-up care, intensive patient education geared to the patient's language and literacy level, and timely information flow to and from primary care. Advanced-practice nurses make in-hospital visits, post-discharge home visits, and phone consultations.<sup>40</sup>

Care coordination depends on clinical and service integration. Organisational integration alone is unlikely to deliver better outcomes and effort must focus on clinical and service integration. The most successful interventions are complex and have many components. Coordinated action is characterized by task fulfilment where actions are synchronized to reach augmentative effects, where tasks are allocated in order to profit optimally from the specialized knowledge of actors.<sup>41</sup> They require continuity of care over time, comprehensiveness, and responsibility to coordinate care throughout the health system, including the transitions between different actors and healthcare levels.

The aim is to ensure that the patient journey in the healthcare system achieves having the right people, doing the right things, in the right order, at the right time, in the right place, with the right outcome. Care Plans are a key tool to achieve it.

There are several efforts to define a structured format care plan, plan of care and treatment plans that can be supported by IT technology. Several different groups, apart from AHRQ, are coordinating activities to address the insufficient standards for transitions of care and care plans including:

- HL7 Patient Care Workgroup:<sup>42</sup> HL7 Care Plan Project initiated in 2011 aims to develop Domain Analysis Model (DAM) for the Care Plan. The draft Care Plan DAM Specification has been published as an Informative Ballot on September 2013. In addition to this, a number of storyboards have been prepared for describing the relevant range of situations sufficient to identify the needs for care plan interoperability. Chronic Care Management is one of the storyboards being addressed. Care Coordination Service (CCS) project<sup>43</sup> aims to provide SOA capabilities to support coordination of patient care across the continuum including providing support to multidisciplinary care team members to communicate changes resulting from care plan interventions. An initial CCS Service Functional Model (SFM) is provided.
- IHE Patient Care Coordination (PCC) Technical Committee:<sup>44</sup> The Patient Plan of Care profile (PPOC) provides a HL7 Certified Design Associate (CDA) based content model for defining plan of care based on the data elements from the nursing process currently in common use. Complementing the PPOC profile, the IHE Patient Care Plan Content Profile (PtCP), aims to serve to the longitudinal coordination of care and provides a CDA based content model for being able to represents one or more Plan(s) of Care developed as a centralized Patient Care Plan during the continuum of care for a specific patient. In other

words, the Patient Care Plan will contain multiple plans of care to deal with varying health concerns such as diabetes plan of care, nursing plan of care, social services plan of care, physical therapy plan of care. After the release of HL7 C-CDA R2 Care Plan templates have been announced (see below), these specifications by IHE PCC has become obsolete. The more recent Dynamic Care Planning (DCP) Profile provides the structures and transactions for care planning, sharing Care Plans that meet the needs of many, such as providers, patients and payers. Care Plans can be dynamically updated as the patient interacts with the healthcare system. FHIR® resources and transactions are used by this profile.

- Office of National Coordinator (ONC) Standards & Interoperability (S&I) Longitudinal Care Coordination (LCC) Workgroup:<sup>45</sup> As a part of this effort, the Longitudinal Care Planning (LCP) sub-workgroup has initially focused on identifying the standards needed to support the interoperable, iterative exchange of the care plan between home health agencies and physicians. The group has decided to collaborate with IHE PCC and HL7 Care Plan groups. As a results of the studies of LCC studies, a “Care Plan” section has been added to the “HL7 Consolidated CDA Templates for clinical Notes (US Realm)”,<sup>46</sup> which has been balloted as a “Draft Standard for Trial Use Release 2” on September 2013. As of October 2013,<sup>47</sup> the standard is now in reconciliation phase. As in the IHE PtCP content profile, this Care Plan section aims to multiple interventions proposed by multiple providers and disciplines for multiple conditions.
- An example from Europe for the definition of machine processable nursing plan of care models is the Sweden V-TIM Aktivitets Plan.<sup>48</sup> In parallel with this, in a research study led by Swedish government,<sup>49</sup> modelling of care plans using CONTsys and openEHR is described.
- FHIR (Fast Healthcare Interoperability Resources)<sup>50</sup> Specification is a standard for exchanging healthcare information electronically. FHIR– is a next generation standards framework created by HL7. It is an effort to support automated clinical decision support and other machine-based processing, to support automated clinical decision support and other machine-based processing, ensuring that the data are structured and standardized. In FHIR, a care plan describes the intention of how one or more practitioners intend to deliver care for a particular patient, group or community for a period of time, possibly limited to care for a specific condition or set of conditions. It captures basic details about who is involved and what actions are intended without dealing in discrete data about dependencies and timing relationships.<sup>51</sup> The HL7 Patient Care workgroup, who has defined the most recent release of HL7 Care Plan DAM is actively participating to the activities to finalize CarePlan Resource as a part of FHIR.

### 3.3. Integrated care deployment

Integrated care puts the patient, not the disease, in the centre. Improvement in care coordination requires that different health care entities, with different aims, interests, culture and sometimes working in competition, perform together. This is a complex process and achievement is often underestimated.<sup>52</sup> Moreover, healthcare systems are organizational forms based on decentralized planning and control by relatively autonomous actors. Such multi-actor systems are characterized by the autonomy, independence, dialogue, negotiation and cooperation of actors. An actor is an autonomous and intelligent being that is able to interpret, determine goals, reason and decide. They perform interdependent activities aimed at achieving certain common goals, even if not always explicit and shared. Cooperation can create more compared to what can be achieved when working individually. Successful implementation of chronic care requires not only multi organizational cooperation but also cross-disciplinary collaboration.

Depending whether public or private, the objectives of integration search for a range of efficiency goals (manage global capitation, form large patient and provider pools to diversify risk, reduce

transaction costs to more efficiently negotiate, monitor and enforce agreements), access goals (offer an equal and seamless continuum of care), and quality goals (assume responsibility for health status of local population).<sup>53</sup>

The long-term determinants of organizational integration involve economies of scale operating a common infrastructure, efficient risk bearing, reductions in transaction costs, and the development of capabilities for innovation.<sup>54</sup>

The key challenges for effective integration are:<sup>55,56</sup>

1. Organizational integration (or how the organisation is formally structured) – for example, by mergers and/or structural change with common governance bodies or virtually through contracts between separate organizations.
2. Functional integration – how are non-clinical support and back-office functions integrated?
3. Service integration – at the organizational level, how are the clinical services offered by the organization integrated with each other?
4. Clinical integration – at the clinical team level, is care for patients integrated in a single process both intra and inter-professionally through, for example, integrated care pathways or the use of shared guidelines.

Service integration is a continuum rather than two extremes of integrated/not integrated. Integration may be real or virtual. High and low levels of care coordination can be achieved both within integrated organisations and between different organisations working together in networks.<sup>57</sup> Real integration entails mergers between organisations, by creating formal organisational structures through diversification, takeover or acquisition. Virtual Integration takes the form of alliances, partnerships and networks created by a number of organisations, held together through agreements and/or contracts. In Virtual integration, Providers are not under the same legal or corporate ownership.

Altogether, they have to allow that the current system workload allocation can be displaced, from hospitals to ambulatory and outpatients' centres, from primary care physicians to nurse practitioners, from specialists to general practitioners. Integrated care will not occur if it is perceived that some actors might gain and others lose, on financial issues, workload and effort, clients at the expense of others or perceptions of authority or status. Transaction costs to more efficiently negotiate, monitor and enforce agreements have to be bearable. Decision makers at the centre possess a system view and that incentives of all stakeholders are better aligned.

There are different approaches to integrated care deployment. Action is needed at the macro, meso and micro levels, and multiple strategies should be pursued at all three levels.<sup>58</sup> WHO Europe, for example, has published its European Framework for Action on Integrated Health Services Delivery<sup>59</sup>. The General Assembly of WHO ratified in 2016 a Framework on Integrated People-Centred Services.<sup>60</sup> The Framework sets out five interwoven strategies that need to be implemented for health service delivery to become more integrated and people-centred:

1. Empowering and engaging people and communities;
2. Strengthening governance and accountability;
3. Reorienting the model of care;
4. Coordinating services within and across sectors;
5. Creating an enabling environment.

A recent study analysed the integrated care deployment through 42 semi-structured interviews with key informants in Austria, Denmark, France, Germany, The Netherlands and Spain.<sup>61</sup> They represented the decision-maker, payer, provider and/or patient perspective. Despite differences among

the healthcare systems studied, a shared set of barriers emerged. These included: (i) a continued focus on complications management and a failure to integrate risk minimisation and disease prevention along the spectrum of care; (ii) care fragmentation acting as a barrier to better coordination; (iii) a mismatch between intent, at national level, to enhance coordination and integration, and ability at regional or local level to translate these ambitions into practice; and (iv) a lack of structures suitable to promote proactive engagement with patients in the management of their own condition.

Implementation of integrated care requires bundled strategies. The reform of the Basque health care system in Spain deployed a wide range of tools that were implemented simultaneously. Four broad lines of work were applied<sup>62</sup>:

- Developing a favourable policy environment;
- Stimulating system thinking with new models of care;
- Aligning bottom-up and top-down ‘integrators’;
- Promoting a distributed leadership approach.

Impediments hinder integrated service delivery both in Beveridge and in Bismarckian health care systems. Some originate from the system, e.g. dividing lines between sectors and a lack of transparency and flexibility in the system. Others, from the regional or local situation, e.g. inadequate structure of incentives, competition between care providers, insufficient support from insurers. A third group of barriers arise from a lack of commitment and support, e.g. inter-organisational and inter-professional distrust; and from weak management, e.g. lack of authority and communication skills, poor information and monitoring systems.<sup>63</sup>

Altogether, a broad range of issues has to be taken into account. Funding allocation and reimbursement are key. e-Referrals in a private fee-for-service context, if not compensating specialists for the time spent handling them, can imply a loss of specialist income. The same could be said of reduced admissions and hospital funding.<sup>64</sup>

Work organization and capacity are also important. The addition of care coordination to an impossible schedule cannot work. The primary care physician can no longer provide short-term, long-term, and preventive care in a 10-15-minute visit. Providing information to patients and engaging in shared decision making take more time and thus are insufficiently done in the primary care visit.<sup>65</sup>

Multi-professional care requires multiple person-to-person interactions. Interoperability of different Organizations’ Information and Communication systems supports them. Information systems that integrate patient data through unique identifiers have the potential to make patient data available to multiple providers and to public health analysts. This can improve patient care by facilitating a specialist’s awareness of a patient’s care in totality. It can also augment surveillance, clinical research, and physician performance measures.<sup>66</sup>

Hospital discharge depends on social care arrangements. Difficulties in organising health and social care packages in the community lead to the phenomenon of ‘bed-blocking’ and results in inefficiency.<sup>67</sup>

Differences in the training and background of professionals or lack of trust (often referred to as ‘cultural’ differences) can block integration in their system.<sup>68</sup>



### 3.4. Examples of Integrated care

In response to the emerging challenge posed by the management of multiple chronic diseases, many countries have experimented with new models or approaches for health care delivery, designed to achieve better coordination of services across the continuum of care required by people with chronic illnesses. Integrated care was identified as one of the six specific priority actions of the European Innovation Partnership on Active and Healthy Ageing (EIP AHA).<sup>69</sup> Since 2012 the B3 Integrated Care Action Group works in this respect to contribute to increasing the average number of healthy life years by 2 years in the European Union by the year 2020, and to ensure the triple win; i.e. improved quality of life, improved sustainability of care systems and improved innovation based competitiveness.<sup>70</sup> Over 200 good practices have been collected throughout 2013-2016, demonstrating that integrated care practices have potential to improve the quality and sustainability of services.<sup>71</sup>

A new call for commitments in January 2016 recruited over 400 participants representing 193 commitments for integrated care, received on behalf of regions, sub-national administrations, delivery organisations, patient/user and carer organisations, academic institutions and industry and member organisations. B3 members are implementing chronic disease management programmes in 44 regions; and are focusing on scaling up and replication of their practices to reach the target of 50 regions and cover 10% of the target population.<sup>72</sup>

There are interesting integrated care and care coordination models across Western Europe and North America. A European picture reports that national Disease management programs for chronic diseases exist or are in development in Austria, Denmark, United Kingdom<sup>73, 74, 75</sup> Finland, France, Germany, Italy, the Netherlands<sup>76</sup> and Poland; while regional or private initiatives are also prevalent in England, France, Italy, Spain, and Sweden.<sup>77</sup> Austria, Germany and the Netherlands have implemented a range of policies and approaches to achieve better coordination within and across the primary and secondary care interface and so better meet the needs of patients with chronic conditions. This has involved changes to the regulatory framework to support more coordinated approaches to care (Austria, Germany), coupled with financial incentives (Austria, Germany) or changes in payment systems (the Netherlands).<sup>78</sup>

New provisions for so-called integrated care were introduced in German statute in 2000, with the aim of improving cooperation between ambulatory care providers and hospitals. The terms of such cooperation are spelled out in contracts between sickness funds (insurers) and individual providers or groups of providers from different sectors. In 2004, a law removed existing barriers to developing and implementing integrated care models and provided financial incentives for both sickness funds and providers to proceed with such models. The basic premise of Integrated Care Programmes is that providers from various sectors form an integrated care network, e.g., a hospital forms an ICN with outpatient physicians, psychologists, psychotherapists, and social workers to prevent re-hospitalizations and thus optimizes the quality of life for patients suffering from schizophrenia.<sup>79</sup>

However, progress has been partial and slow. Spending on care provided through integrated care contracts has accounted for less than 1 percent of total expenses on health care.<sup>80</sup> There are some exceptions such as *Gesundes Kinzigtal GmbH*, truly population-based integrated care approach, accountable for the whole health care service budget for nearly half of the 69,000 inhabitants of the Kinzigtal region in southwestern Germany. The first results presented showed positive effects in all three Triple Aim dimensions, improving the health of the population, improving the individual's experience of care, and at the same time reducing the per capita costs of care.<sup>81</sup> The 2015 Health Care Strengthening Act promotes the establishment of integrated care programs through a number of measures. These networks or the individual providers then create an integrated care contract (ICC) with a payer, i.e., a sickness fund, and provide the negotiated services to the patient. An “innovation

fund” totalling EUR 300 million annually has been established for start-up funding of innovative integrated care programs, and administrative barriers have been lowered. Information on quality and costs of existing programs are often unavailable. This substantial start-up funding has shown to unleash creative ideas to re-design integrated care of different sectors, with more than 6400 Integrated Care Plans (ICPs) created in the last few years.<sup>82</sup>

In the Netherlands, primary care, with gatekeeping GPs at its core, is a strong foundation of the health care system. Gatekeeping GPs are a relatively unusual element in social health insurance systems. The strong position of primary care is considered to prevent unnecessary use of more expensive secondary care, and promote consistency and coordination of individual care.<sup>83</sup> Integrated care has been on the political agenda since the early 1990s. The government has launched measures to improve interagency collaboration, such as regulations to allow shifts of care delivery between providers, and funding of experiments on care delivery across the boundaries of long term and acute care. The key actors are the government who sets the regulations and standards, and care providers from the various care sectors. The latter take initiatives of collaboration and coordination to provide integrated services for (mostly) older persons suffering from chronic illnesses and handicaps like type 2 diabetes, rheumatoid arthritis, stroke, orthopaedic and cardiovascular conditions, and psycho-geriatric problems.<sup>84</sup>

The first efforts to integrate health care in Sweden appeared in the beginning of the 1990s. There have been a number of mergers of hospitals and creation of hospital groups under joint management. These mergers are aiming at large-scale production and motivated by economies of scale. They have also been strongly endorsed by policy makers. In spite of bad experiences, related to the size and complexity of the new hospital organisations, the mergers are spreading to more and more county councils.<sup>85</sup> The focus was on integration of intra-organisational processes, aiming at a more cost-effective health care provision. During the 2000s, many county councils have also introduced inter-organisational systems of ‘local health care’, which can be described as an upgraded family- and community-oriented primary health care within a defined local area, supported by flexible hospital services. There is no single model of local health care to be applied everywhere.<sup>86</sup> Out of this work emerged the ‘chains of care’, integrating all health care providers involved in the care of specific patient groups. This is a Swedish concept of integration and collaboration in health care, which includes all the services provided for a specific group of patients within a defined geographical area. Chains of care are inter-organisational networks based on clinical guidelines, i.e., agreements on the content and distribution of the clinical work between different health care providers and professionals. Most chains of care can be described as co-ordinated networks, where financial and clinical responsibilities of the parties involved remain separated. Furthermore, binding contracts, regulating the activities performed, are usually not in place. A national survey has shown that seven out of 10 county councils in Sweden were disappointed with their development work. It seems that the chains of care had been implemented mainly through a top-down approach, which was not appropriate in an environment dominated by strong professional groups.<sup>87</sup> In such an environment, developments initiated from the top of the organisation are often resisted. If dedicated professionals had initiated from below the development of chains of care, it would probably have been more successful.<sup>88</sup> Local health care needs chains of care as integrating mechanisms and the chains of care are strengthened by the integrative context of local health care.<sup>89</sup> However, it is not always easy. General practitioners have not supported the decentralisation of responsibility for the care of the elderly to the municipalities, since it has threatened their position as managers of the nursing homes and have thought there is a risk that primary health care will disappear or become more anonymous.<sup>90</sup>

In the UK, the reform introduced by the Health and Social Care Act of 2012 renewed the focus on integrated patient centered care by emphasising “care is integrated around the needs of the patient.”<sup>91</sup> Following the NHS Five Year Forward View<sup>92</sup>, there are also proposals to develop and implement new models of care with integration as their central principle. Common elements of managing chronic

care include nurse-led clinics and other nurse-led services, including specialist nurses as case managers of individuals with complex needs (“community matrons”), and multidisciplinary teams. On March 2013, Department of Health in the UK has published the Policy for “Improving quality of life for people with long term conditions”.<sup>93</sup> In support to this policy, the Long term conditions (LTC) Quality, Innovation, Productivity and Prevention (QIPP) Workforce established an expert panel which created an evidence-based model of care consisting of risk stratification, creating integrated care teams between health and social care, and reinforcing self-care and shared decision making.<sup>94</sup> A UK report describing findings from multi-morbidity pilot projects highlighted “there is a major need to develop multi-morbid disease management templates, which are geared to the individual patient and which take into account common psychosocial factors such as depression and the needs of carers”<sup>95</sup>. In North West London, one of the pioneers of integrated care in the UK focused on elderly care pathways.<sup>96</sup> As of October 2013, 37,000 personalised care plans have been created in one-to-one meetings between professionals and patients. 96% of patients agree that having the care planning discussion has helped improve how they manage their health problems.

In Spain, fragmentation of healthcare delivery is however, commonplace in the health system, despite centralised public ownership of healthcare services in most regions.<sup>97</sup> The Ministry of Health, Social Services and Equality developed a Chronicity Strategy in 2012, and several scientific societies have promoted the Seville Declaration on Chronic Patients.<sup>98</sup> There are many initiatives towards integrated care in the Spanish National Health System.<sup>99</sup> In the Basque Country, the reform of the health care systems was driven by many projects including new professional roles, organizational changes, eHealth, bottom up innovation, call centre and bundled health commissioning amongst others.<sup>100</sup> In a study done in Catalonia, patients in three areas generally perceived that continuity of clinical management across levels existed, on referring to consistent care (same diagnosis and treatment by doctors of both care levels, no incompatibilities of prescribed medications, referrals across levels when needed) and accessibility across levels (timeliness of appointments). In terms of continuity of information, patients in most areas mentioned the existence of information sharing via computer and its adequate usage. Only a few discontinuity elements were reported such as long waiting times for specific tests performed in secondary care or insufficient use of electronic medical records by locum doctors.<sup>101</sup>

ValCrònic is a program initiated by the Health Agency of Valencia, Spain, and Telefónica with the aim of integrating and improving care for a subpopulation: patients with long-term conditions. It was implemented in 2011 as a pilot covering four health centres in Valencia; and still on going. Another two health centres joined the program later. An important focus of this integrated care model is on preventing complications of long-term conditions, which is carried out through telemonitoring and education. These interventions are tailored to patients’ needs using a segmentation approach, CARS (Community Assessment Risk Screen). This uses data in the current health information system as a chronic disease diagnosis, hospital admissions or emergency, and consumption of drugs. The programme does not create new coordinating structures, but uses existing ones.<sup>102</sup>

The Spanish National Health System (SNS) Quality Plan includes the work in progress to implement the national health information system. It emphasizes the development of a single electronic clinical record (ECR) containing relevant clinical information and guaranteeing patients’ continuity of care outside their Autonomous Community (AC) of residence or a single patient ID to be used across the country, thus creating the basis for the SNS functional single insurer.<sup>103</sup>

Examples in the United States include hospital-physician relationships, health maintenance organizations accountable care organizations (ACOs), the chronic care model, chains of care, and managed clinical networks. Vertical combinations included acquisition of primary care physicians (PCPs), strategic alliances with physicians in physician-hospital organizations (PHOs) and management services organizations (MSOs), and the development of health maintenance

organizations (HMOs).<sup>104</sup> Kaiser Permanente has common characteristics with other integrated systems that include multispecialty group practice, aligned incentives, the use of IT and guidelines, accountability for performance and defined populations, a physician–management partnership, effective leadership and a collaborative culture.<sup>105</sup> The Veterans Health Administration (VA) is an example of real integration at macro level, in contrast to Kaiser Permanente, which is virtually integrated.

### 3.5. Integrated care evaluation

The expectation is that integrated care will lead to more person-centred, coordinated care, improve outcomes for individuals, deliver more effective care and support and provide better value from public spending.<sup>106</sup> Evaluation studies include different dimensions<sup>107</sup> such as community wellbeing and population health, organisational processes and systems, personal outcomes, resource use/balance of care service proxies for outcomes and user/carer experience. There is a lack of standardized, validated tools that have been systematically used to evaluate integration outcomes. This makes measuring and comparing the impact of integration on system, provider and patient level challenging.<sup>108</sup> A recent systematic review identified 209 index instruments measuring integrated care constructs. The majority of studies reported on instruments measuring constructs related to care integration (33%) and patient-centred care (49%); fewer studies measured care continuity/comprehensive care (15%) and care coordination/case management (3%).<sup>109</sup>

There is little high quality evidence available about some of the interventions currently being implemented. However, despite considerable heterogeneity in interventions, patient populations, and processes and outcomes of care, integrated care programmes seemed to have positive effects on the quality of patient care.<sup>110</sup>

There is a lack of robust economic evaluations in the literature on the potential of service integration to improve the effectiveness of health services.<sup>111</sup> A review of economic evaluation papers found that the majority of outcomes focused on hospital utilization through (re)admission rates, length of stay or admission days and emergency department visits. There was some evidence of cost reduction in a number of reviews; however, findings were frequently based on a small number of original studies only, or studies that only used a before–after design without control, or both. There was little or no evidence of incremental quality-adjusted life year (QALY) gain over usual care of structured home-based, nurse-led health promotion for older people at risk of hospital or care home admission. Some reviews reported on cost per QALY as a measure of cost–utility, suggesting increased cost associated with the integrated care approach in question in some studies but not others. Overall the evidence was difficult to interpret. Evidence that is available points to a positive impact of integrated care programmes on the quality of patient care and improved health or patient satisfaction outcomes but uncertainty remains about the relative effectiveness of different approaches and their impacts on costs.

<sup>112</sup>

A review of 560 studies suggests that initiatives to improve the care of people with long-term conditions can enhance satisfaction with care, quality of life, and in some cases, use of health services. There is evidence to support the initiatives such as broad chronic care management models, integrated community and hospital care, greater reliance on primary care, identifying people with long-term conditions in decision – making, providing accessible structured information for people with long-term conditions and their families, self-management education, self-monitoring and referral systems, electronic monitoring and telemonitoring and using nurse-led strategies. However, it has been found that it is very difficult to improve care and lower costs for people with multiple chronic conditions. There is less evidence to support case management, evidence-based care pathways or

shared learning among health professionals. There is limited information about new models of commissioning services, appropriate data collection and monitoring and linking health services with voluntary and community sectors.

There have been no studies that have examined the relative importance of the different components and roles of integrated care. It is plausible to argue that it is their combined impact that lies behind the achievements of integrated systems rather than individual factors.<sup>113</sup> There is also limited evidence about combining different strategies into a broad programme of care.<sup>114</sup> Understanding to which component effect is due, is not easy either. Positive results of a heart failure telemonitoring system was attributed more to the infrastructure of trained heart failure specialists who actually manage care is as important as a home monitoring device that reports to busy primary care clinicians.<sup>115</sup> There is evidence in the literature suggesting differences between specialists and generalists in terms of knowledge, patterns of care, and clinical outcomes of care for a broad range of diseases. In published studies, specialists were generally more knowledgeable about their area of expertise and quicker to adopt new and effective treatments than generalists. Further work is needed to delineate the components of care for which generalists and specialists should be responsible, in order to provide the highest quality of care to patients while most effectively utilizing existing physician workforce.<sup>116</sup>

Since 1999, the Centres for Medicare and Medicaid Services in the USA conducted seven Disease Management demonstrations involving some 300,000 beneficiaries in 35 programs. Programs include provider-based, third party, and hybrid models. Reducing costs sufficient to cover program fees has proved particularly challenging. Final evaluations on twenty programs found three with evidence of quality improvement at or near budget neutrality, net of fees. Interim monitoring covering at least twenty-one months on the remaining fifteen programs suggests that four are close to covering their fees.<sup>117</sup>

In a review article, interventions outcomes were reported. 29 reviews reported statistically significant improvements in at least one outcome. 11/21 reviews reported significantly reduced emergency admissions (15–50%); 11/24 showed significant reductions in all-cause (10–30%) or condition-specific (15–50%) readmissions; 9/16 reported length of stay reductions of 1–7 days and 4/9 showed significantly lower Accident & Emergency use (30–40%). 10/25 reviews reported significant cost reductions but provided little robust evidence.<sup>118</sup>

A recent paper reviews three recent efforts at care coordination that have been evaluated but have not yet been included in systematic reviews. The first is Germany's *Gesundes Kinzigtal*, a population-based approach that organizes care across all health service sectors and indications in a targeted region. The second is a program in the Netherlands that bundles payments for patients with certain chronic conditions. The third is England's integrated care pilots, which take a variety of approaches to care integration for a range of target populations. Results have been mixed. Some intermediate clinical outcomes, process indicators, and indicators of provider satisfaction improved; patient experience improved in some cases and was unchanged or worse in others. Across the English pilots, emergency hospital admissions increased compared to controls in a difference-in-difference analysis, but planned admissions declined. Using the same methods to study all three programs, they observed savings in Germany and England. However, the disease-oriented Dutch approach resulted in significantly increased costs.<sup>119</sup>

The United States experience shows the arguments for both real and virtual integration. The Veteran Administration Health system demonstrates what can be achieved through real integration. However there is theoretical and empirical evidence in favour of virtual integration, emphasizing in particular the weaknesses of incentive attenuation and influencing costs associated with real integration.<sup>120</sup> Kaiser Permanente and Geisinger Health System, demonstrate high levels of performance on many indicators for the populations that they serve.<sup>121</sup> The exception may be in relation to relatively well-

defined population groups such as older people for whom there is evidence that real integration can deliver positive results.<sup>122</sup>

To compare and better understand the cost-effectiveness of integrated care programs, consistent definitions must be used and component interventions must be well described.<sup>123</sup> The Agency for Healthcare Research and Quality (AHRQ) has developed a care coordination measurement framework with those activities that have been hypothesized or demonstrated to facilitate care coordination and broad approaches commonly used to improve the delivery of health care, including improving care coordination.<sup>124</sup> They include Coordination Activities and Broad Approaches. Coordination Activities include establish accountability or negotiate responsibility, communicate, facilitate transitions, assess needs and goals, create a proactive plan of care, monitor, follow up, and respond to change, support self-management goals, link to community resources and align resources with patient and population needs. Broad Approaches include teamwork focused on coordination, health care home, care management, medication management and health IT-enabled coordination. The experience of service users is influenced by the nature of team working, clinical expertise and decision support and the adoption of shared guidelines and policies.

## 4. ORGANIZATIONAL ELEMENTS IN INTEGRATED CARE ANALYSIS

Care coordination is the deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient's care to facilitate the appropriate delivery of health care services. The goal is that care for patients is integrated in a single process both intra and inter-professionally. Coordination consists of inter-relating the various parts of the work, different organizations and various job roles and responsibilities. Organizing care involves the marshalling of personnel and other resources needed to carry out all required patient care activities and is often managed by the exchange of information among participants responsible for different aspects of care.<sup>125</sup> McDonald *et al.* identified five key elements comprising care coordination:<sup>126</sup>

1. Numerous participants are typically involved in care coordination;
2. Coordination is necessary when participants are dependent upon each other to carry out disparate activities in a patient's care;
3. In order to carry out these activities in a coordinated way, each participant needs adequate knowledge about their own and others' roles, and available resources;
4. In order to manage all required patient care activities, participants rely on exchange of information; and
5. Integration of care activities has the goal of facilitating appropriate delivery of health care services.

C3-CLOUD is focusing on the care plan as a principal tool to achieve care coordination. The Care Plan represents the synthesis and reconciliation of the multiple plans of care produced by each provider to address specific health concerns. It serves as a blueprint shared by all participants to guide the individual's care. As such, it provides the structure required to coordinate care across multiple sites, providers and episodes of care. The care plan supports collaborations across care settings and providers, and allows for and encourage a team-based care.<sup>127</sup>

Based on the analysis of the Integrated Care literature and the objectives of C3-CLOUD project (based on a Health IT-Enabled Coordination) a descriptive and analytical framework to assess Integrated Care for Organizational Models in the Pilot Sites has been defined. The aim is to be able to identify those features that have to be implemented in order to provide coordinated care using individual care plans. A systems thinking approach has been used, to take into greater consideration how the constituent parts of the system interact with each other and the structural elements that condition interaction, and not so much focusing on analysing individual parts. The framework is structured in two main levels, System Context level and Service and Care Coordination<sup>128</sup>. The former includes those elements regarding the organizational key elements that conditions integrated care. They are core components that we do not expect to undergo much change during the timeframe of C3-CLOUD. However, they are essential to understand the overall performance of care coordination. The latter focuses on the process of clinical care coordination itself, and much closely related with Health IT-enabled coordination.

### 4.1. System's requirements for integrated care

The system design defines the degree the environment enables integrated care. It needs a sharing atmosphere as well as commonly agreed direction, which permits bringing together the human and material resources of the organizations involved. The main elements are:

- **Organizations**

- Number and type of Provider Organizations accountable for maintaining some aspect of the care plan along the continuum of care (services required to implement an activity such as diagnostic, pharmacy and other services);
- Virtual integration in place in any form such as alliances, partnerships or networks, held together through regulations, agreements and/or contracts that allow sharing information, collaborating in tasks and aligning their incentives, and competition between care providers;
- Organizational and geographical settings and place of service for interventions;
- Cultural factors: pre-existing inter-organisational and inter-professional distrust, support from insurers and funders.
- **Resources**
  - Community resources and policies: resources available in the community that may support patients' health and wellness or meet their care goals. Community resources are any service or program outside the health care system that may support a patient's health and wellness. These might include financial resources, social services, educational resources, community schools, support groups, or support programs.
  - Availability of assets and consumable resources.
    - Human assets as well as equipment (diagnostic, treatment, rehabilitation), rooms, etc.;
    - Consumables: represent medications and other expendable materials (gloves, syringes, etc.).
  - Clinical information systems and monitoring systems.
- **Management**
  - Establish accountability or negotiate responsibility: Authority distribution, specify who is primarily responsible for key care and coordination activities, the extent of that responsibility, and when that responsibility will be transferred to other care participants.
  - Decision-making: hierarchy of roles and rules or guidelines to decide on the allocation of type and volume of asset, services and consumable resources.
  - Structure of incentives: analyse if incentives of all stakeholders are well aligned, whether some actors might gain and others lose on financial issues, workload and effort, clients at the expense of others or perceptions of authority or status.
  - Transaction costs in negotiating, monitoring and enforcing agreements
  - Assessment of integrated care actors, evaluation schemes and physician performance measures
- **Work organization**
  - Knowledge, clinical and communication skills management.
  - Work allocation, schedule organization and workload displacement capacity (from hospitals to ambulatory and outpatients centres, from primary care physicians to nurse practitioners or from specialists to general practitioners)
  - Coordination mechanisms, like case management, care teams and clinical pathways
  - Care transitions: which occur when information about or accountability for some aspect of a patient's care is transferred between two or more health care entities (e.g., transitions across settings, within care teams, among care participants, between encounters or care episodes, as patient needs change)



- **Restriction and inhibiting factors and risks**

- Care barriers: characteristics of regulation, agreements, geographical, resources or management that hinders care coordination. A barrier may block individual actions or may block the progression of the entire care plan, plan of care or treatment plan.
- Risks: changes in structure of incentives or in workload displacement that may imply a loss of income for any actor experience failures in coordination particularly at points of transition. Failures in transitions between health care entities and over time, when there is shifts in responsibility and information flow.

As a result of this analysis, a tool has been designed to analyse the Promoting and Inhibiting Factors for System Integration and Care Coordination. It has been constructed as a Likert type questionnaire (“System Factors questionnaire”) with 14 items regarding:

- Virtual integration;
- Transaction costs;
- Community resources;
- Availability of health related assets, including human resources;
- Clinical information systems;
- Responsibility for care;
- Inter-organisational trust and support;
- Decision making process;
- Structure of incentives;
- Clinical knowledge and skills;
- Patient empowerment strategies;
- Work allocation schemes;
- Care coordination mechanisms;
- Health care professionals’ evaluation.

## System Factors Questionnaire

PROMOTING AND INHIBITING FACTORS AT THE SYSTEM LEVEL					
1. Virtual or real integration is in place in forms such as alliances, partnerships or networks, held together through regulations, agreements and/or contracts that allow sharing information, collaborating in tasks and align their incentives.	1	2	3	4	5
2. Transaction costs in negotiating, monitoring and enforcing agreements are reasonable	1	2	3	4	5
3. There are resources available in the community that may help support patients' health and wellness or meet their care goals.	1	2	3	4	5
4. There is availability of assets (human assets as well as equipment) and consumable resources (medications and other expendable materials)	1	2	3	4	5
5. There are adequate clinical information and monitoring systems in place.	1	2	3	4	5
6. It is clear who is primarily responsible for key care and coordination activities, the extent of that responsibility, and when that responsibility will be transferred to other care participants, including care transitions..	1	2	3	4	5
7. There is inter-organisational and inter-professional trust and support.	1	2	3	4	5
8. Decision-making roles and rules are clearly established to decide on the allocation of type and volume of assets, services and consumable resources.	1	2	3	4	5
9. Incentives of all stakeholders are well aligned, no actors gain and others lose on financial issues, workload and effort, clients at the expense of others or perceptions of authority or status with coordinated care arrangements.	1	2	3	4	5
10. Actors' knowledge, clinical and communication skills management are adequate.	1	2	3	4	5
11. Patient and caregivers empowerment schemes and tools are in place allowing them taking an active role in decisions on their health.	1	2	3	4	5
12. Work allocation schemes, schedule organization and workload displacement capacity amongst actors is adequate	1	2	3	4	5
13. Coordination mechanisms, like case management, care teams and clinical pathways are in place and effective	1	2	3	4	5
14. Assessment of integrated care actors, including evaluation schemes and professional's performance measures are well defined and used.	1	2	3	4	5

Figure 2. System Factors Questionnaire

## 4.2. Multidisciplinary team care coordination

Multidisciplinary Teamwork focused on coordination is the integration among separate health and social care actors participating in a particular patient's care (whether health and social care professionals, care teams and or nonprofessional caregivers) into a cohesive and functioning whole capable of addressing patient needs. Care coordination is based on actors involved, activities performed and interpersonal communication. As care needs become more complex, the number of potential participants and relationships among participants tends to increase. Coordination implies utilization of knowledge, transmission of information and allocation of talent amongst actors. Interpersonal communication, that allows to share knowledge among participants in a patient's care, the give-and-take of ideas, preferences, goals, and experiences through personal interactions.

- *Actors/roles:* An actor is an autonomous and intelligent being that is able to perceive and act, i.e. to interpret, determine goals, reason and decide, either independently or in dialogue, negotiation and cooperation with other actors. They include Patient, Care Team health professionals (general practitioners, primary care and hospital nurses, specialists and other professionals), Social workers, Family, Caregivers, other Support Individuals...).
- *Activities performed:* A classification based on the AHRQ<sup>129</sup> and the FHIR<sup>130</sup> classification and PAR described in D8.1 and use cases from D3.2, for care plan development.

- *Assessment*: determine the patient's needs for care and for coordination, including physical, emotional, and psychological health; functional status; current health and health history; self-management knowledge and behaviours; current treatment recommendations, including prescribed medications; risk assessment and need for support services. It includes observation or plans to capture information about a patient (vitals, labs, diagnostic images, etc.).
- *Diagnosis*: Identification of a condition, disease, disorder, or problem by systematic analysis of the background or history, examination of the signs or symptoms, evaluation of the research or test results, and investigation of the assumed or probable causes.<sup>131</sup> It includes medical, nursing and social diagnosis.
- *Treatment or procedure*: Plan to modify the patient in some way including drugs prescription, nursing interventions, surgery (includes minor) treatment, life style interventions (including education or plan for the patient to consume food of a specified nature) counselling and others. It also involves reconciling discrepancies in medication use in order to avoid adverse drug events associated with transitions in care.
- *Involving other stakeholders*: includes referrals, consult (discuss with, confer with others), share, delegate, assign or entrust tasks, including negotiate responsibility for a particular aspect of that care and facilitate transitions to ensure timely and complete transmission of information or accountability. It is key in setting a stable MDT.
- *Rehabilitation*: The process of helping a person who has suffered an illness or injury restore lost skills and so regain maximum self-sufficiency so as to restore to a condition of good health, ability to work, or the like. Rehabilitation provides disabled people with the tools they need to attain independence and self-determination.<sup>132</sup> Includes physical, cognitive and other neurological functions, occupational and others rehabilitation.
- *Monitoring and review*: Includes follow up of symptoms, biomarkers (blood results, x-rays, vital signs, etc.), medication adherence, lifestyles, patient/caregiver's experience, health Outcomes and others. Jointly with the patient/caregiver, assess progress toward care and coordination goals. Monitor for successes and failures in care and coordination. Refine the care plan as needed to accommodate new information or circumstances and to address any failures. Provide necessary follow up care to patients.
- *Patient empowerment and self-supported management*: Tailor education and support to align with patients' capacity for and preferences about involvement in their own care. Education and support include information, training, or coaching provided to patients or their informal caregivers to promote patient understanding of and ability to carry out self-care tasks, including support for navigating their care transitions, self-efficacy, and behaviour change.
- *Care plan drafting*: Establish and maintain a personalized plan of care, jointly created and managed by the patient/formal and informal caregivers and health care team, which outlines the patient's current and longstanding needs and goals for care and/or identifies coordination gaps. The personalized plan is designed to fill gaps in coordination, establish patient goals for care and, in some cases, set goals for the patient's providers. Ideally, the care plan anticipates routine needs and tracks current

progress toward patient goals. It includes create a new care plan, review and reconcile multiple plans, update existing care plan, discard care plan and share care plan. It includes encounter or plans to meet or communicate with the patient (in-patient, outpatient, phone call, etc.).

- *Interpersonal communication* describing information and communication channels amongst actors. Examples include face-to-face interactions, telephone conversations, email, and letters. Health IT-enabled coordination consists of using tools, such as electronic health records (EHR), patient portals, or databases, to communicate information about patients and their care between health care entities (health care professionals, care teams, or health care organizations) or to maintain information over time.

As result of these analyses, a tool (“Care Coordination Profiles Questionnaire”) to describe care coordination components including actors, activities performed and communication channels has been designed. The Questionnaire is an excel document which comprises as many sheets as actors (one excel sheet per actor). In each excel sheet, the first row includes all the actors (one actor per column) and the first column describe the activities and tasks performed.

Both tools, System Factors questionnaire and Care coordination profiles questionnaire, have been used to collect information and describe the Organizational Models in the three Pilot Sites.

<b>PATIENT</b>	<i>Patient</i>	<i>GP</i>	<i>Primary</i>	<i>Specialist</i>	<i>Hospital</i>	<i>Specialist</i>	<i>Call Center</i>	<i>Other</i>	<i>Psychologi</i>	<i>Social</i>	<i>Physiother</i>	<i>Other</i>	<i>Pharmacist</i>	<i>Caregiver</i>	<i>Volunteer</i>	<i>Others</i>
		<i>as-is</i>	<i>Care Nurse</i>	<i>care doctor</i>	<i>Nurse</i>	<i>nurse</i>	<i>(nurse)</i>	<i>nurses</i>	<i>st</i>	<i>worker</i>	<i>apist</i>	<i>therapist</i>	<i>as-is</i>	<i>as-is</i>	<i>as-is</i>	<i>as-is</i>
<b>ASSESSMENT</b>																
o Risk assessment																
o Clinical appraisal																
o Functional assessment																
o Social needs																
o Other needs (emotional, spiritual, etc.)																
<b>DIAGNOSIS</b>																
o Medical																
o Nursing																
o Social																
<b>TREATMENT</b>																
o Drugs prescription																
o Nursing interventions																
o Surgery (includes minor) treatment																
o Life style interventions																
o Counseling																
o Others																
<b>INVOLVING OTHER STAKEHOLDERS</b>																
o Referrals																
o Consult (discuss with, confer with)																
o Share, delegate, assign or entrust tasks																
o Setting a stable MDT																
<b>REHABILITATION</b>																
o Physical																
o Cognitive and other neurological functions																
o Occupational																
o Others																
<b>MONITORING AND REVIEW</b>																
o Symptoms																
o Biomarkers																
o Medication adherence																
o Lifestyles																
o Patient/family's experience																
o Health Outcomes																
o Others																
<b>PATIENT EMPOWERMENT</b>																
o Health coaching programs																
o Patient/family's involvement promotion programs/interventions																
o Training (patient education)																
o Health advice (short/brief)																
o Self-care/management materials																
o Others																
<b>CARE PLAN DRAFTING</b>																
o Create a new care plan																
o Review and reconcile multiple plans (professionals and/or conditions)																
o Update existing care plan																
o Discard care plan																
o Share care plan																

Figure 3. Care Coordination Profiles Questionnaire

## 5. CURRENT ORGANIZATIONAL MODELS IN C3-CLOUD PILOT SITES

Based on the literature review and in the information collected using the above described tools a description of the organizational models at present in the three Pilot Sites has been produced. We will focus on some key issues of integrated care and care coordination:<sup>133</sup>

- Principal characteristics of the health and social care systems: the structure of the health care system, legislation, funding, policy developments on integrated care, key players and variations.
- Target groups of integrated care, such as the elderly or chronically ill.
- Integrated care providers and services, which includes various care sectors, providers, and provincial or local authorities.
- Coordination mechanisms, like case management, care teams, or clinical pathways.
- Promoting and inhibiting factors at the system level.
- Coordinated care actors, activities and interpersonal communication.

### 5.1. Region Jämtland-Härjedalen, Sweden

#### 5.1.1. *Principal characteristics of the health care systems*

In Sweden, 21 county councils/regions are responsible for the primary and secondary care in their regions. Practically all this care is tax-funded, both private and care delivered by the county councils/regions. Tertiary care is delivered at university hospitals and The Region Jämtland Härjedalen (RJH) together with three other counties in northern Sweden jointly finance the tertiary care at Umeå University. RJH covers a population of 126,000 inhabitants of which 23% are elderly people (65+). The population is spread over a large area of 53,753 km<sup>2</sup> (larger than the Netherlands). RJH's legal status is a County Council with main responsibility for primary and secondary healthcare as well as regional development in the region. Municipality care with home care and special housings are organized and driven by the local communities, in total, 290 in Sweden. The municipality care is staffed with nurses, nurse assistants and paramedics but no doctors, the latter come from the primary care. RJH is divided in 8 municipalities, each with their own organisation and taxation.

#### 5.1.2. *Target groups of integrated care*

A joint project between the county's municipalities and RJH identified 4,930 persons (18% of the 65+ population) to be elderly with comprehensive hospital (>3 hospitalisations/a) or home care needs (>7 out-patient specialist care/a).

#### 5.1.3. *Integrated care providers and services*

The region's only hospital is located in the only town Östersund and the most remote healthcare centres are located almost 400 km away. There are 416 beds and 51 outpatient clinics. Primary health care is carried out in 28 locations of which 23 are run by the region and 5 are private. Each of the primary care centres have point of care (POC) laboratory facilities, in many also including x-ray. There are about 4,000 employees in 100 different professions in RJH, and around 93% of the total budget is allocated to health care and RJH employs 358 doctors, 922 nurses and 546 nurse assistants. Primary care centres are staffed with GPs and primary care nurses, some of which are specialist nurses in diabetes or radiology. In addition, every health care centre has laboratory personnel and (sometimes part time) access to physiotherapist, psychologist, and social counsellor. Some health centres have nutritionists but in most instances, this is provided from the secondary care. Podiatrists

for patients with more severe problems are provided from the hospital and for other patients they are private but work in collaboration with primary and municipality care.

All primary and secondary care in the region share the same electronic health record (EHR). Most of the tertiary care is provided in collaboration with other county councils at a university hospital (Umeå) 400 km away, though some specialities are located to the southern part of the country. RJH has 12 ambulances spread over the county and one helicopter.

Social and home care are provided by the municipalities, and the collaboration with the Region's primary and secondary care is well-established. Every nurse and nurse assistant in the municipality care and in special housings have some POC equipment. To this, physiotherapists and occupational therapists are employed in the municipalities. A few specialist nurses in diabetes are employed in the municipalities but mostly this is supplied from the primary care. Each of the eight municipalities have their own EHR without integration with the EHR in RJH.

Pharmacies are located all over the region and all are nationally linked to the same electronic prescribing functionality.

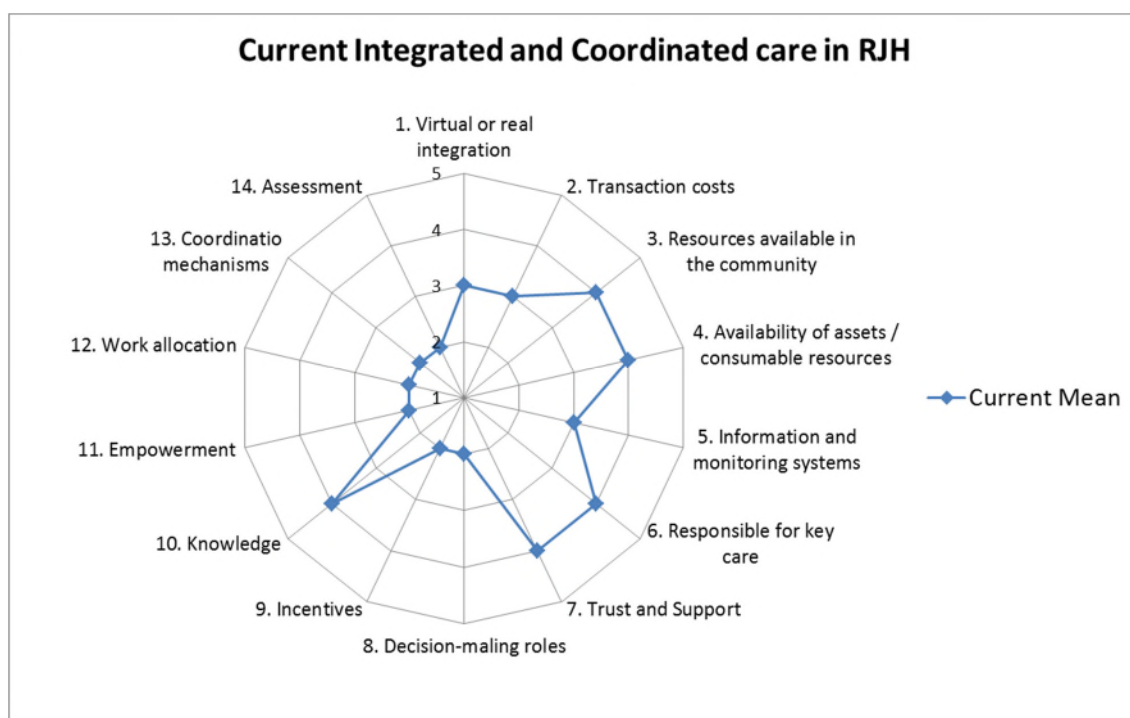
#### ***5.1.4. Coordination mechanisms***

Most of the care of patients with chronic diseases is provided by family physicians in cooperation with district nurses at health care centres. They coordinate the care given at the secondary care level. If patients have a need for care in their homes, a district nurse together with a nurse assistant are provided by the municipality. The doctor from the health care centre and the district nurse from the municipality have regular meetings around the patients. The municipality nurse also co-operates with specialist nurses (mostly diabetes nurses) in primary care and with a variety of specialist nurses and other specialist functions, e.g. nutritionists in secondary care. A direct contact between the municipality nurse and a secondary care doctor is also established in some cases.

Patient education programmes and group activities exist for patients of some chronic diseases, e.g. diabetes. RJH has an on-going collaboration with the county's eight municipalities - formalised collaborations such as an agreement from 1996 with the purpose of improving the integrated care process for elderly and people with multi-morbidity.

RJH is working on a national project "Medicine in Sparsely Populated Areas - Virtual Health Rooms" that was initiated by themselves in 2014, using tested settings to develop a health care process where the professional medical care sector interacts with a remote health status assessment system and networks around the patient. RJH is a national leading actor in developing a compensation model relating to integrated care.

### 5.1.5. Promoting and inhibiting factors at the system and policy level



**Figure 4.** Current Integrated and Coordinated care in RJH

The System Factors questionnaire analysis provides a good overview of the system integrated care promoting and inhibitor factors. There is a good knowledge (Q10), mutual trust (Q7) as well as assets/resources (Q4) for the care deliverance. The formality around responsibility and the legislation (Q6, Q8) is in most instances not a large problem but the boundaries between different caregivers (primary, secondary, and municipality care) sub optimizes the care performance (Q9). The technical integration between primary and secondary care is good but their integration with the municipality care is much poorer, not to mention with the patient (Q5). Thus, a real integration and collaboration is not at hand (Q1, Q2). The well-functioning coordinated care (Q12-14) is only partly (especially at hospital discharge to municipality care and between municipality care and primary care in special housings) existing. A systematized patient empowerment organization/activity (Q11) does not exist.

### 5.1.6. Care coordination actors, activities and interpersonal communication

The analysis of the Care Coordination Profiles Questionnaire data provides a detailed picture of care coordination actors, roles and channels in RJH.

#### Actors, activities and settings

This diagram (Figure 5) shows the **actors** (modelled as “Classes” in UML language) involved in the current organizational model and the activity that they carry out, distributed by **settings** (modelled as “Abstract Classes” in UML language). The relationship between the actors is shown by means of the



link with the setting. The four settings are connected, confirming in turn the linkage/interaction between actors related to different settings.

Actors depicted in the diagram represent the most frequently involved in Coordinated Care for multi-morbid patients as defined in C3-CLOUD. They are placed in four settings: primary care, secondary care (in RJH only at the hospital), municipality care and in the patient's home. In primary care work GP's, primary care nurses (i.e. specialist nurse in primary care), specialist and non-specialist (other) nurses, physiotherapists and other therapists and psychologists. Pharmacists work in collaboration with both primary and secondary care, sometimes employed by these organizations. They also through the primary care serve the municipality care.

Secondary care includes specialist doctors, specialist and hospital/other nurses, psychologist, physiotherapists and other therapists. Municipality care includes other nurses, primary care nurses and more rarely specialist nurses of other types (geriatrics or diabetes), physiotherapists, other therapists and nurse assistants (Others). Caregivers and sometimes social workers and volunteers are involved. The home setting includes the patient and the caregivers. Each of those actors are related in different degrees and perform different activities (and tasks within them) related to the Care Plan.

Most of the communication between primary, secondary, and municipality care, goes through the doctors or nurses but other MDT team members often have a direct interdisciplinary contact.

Other nurses are most important and frequent in the community care. The only other nurses in primary care are the call centre nurses (the same goes for secondary care). From an organizational aspect these latter nurses are part of the primary care but they work tightly also with the secondary care and the municipality care. Specialist nurses also exist at all health care centres in primary care. Other therapists, as well as physiotherapists are frequent at all three levels of care, including municipality care.

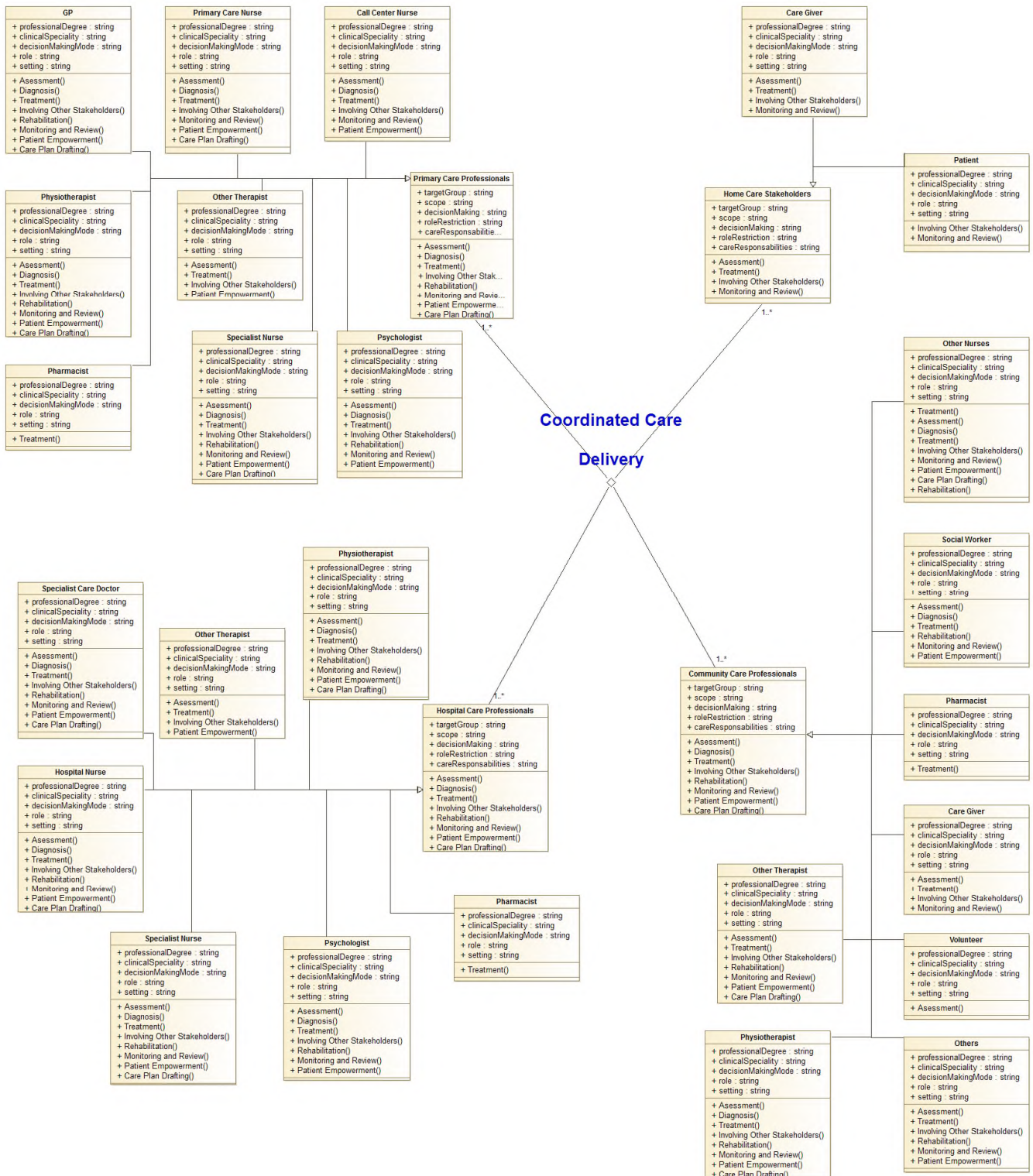


Figure 5. Actors, activities and settings diagram in RJH

### Personal intercommunication

(dark green= bidirectional, light green=unidirectional (read vertical axis actor with horizontal axis actor), whit= no communication)

	Patient	GP	Primary Care Nurse	Specialist Care Doctor	Hospital Nurse	Specialist Nurse	Call center Nurse	Other Nurses	Psychologist	Social Worker	Physiotherapist	Other therapist	Pharmacist	Caregiver	Volunteer	Others
Patient																
GP																
Primary Care Nurse																
Specialist Care Doctor																
Hospital Nurse																
Specialist Nurse																
Call center Nurse																
Other Nurses																
Psychologist																
Social Worker																
Physiotherapist																
Other therapist																
Pharmacist																
Caregiver																
Volunteer																
Others																

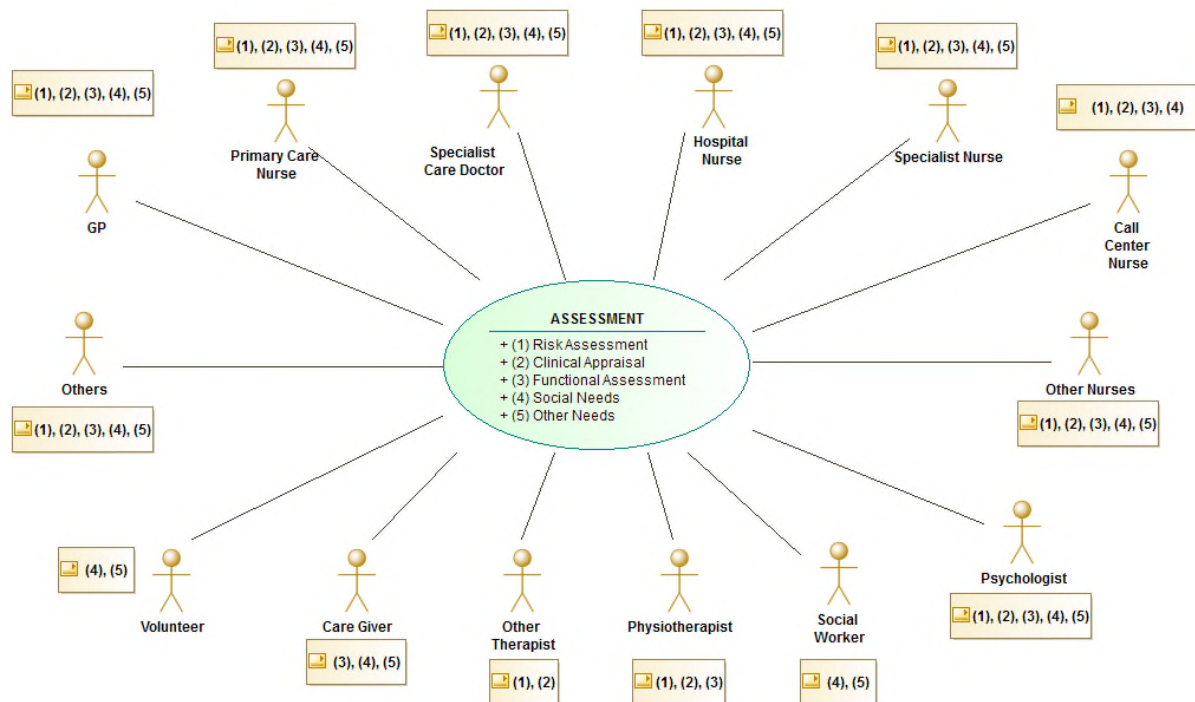
**Figure 6.** Personnel intercommunication matrix in RJH

The figure outlines the more prevalent intercommunication paths, though other than listed occasionally occur. Unilateral communication means that one professional contacts the other to perform a specific task, but the reverse does not happen. Patient, GP, Primary care nurse and Caregiver are the actors with a higher level of communication. Therefore, most of these interactions are two-way communications with the other actors involved. Whereas Volunteers and Others interact the least.

Actors involved in the different activities:

Use case Diagrams (UCD) show for each activity, the actors involved in each of them and the specific tasks they carry out. This is shown by a number, assigned to each tasks, in an information box next to each actor.

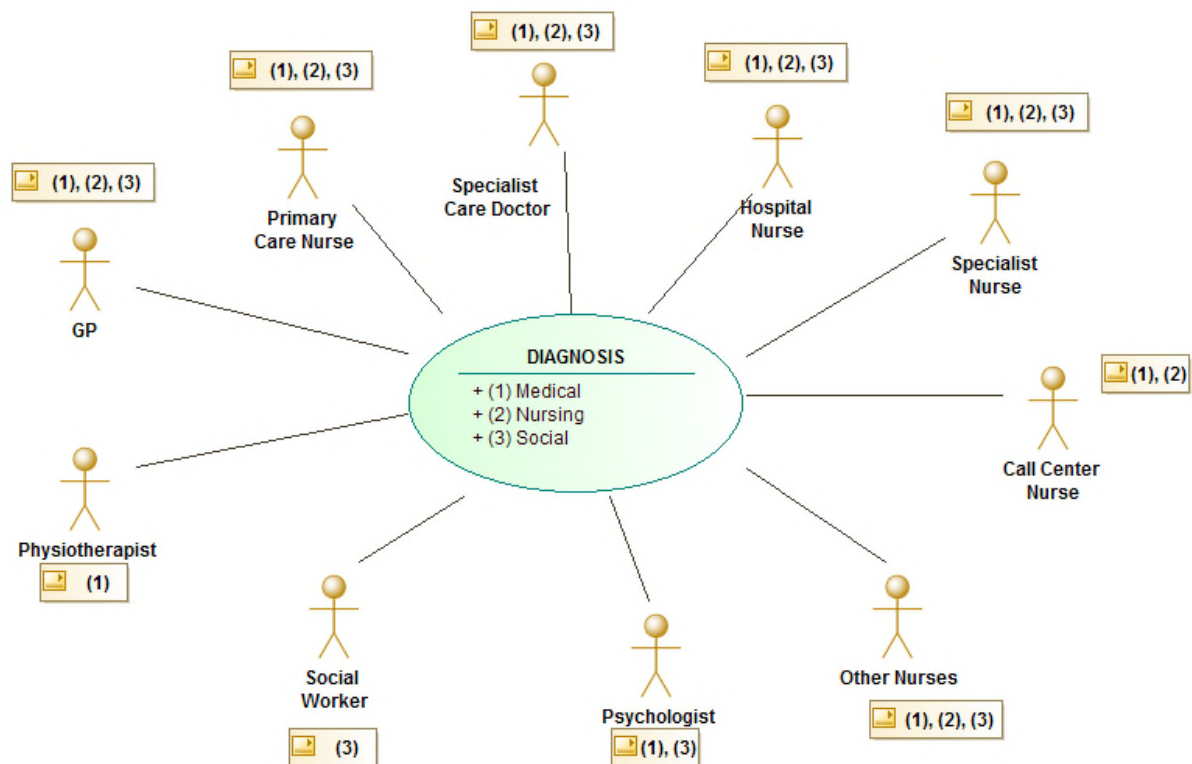
## i. UCD – Assessment:



**Figure 7.** Use Case Diagram – Assessment - RJH

Many parts take an active role in assessment of the patient's situation, though this does not with necessity means that a spreading of the information takes place. The communication of the assessments, especially to other care organizations is a big challenge.

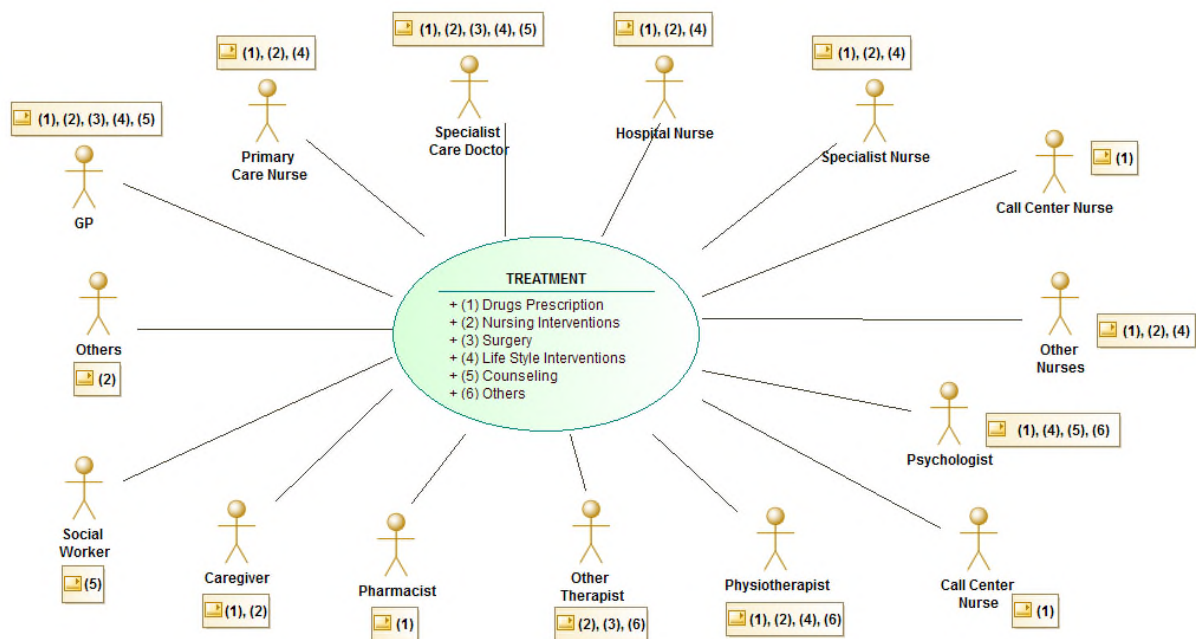
## ii. UCD – Diagnosis:



**Figure 8.** Use Case Diagram – Diagnosis - RJH

The spectrum and number of diagnosis varies between professions. This is based on knowledge but also on legal aspects. In most instances, GP's are the ones involved and are the ones with the broadest diagnostic task.

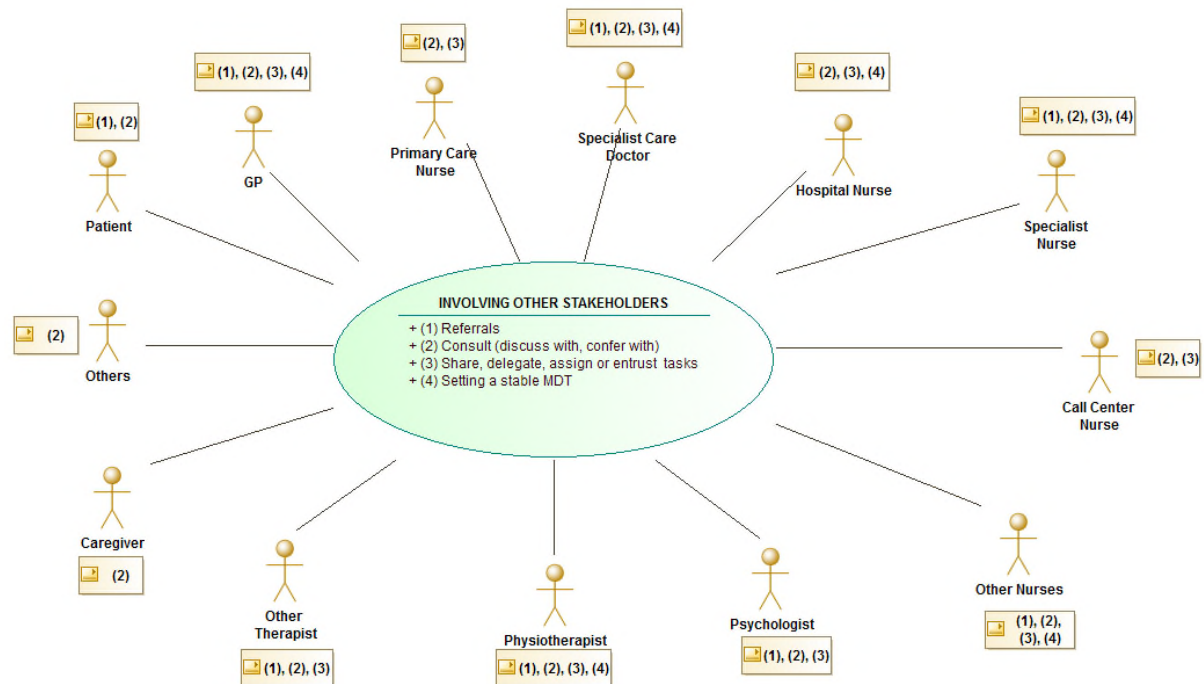
## iii. UCD – Treatment:

**Figure 9.** Use Case Diagram – Treatment - RJH

All primary care nurses, and some other specialist nurses have the right to prescribe some drugs and they, together with other around the patient often follow up medication started up by a doctor. They can in such cases increase or reduce the medication or recommend “over the counter” medication.



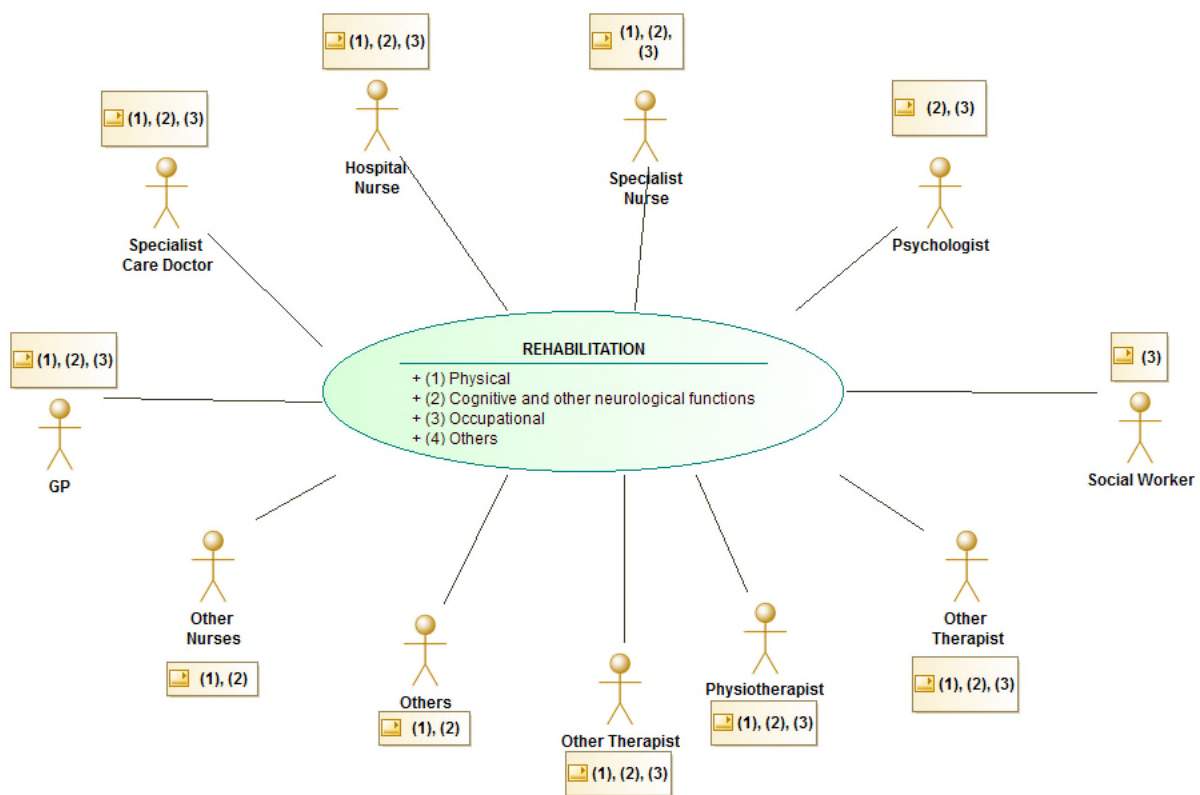
## iv. UCD – Involving Other Stakeholders



**Figure 10.** Use Case Diagram – Involving other stakeholders – RJH

There is an option, not often used, for self-referral for the patient. Referrals from psychologists to secondary care psychiatry specialists and from physiotherapists to x-ray examinations are slowly increasing in number. Most health professionals have the option of either a formal (for some) referral or informal referral of the patient to another professional. They transfer patient information but also decision-making power on some aspects of care, at least for some time. The GP and the nurses frequently work as a team, sharing, delegating or assigning specific tasks.

## v. UCD – Rehabilitation

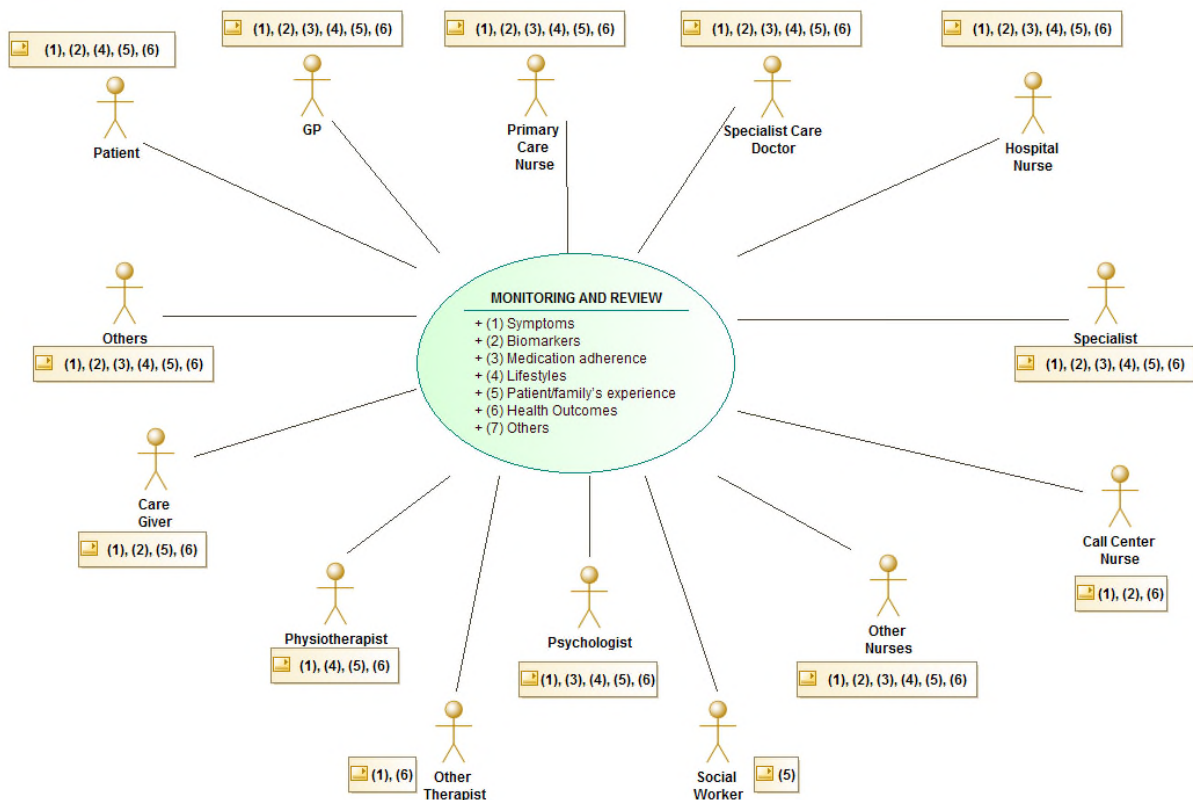


**Figure 11.** Use Case Diagram – Rehabilitation - RJH

Rehabilitation teams exist in both primary, secondary, and municipality, care with largely the same type of personnel. Co-operation between these teams over the organizational borders also, though less frequent, exist.



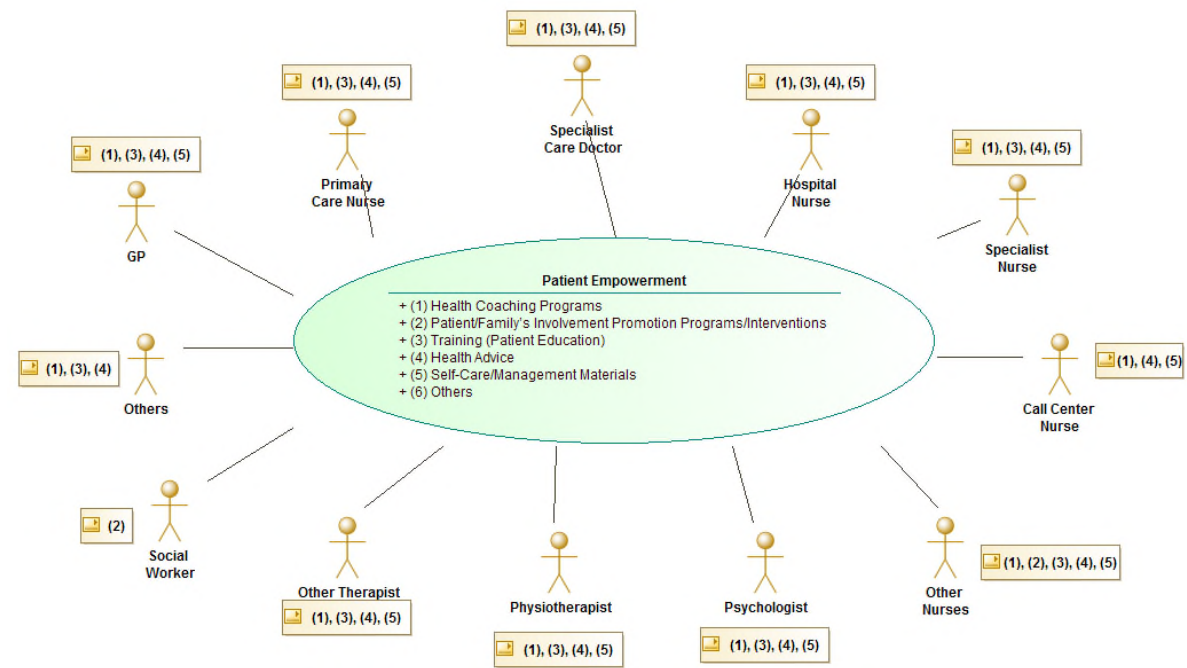
## vi. UCD – Monitoring and Review



**Figure 12.** Use Case Diagram – Monitoring and review – RJH

The monitoring of the patients situation is performed by many careers, sometimes in three different organizations (primary, secondary and municipality care) which is challenging to the information flow. Call Centre nurses have access to the patient EHR data if required.

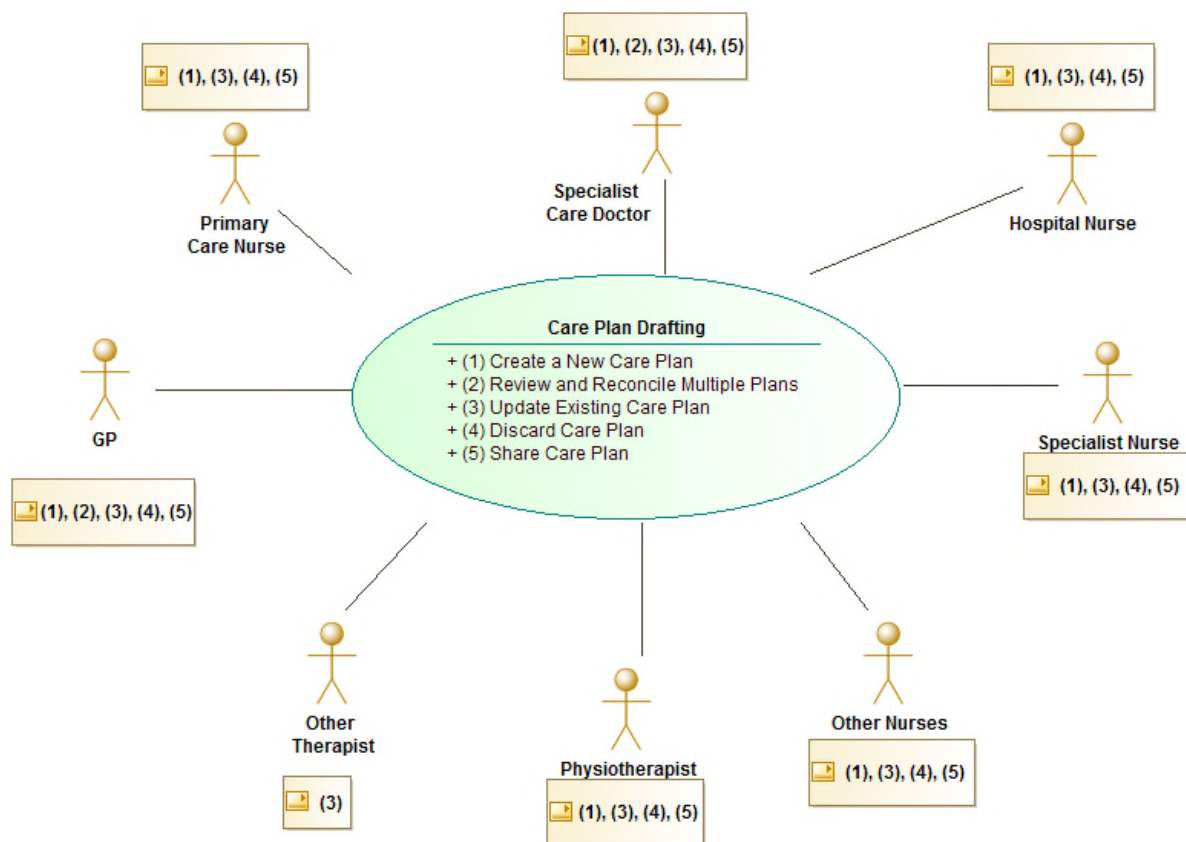
## vii. UCD – Patient Empowerment



**Figure 13.** Use Case Diagram – Patient Empowerment - RJH

All partners in a MDT shall, in different ways, always try to contribute to the patient's empowerment.

## viii. UCD – Care Plan Drafting



**Figure 14.** Use Case Diagram – Care Plan Drafting – RJH

Care plans exist for practically all patients in special housings and for many other elderly with the municipality nurse taking the lead in its creation. Second most common is a care plan created at discharge from hospital. As in previous activities, care plan drafting is not necessarily done in a joint collaborative way.

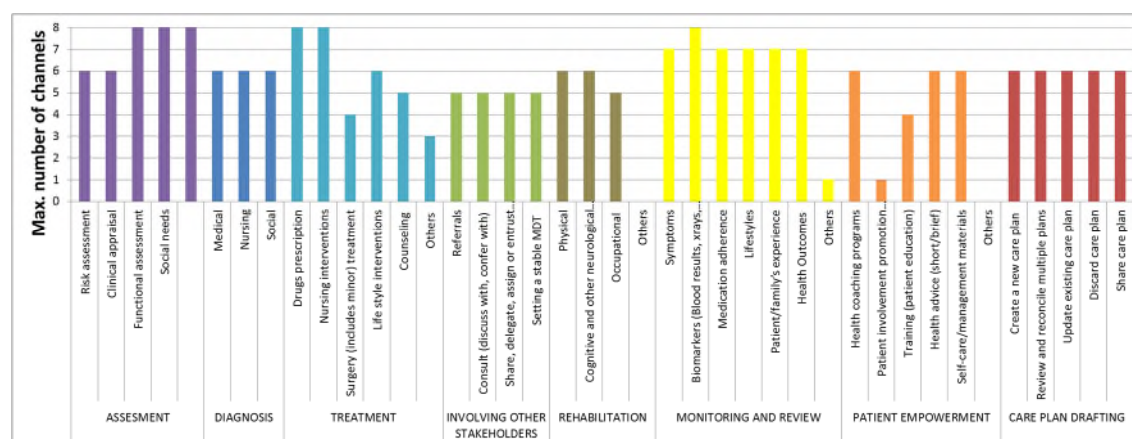
Activities and tasks performed by each Actor (one color per each activity and related tasks)

		Patient	GP	Primary Care Nurse	Specialist Care Doctor	Hospital Nurse	Specialist Nurse	Call center Nurse	Other Nurses	Psychologist	Social Worker	Physiotherapist	Other therapist	Pharmacist	Caregiver	Volunteer	Others
ASSESSMENT	Risk assessment																
	Clinical appraisal																
	Functional assessment																
	Social needs																
	Other needs (emotional, spiritual, etc.)																
DIAGNOSIS	Medical																
	Nursing																
	Social																
TREATMENT	Drugs prescription																
	Nursing interventions																
	Surgery (includes minor) treatment																
	Life style interventions																
	Counseling																
	Others																
INVOLVING OTHER STAKEHOLDERS	Referrals																
	Consult (discuss with, confer with)																
	Share, delegate, assign or entrust tasks																
	Setting a stable MDT																
REHABILITATION	Physical																
	Cognitive and other neurological functions																
	Occupational																
	Others																
MONITORING AND REVIEW	Symptoms																
	Biomarkers (Blood results, xrays, Vital signs, etc.)																
	Medication adherence																
	Lifestyles																
	Patient/family's experience																
	Health Outcomes																
PATIENT EMPOWERMENT	Others																
	Health coaching programs																
	Patient involvement promotion programs																
	Training (patient education)																
	Health advice (short/brief)																
	Self-care/management materials																
CARE PLAN DRAFTING	Others																
	Create a new care plan																
	Review and reconcile multiple plans																
	Update existing care plan																
	Discard care plan																
	Share care plan																

**Figure 15.** Activities and tasks by actors in RJH

The figure depicts the more prevalent activities for different actors, though other than listed occasionally occurs. It provides similar information than the previous use case diagrams but organized in a way in which each actor role can be seen in a glance. Most health professionals are involved in all activities and tasks. Call centre nurses are not involved in care plan drafting. Other professionals such as pharmacists or social workers have a much more limited breadth of scope.

#### Use of channels for each Activity (number of channels per task)



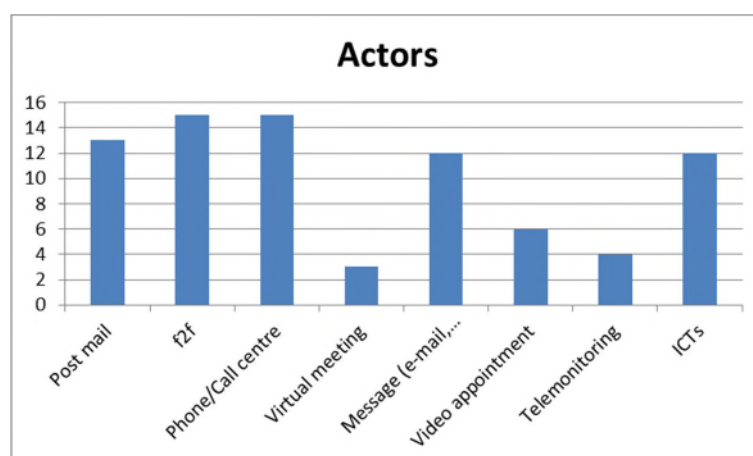
**Figure 16.** Use of channels per activity in RJH

Especially the clinical assessments and the monitoring involves many actors, which improves the possibility to gain information but at the same time largely increases the complexity of the communication. Notably patient involvement promotion in patient empowerment uses only one channel.

#### Interpersonal communication channels

In RJH, ICT includes from EHR, tools as Cosmic, 1177.se, Meddix web-based, web pages, Internet.

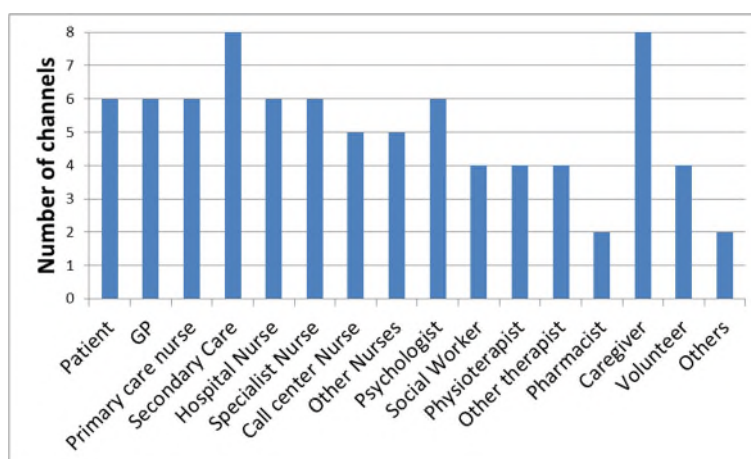
- i. Use of channels by Actors (number of Actors using each channel)



**Figure 17.** Use of channels by actors in RJH

Traditional ways of communication dominate but the common EHR in the Region for primary and secondary care is also used as a tool for communication. Virtual meetings and video appointment exist, though quite rarely, but are expected to increase in coming years.

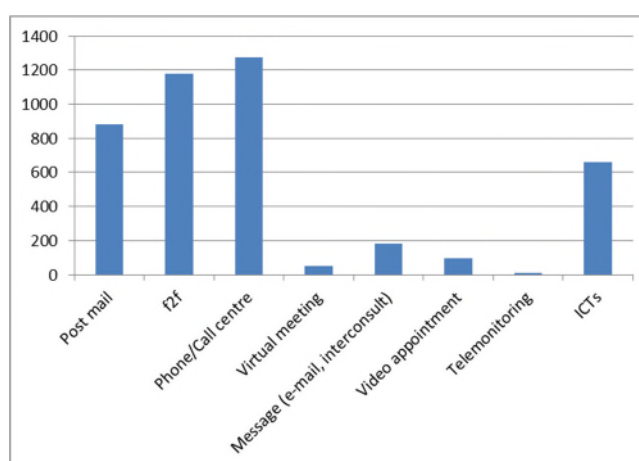
ii. Number of different communication channels used by each Actor



**Figure 18.** Number of channels per actor in RJH

The number of different communication channels has increased over recent year, but as yet none of the old communication ways have been abandoned. Virtual meetings and appointment (patient/doctor) now also exist for GPs

iii. Use of different channels (number of interrelations using the channel)



**Figure 19.** Use of channels in RJH

Older communication channels still dominate.

Use of channels by each Actor (percentage of interrelations using each channel)







**Figure 20.** Use of channels by each actor (%) in RJH

Though more traditional communication channels dominate, it's likely that the pattern will change markedly for all actors in coming years as the care organization is preparing a re-structuring to handle modern communication channels 24/7/365. In some instances, there might also be a need for a new legislation to fully do this.



### **5.1.7. Summary**

In RJH there are three different formal care levels (primary, secondary, and municipality care) around the patient. Each of them has many different professionals, largely similar in each of the organizations. All these partners give a complexity in information sharing and in joint care planning. The fact that the borders between the caregivers are somewhat flexible depending on the diseases of the patient and their severity increases the complexity. The fourth care level, the patients home, with the patient and informal care givers, has till today only partly been integrated in the information sharing and in the care planning.

There is fundamentally a good trust between the different formal caregivers but a dysfunction regarding the technical possibilities for information sharing and a joint care planning.

Most of the communication between care partners take place through more traditional paths as phone calls, face to face or through mailing system linked to the EHR, as IT tool, but virtual/video meeting are beginning to come in use.

## **5.2. South Warwickshire NHS Foundation Trust (SWFT)**

### **5.2.1. Principal characteristics of the health care systems:**

South Warwickshire NHS Foundation Trust (SWFT) is a vertically integrated healthcare provider, offering acute hospital services to the population of South Warwickshire and integrated community and children's services across the whole county. Warwickshire ICT Services is a division of SWFT and provides ICT services to all GP practices across the county, as well as to the Trust. This unique support arrangement enables Warwickshire ICT Services to act as an intermediary between acute, community and primary care services across the whole county and serve a total population of 550,000. Hospital Electronic Patient Record (EPR) is in development. There is no joined up EPR across providers.

### **5.2.2. Target groups of integrated care**

Warwickshire has an elderly population of over 20% (113,000). An estimated 1 in 3 people in Warwickshire are living with one or more long term condition, in South Warwickshire this equates to 70,000 people. Currently, 12.2% of the total population in Warwickshire is estimated to be living with cardiovascular disease (CVD), whilst 5.6% of the adult population is estimated to be living with coronary heart disease (CHD) and 2.6% with stroke. 7.3% of the population is estimated to have diabetes, and if current trends persist, the total prevalence of diabetes is expected to rise to 8.1% by 2020 and 9.1% by 2030.

### **5.2.3. Integrated care providers and services**

It includes various care sectors, providers, and provincial or local authorities. The total workforce of SWFT is over 3,700 staff working across 220 sites, including 76 GP practices. SWFT provides nationally recognised innovative services to help patients to stay out of hospital, including a Community Emergency Response Team (CERT) and Discharge to Assess (D2A). In D2A, the Trust utilises 40 beds in local care homes to assess what a patient's long term needs are. Building on joint work with social care workers, a new 'Trusted Assessment' approach has been adopted, which allows packages of care to be restarted without a full assessment having to be repeated by social services.

35 of the 36 South Warwickshire GP practices have recently formed a federation to improve their ability to coordinate their activities and improve efficiency. They have been developing specific services to support patients over the age of 75. This has complimented other work, between local partners, to improve care coordination for patients with long-term conditions, which has focused on

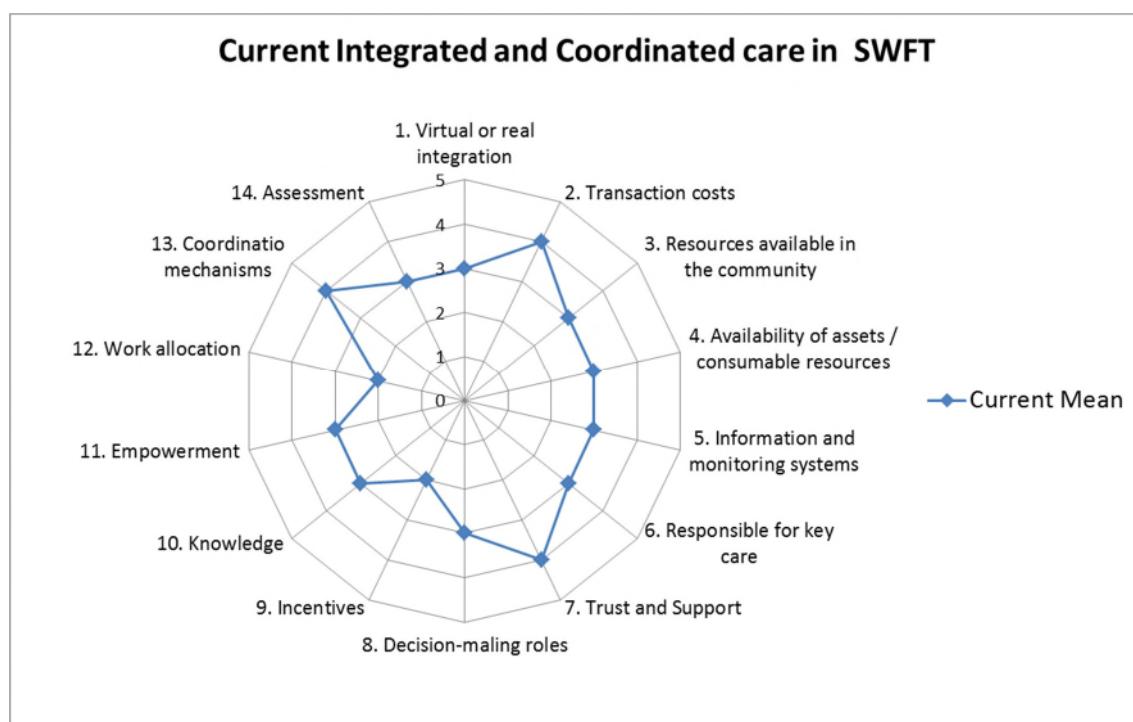
the establishment of practice, based multidisciplinary team meetings between health, mental health and social care.

#### 5.2.4. *Coordination mechanisms*

The current organizational model in South Warwickshire is a traditional system with separation of community, primary care and specialist hospital care including a completely separate community and hospital psychiatry system. SWFT is working closely with its local GP Federation to develop more integrated services, particularly in relation to multidisciplinary team working and long term condition management. The GP community has many years of experience of using EPRs and a project is currently underway to move all South Warwickshire practices onto a common system, which will support interoperability.

#### 5.2.5. *Promoting and inhibiting factors at the system and policy level*

The System Factors questionnaire results provide a broad picture of promoting and inhibitor factors for integrated care in SWFT.



**Figure 21.** Current Integrated and Coordinated care in SWFT

### 5.2.6. Care coordination actors, activities and interpersonal communication

The analysis of the Care Coordination Profiles Questionnaire data provides a detailed picture of care coordination actors, roles and channels in SWFT.

#### Actors, activities and settings

This diagram shows the **actors** (modelled as “Classes” in UML language) involved in the current organizational model and the activity that they carry out, distributed by **settings** (modelled as “Abstract Classes” in UML language). The relationship between the actors is shown by means of the link with the setting. The four settings are connected, confirming in turn the linkage/interaction between actors related to different settings.

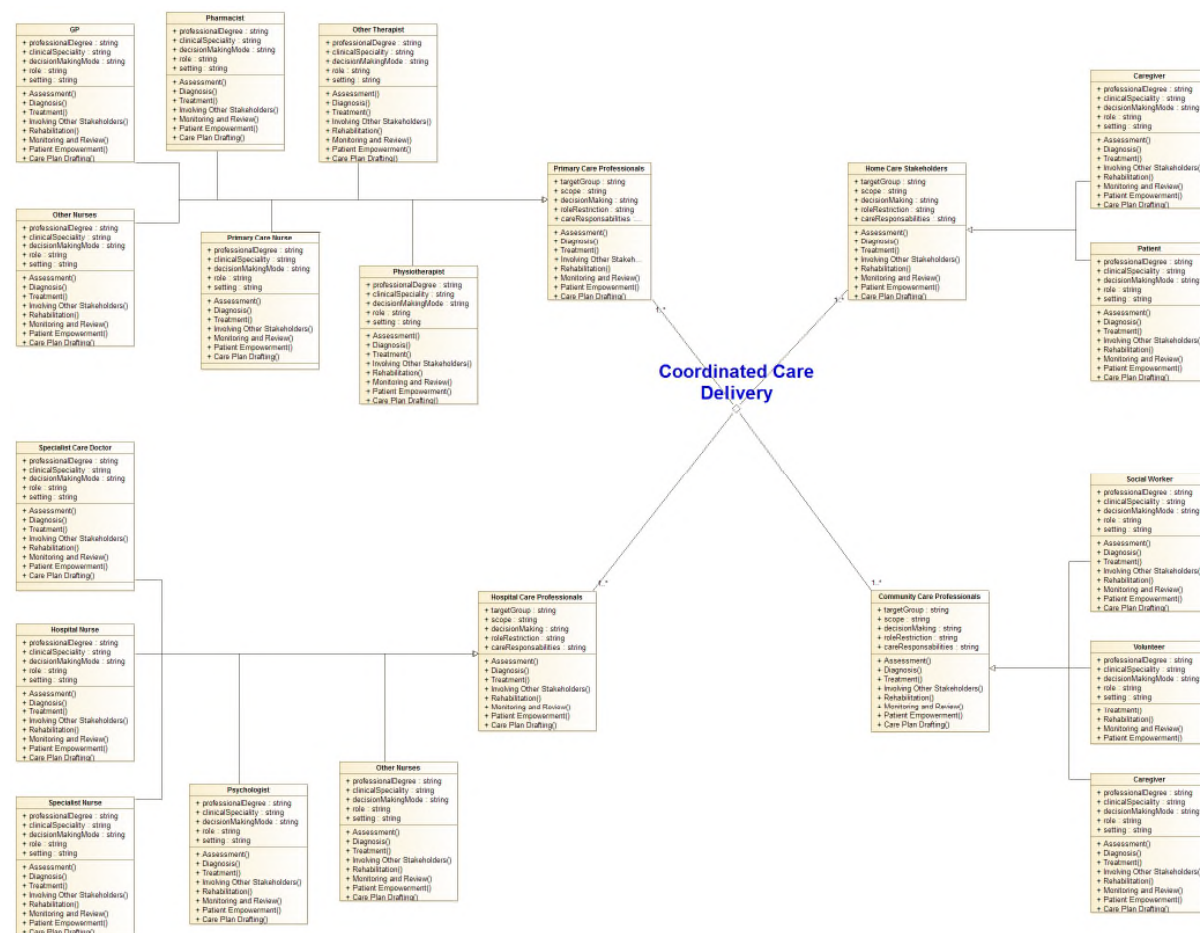


Figure 22. Actors, activities and settings diagram in SWFT

Actors depicted in the above diagram represent those most often involved in coordinated care for multi-morbid patients as defined in C3-CLOUD. They are placed in four settings: primary care, hospital care, community (part of the hospital service in SWFT) and the home. In Primary care, the GP and Practice Nurse are the main actors. Hospital/secondary care includes medical specialists, specialist nurses, nurse practitioners, psychologists and hospital pharmacists. Community Care is a separate service but is managed by the main secondary care provider South Warwickshire, this is not common in UK, and this allows greater integration. Local councils provide many components of social care that is not directly linked to health care needs supporting activities of daily living in the home; this includes social workers, and other nonmedical providers of care. The community service

includes other actors involved in the care of patients, but not directly linked with the Health System, such as the out of hospital pharmacist, volunteers and caregivers. There is close collaboration between the community hospital team, the local council, the primary care team and the hospital. The home setting includes the patients themselves and the caregivers. Each of those actors are related in different degrees and perform different activities (and tasks within them) related to the Care Plan.

### Personal intercommunication

(dark green= bidirectional, light green=unidirectional (read vertical axis actor with horizontal axis actor, whit= no communication)

	Patient	GP	Primary Care Nurse	Specialist Care doctor	Hospital Nurse	Specialist Nurse	Call center Nurse	Other Nurses	Psychologist	Social Worker	Physiotherapist	Other therapist	Pharmacist	Caregiver	Volunteer	Others
Patient																
GP																
Primary Care Nurse																
Specialist Care doctor																
Hospital Nurse																
Specialist Nurse																
Call center Nurse																
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Social Worker																
Physiotherapist																
Other therapist																
Pharmacist																
Caregiver																
Volunteer																
Others																

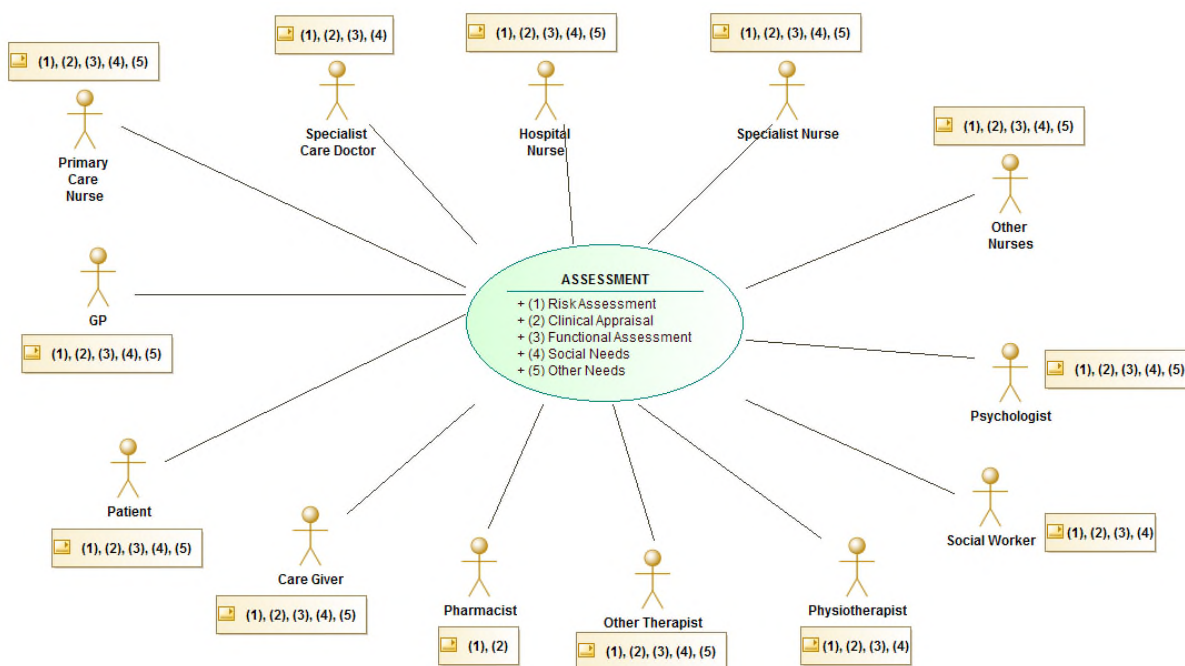
**Figure 23.** Personnel intercommunication matrix in SWFT

The figure outlines the common communication pathways, there are others not listed which occur less frequently. Unilateral communication (light green) means that one professional contacts other to perform a specific task, but the reverse does not happen. Professionals, patients and caregivers have multiple interpersonal communications. The patients, GP and Primary Care Nurse are the ones that have more bilateral connections (bilateral communication are shown in dark green) performing their activities and tasks. A number of MDT mechanisms aim to support coordination and communication between the actors and the patient.

Actors involved in the different activities:

Use case Diagrams (UCD) show for each activity, the actors involved in each of them and the specific tasks they carry out. This is shown by a number, assigned to each tasks, in an information box next to each actor.

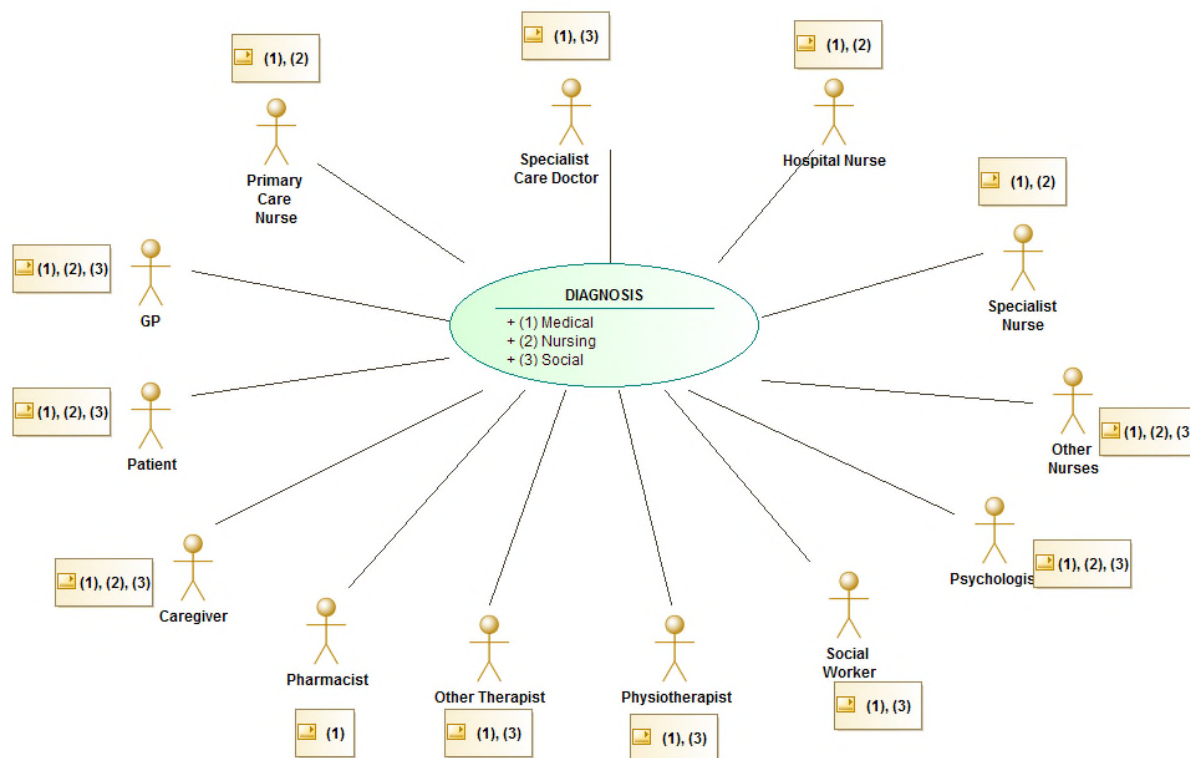
## i. UCD – Assessment:



**Figure 24.** Use Case Diagram – Assessment - SWFT

Most actors take an active role in assessment of the patient's needs. Hospital and Primary Care health professionals perform different tasks when assessing patients (Risk assessment, clinical appraisal, functional assessment, social needs and others). This does not mean that they share their results. The communication of the assessments, especially to other care organizations is a big challenge. In the UK the primary care record is not available to actors other than those who work in primary care. The hospital record is not available to the primary care team. In South Warwickshire, there is some communication between the secondary care record and the community record; this is a current development. Other actors are just involved in one or two tasks. MDT organized through primary care deal with complex situations, especially in more severe cases. Generally, the primary care team uses the communications from the various actors to maintain a care plan, typically this is out of date due to various delays.

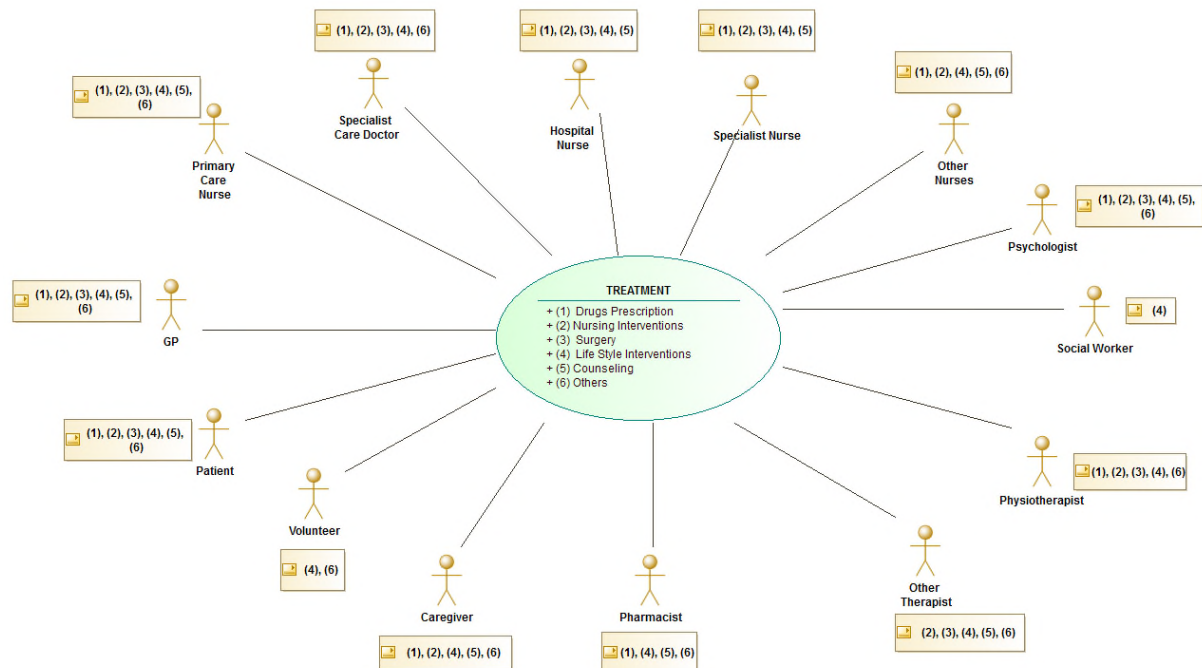
## ii. UCD – Diagnosis:



**Figure 25.** Use Case Diagram – Diagnosis - SWFT

The involvement in making diagnosis varies between professions. This is based on knowledge, training and may have legal implications. For some diagnoses, a specialist nurse may have the appropriate training in a single disease- this applies to diabetes, heart failure and some aspects of mental health. Nurses play a much larger role in assessment and adjusting therapies. Unlike assessment, only nine actors participate to a greater or lesser degree in diagnostic activities. The main actors for diagnosis remain the doctors; the main actors in giving complex therapies are the nurses. The GP widest scope in making a diagnosis and taking into account medical, nursing and social information before deciding on therapy.

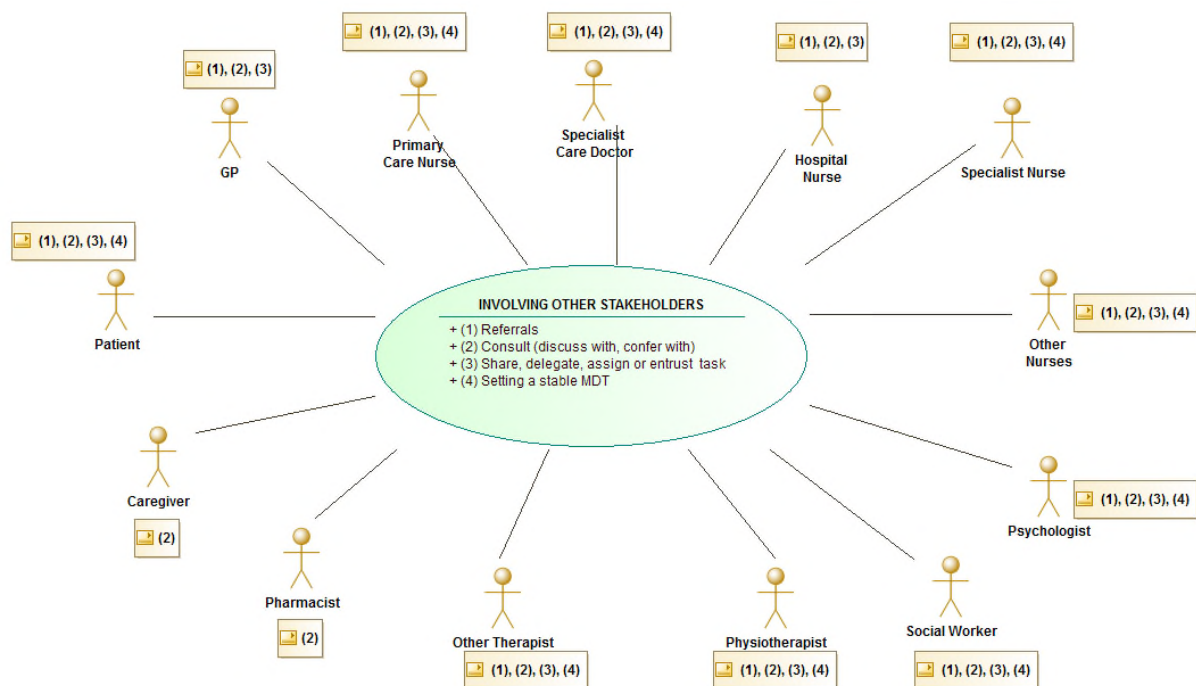
## iii. UCD – Treatment:

**Figure 26.** Use Case Diagram – Treatment - SWFT

Physicians (GP and Specialists) are the principle initial prescriber drugs. Some specialist nurses with appropriate training can prescribe from a limited specialist pharmacopeia. Several other professionals (nurses, pharmacists) are involved drug treatment- dispensing, counselling or enhancing adherence. Most of them are involved in lifestyle and counselling interventions. Some surgery is just performed by some GPs and Primary Care Nurses (minor surgery) and Medical Specialists (surgeons). Psychologists may administer treatments that only they are trained to provide all though the initiation may have been made by another member of the psychiatry team.



## iv. UCD – Involving other stakeholders

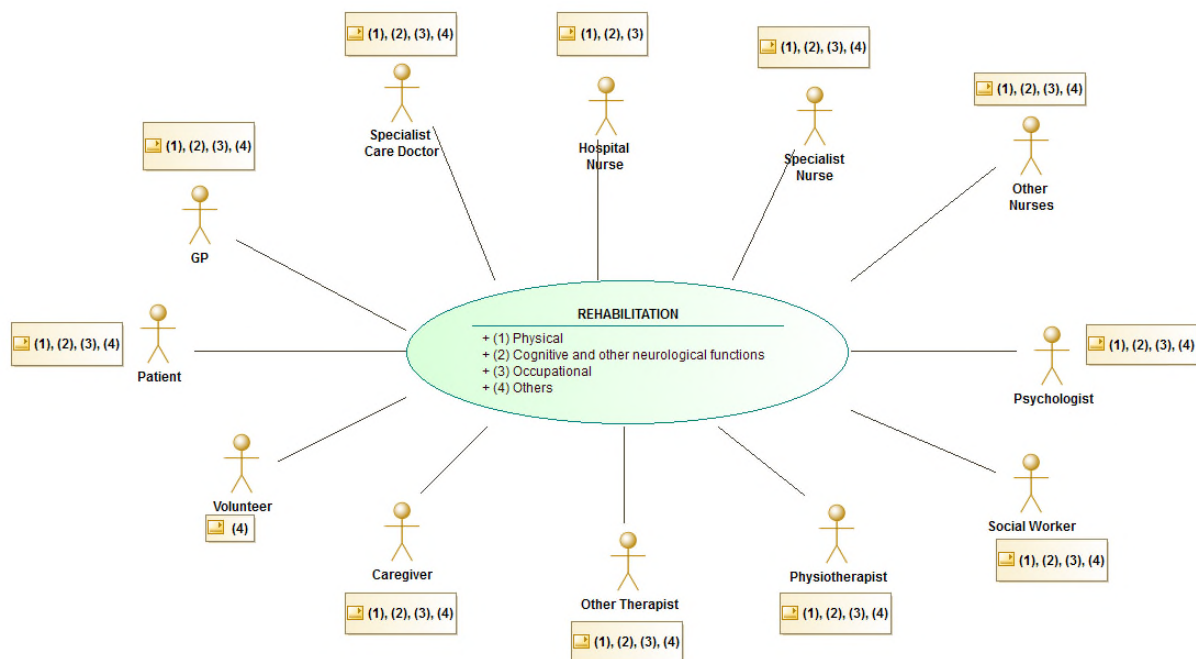


**Figure 27.** Use Case Diagram – Involving other stakeholders - SWFT

Some health professionals, mainly physicians, some nurse practitioners, and physiotherapists have the option of referring a patient to another professional. In some circumstances, a psychologist may refer a patient within the mental health team. Professionals, patients, and caregivers use channels for consultation without referring the patient. Within each organization, there is delegation and sharing. Many actors can arrange an MDT although its remit may be narrow. The actor most involved in medical MDTs is the primary care physician. The commonest MDT is around therapy and the needs for support with activities of daily living and where that should take place, i.e. home or hospital.



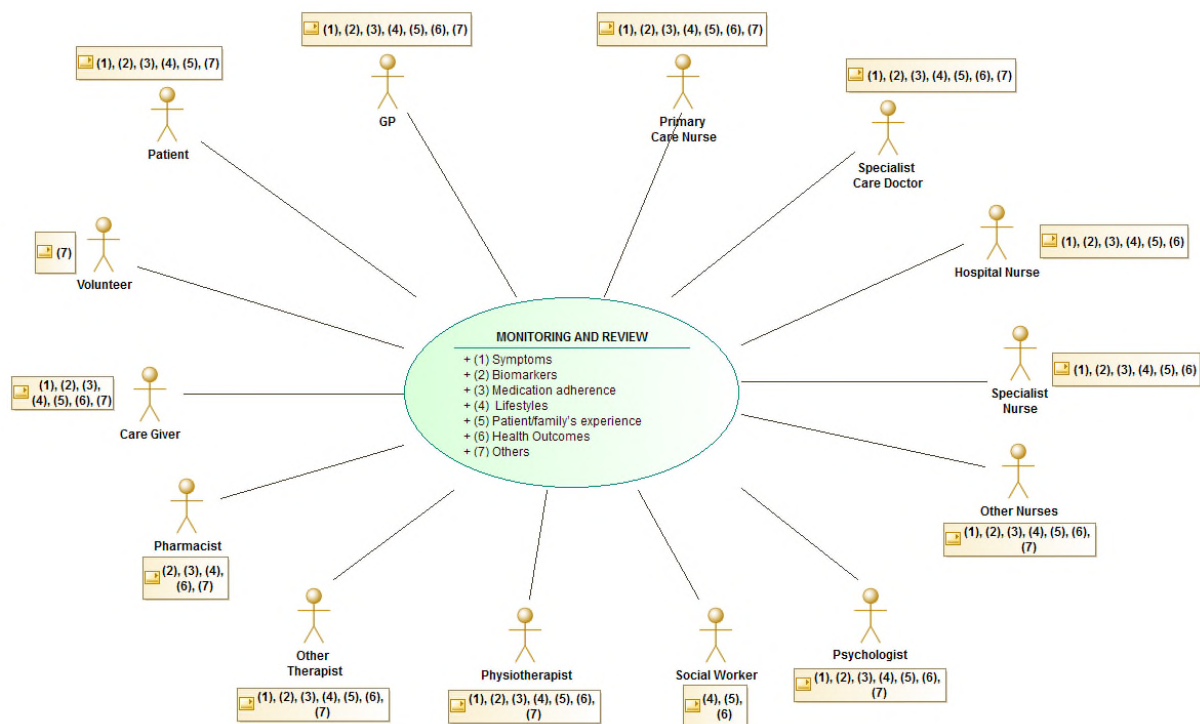
## v. UCD – Rehabilitation



**Figure 28.** Use Case Diagram – Rehabilitation - SWFT

The main actors involved in delivering rehabilitation activities are: the Psychologist (mental health); the Physiotherapist; and occupational therapists (physical health). Specialist nurses are involved in diabetes and cardiovascular rehabilitation. To coordinate these tasks a limited MDT may be required. The current coordination requires physical MDTs, which are often several days to weeks after the need was identified. Coordination is often by large repetitive documents, which have separate parts, which are completed by different actors.

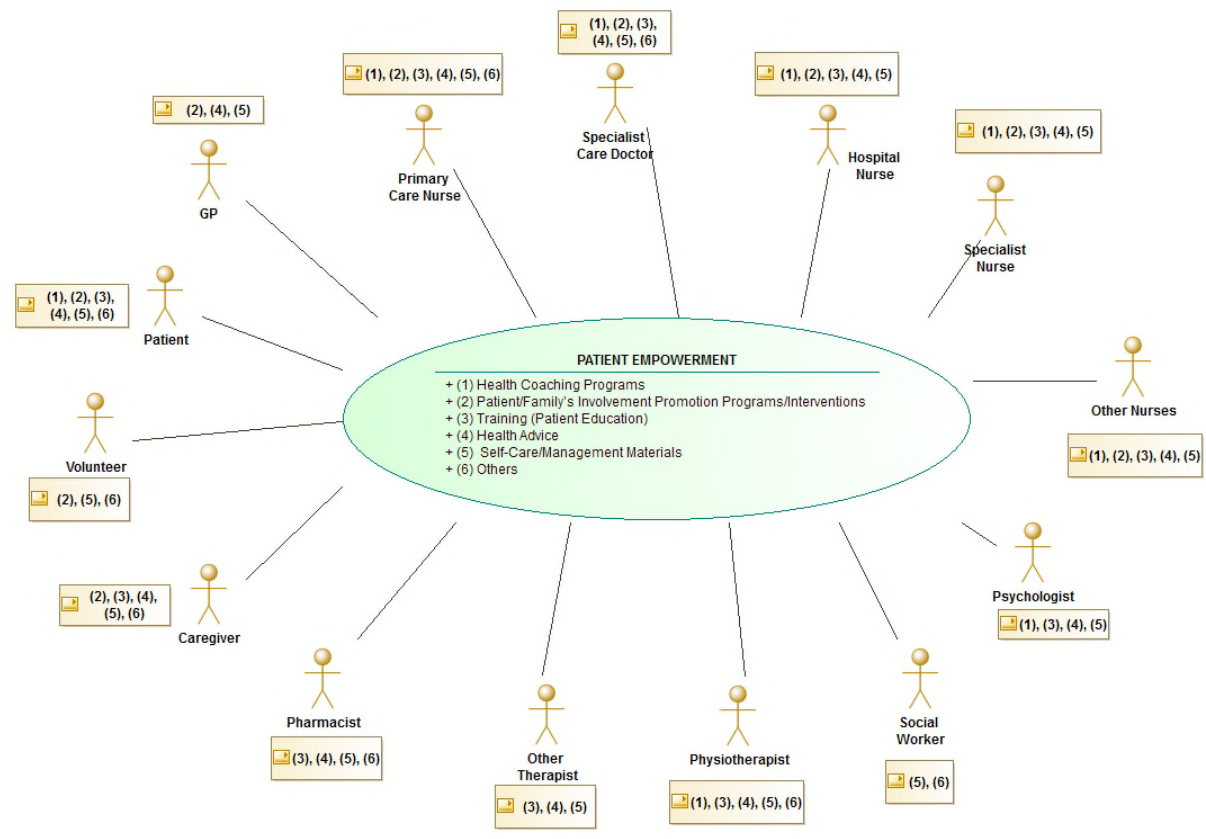
## vi. UCD – Monitoring and review



**Figure 29.** Use Case Diagram – Monitoring and review – SWFT

Most professionals are involved in monitoring and review activities. Nurses in primary care and in secondary care provide most of the routine monitoring- they will involve the specialist or GP as needed. Patients and caregivers actively participate. Information flows through many different channels, although it does not mean it is necessarily complete or timely.

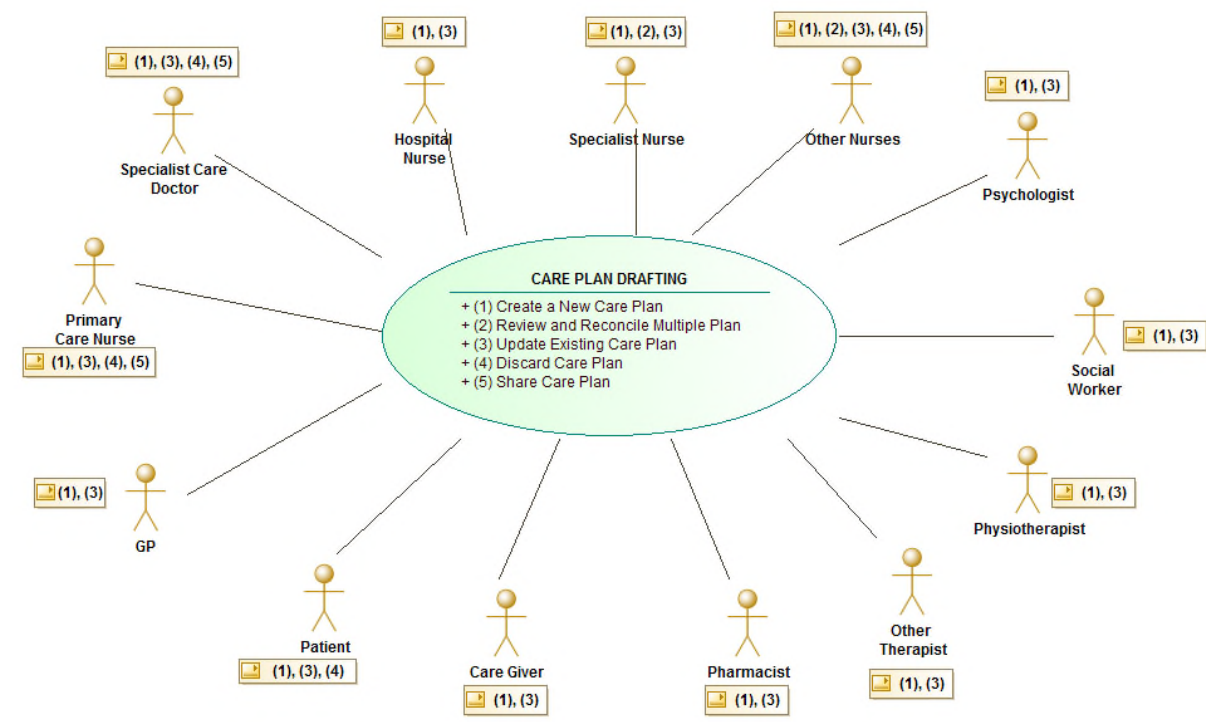
## vii. UCD – Patient Empowerment



**Figure 30.** Use Case Diagram – Patient Empowerment - SWFT

Most actors contribute to the patient empowerment. GP and Primary Care Nurses will support patients to become independent. The patient will be given easy access to the team electronically or by phone. Similarly, the secondary care system has equivalent systems. The patient's ability to quickly access advice may be variable. They have no access to secondary care records in South Warwickshire currently. They do have limited access to their information and results in the primary care record.

## viii. UCD – Care Plan Drafting



**Figure 31.** Use Case Diagram – Care Plan Drafting – SWFT

Many actors participate in producing the care plan. The involvement of Patient and Caregiver in this activity implies their participation as contributors to the care plan drafting (as defining their health concerns, setting the goals, marking the state of their activities, etc.). While the health and social professionals comprising the MDT are the responsible actors for the development and management of the care plan. Only the GP has access to all of the care plan information. Most participate in one or two tasks, e.g. the pharmacist reconciling drugs prescribed. Coordinating care plans that address specific needs is the task of the primary care team. They may need to reconcile several different components which may not all agree from a number of health care providers, e.g., the local council, specialist groups in secondary care of psychiatry. Patient and caregivers cannot adhere to the plans if communication is not efficient or effective. There may be many delays in communicating the results of each teams plan. The majority of the plans will require the gathering of the same information but some of this information may be out of date.

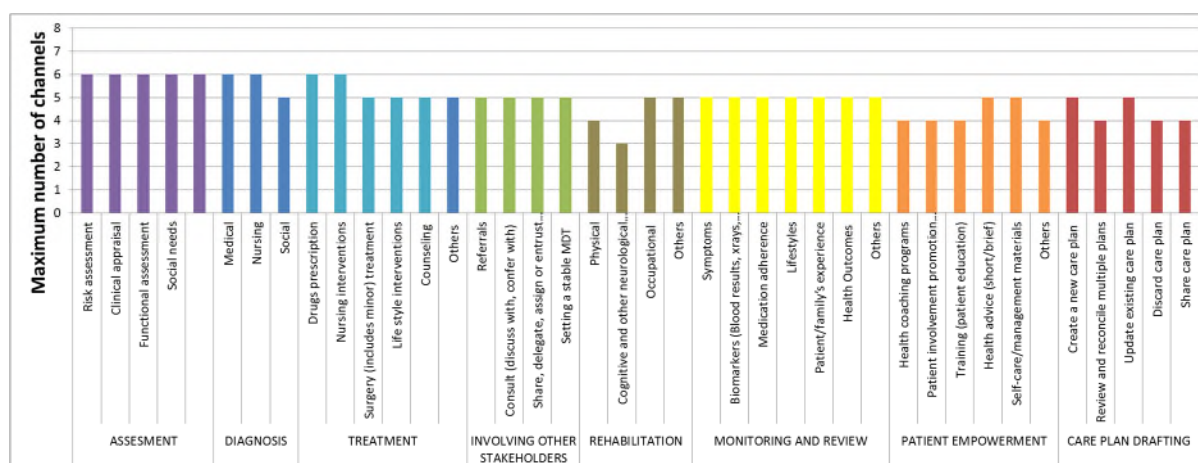
Activities and tasks performed by each Actor (one colour per each activity and related tasks)

		Patient	GP	Primary Care Nurse	Specialist Care doctor	Hospital Nurse	Specialist Nurse	Call center Nurse	Other Nurses	Psychologist	Social Worker	Physiothera pist	Other therapist	Pharmacist	Caregiver	Volunteer	Others
ASSESSMENT	Risk assessment																
	Clinical appraisal																
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	Social needs																
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	Biomarkers (Blood results, xrays, Vital signs, etc.)																
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	Health Outcomes																
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PATIENT EMPOWERMEN T	Health coaching programs																
	Patient involvement promotion programs																
	Training (patient education)																
	Health advice (short/brief)																
	Self-care/management materials																
	Others																
CARE PLAN DRAFTING	Create a new care plan																
	Review and reconcile multiple plans																
	Update existing care plan																
	Discard care plan																
	Share care plan																

Figure 32. Activities and tasks by actors in SWFT

Most health professionals are involved in all activities and tasks. Other professionals such as pharmacists, physiotherapist or social worker have a much more limited breadth of scope.

### Use of channels for each Activity (number of channels per task)



**Figure 33.** Use of channels per activity in SWFT

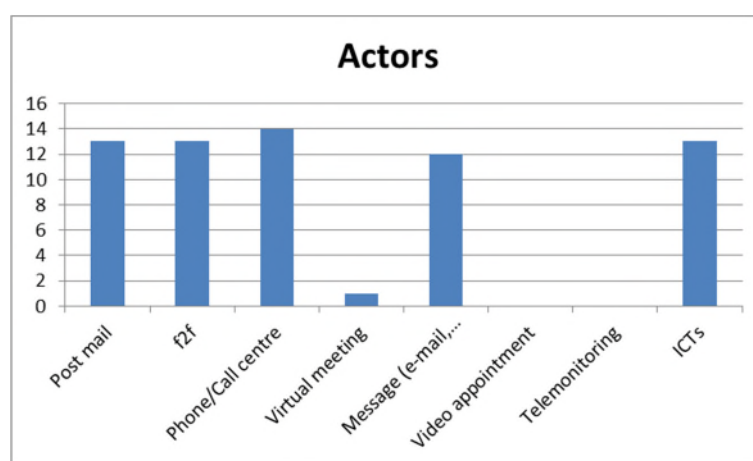
The number of channels used in the interpersonal communication for the different activities and tasks is homogenous (four). Only “referrals” uses a fifth one. Tasks that involve less actors use less channels (setting a MDT, physical or occupational rehabilitation, amongst others).

Electronic patient record systems are different in primary care and the hospital. Currently there is only rudimentary connectivity. There is some integration of community and hospital. The default communication is by standard letter. Letters still make up the bulk of communications. These are scanned as pdf into the electronic record. The process is cumbersome and slow. The opportunities for delays and lost communications substantial. Typically, most systems are operating on information, which is several weeks old. A number of these problems are inherent in the current organizational model. Contracts and payment may not allow radical change.

### Interpersonal communication channels

In SWFT, ICT tools include EHR and electronic

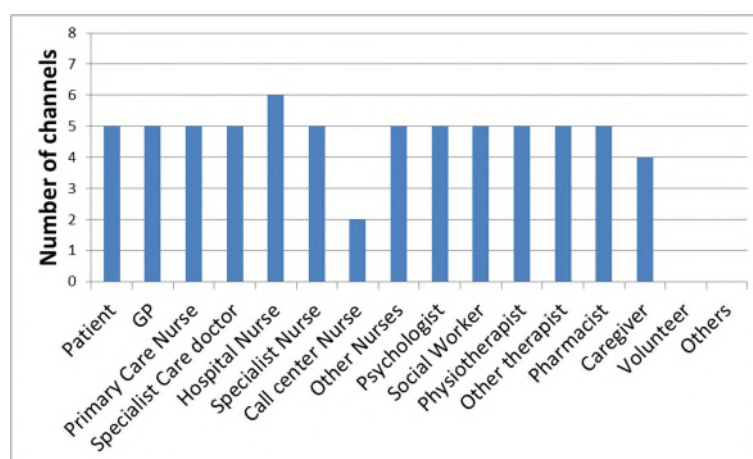
- i. Use of channels by Actors (number of Actors using each channel)



**Figure 34.** Use of channels by actors in SWFT

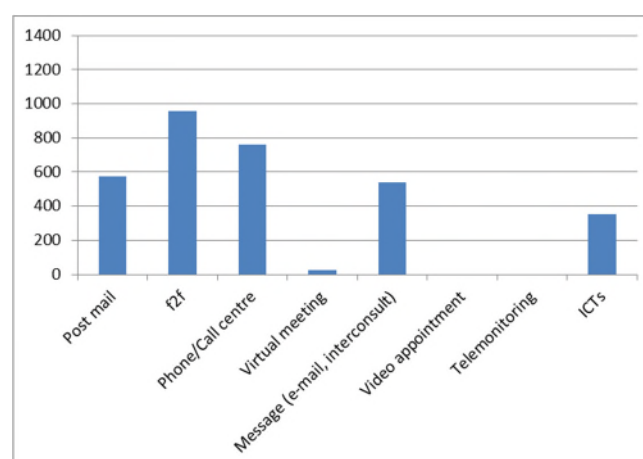
Face to face (F2F) and phone are the most common channels of communication. E-mail is also used and is replacing postal mail. There is concern in the NHS regarding the privacy of general email. Encrypted emails however are very cumbersome. There is still substantial duplication- postal/email. Text messaging is becoming more common to communicate directly with the patient. In primary care the electronic record is starting to be used to communicate directly with the patient – e.g., to update drugs or communicate results.

ii. Number of different communication channels used by each Actor



**Figure 35.** Number of channels per actor in SWFT

iii. Use of different channels (number of interrelations using the channel)



**Figure 36.** Use of channels in SWFT

In the UK, Face to face, postal/email and telephone are the main interpersonal communication channels. The EHR is used only in primary care currently.



### Use of channels by each Actor (percentage of interrelations using each channel)







**Figure 37.** Use of channels by each actor (%) in SWFT

F2F, phone, messaging and email are the most widely used channels by health professionals. Volunteers and Patients rely on F2F and Phone communications and traditional mail. In the UK, volunteers communicate directly with the patient. There may be limited communication with hospital and primary care e.g. the need for a car to take a person to hospital. Their observations of patients may be communicated to the patient directly.

### 5.2.7. Summary

Communication systems are in place; they rely on traditional paper systems for accessing diagnostics and the communication of different actors opinions and advice on a patient. The patients' participation is as a passive recipient. The primary care team take the lead in coordinating the output from these systems. There is patchy use of modern communications; these are mainly internal systems in each organization. EMIS in an individual practice for example. This will allow common standards between practices and commonality of function but these systems generate an electronic output, which is often turned to a paper communication to then send on to another part of the system, e.g., a request for an opinion from a hospital specialist. The return communication has some electronic components and the output is a digital letter, which is often printed and sent as a pdf or an attachment to be printed and

loaded in to the primary care electronic record. There is no accepted hierarchy of communication method; other than the letter being the primary modality. The use of email is increasing, as is the use of text messages to patients. Each part of the system has adopted some EPR systems and the intention is increasing integration. Most MDT have to occur face to face and their output communicated by paper systems with some integration of electronic systems. There is more use of technology to facilitate separate assessments, which can be integrated in the electronic record. This is variable currently but improving.

The communications between different parts of the system are appropriate but contain substantial delays and are inefficient. There are large parts of the care system, which have no visibility to other except by paper communication.

The current system is complex and appears complete but is inefficient and information is often incomplete. The many traditional systems are often relying on out of date information and duplicate many tasks. They deal with different aspects of patient care largely independently, relying on primary care to decide between plans that may contradict each other. There are multiple communications systems as there is no single health record. Much effort goes into integrating and reconciling advice from different actors. The ability to empower the patient to care for themselves and monitor their condition is limited by access to their information supported by rapid communication and support from the various medical teams.

### **5.3. Basque Country**

#### ***5.3.1. Principal characteristics of the health care systems:***

Basque Autonomous Community - Euskadi is configured by three constituent provinces. The Ministry for Health controls policy planning, financing and contracting of health services, the Ministry for Employment and Social Affairs defines the social policies, whilst the contracting of social services is done by the Provincial Councils and municipalities. The Public Basque Health System is a Beveridge kind system working to improve the health status of the population. It is funded by taxes, and healthcare professionals are public employees. It governs and funds the public Healthcare provider (Servicio Vasco de Salud - Osakidetza) and other organizations in charge of biomedical research and innovation. All the public hospitals and primary care centers of the Basque Region are under this governmental organisation.

#### ***5.3.2. Target groups of integrated care***

Osakidetza has a target population of 2.17 million inhabitants, where in 2015 more than 20% of the total population was 65 or older. 100% of Basque population has been stratified since 2010. The aim of stratifying by use of healthcare resources allows identifying and selecting target populations that may benefit from specific programs of action. Consequently, four Poblational Integrated Intervention Programmes have been deployed: Multimorbid, COPD, Heart failure and Diabetics programs. According to data from 2015-2016 stratification, the 5% of the population with the highest Predictive Index includes 65.669 people.

#### ***5.3.3. Integrated care providers and services***

It includes various care sectors, providers, and provincial or local authorities. Osakidetza includes 320 primary care centres, 14 acute hospitals (4,278 beds), 4 sub-acute hospitals, 4 psychiatric hospitals and 2 contracted long term mental hospitals. In this moment these organizations are transforming into

12 Integrated Care Organizations with a unique management team. There are 1,808 GPs, 6,743 specialists, 3,209 Primary care nurses and 8,099 hospital nurses. Activity indicators (2015) are: 15053861 primary care and 4,199,534 specialized care consultations, 253,579 hospital admissions, and 118,049 surgical interventions per year.

Integrasarea is a Collaborative Network in which different Osakidetza integrated care organizations (OSI) and an external support network take part. Integrasarea project facilitates exploring, conceptualising, identifying, proposing and scaling good practices amongst health professionals and other stakeholders.

ICP has demonstrated capability to scale at large. Population risk stratification has been updated. 100% of primary care and hospital structures have merged in Integrated Care Organizations (OSIs) and integrated pathways for chronic diseases in all of them, liaison nurses and case managers and active patient activities have been implemented.

The Plan is evaluated yearly with IEMAC and D'amour tools. It provides evidence of added-value and benefits. In the Basque Country a new assessment framework has been implemented to evaluate the Integrated Care Organizations. They include three dimensions organisation performance, design and planning of services and top down/bottom up.

Organisation performance includes Security, Effectiveness, Equity, Centred patient care, Accessibility and waiting lists and Efficiency. Design and Planning of Services includes Resources, Services and Integrated care. Out of the 24 points, 16 are allocated to Integrated care performance. Top Down/Bottom Up includes development of innovation projects.

The Integrated care sub-dimensions are evaluated taken into account actions that favour a population approach in the context of integrated social and health care, deployment of elements that facilitate greater integration between care levels in the Integrated Care Organisations (OSIs), elements that enable the sustainability of the system and initiatives to improve patient health outcomes.

### **5.3.4. Coordination mechanisms**

ICP, is a model with a population focus based on preventive interventions, patient empowerment and personalized medical care, with an increasing emphasis in continuity of care, security, adherence and improving patient experience. It searches efficiencies locally, avoiding duplications and innovating in service delivery. It has been designed involving different stakeholders. The main elements are:

- Creating Integrated Care Organizations including primary care and hospitals with joint governance with a defined population catchment area.
- Integrated communication systems.
- Risk stratification and care plans based on needs for complex patients.
- New nursing figures such as liaison nurse and case manager.
- Patient empowerment and self-management.
- Social and Health coordination.
- Integrated Intervention Plans for population groups, with clinical pathways for Multimorbidity, Diabetes Mellitus, Heart Failure and COPD.

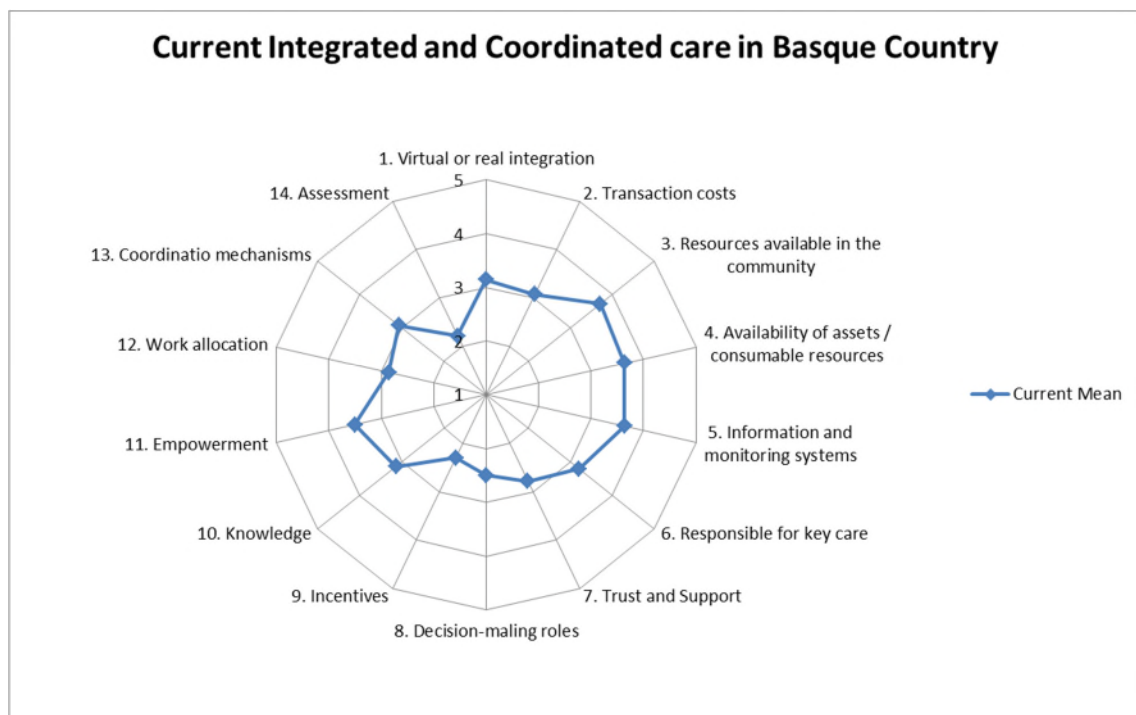
In the current organizational model for multi-morbid elderly, Primary Care professionals (GP and GP nurse) are principally responsible for a patient's case management, therapeutic/care plan definition, drug prescription, patient training, home visits and follow-up when the patient is stable. Promoting and inhibiting factors at the system and policy level (including finance), and the level of care provision.

Excel sheet results and assessment of care coordination. While the communication between healthcare professionals and patient is mainly via traditional channels (f2f, phone), GP and Primary Care Nurse can communicate and share information through the EHR and the electronic prescription.

Additionally, healthcare professionals can exchange patient related documentation by meeting on a periodic-basis, phone or a social EHR.

### 5.3.5. *Promoting and inhibiting factors at the system and policy level*

Promoting and inhibitor factors at system level have different values. There are many opportunities for improvement. Resources available in the community, availability of assets, information clinical systems and patient empowerment are the most valued. Professional assessment, structure of incentives, decision-making roles, virtual integration and transaction costs are the domains less mature for integrated care.



**Figure 38.** Current Integrated and Coordinated care in Basque Country

### 5.3.6. Care coordination actors, activities and interpersonal communication

The analysis of the Care Coordination Profiles Questionnaire data provides a detailed picture of care coordination actors, roles and channels in the Basque Country.

#### Actors, activities and settings

This diagram shows the **actors** (modelled as “Classes” in UML language) involved in the current organizational model and the activity that they carry out, distributed by **settings** (modelled as “Abstract Classes” in UML language). The relationship between the actors is shown by means of the link with the setting. The four settings are connected, confirming in turn the linkage/interaction between actors related to different settings.

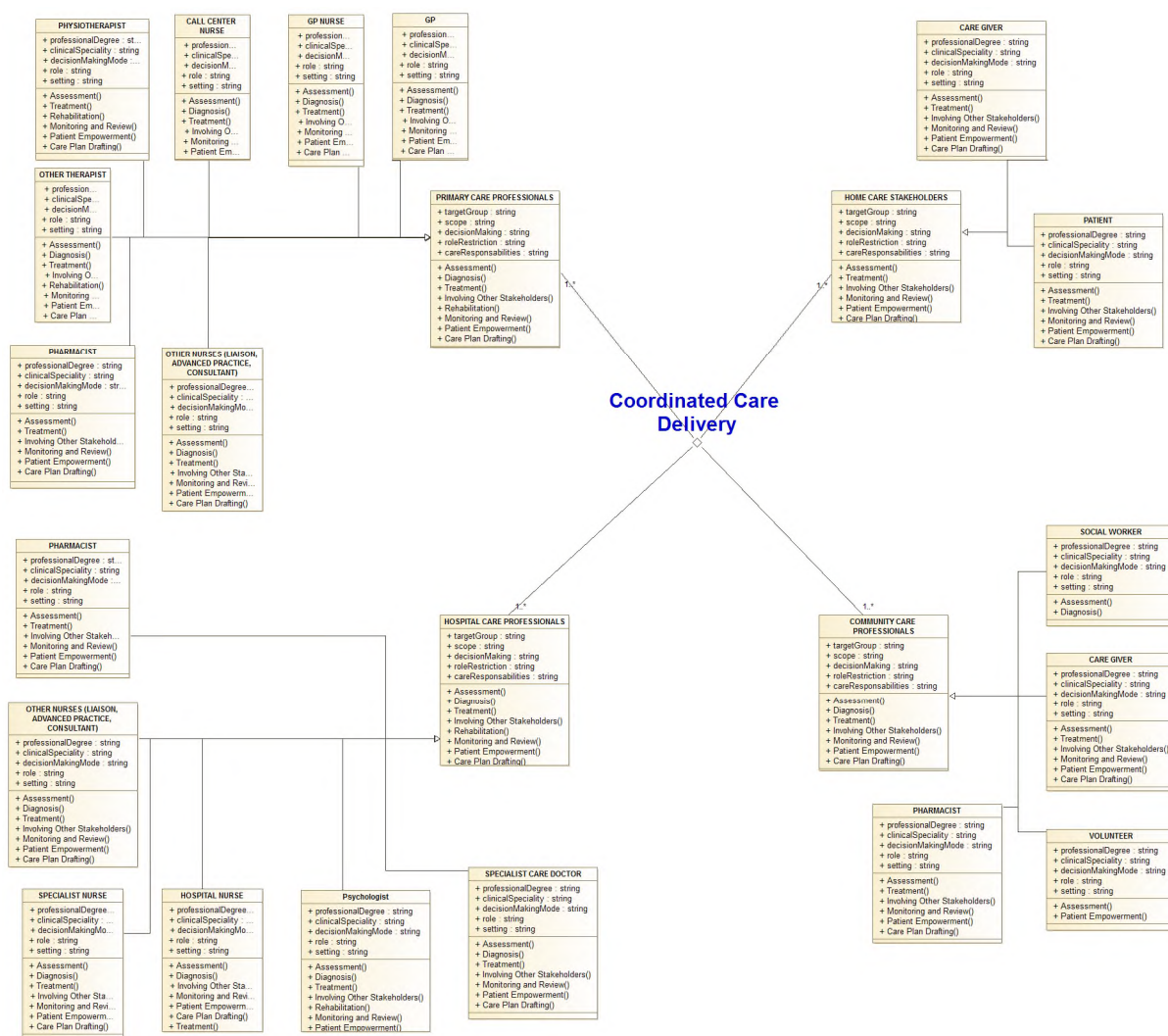


Figure 39. Actors, activities and settings diagram in Basque Country

Actors depicted in the above diagram represent those most often involved in Coordinated Care for multimorbid patients as defined in C3-CLOUD. They are placed in four settings: primary care, hospital care, community and home. In Primary care, work GP, Primary Care Nurse and other nurses,

physiotherapists and other therapists and pharmacists. Hospital or secondary care includes medical specialists, hospital, specialists and other nurses, psychologist and pharmacist. Community Care includes those actors involved in the care of patients but not directly linked with the Health System, the private pharmacist, the social worker, volunteers and caregivers. The home setting includes the patients themselves and the caregivers. Each of those actors are related in different degrees and perform different activities (and tasks within them) related to the Care Plan. Mental Health professionals are included into the Mental Health network provide community mental health services.

### Personal intercommunication

(dark green= bidirectional, light green=unidirectional (read vertical axis actor with horizontal axis actor), whit= no communication)

	Patient	GP	GP Nurse	Secondary Care	Hospital Nurse	Specialist Nurse	Call center Nurse	Other Nurses	Psychologist	Social Worker	Physiotherapist	Other therapist	Pharmacist	Caregiver	Volunteer	Others
Patient	Dark Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
GP	Light Green	Dark Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
GP Nurse	Light Green	Light Green	Dark Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Secondary Care	Light Green	Light Green	Light Green	Dark Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Hospital Nurse	Light Green	Light Green	Light Green	Light Green	Dark Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Specialist Nurse	Light Green	Light Green	Light Green	Light Green	Light Green	Dark Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Call center Nurse	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Dark Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Other Nurses	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Dark Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Psychologist	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Dark Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Social Worker	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Dark Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Physiotherapist	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Dark Green	Light Green	Light Green	Light Green	Light Green	Light Green
Other therapist	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Dark Green	Light Green	Light Green	Light Green	Light Green
Pharmacist	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Dark Green	Light Green	Light Green	Light Green
Caregiver	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Dark Green	Light Green	Light Green
Volunteer	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Dark Green	Light Green
Others	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Dark Green

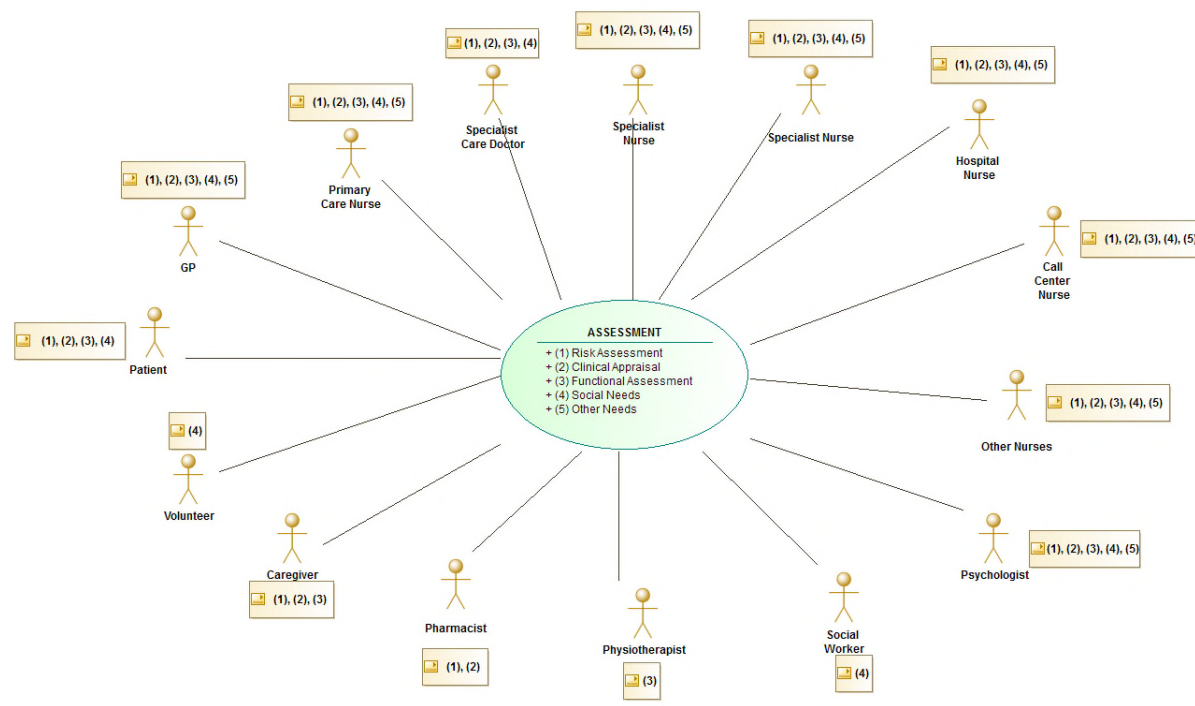
**Figure 40.** Personnel intercommunication matrix in Basque Country

The figure outlines the more prevalent intercommunication paths, though other than listed occasionally occur. Unilateral communication means that one professional contacts other to perform a specific task, but the reverse does not happen. This is the case for a caregiver consulting the hospital nurse or the call centre nurse contacting the GP, but not the other way round. Professionals, patients and caregivers have multiple interpersonal communications. The patients, GP and Primary Care Nurse are the ones that have more bilateral connections performing their activities and tasks.

Actors involved in the different activities:

Use case Diagrams (UCD) show for each activity, the actors involved in each of them and the specific tasks they carry out. This is shown by a number, assigned to each tasks, in an information box next to each actor.

## i. UCD – Assessment:

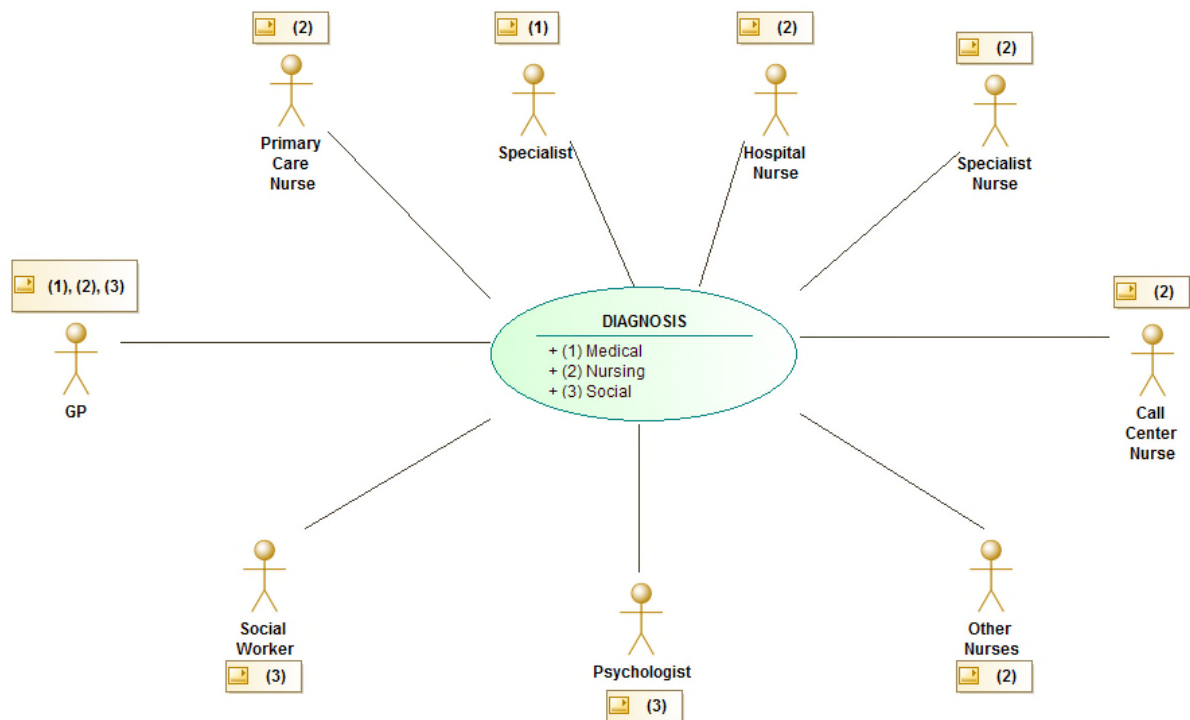


**Figure 41.** Use Case Diagram – Assessment - Basque Country

Most actors take an active role in assessment of the patient's situation. Hospital and Primary Care health professionals perform different tasks when assessing patients (Risk assessment, clinical appraisal, functional assessment, social needs and others). This does not mean that they share their results. The communication of the assessments, especially to other care organizations is a big challenge. Other actors are just involved in one or two tasks.

## ii. UCD – Diagnosis:



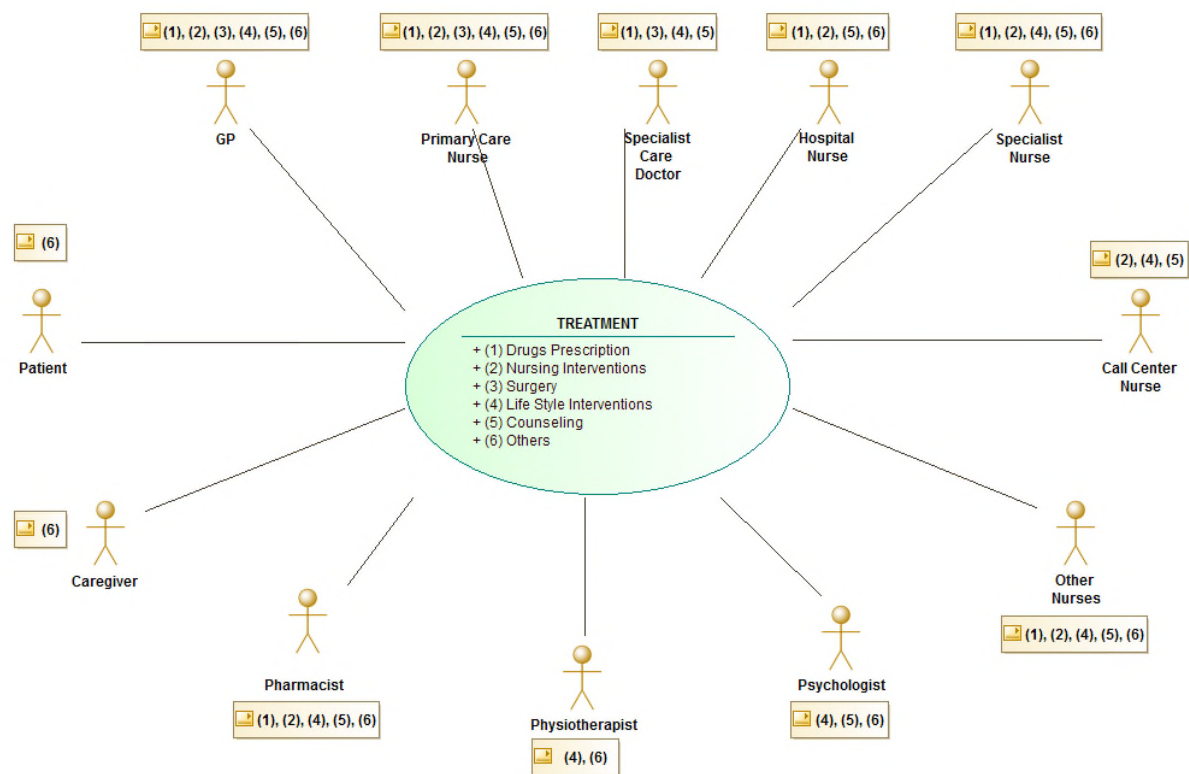


**Figure 42.** Use Case Diagram – Diagnosis - Basque Country

The spectrum and number of diagnosis varies between professions. This is based on knowledge but also on certification and legal aspects. Unlike assessment, only nine actors participate in diagnostic activities. The GP is the one that has the wider scope in diagnosis task, taking into account medical, nursing and social information.

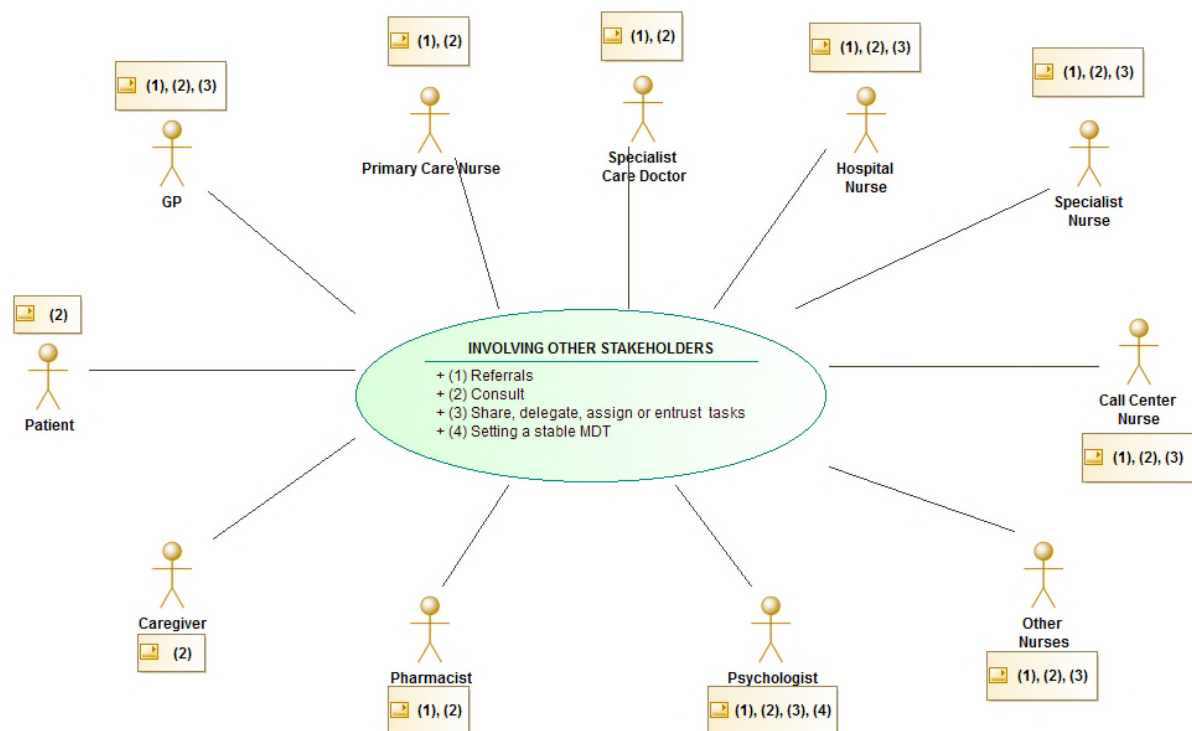


## iii. UCD – Treatment:

**Figure 43.** Use Case Diagram – Treatment - Basque Country

Physicians (GP and Specialist) are the only ones authorized to prescribe drugs. However, several other professionals (nurses, pharmacists) are involved in the process of drug treatment, dispensing, counselling or enhancing adherence. Most of them are involved in lifestyle and counselling interventions. Surgery is just performed by GPs and Primary Care Nurses (minor surgery) and Medical Specialists (surgeons).

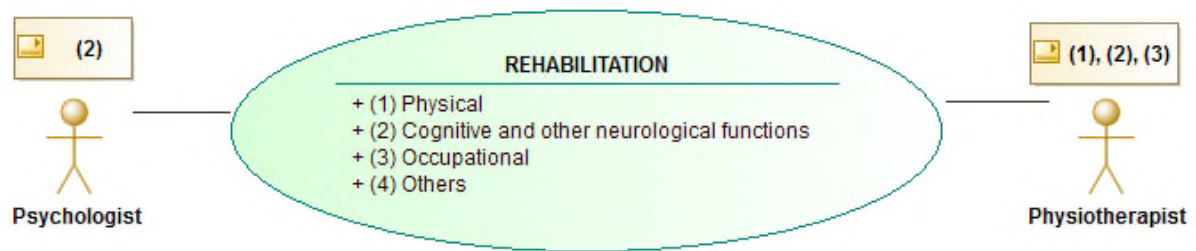
## iv. UCD – Involving other stakeholders



**Figure 44.** Use Case Diagram – Involving other stakeholders - Basque Country

Most health professionals have the option of referring a patient to another professional. They transfer patient information but also decision-making power on some aspects of care, at least for some time. Professionals, patients, and caregivers use channels for consultation without referring the patient. The GP and the nurses seem to work more on team, sharing, delegating or assigning specific tasks. Nobody, except the Psychologist, performs the task “setting a stable MDT”.

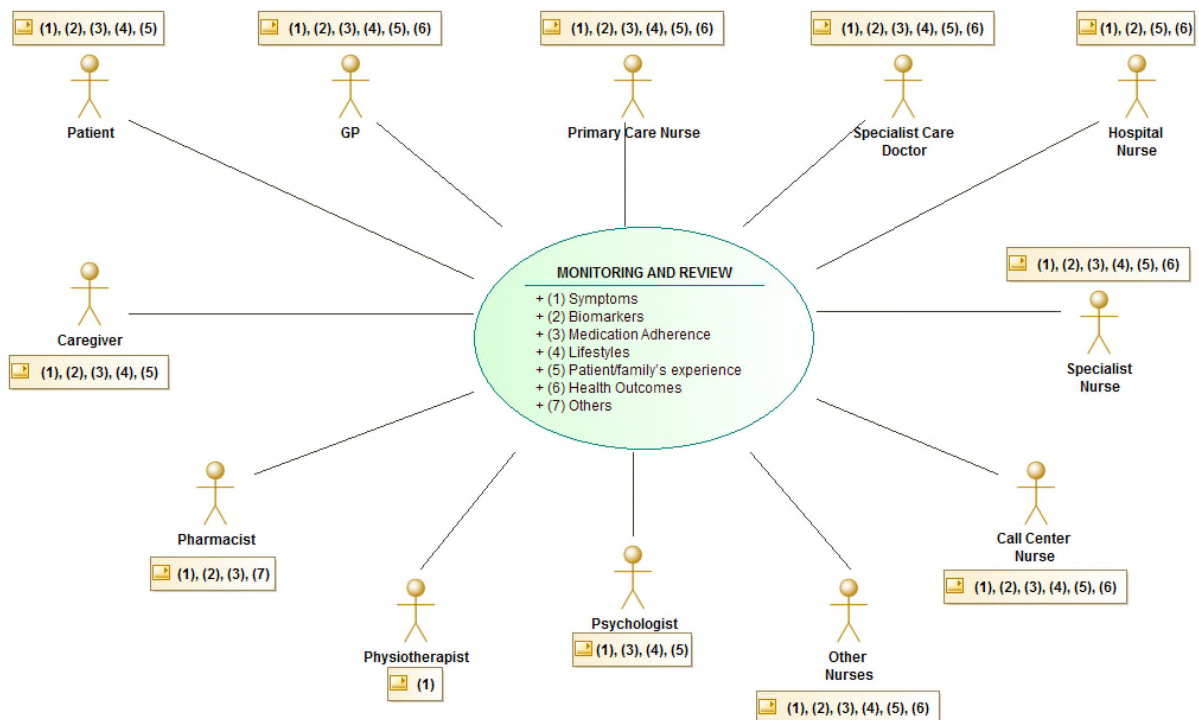
## v. UCD – Rehabilitation



**Figure 45.** Use Case Diagram – Rehabilitation - Basque Country

There are only two professionals involved in rehabilitation Activities, the Psychologist and the Physiotherapist. As can be seen in the communication matrix above, no communication exists between them. When mental health problems are diagnosed, psychiatrists and other professionals may be involved in the patient care.

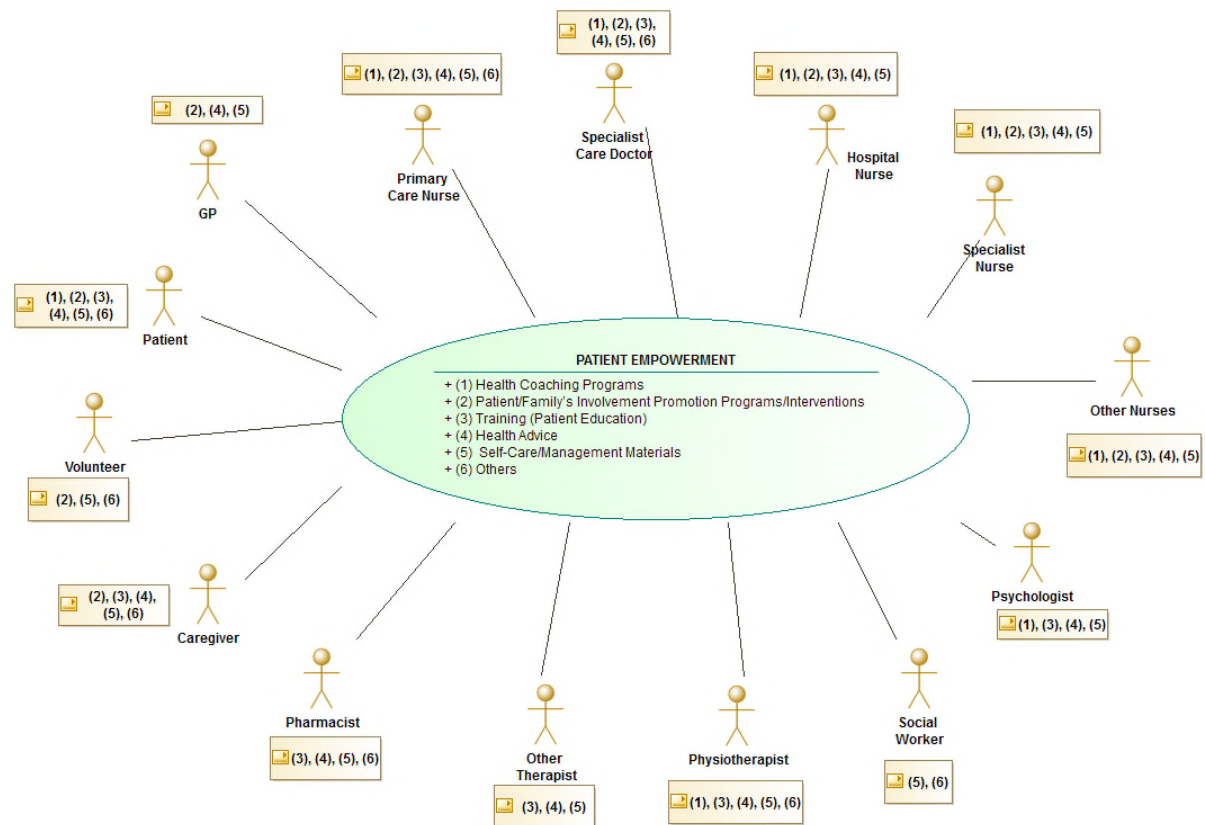
## vi. UCD – Monitoring and review



**Figure 46.** Use Case Diagram – Monitoring and review – Basque Country

Most professionals are involved in monitoring and review activities. Call Centre nurses have access to the Patient EHR data if required. Patients and caregivers do actively participate. Information flows through many different channels, although it does not mean it is necessarily complete or timely.

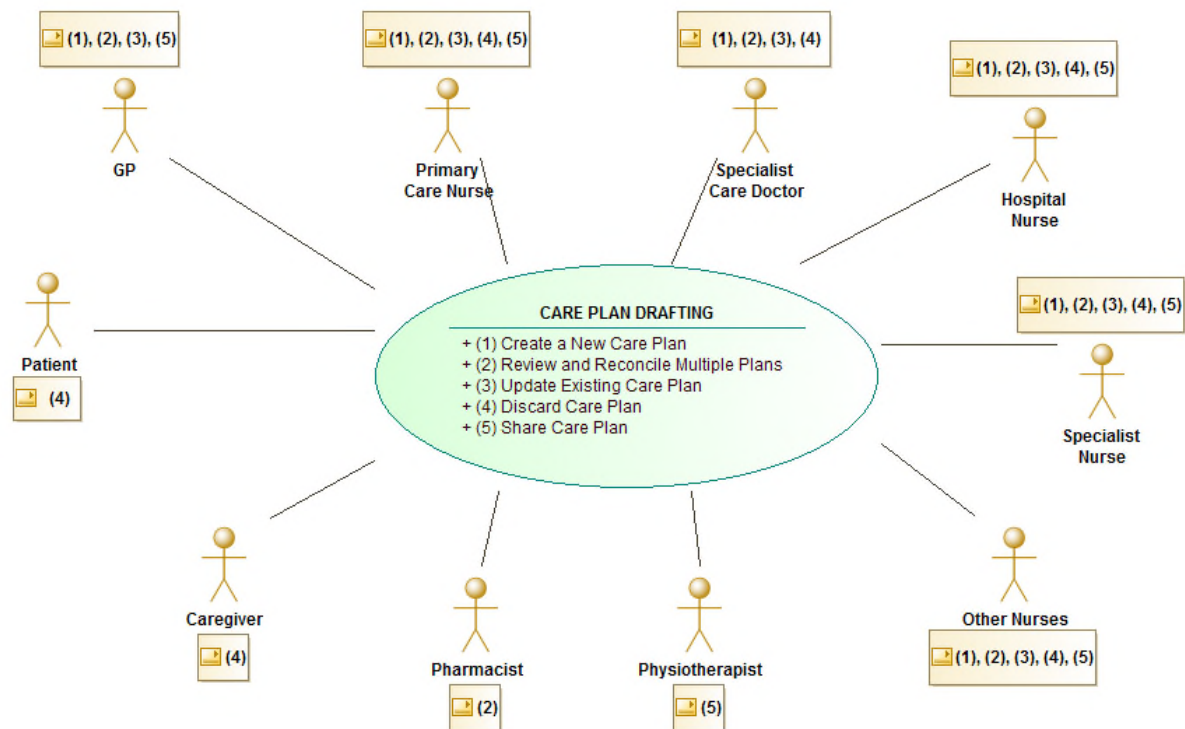
## vii. UCD – Patient Empowerment



**Figure 47.** Use Case Diagram – Patient Empowerment - Basque Country

Most partners contribute in different ways to the patient's empowerment. GP and Primary Care Nurse perform coaching activities. Nurses are more involved in training, family involvement or developing self-management skills. All of them, including the specialists provide health advice.

## viii. UCD – Care Plan Drafting



**Figure 48.** Use Case Diagram – Care Plan Drafting – Basque Country

Six actors participate in care plans drafting (create, review and reconcile, update or discard). Others only participate in one or two tasks, as the pharmacist reconciling drugs prescribed. Patient and caregivers can discard the plans, not adhering to it. As in previous activities, performing this activity does not mean that they share or agree other partner's decision-making process and results.

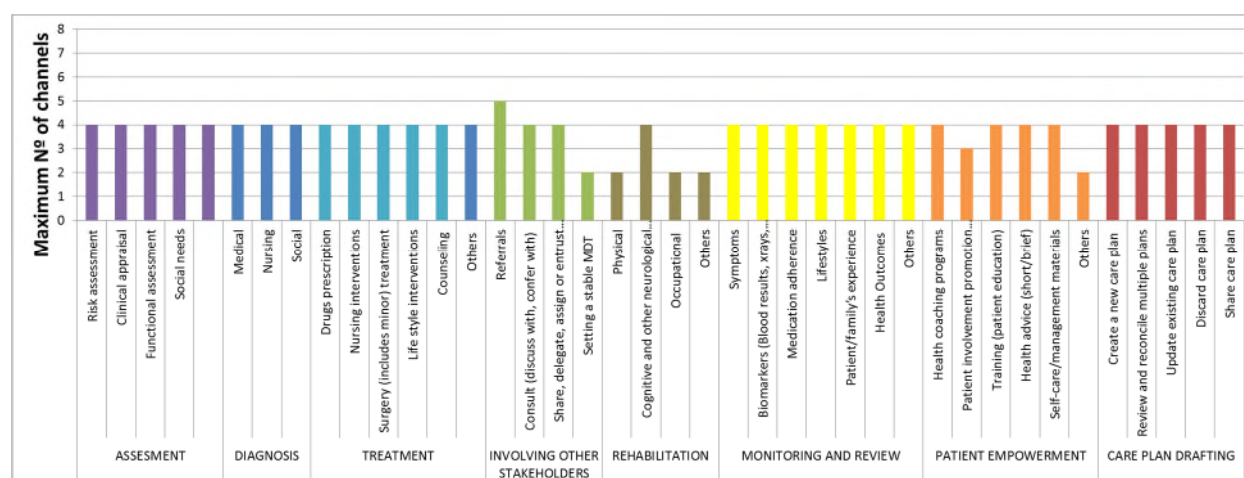
Activities and tasks performed by each Actor (one colour per each activity and related tasks)

		Patient	GP	GP Nurse	Secondary Care	Hospital Nurse	Specialist Nurse	Call center Nurse	Other Nurses	Psychologist	Social Worker	Physiotherapist	Other therapist	Pharmacist	Caregiver	Volunteer	Others
ASSESSMENT	Risk assessment																
	Clinical appraisal																
	Functional assessment																
	Social needs																
	Other needs (emotional, spiritual, etc.)																
DIAGNOSIS	Medical																
	Nursing																
	Social																
TREATMENT	Drugs prescription																
	Nursing interventions																
	Surgery (includes minor) treatment																
	Life style interventions																
	Counseling																
	Others																
INVOLVING OTHER STAKEHOLDERS	Referrals																
	Consult (discuss with, confer with)																
	Share, delegate, assign or entrust tasks																
	Setting a stable MDT																
REHABILITATION	Physical																
	Cognitive and other neurological functions																
	Occupational																
	Others																
MONITORING AND REVIEW	Symptoms																
	Biomarkers (Blood results, xrays, Vital signs, etc.)																
	Medication adherence																
	Lifestyles																
	Patient/family's experience																
	Health Outcomes																
PATIENT EMPOWERMENT	Others																
	Health coaching programs																
	Patient involvement promotion programs																
	Training (patient education)																
	Health advice (short/brief)																
	Self-care/management materials																
CARE PLAN DRAFTING	Others																
	Create a new care plan																
	Review and reconcile multiple plans																
	Update existing care plan																
	Discard care plan																
	Share care plan																

**Figure 49.** Activities and tasks by actors in Basque Country

The figure depicts the more prevalent activities for different actors, though other than listed occasionally occurs. It provides similar information as the previous use case diagrams but organized in a way in which each actor role can be seen in a glance. Most health professionals are involved in all activities and tasks. Call Center nurses and Psychologists are not involved in Care Plan Drafting and its tasks. Other professionals such as pharmacists, physiotherapist or social worker have a much more limited breadth of scope.

### Use of channels for each Activity (number of channels per task)



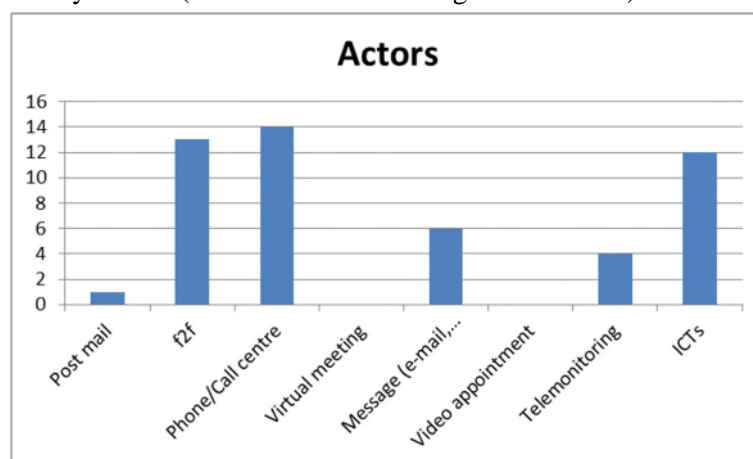
**Figure 50.** Use of channels per activity in Basque Country

The number of channels used in the interpersonal communication for the different activities and tasks is homogenous (four). Only “referrals” uses a fifth one. Tasks that involve less actors use less channels (setting a MDT, physical or occupational rehabilitation, amongst others).

### Interpersonal communication channels

In Basque Country ICT tools includes Osabide, OSANAIA, Presbide and Personal Health Folder

#### i. Use of channels by Actors (number of Actors using each channel)

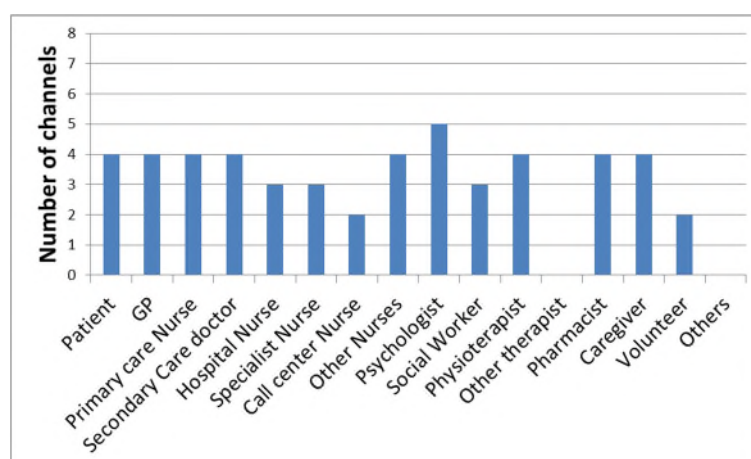


**Figure 51.** Use of channels by actors in Basque Country

Face to face and phone are the most common channels of communication. Postal mail is seldom used. Digital tools such as the Electronic Health Record and other IT tools are already a significant channel, mostly amongst health professionals. Virtual meetings or video appointments are seldom used.

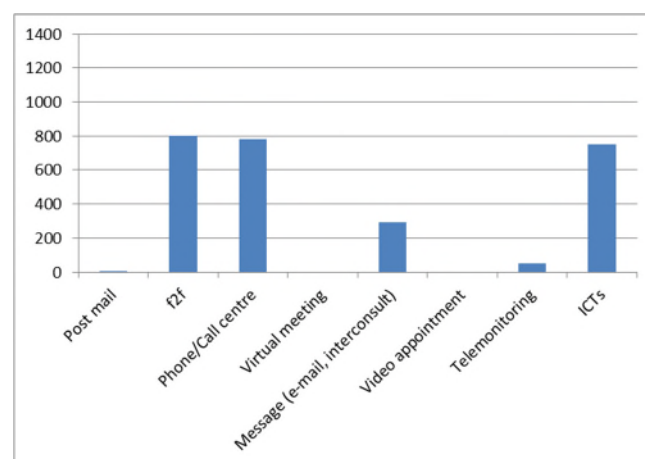


ii. Number of different communication channels used by each Actor



**Figure 52.** Number of channels per actor in Basque Country

iii. Use of different channels (number of interrelations using the channel)

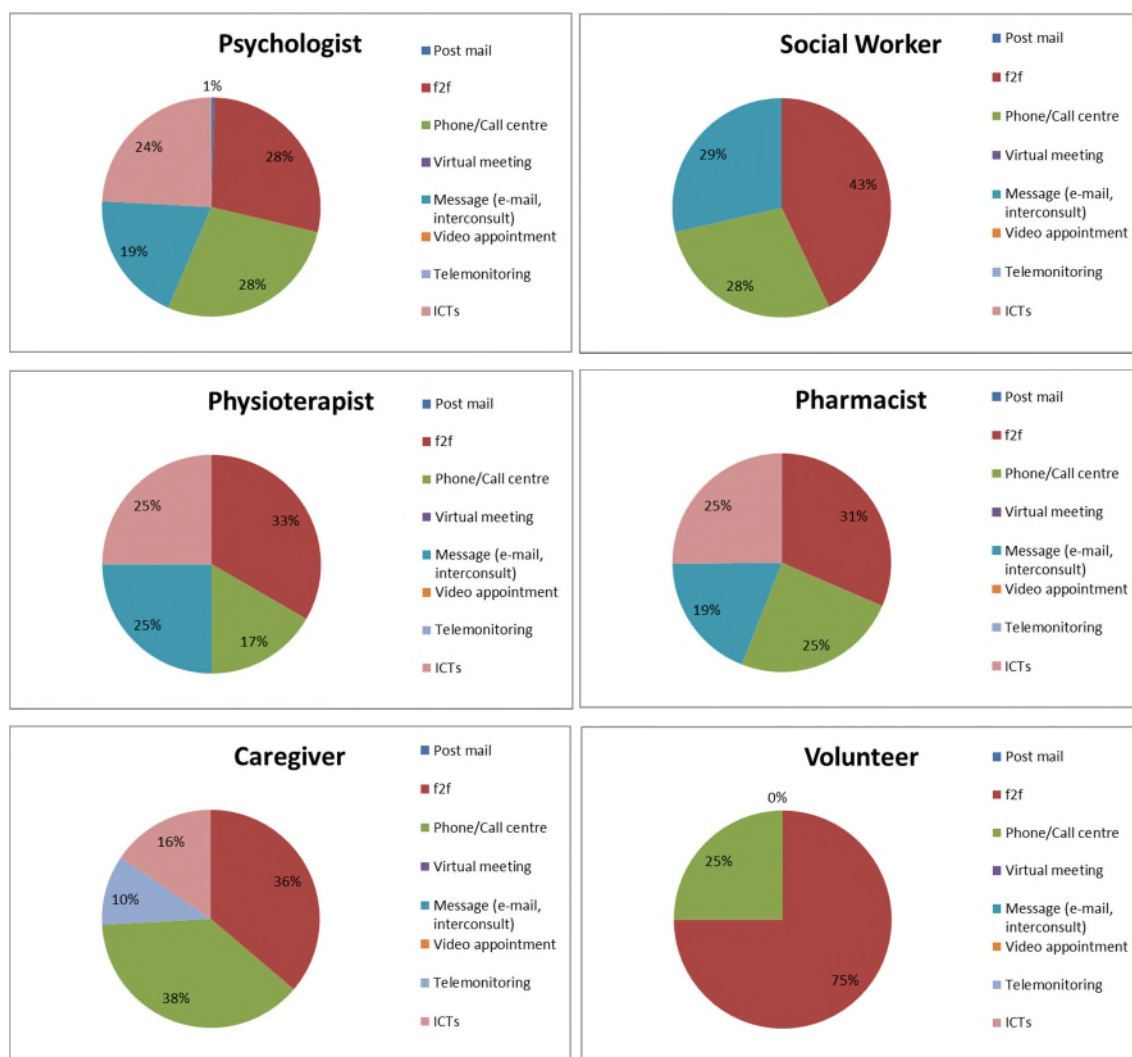


**Figure 53.** Use of channels in Basque Country

The total number of interpersonal communications (between actors for all activities and tasks) follows the same pattern as in the previous figure. Mail is seldom used. F2F, phone and the EHR are the most used ones.

Use of channels by each Actor (percentage of interrelations using each channel)





**Figure 54.** Use of channels by each actor (%) in Basque Country

Graphs related to “Other therapist” and “Others” are not shown, as no information about the channels they use is available.

F2F, phone, messaging and EHR are the most widely used channels by health professionals (GP, Specialist and Primary Care Nurse). Hospital and specialist nurses use F2f and EHR, but not so much the phone, whereas the Call Centre Nurse relies mostly on this latter channel. Volunteers and Patients rely on F2F and Phone communications, although Patients use messaging and IT altogether in 20% of their intercommunications.

### 5.3.7. Summary

#### Comments:

In Basque Country, most of the communication between care partners takes place through 3 communication paths: face-to-face, phone calls and ICT tools. ICT tools are widely used among all the stakeholders. Osakidetza has developed processes and tools to promote integrated care Integrated governance bodies between primary care regions and hospital, creating Integrated Care Organizations (OSI), with the support of the deployment of integrated communication systems: Electronic Health Record (EHR), e-prescription, intranets and other communication mechanisms. 100% of Osakidetza centres (including hospitals and primary care centres) have deployed the Unified Electronic Health Record (called Osabide) and the e-Prescription system all over the Basque Country. Due to Osabide, all health care professionals can access the EHR of any patient, facilitating service delivery and enabling the provision of new forms of healthcare. However, a better coordination and communication of health and social care sectors is required. They do communicate directly using traditional channels as face-to-face and phone calls mainly, as Osabide is used by health care professionals.

In Basque Country the four care settings (Primary, Hospital, Community and Home care) include professionals generally well communicated. Moreover, patients and caregivers from home, can contact and ask question directly to their GP, upload tests and access their EHR by means of the Personal Health Folder (PHF), the Regional Patient Empowerment tool in Basque Country.

## 5.4. Final summary and conclusions

The analysis done has been done from a Healthcare services perspective. It has been completed analysing some functions relevant to multimorbid patients care in which social workers and community services participate. The emphasis has been put on organizational dimensions relevant to integrated care and care coordination. The aim has been to identify key issues and improvement areas that have to be taken into account when preparing and deploying C3-CLOUD Proof of Concept Prototypes in the three Pilot Sites.

The three systems have broadly similar characteristics. They are based on Beveridge type systems, publicly funded, mostly by taxes.<sup>134</sup> Tertiary care is delivered at University Hospitals and they have strong Primary Care services with General Practitioners as “gatekeepers”<sup>135</sup> and Primary Care Nurses. They have a high percentage of over 65 populations, with a higher geographical dispersion in RJH.

Subnational organizations are responsible for most of Healthcare in the three Pilot Sites (County Council in RJH, Trust in SWFT and Region in Basque Country). Local authorities, mainly, run community and social services. Efforts to increase coordination have been developing for several years already.

The analysis of the care coordination topics (based on the System Factors and Care Coordination Profiles questionnaires) has been done with information collected from key informants. Key Informants are professionals in each region with a good knowledge and working experience in the system and who will have a key role in C3-CLOUD implementation and deployment in each Region. The results do not try to be statistically representative of the overall opinion of health professional in the Regions. A comparison between regions scores is not possible. The methodology has been designed to facilitate a self-assessment process, aimed to identify perceived barriers and opportunities to deploy the C3-CLOUD Proof of Concept Prototypes in each Region. The information has to be read and interpreted as perceived areas of improvement and strengths in each Region, and not as a benchmarking exercise. It has to be used to draw each region “change management” plan. It is interesting to see, however, that the profile of perceived promoting and inhibitor factors for integrated care at system level is different. Perception on factors varies in the three regions, being RJH the one scoring lower. The highest score are transaction costs, trust and support and coordination mechanisms in SWFT. Work allocation schemes seem to be an area of improvement in the three regions. Availability of assets and resources and information and monitoring systems are not perceived as barriers in any of the three regions. Incentives are not a problem in RJH but are perceived as an improvement area in SWFT and Basque Country. Transaction costs, trust and support and professionals evaluation, on the contrary are perceived as a problem in RJH and the Basque Country, and not in SWFT. Patient empowerment is marked as an area of improvement in RJH.

All three Pilot sites have the care organized based on actors coordinated in four settings (Primary Care, Hospital, Community and Home care). Patients are connected with most actors. The level of communication amongst professionals varies. General Practitioners and Primary Care Nurses are the ones that have more channels open with other professionals, when caring for multimorbid patients. Hospital Specialists are quite connected too. Nurses in SWFT seem to have more connections than in the other Sites. The main difference between regions is the role the Call Center Nurse plays in communication. It seldom plays any in RJH and SWFT whereas it is a key player in the Basque Country. Differences between unilateral or bilateral communication also exist. Unilateral communication means that one professional contacts other to perform a specific task, but the reverse does not happen.

Actors perform and are involved in quite similar activities in the three sites. They are involved in patient assessment, diagnosis, treatment, involving other stakeholders in care, rehabilitation, monitoring and patient follow up, patient empowerment and care plan drafting. There are some variations though. The activities in which more actors participate in the three sites are “Assessment”, “Treatment”, Monitoring, and review, around 14 to 15 different profiles, including health and non-professionals, patients and caregivers. “Diagnosis” and “Care plan drafting” involve a reduced number of actors, mostly health professionals and social workers.

Tasks are related with the professional profile. So for example, “Treatment” tasks such as “drug prescription”, Nursing interventions” or “surgery” are limited to those actor certified to do so. Distribution of “diagnosis” tasks by professional profile is more clearly seen in the Basque Country. It is GPs, Primary Care Nurses and Hospital specialist doctors who are involved in more tasks. Social Workers, the least, in the three sites. There is no big difference between the three Sites, but some variations exist in actors involvement in specific tasks. It has been already mentioned the role of the Call Centre Nurse, which is much bigger in the Basque Country. Caregivers, pharmacists and other

therapist play a bigger role in SWFT than in RJH or the Basque Country. Just two actors seem to be involved in “rehabilitation” or only the psychologist performs “setting a stable MDT” in the Basque Country, whereas several other actors are involved in it in the other Sites.

Actors use between four and eight different communication channels to coordinate activities, RJH using some more and the Basque Country less. The most widely used by most actors in the three Sites are “face to face” communication, the “phone” and Information Technology ones, such as the Electronic Health Record. The main difference is in “Post mail” quite used in RJH and SWFT, but seldom used in the Basque Country. Virtual meetings, video appointments and telemonitoring are little used in the three sites. There are no big differences in the number of channels used by the different actors in the three sites. In terms of the channels used by each actor, patients in the three sites mostly use “face to face” (F2F) and the phone. In RJH and SWFT they also use the post mail. In all three sites, they use messaging and, in the Basque Country, other IT tools. GPs mainly use F2F and the phone. IT (mainly the EHR) as communication tools are more used by GPs in RJH and the Basque Country than SWFT. The use profile of Primary Care Nurses is very similar in the three Sites to the GP profile, except that in the Basque Country they seldom use messaging but have a bigger use of the EHR. Specialist Hospital Doctors use in the three sites F2F, Phone and the IT (EHR) tools. They use the post mail in RJH and SWFT too. Hospital and Specialist nurse use profiles differ. They use F2F in the three sites. However, in RJH they use post mail and the IT (EHR) for communication purposes too. SWFT Hospital and specialist nurses use messaging much more, whereas in the Basque Country they mostly use F2F and IT. Call Centres Nurses in the Basque Country communicate by phone and IT /EHR) tools. The Use profile of the Pharmacists is different in the three Sites. In SWFT and the Basque Country they use IT tools (electronic prescription). In SWFT, they use the post mail tool.

Finally, there are no differences in the use of channels per activity, except for a lower number in rehabilitation and patient empowerment.

## 6. PROOF OF CONCEPT PROTOTYPES

C3-CLOUD High Level Components (HLC) are not just new IT platforms. They have a close interdependence with the healthcare system in which they are going to be deployed. They require some preconditions but also impact them. Understanding this interdependence is a key factor for their potential success. Prototyping is a good way to learn more about the characteristics, elements and processes influencing it. Prototypes are an early approximation of a final system or product. The word prototype comes from the Latin words *proto*, meaning original, and *typus*, meaning form or model. Prototyping is an approach to developing and testing ideas at an early stage before large-scale resources are committed to implementation. It is generally used at the early stages of the service development cycle where you have something that you want to find out more about or test relatively quickly, in practice, and with others.<sup>136</sup> They have three primary objectives:<sup>137</sup>

- a) Building to think—creating tangible expressions of ideas that enable organizational thinking through action on improvement areas.
- b) Learning faster by failing early (and often)—making things tangible allows many small, low-impact failures to occur early, resulting in faster learning about what does and does not work and why in integrated care and care coordination.
- c) Allowing exploring—encouraging new behaviours, to consciously change what professionals do.

C3-CLOUD Organizational Model Prototypes are a scaled-down system, based on real health care services in the three Pilot Sites. Organizational Model Prototypes are based on the current systems. They, therefore, have the healthcare services characteristics and system functions but highlight some key issues relevant to the deployment and operation of a new care coordinated integrated system. The new system requirements are defined in as much detail as possible. We have prioritized the elements which are most important to service delivery or where our biggest assumptions about how the coordinated decision making is. They identify the changes required in the organizational models that have to be implemented to ensure the adequate operation of C3-CLOUD HLC. When describing them in the following section, the emphasis will be made on the changes required. They will be the basis for the pilot processes in the three C3-CLOUD Regions.

The final prototypes that will be tested in the Proof of Concept pilots include:

1. A narrative description of the new organizational model in each pilot site, in the new C3-CLOUD scenario.

A brief summary on the actual environment in which the Project will be tested including a class diagram representing actors, activities and settings and the promoting and inhibitor factors at the system and policy level.

2. The main internal coordination elements: interpersonal communication and activities performed by each actor in the C3-CLOUD scenario.

The prototype will show two new Matrix. One emphasizes the intercommunication amongst actors. It addresses the modifications that will take place on the coordination between actors involved in the MDT. The matrix will allow to highlight new channels and/or changes in bidirectionality. The other Matrix shows the new roles of the different stakeholders. The alterations in activities and tasks performed by different actors will be described.

3. The main System Promoting and Inhibitor Factors for Integrated Care.

They describe the level of maturity that fourteen dimensions of the system environment should have to achieve care coordination in the new system.

4. The relation between actors, activities and C3-CLOUD HLC functionalities, drawn as Mind Maps.

The Mind Maps summarize the organizational models supporting the HLC. They describe the elements of the organizational model and how they combine with the C3-CLOUD HLC. Both are presented in the Mind Map diagram as nodes. Activities (node 1), tasks (node 2) and actors (node 5) have been associated to the specific functionalities of HLC (node 3). Each functionality is linked to a primary actor (node 4) who can be a system user and/or a human user actor (called “care team member”). When a system user is identified, it is displayed as “New Care Team NA”.

The diagrams depict the composition of the care teams (node 5) in three activities that will be drastically influenced by the C3-CLOUD project: Involving other stakeholders, patient empowerment and care plan drafting (see Figure 1 in Section 2 –Methodology-).

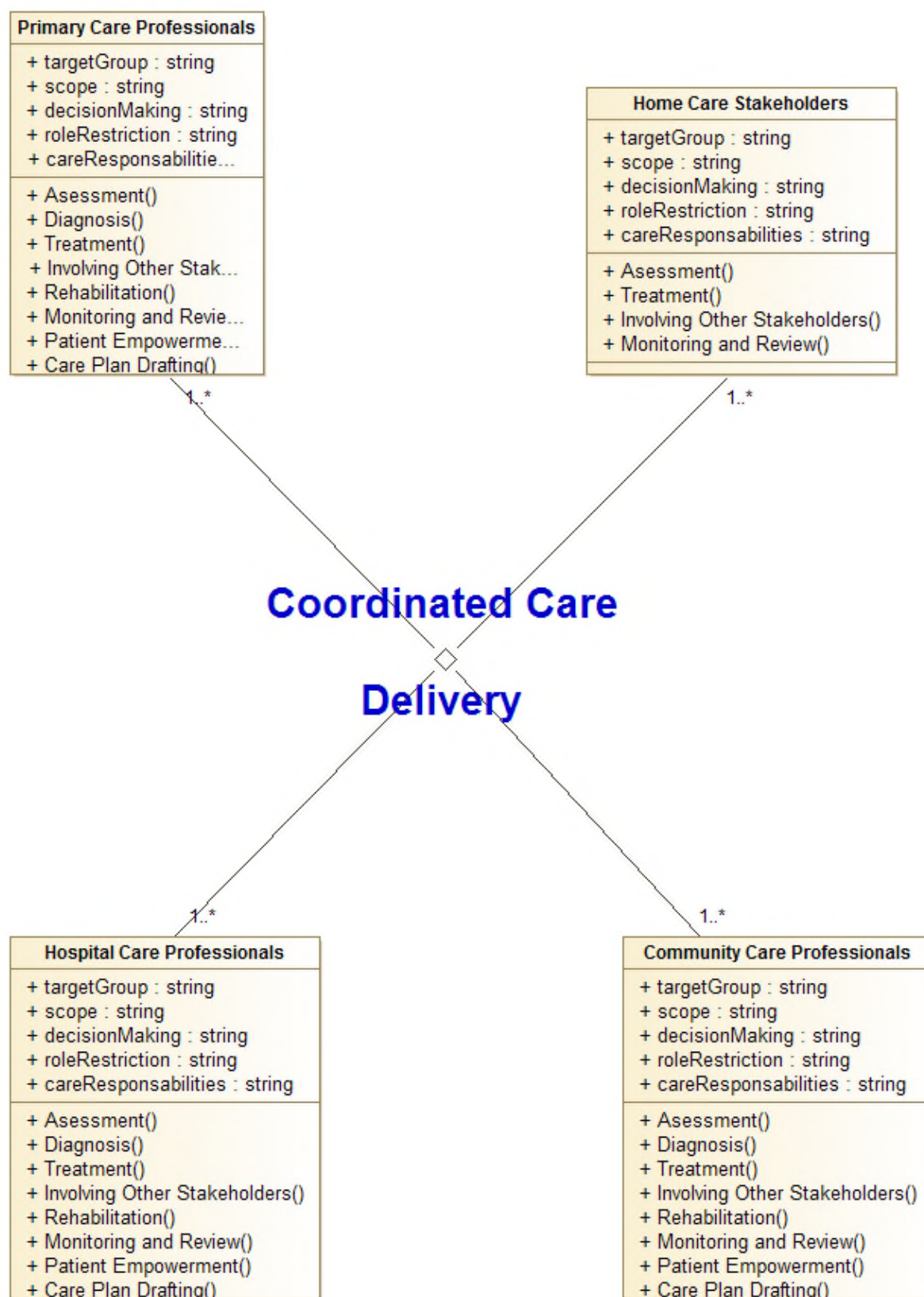
## **6.1. Region Jämtland-Härjedalen, Sweden**

Due to many combined challenges of the county, there is political, economic and demographical pressure to reform the healthcare chain. The overall wish from both stakeholders and end-users is to develop integrated care. Patient will emanate from the geographical areas and include healthcare centres, home and special accommodations. Special focus will be placed upon sparsely populated areas.

### ***6.1.1. Actors, settings and system factors***

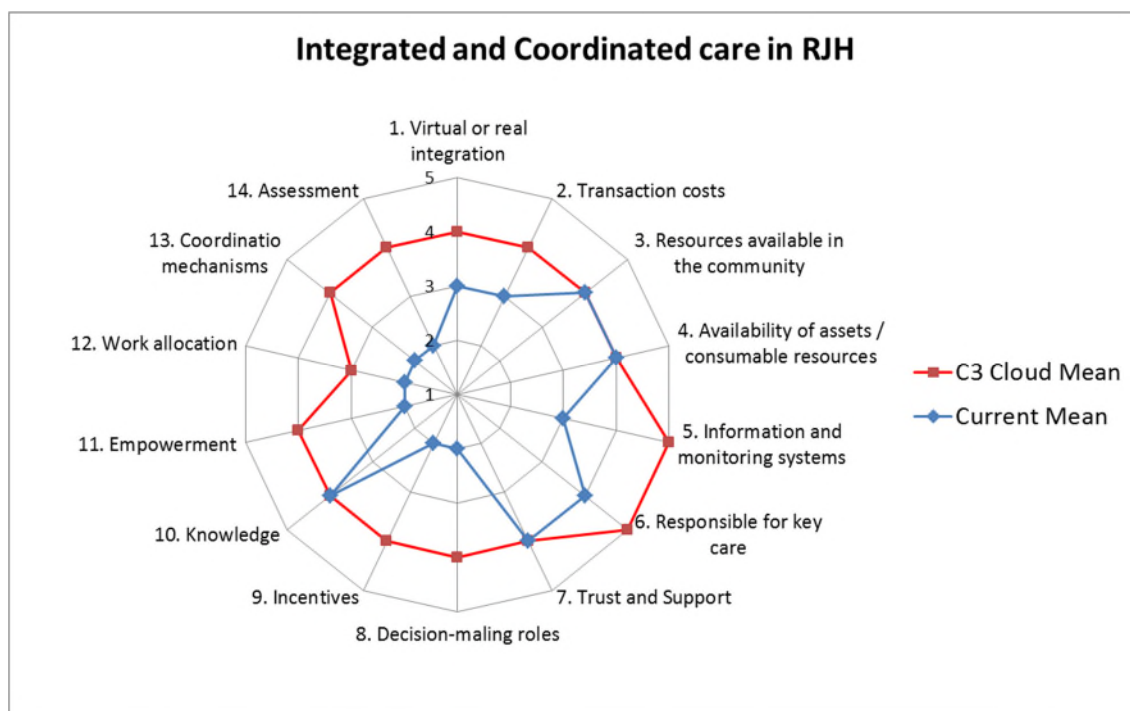
C3-Cloud will be piloted throughout RJH involving primary care, hospital care in the only hospital and municipalities with home care both in the central, more densely populated parts of the region and in more remote and sparsely populated parts. The aim is to include in total 500 patients with 250 in the intervention arm and 250 as controls.





**Figure 55.** Settings in Proof of concept prototype in RJH

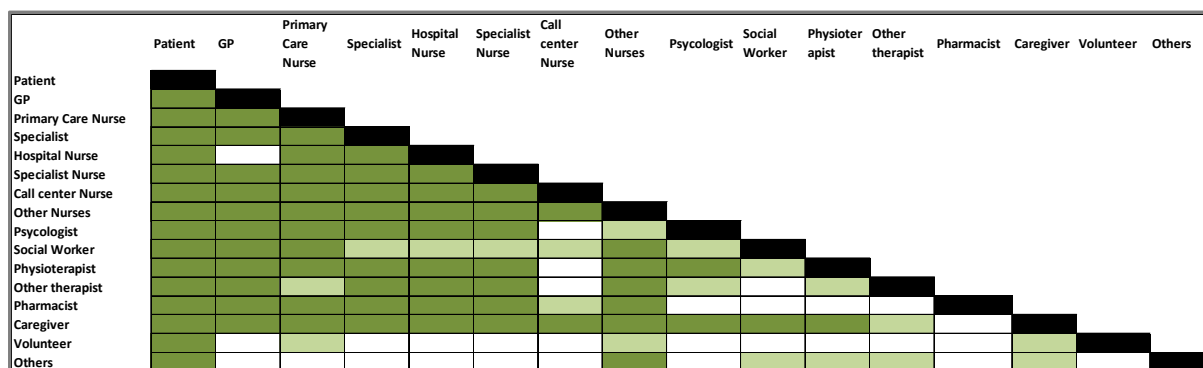
C3-Cloud requires changes in most domains, most pronounced in care coordination, information sharing, a joint and clarified assessment and decision-making. A major improvement in patient empowerment and regarding incentives for a patient focused care is also at need. Regarding knowledge, trust and resources is no fundamental improvement needed.



**Figure 56.** Integrated and Coordinated care in Proof of concept prototype in RJH

### 6.1.2. Personal intercommunication matrix

The interpersonal communication matrix in the C3-CLOUD RJH Prototype do not show any change in comparison to the as-is organization. Many communication pathways already exist, being most of them bidirectional. The MDT team does not think that C3-CLOUD has a need to create new paths of communication in RJH but rather to enhance communication, speeding it up and adding a completeness in the information shared.



**Figure 57.** Personnel intercommunication matrix in Proof of concept prototype in RJH

### ***6.1.3. Activities and tasks performed by each Actor***

According to the C3-CLOUD organizational prototype of RJH, different members of the MDT participate in more activities and tasks than before. The most pronounced differences with C3-CLOUD would be in the involvement of the patient in different aspects of the care but also to, in a more formal way, introduce other partners, as Psychologist, Social worker, Other therapist, Pharmacist and Caregiver in the MDT in the care plan drafting. Squared cells indicate specific changes due to C3-CLOUD impact.

		Patient	GP	Primary Care Nurse	Specialist Care Doctor	Hospital Nurse	Specialist Nurse	Call center Nurse	Other Nurses	Psychologist	Social Worker	Physiotherapist	Other therapist	Pharmacist	Caregiver	Volunteer	Others
ASSESSMENT	Risk assessment																
	Clinical appraisal																
	Functional assessment																
	Social needs																
	Other needs (emotional, spiritual, etc.)																
DIAGNOSIS	Medical																
	Nursing																
	Social																
TREATMENT	Drugs prescription																
	Nursing interventions																
	Surgery (includes minor) treatment																
	Life style interventions																
	Counseling																
	Others																
INVOLVING OTHER STAKEHOLDERS	Referrals																
	Consult (discuss with, confer with)																
	Share, delegate, assign or entrust tasks																
	Setting a stable MDT																
REHABILITATION	Physical																
	Cognitive and other neurological functions																
	Occupational																
	Others																
MONITORING AND REVIEW	Symptoms																
	Biomarkers (Blood results, xrays, Vital signs, etc.)																
	Medication adherence																
	Lifestyles																
	Patient/family's experience																
	Health Outcomes																
PATIENT EMPOWERMENT	Others																
	Health coaching programs																
	Patient involvement promotion programs																
	Training (patient education)																
	Health advice (short/brief)																
	Self-care/management materials																
CARE PLAN DRAFTING	Others																
	Create a new care plan																
	Review and reconcile multiple plans																
	Update existing care plan																
	Discard care plan																
	Share care plan																

**Figure 58.** Activities and tasks by actor in Proof of concept prototype in RJH

There is a significant increase in the activities performed by patient, followed by pharmacists, psychologist, social worker, caregivers and other therapist.

The following tasks have been modified in the C3-CLOUD prototype:

- Assessment
  - All the tasks but Clinical appraisal, are added for Patients.
  - Risk assessment is added for Caregiver.
- Treatment
  - Life style interventions for Patient and Caregiver.
- Monitoring and Review
  - Medication adherence added for Patient, Pharmacist and Caregiver.
- Patient empowerment
  - Health coaching programs, Training (patient education) and Self-care/management material are added for Patient and Pharmacist.
- Care Plan Drafting
  - Create a new care plan, update existing care plan and share care plan are added for Patient, Psychologist, Social worker, Other Therapist and pharmacist.
  - Review and reconcile are added for Patient and Pharmacist.
  - Discard care plan are added for Patient, Psychologist, Social worker, other therapist and Pharmacist.

As it was mentioned above, section 2, although care plan drafting activity is restricted to the professional members of the MDT, patients and caregivers have both an active and crucial participation as key contributors.

#### ***6.1.4. Relationship between the functionalities of High Level Components (HLC) with activities, subtasks and actors***

Mind Maps summarize the organizational models supporting the High Level Component (HLC) in RJH. The diagrams drawn relates to those activities in which C3-CLOUD project is going to influence most significantly. According to the C3-CLOUD project, a modification in care team members performing these activities is expected. The activities are: Involving other stakeholders; Patient empowerment; and Care plan drafting.

##### **a) Involving other stakeholders**

This Mind Map summarizes the organizational models supporting the “involving other stakeholders” activity” (node 1). The tasks are defined in the nodes 2 level: referrals, consult or discuss with others, share delegate, assign or entrust tasks, setting a stable MDT). They have been associated to the specific functionalities of HLC (node 3 level): manage the organization of virtual meetings, sharing care plans with others, etc. New Actors (node 5) have been associated to the specific functionalities of HLC (node 3), in addition to those previously identified based on the current organization and on the new C3-CLOUD communication and activities requirements described in the above sections.

In the diagram referred to the C3-CLOUD organizational prototype, the names of the new actors are written in capital letters in order to be differentiated from the current organization. When GPs are incorporated as new actors, they are named as GP\_.

In RJH, no modifications or changes on the current organizational models are required for C3-CLOUD. The project will not open up new paths for communication but improve them.

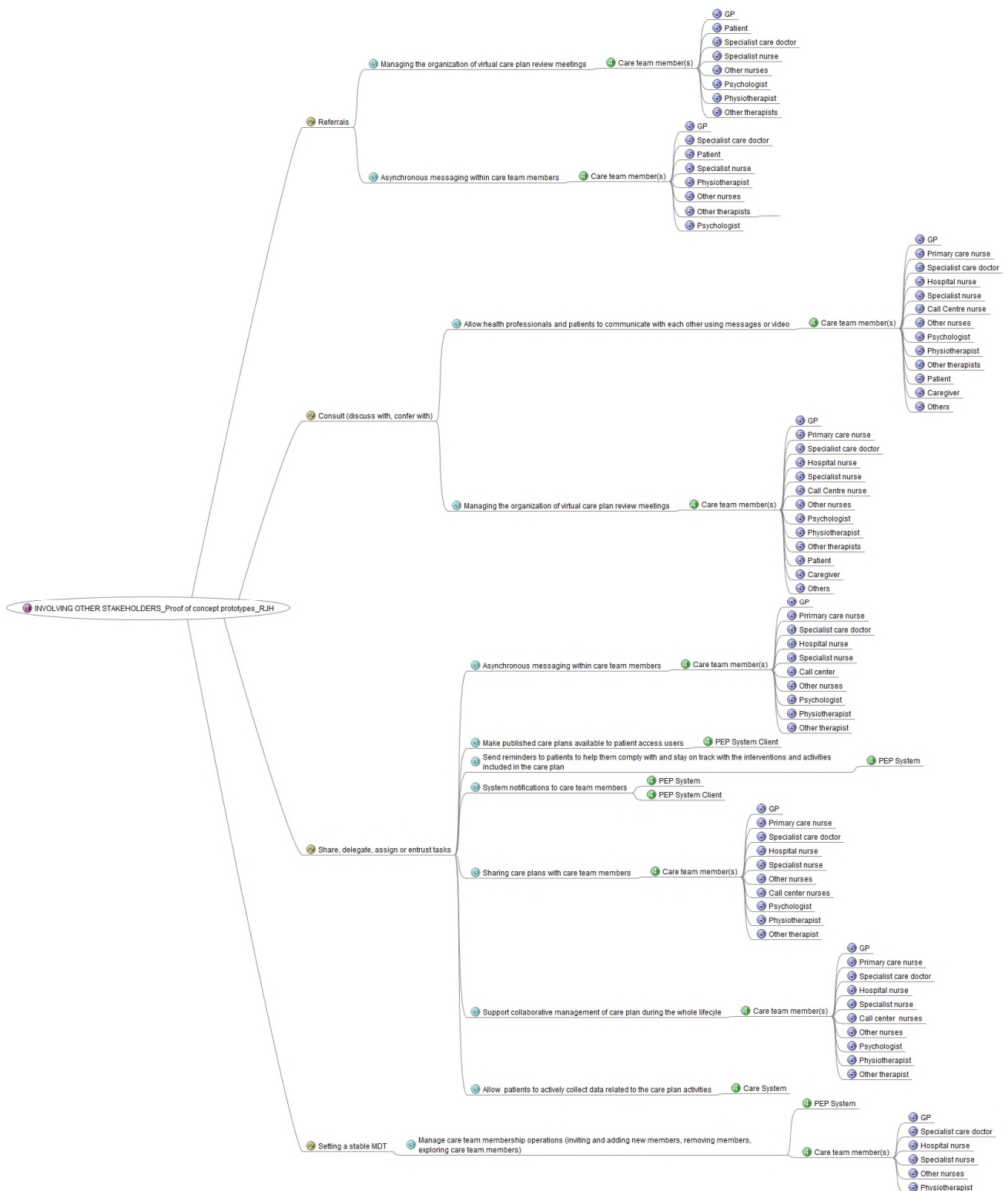


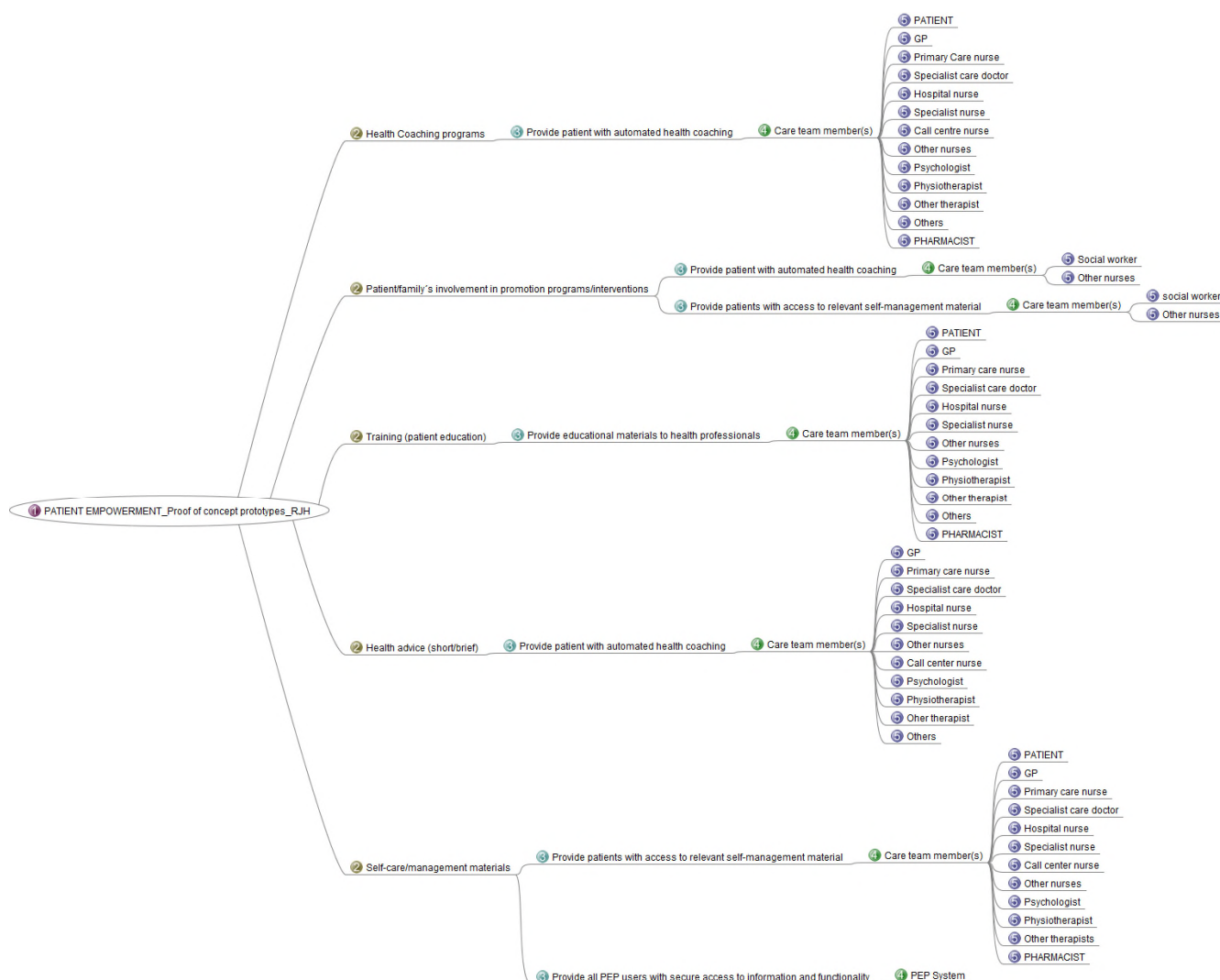
Figure 59. Involving other stakeholders in Proof of concept prototype in RJH

## b) Patient Empowerment

This Mind Map summarizes the organizational models supporting the “Patient Empowerment” activity” (node 1). The tasks are defined in the nodes 2 level: Health coaching programs, Patient/family’s involvement in promotion program/interventions and others. They have been associated to the specific functionalities of HLC (node 3 level): Provide patient with automated health coaching or provide patient with access to relevant self-management material, amongst others. New Actors (node 5) have been associated to the specific functionalities of HLC (node 3), in addition to those previously identified based on the current organization and on the new C3-CLOUD Patient Empowerment requirements described in the above sections.

In the diagram referred to the C3-CLOUD organizational prototype, the names of the new actors are written in capital letters in order to be differentiated from the current organization. When GPs are incorporated as new actors, they are named as GP\_.

In RJH, the involvement of the patient in the development of all different aspects of the care is crucial for a successful care.



**Figure 60.** Patient Empowerment in Proof of concept prototype in RJH

In comparison to the as-is organizational models, in RJH the Proof of concept prototypes incorporate more actors as members of the care team performing “Patient empowerment” activity, to ensure the adequate operation of C3-CLOUD HLC:

- a. Task: ***Health coaching programs:***
  - i. *Provide patient with automated health coaching:*
    - New Care Team Members: PATIENT and PHARMACIST.
- b. Task: ***Patient/family’s involvement in promotion program/interventions:***
  - i. *Provide patient with automated health coaching:*
    - New Care Team Members: No one.
  - ii. *Provide patient with access to relevant self-management material:*
    - New Care Team Members: No one.
- c. Task: ***Training (patient education):***
  - i. *Provide patient with automated health coaching:*
    - New Care Team Members: PATIENT and PHARMACIST.
- d. Task: ***Health advice:***
  - i. *Provide patient with automated health coaching:*
    - New Care Team Members: No one.
- e. Task: ***Self-care management materials:***
  - i. *Provide patient with access to relevant self-management materials:*
    - New Care Team Members: PATIENT and PHARMACIST.
  - ii. *Provide all PEP users with secure access to information and functionality:*
    - New Care Team Members: NA.

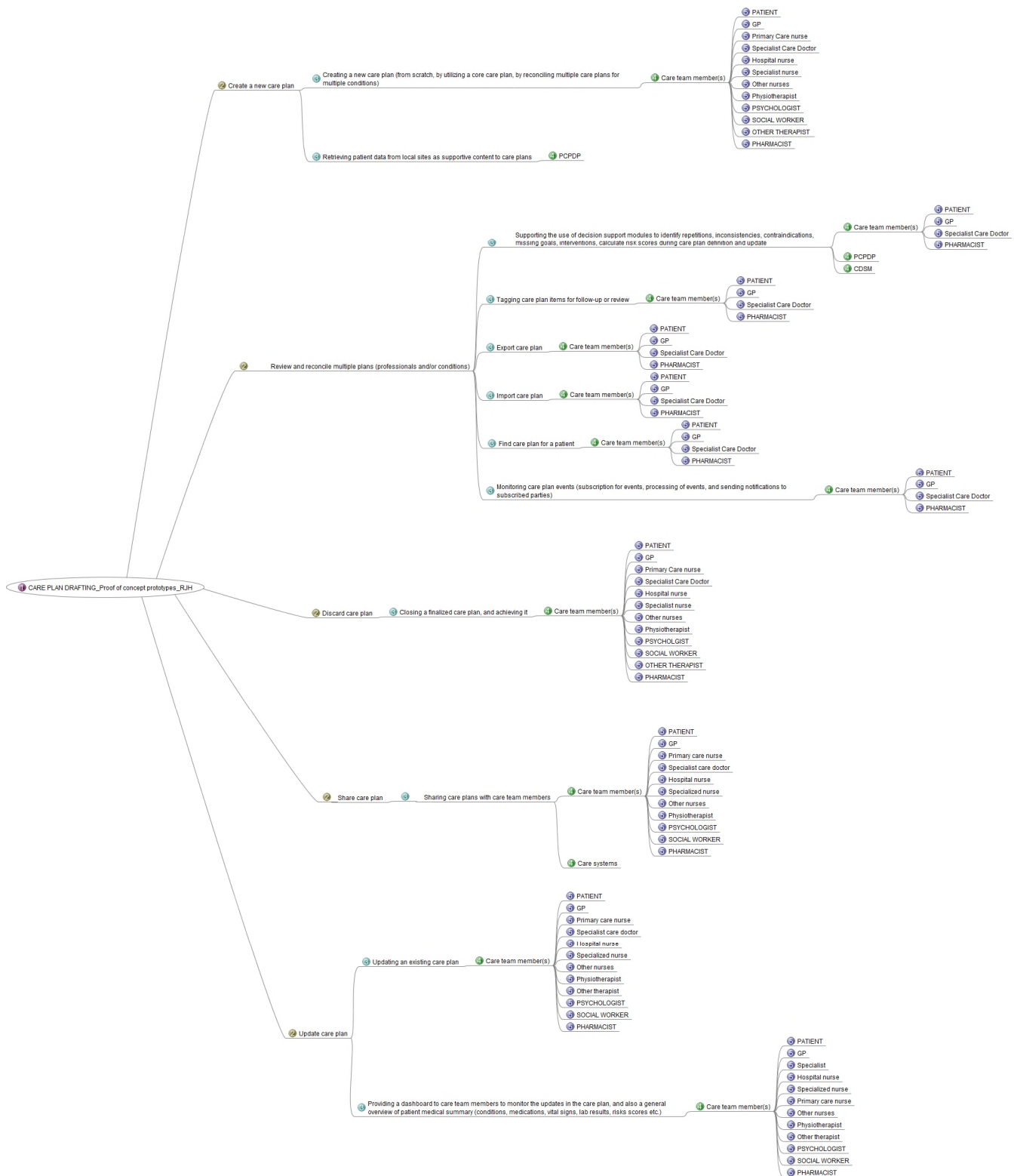
### c) Care plan drafting

This Mind Map summarizes the organizational models supporting the “Care Plan Drafting” activity (node 1). The tasks are defined in the nodes 2 level: Create a new care plan and others, Review and reconcile multiple plans, Discard care plan and others. They have been associated to the specific functionalities of HLC (node 3 level): Supporting the use of DSM to identify repetitions inconsistencies, contraindications, missing goals, interventions calculate risk scores during care plan definition and update, Find a care plan for a patient or Sharing care plans with care team members amongst others. New Actors (node 5) have been associated to the specific functionalities of HLC (node 3), in addition to those previously identified based on the current organization and on the new C3-CLOUD Care Plan Drafting requirements described in the above sections.

In the diagram related to the C3-CLOUD organizational prototype, the names of the new actors are written in capital letters in order to be differentiated from the current organization. When GPs are incorporated as new actors, they are named as GP\_.



In C3-CLOUD organizational prototype in RJH, the involvement of the patient in the care plan drafting is the major change and to this the formal introduction of all other partners in the MDT in the work and information sharing.



**Figure 61.** Care Plan Drafting in Proof of concept prototype in RJH

In comparison to the as-is organizational models, the Proof of concept Prototype in RJH incorporates more actors as members of the care team performing “Care Plan Drafting” activity, to ensure the adequate operation of C3-CLOUD HLC:

- a. Task: **Create a new care plan:**
  - i. *Creating a new care plan:*
    - New Care Team Members: PATIENT, PSYCHOLOGIST, SOCIAL WORKER, OTHER THERAPIST and PHARMACIST.
  - ii. *Retrieving patient data from local sites as supportive content to care plans:*
    - New Care Team NA.
- b. Task: **Review and reconcile multiple plans (professionals and/or conditions):**
  - i. *Supporting the use of DSM to identify repetitions inconsistencies, contraindications, missing goals, interventions calculate risk scores during care plan definition and update:*
    - New Care Team Members: PATIENT, PHARMACIST.
  - ii. *Tagging care plan items for follow-up of review:*
    - New Care Team Members: PATIENT, PHARMACIST.
  - iii. *Export care plan:*
    - New Care Team Members: PATIENT, PHARMACIST.
  - iv. *Import care plan:*
    - New Care Team Members: PATIENT, PHARMACIST.
  - v. *Find a care plan for a patient:*
    - New Care Team Members: PATIENT, PHARMACIST.
  - vi. *Monitoring care plan events (subscription for events, processing of events and sending notifications to subscribed patients):*
    - New Care Team Members: PATIENT, PHARMACIST.
- c. Task: **Discard care plan:**
  - i. *Closing a finalized care plan and achieving it:*
    - New Care Team Members: PATIENT, PSYCHOLOGIST, SOCIAL WORKER, OTHER THERAPIST and PHARMACIST.
- d. Task: **Share care plan:**
  - i. *Sharing care plans with care team members:*
    - New Care Team Members: PATIENT, PSYCHOLOGIST, SOCIAL WORKER, and PHARMACIST.
- e. Task: **Update care plan:**
  - i. *Updating an existing:*
    - New Care Team Members: PATIENT, PSYCHOLOGIST, SOCIAL WORKER and PHARMACIST.

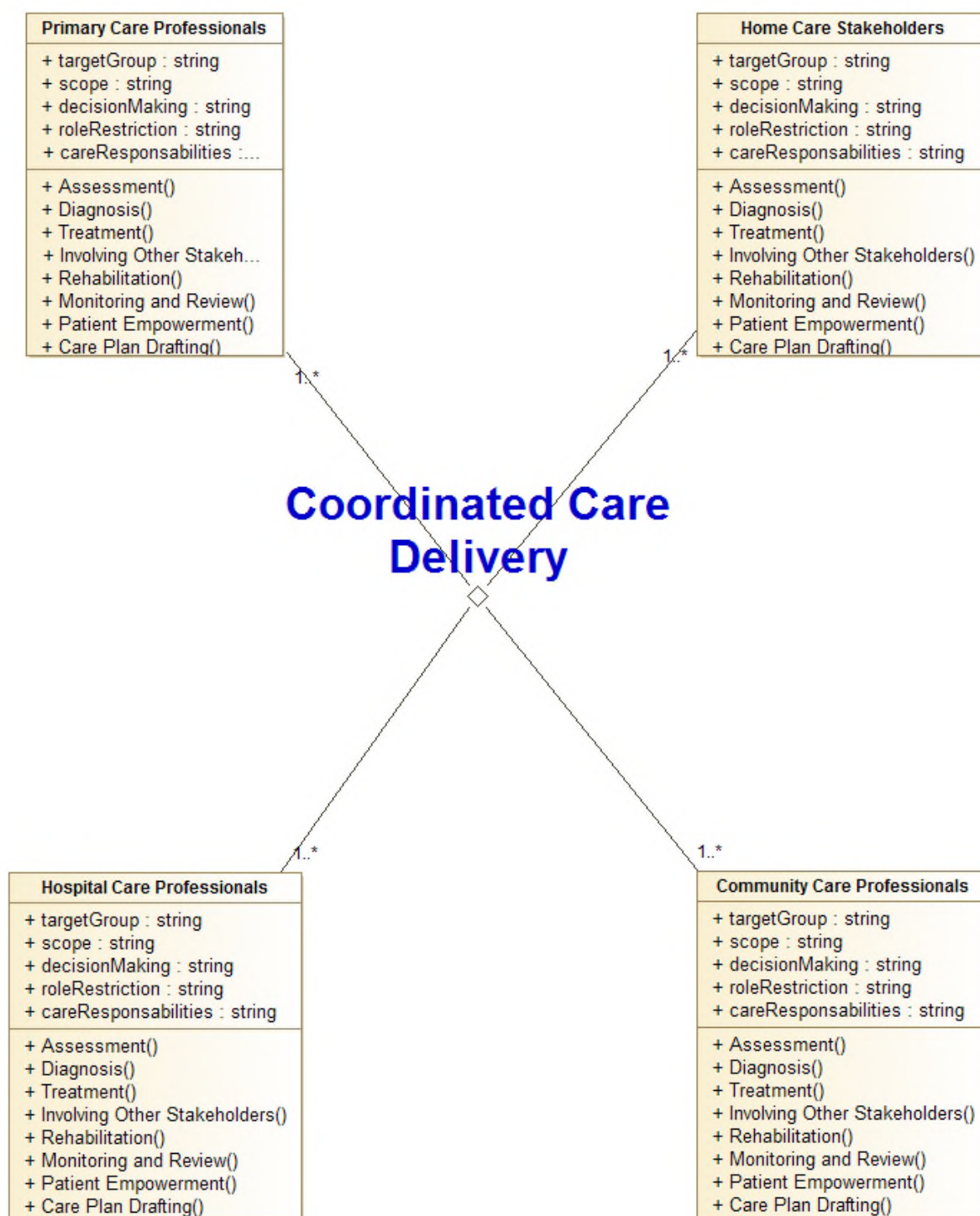
- ii. *Providing a dashboard to care team members to monitor the updated in the care plan, and also a general overview of patient medical summary (conditions, medications, vital signs, lab results, risks scores etc.):*
  - New Care Team Members: PATIENT, PSYCHOLOGIST, SOCIAL WORKER and PHARMACIST.

## **6.2. South Warwickshire NHS Foundation Trust (SWFT)**

### ***6.2.1. Actors, settings and system factors***

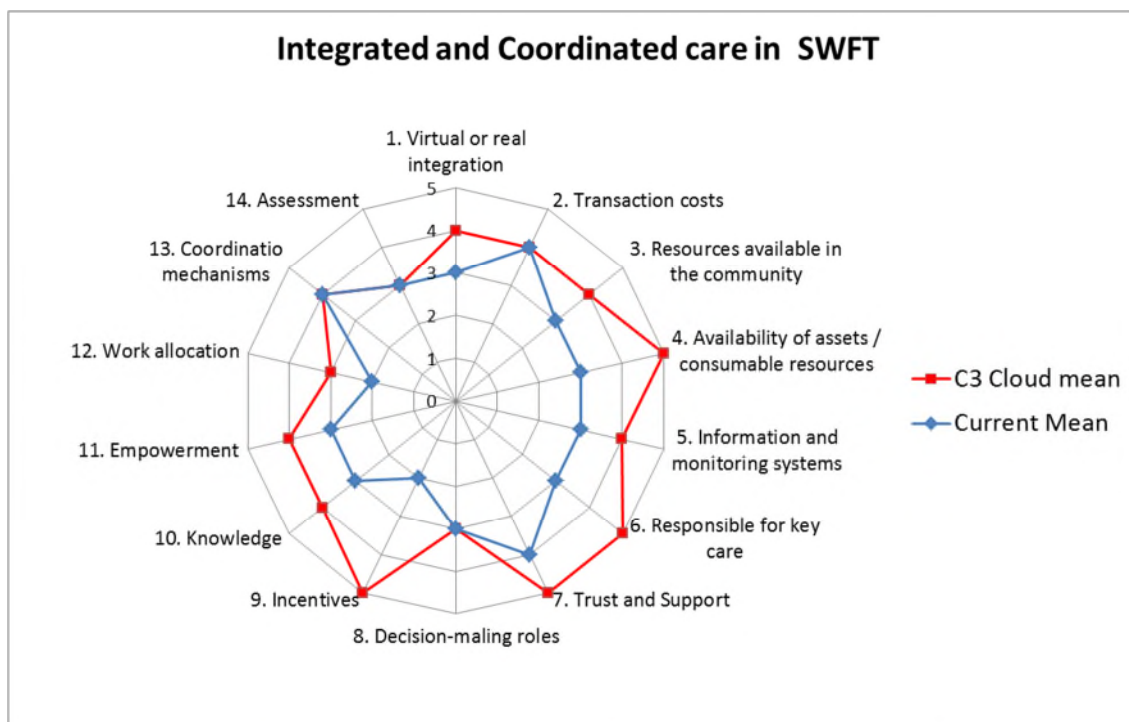
The C3-Cloud integrated care solution will initially be piloted at the Rother House Medical Centre in Stratford, South Warwickshire. This Practice has a total list of 13,600 patients and anticipates that **between 400 and 500** have complex multiple long-term conditions that could benefit from the C3-Cloud solution. With the help of C3-Cloud, patients will be stratified to target those who are at the highest risk of hospital readmission and volunteers sought from that group. These patients will be reviewed during existing MDTs and developed alongside the existing Care Coordination project, which brings together GPs, community nurses, mental health nurses and social workers to specifically support patients with long-term conditions. Once the solution has been tested, it will be rolled out to at least two additional GP practices after the end of project.

Integration with the GP system, EMIS, and the Trust EPR, Lorenzo, will provide the easiest access to medication histories and ensure that the solution remains closely focused on the patient. SWFT will use C3-Cloud care pathways for patients with multi-morbidity across primary and secondary care. Overall, SWFT would like to reduce hospitalisation of patients with multiple co-morbidities and increase adherence to treatment and medication regimes.



**Figure 62.** Settings in Proof of concept prototype in SWFT

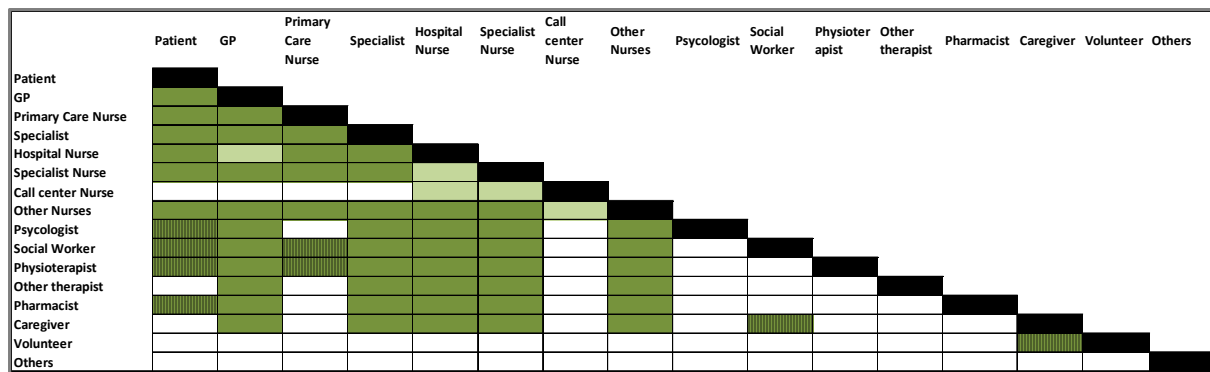
The implementation of C3-CLOUD would not affect the organizational model but would improve access times and increase the effectiveness of coordinated care. Therefore, the effective communication between actors will increase, as they would have a common care plan to discuss or modify.



**Figure 63.** Integrated and Coordinated care in Proof of concept prototype in SWFT

### 6.2.2. Personal intercommunication matrix

In the C3-CLOUD SWFT Prototype, all actors will be dealing with a single care plan; hence, the integrated information has to be available for disparate MDTs. The Interpersonal communication pattern in the C3-CLOUD SWFT Prototype requires an increase of bidirectional relations between MDT members. Currently, a number of mechanisms exist which allows bilateral communication but these are used infrequently. The output of these communications may be lost- in a care plan that not all actors can access. The implementation of C3-CLOUD would speed up communication and allow all relevant actors access to the latest care plan and also to view feedback from patients and carers allowing fine tuning of the treatment plan. Patients, GPs, Specialist, Hospital nurses, Specialists nurses, Primary Care nurses and other nurses are the most related in a bidirectional way, as is depicted in the matrix below. Dashed cells relates to changes due to C3-CLOUD impact.



**Figure 64.** Personnel intercommunication matrix in Proof of concept prototype in SWFT

The relationships that have been changed or added from the current situation to the C3-CLOUD scenario deal with bidirectional relations.

-Extended to Bidirectional Relations:

- Patient with Psychologist, Social Worker, Physiotherapist and Pharmacist;
- Primary Care Nurse with Social worker and Physiotherapist;
- Caregiver with Social Work and Volunteer;
- Volunteer with Caregiver.

### **6.2.3. Activities and tasks performed by each Actor**

The C3-CLOUD Organizational Prototype involves a single care plan in which all the key care stakeholders can access. It requires that Patient, GP, Hospital Nurse, Specialist nurse, Primary Care nurse, and Specialist care doctor increase the activities they perform, as is shown in the matrix below. Squared cells relates to changes due to C3-CLOUD impact.

		Patient	GP	Primary Care Nurse	Specialist Care Doctor	Hospital Nurse	Specialist Nurse	Call center Nurse	Other Nurses	Psychologis t	Social Worker	Physiotherap ist	Other therapist	Pharmacist	Caregiver	Volunteer	Others
ASSESSMENT	Risk assessment																
	Clinical appraisal																
	Functional assessment																
	Social needs																
	Other needs (emotional, spiritual, etc.)																
DIAGNOSIS	Medical																
	Nursing																
	Social																
TREATMENT	Drugs prescription																
	Nursing interventions																
	Surgery (includes minor) treatment																
	Life style interventions																
	Counseling																
	Others																
INVOLVING OTHER STAKEHOLDERS	Referrals																
	Consult (discuss with, confer with)																
	Share, delegate, assign or entrust tasks																
	Setting a stable MDT																
REHABILITATION	Physical																
	Cognitive and other neurological functions																
	Occupational																
	Others																
MONITORING AND REVIEW	Symptoms																
	Biomarkers (Blood results, x-rays, Vital signs, etc.)																
	Medication adherence																
	Lifestyles																
	Patient/family's experience																
	Health Outcomes																
PATIENT EMPOWERMEN T	Others																
	Health coaching programs																
	Patient involvement promotion programs																
	Training (patient education)																
	Health advice (short/brief)																
	Self-care/management materials																
CARE PLAN DRAFTING	Others																
	Create a new care plan																
	Review and reconcile multiple plans																
	Update existing care plan																
	Discard care plan																
	Share care plan																

**Figure 65.** Activities and tasks by actor in Proof of concept prototype in SWFT

In SWFT, the main benefit of C3-CLOUD is a reduction in repletion, ensuring the latest data is available to the relevant actor and improving coordination of care. The most significant change consists of the increase of activities and tasks in which patients participate, as a real patient centred care requires. In addition, GPs, Primary care nurse, Specialist, Hospital nurse and Specialist nurse reinforce their participation in the coordinated and integrated care, by means of acquiring more responsibilities in Care Plan drafting.

In comparison to the current situation, the C3-CLOUD prototype involves the following changes:

- Rehabilitation:
  - Patient participates in all tasks.
- Monitoring and review:
  - Health outcomes is added for Patient
- Patient Empowerment:
  - Health coaching programs and Training (patient education) tasks are added for Patient
  - Health outcomes is added for Patient
- Care Plan Drafting:
  - Patients participate as key contributors in all tasks of this activity.
  - Review and reconcile of multiple plans task is added for GP, Primary Care Nurse, Specialist Care doctor and Hospital nurse.
  - Share care plan is added for GPs, Hospital nurse and Specialist nurses.
  - Discard care plans is added for Specialist nurses.

#### ***6.2.4. Relationship between the functionalities of High Level Components (HLC) with activities, subtasks and actors***

Mind Maps summarize the organizational models supporting the High Level Component (HLC) in SWFT.

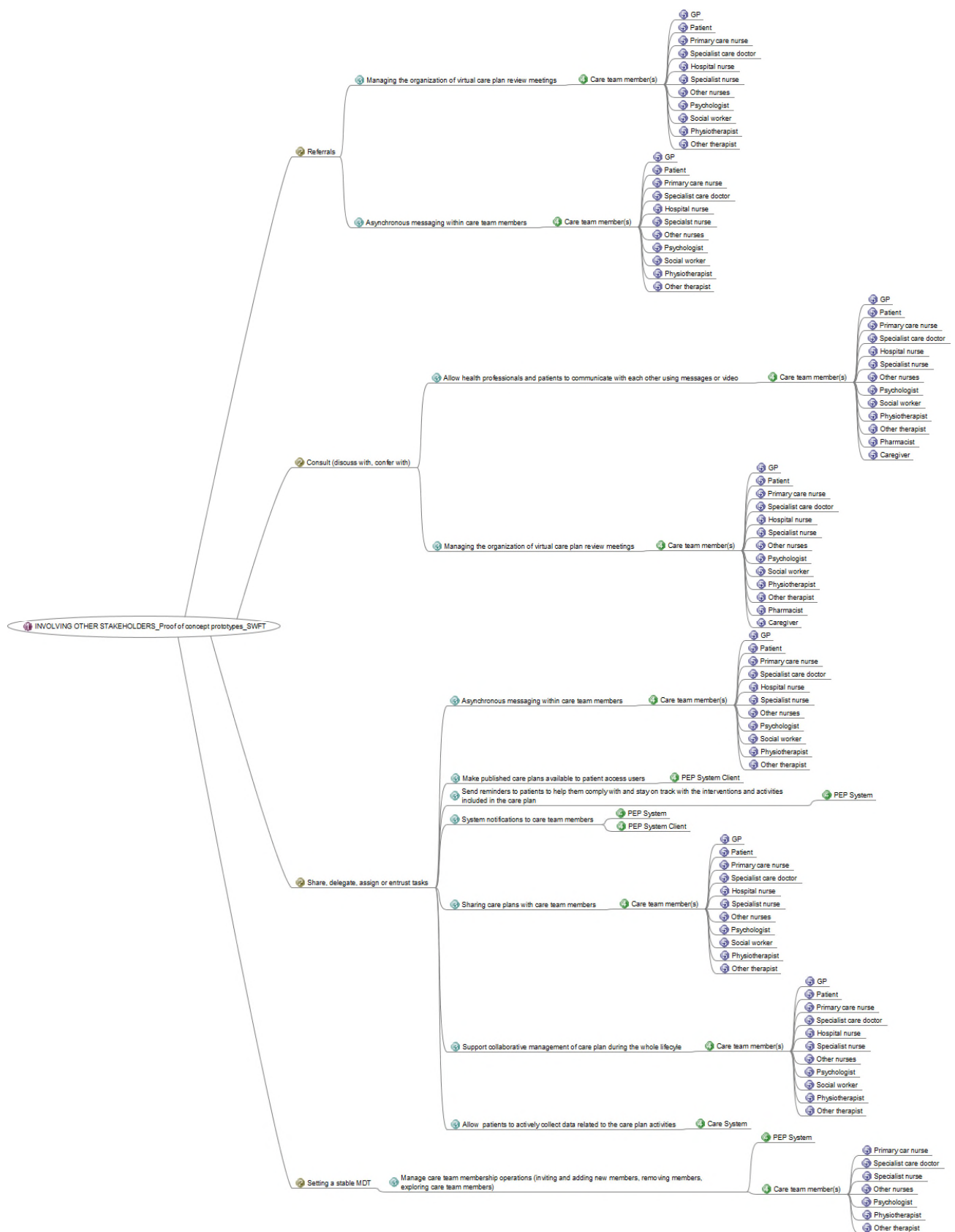
The diagrams drawn relates to those activities in which C3-CLOUD project is going to influence significantly. According to the C3-CLOUD project, a modification in care team members performing these activities is expected. The activities are: Involving other stakeholders; Patient empowerment; and Care plan drafting.

##### **a) Involving other stakeholders**

This Mind Map summarizes the organizational models supporting the “involving other stakeholders” activity” (node 1). The tasks are defined in the nodes 2 level: referrals, consult or discuss with others, share delegate, assign or entrust tasks, setting a stable MDT). They have been associated to the specific functionalities of HLC (node 3 level): manage the organization of virtual meetings, sharing care plans with others, etc. The members of care team (node 5) associated to the specific functionalities of HLC (node 3), are the same as in the current organization.

In SWFT, regarding the Involving other stakeholders activity, C3-CLOUD will allow greater flexibility in accessing other stakeholders in identifying patient needs, and in allowing patients to feedback and influence these decisions. It will allow decisions to be made more quickly without repeat assessments already performed. However, no significant changes will take place in terms of Care Team members performing this activity.





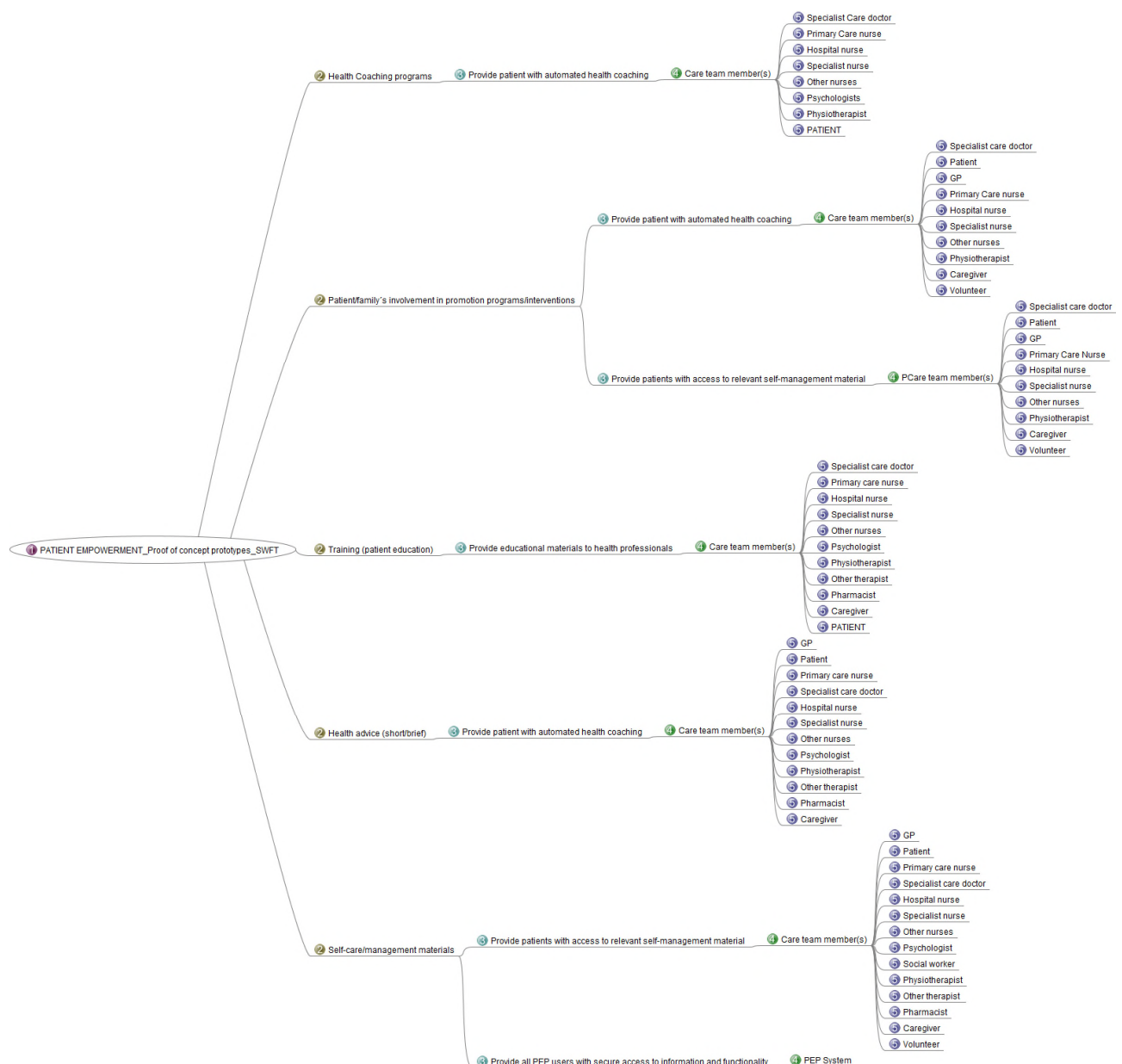
**Figure 66.** Involving other stakeholders in Proof of concept prototype in SWFT

## **b) Patient empowerment**

This Mind Map summarizes the organizational models supporting the “Patient Empowerment” activity” (node 1). The tasks are defined in the nodes 2 level: Health coaching programs, Patient/family’s involvement in promotion program/interventions and others. They have been associated to the specific functionalities of HLC (node 3 level): Provide patient with automated health coaching or provide patient with access to relevant self-management material, amongst others. New Actors (node 5) have been associated to the specific functionalities of HLC (node 3), in addition to those previously identified based on the current organization and on the new C3-CLOUD Patient Empowerment requirements described in the above sections.

In the diagram referred to the C3-CLOUD organizational prototype, the names of the new actors are written in capital letters in order to be differentiated from the current organization. When GPs are incorporated as new actors, they are named as GP\_.

In SWFT, currently patients have little access to their care plan. Feedback on the outcome of a particular treatment trial may be slow in reaching their care plan or record and it may not influence decisions efficiently. The patients’ ability to participate and take control of their treatments and their monitoring should be transformed by C3-CLOUD. This is likely to improve compliance outcomes for the patient and is likely to lead to more cost effective health care for the patient.



**Figure 67.** Patient Empowerment in Proof of concept prototype in SWFT

In comparison to the as-is organizational models, the Proof of concept prototypes in SWFT incorporate PATIENT as a new actor performing “Health Coaching Programs” and “Training (Patient Education)” tasks.

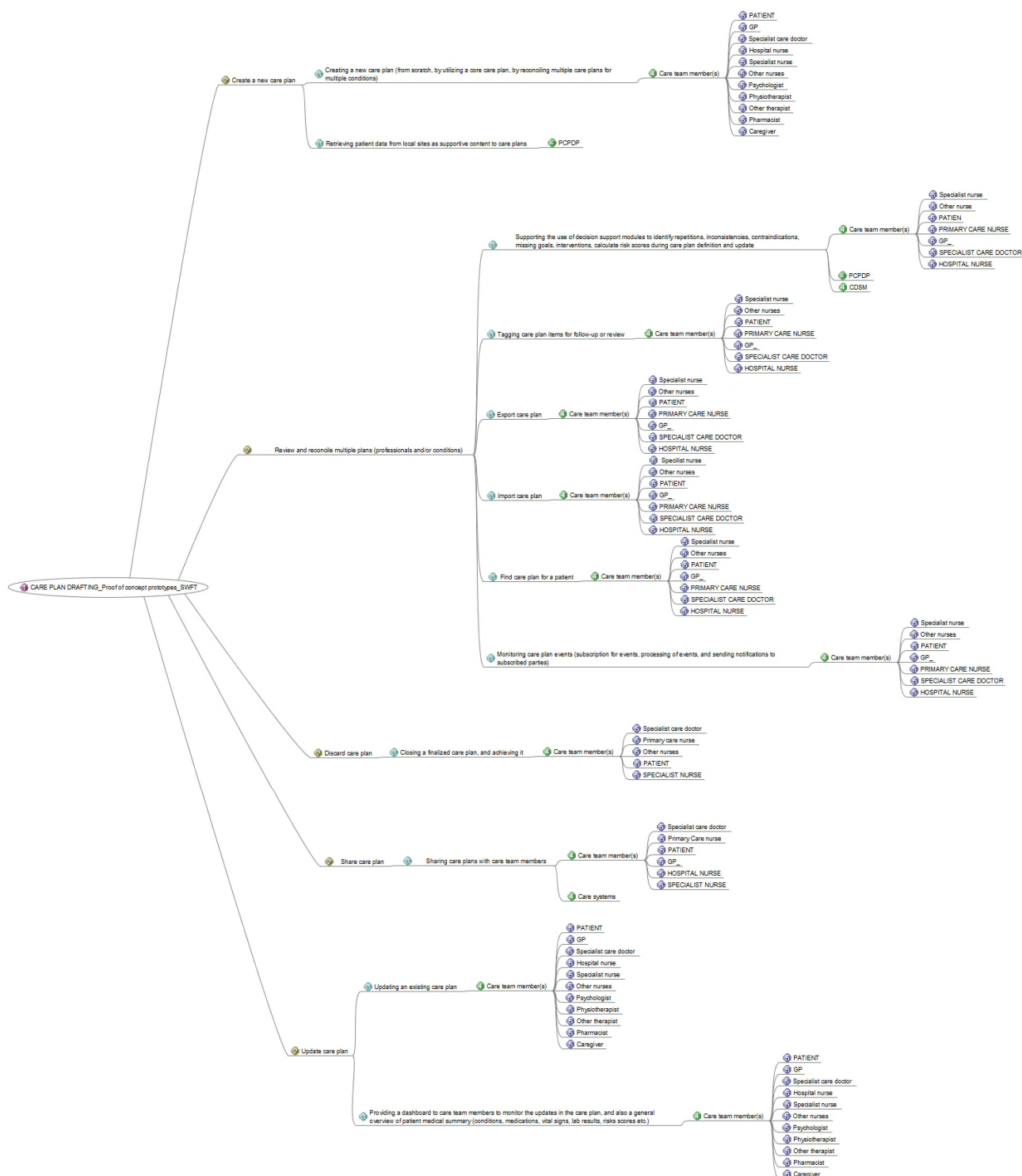
### c) Care plan drafting

This Mind Map summarizes the organizational models supporting the “Care Plan Drafting” activity (node 1). The tasks are defined in the nodes 2 level: Create a new care plan and others,

Review and reconcile multiple plans, Discard care plan and others. They have been associated to the specific functionalities of HLC (node 3 level): Supporting the use of DSM to identify repetitions inconsistencies, contraindications, missing goals, interventions calculate risk scores during care plan definition and update, Find a care plan for a patient or Sharing care plans with care team members amongst others. New Actors (node 5) have been associated to the specific functionalities of HLC (node 3), in addition to those previously identified based on the current organization and on the new C3-CLOUD Care Plan Drafting requirements described in the above sections.

In SWFT, C3-CLOUD will make the process of agreeing and especially updating a care plan more efficient and timely. The visibility of the plan will be increased allowing greater participation by the various actors especially the patient.

In the diagram related to the C3-CLOUD organizational prototype, the names of the new actors are written in capital letters in order to be differentiated from the current organization. When GPs are incorporated as new actors they are named as GP\_.



**Figure 68.** Care Plan Drafting in Proof of concept prototype in SWFT

The SWFT proof of concept prototypes incorporate more actors as care team members to perform “Care Plan drafting” activity. The management of the care plan is responsibility of the health and social professionals, and it is supported by the participation of patients and caregivers by means of crucial contributions.

- a. Task: **Create a new care plan:**
  - iii. *Creating a new care plan:*
    - New Care Team Members: PATIENT.
  - iv. *Retrieving patient data from local sites as supportive content to care plans:*
    - New Care Team NA.
- b. Task: **Review and reconcile multiple plans (professionals and/or conditions):**
  - vii. *Supporting the use of DSM to identify repetitions inconsistencies, contraindications, missing goals, interventions calculate risk scores during care plan definition and update:*
    - New Care Team Members: PATIENT, GP, PRIMARY CARE NURSE, SPECIALIST CARE DOCTOR, HOSPITAL NURSE.
  - viii. *Tagging care plan items for follow-up of review:*
    - New Care Team Members: PATIENT, GP, PRIMARY CARE NURSE, SPECIALIST CARE DOCTOR, HOSPITAL NURSE.
  - ix. *Export care plan:*
    - New Care Team Members: PATIENT, GP, PRIMARY CARE NURSE, SPECIALIST CARE DOCTOR, HOSPITAL NURSE.
  - x. *Import care plan:*
    - New Care Team Members: PATIENT, GP, PRIMARY CARE NURSE, SPECIALIST CARE DOCTOR, HOSPITAL NURSE.
  - xi. *Find a care plan for a patient:*
    - New Care Team Members: PATIENT, GP, PRIMARY CARE NURSE, SPECIALIST CARE DOCTOR, HOSPITAL NURSE.
  - xii. *Monitoring care plan events (subscription for events, processing of events and sending notifications to subscribed patients):*
    - New Care Team Members: PATIENT, GP, PRIMARY CARE NURSE, SPECIALIST CARE DOCTOR, HOSPITAL NURSE.
- c. Task: **Discard care plan:**
  - iii. *Closing a finalized care plan and achieving it:*
    - New Care Team Members: PATIENT, SPECIALIST NURSE.
- d. Task: **Share care plan:**
  - ii. *Sharing care plans with care team members:*
    - New Care Team Members: PATIENT, GP, HOSPITAL NURSE, SPECIALIST NURSE.
- e. Task: **Update care plan:**
  - ii. *Updating an existing:*
    - New Care Team Members: PATIENT.

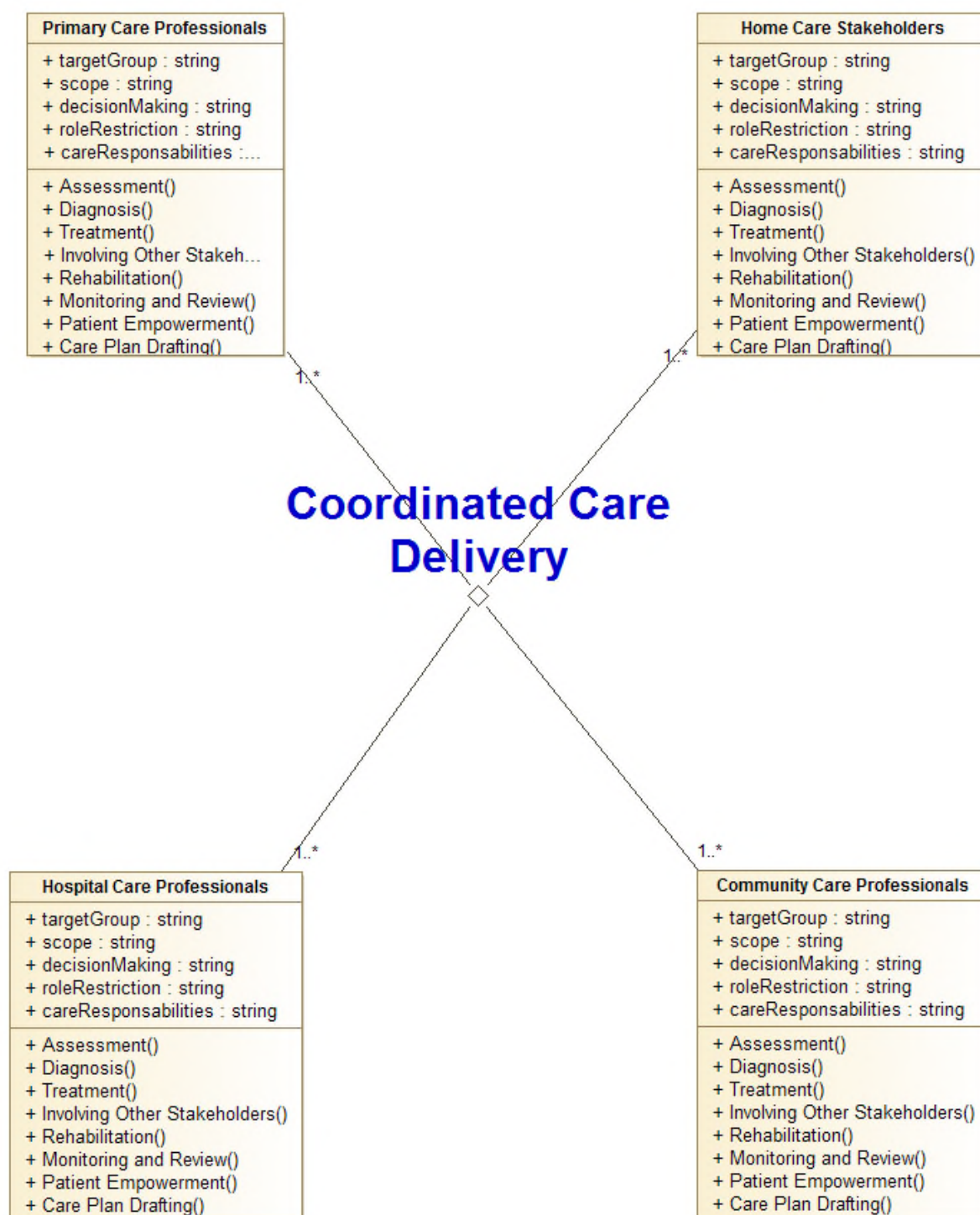
- iv. *Providing a dashboard to care team members to monitor the updated in the care plan, and also a general overview of patient medical summary (conditions, medications, vital signs, lab results, risks scores etc.):*
  - New Care Team Members: PATIENT.

In SWFT, once C3-CLOUD is implemented, it will allow all actors access to the latest care plan and summary treatment record. This is especially important in elderly patients with multiple morbidity; since several treatment decisions will have to take into account the consequences of their multimorbidity and require tailored pragmatic therapies which will have been influenced by trials of therapy in each patient. C3-CLOUD will reduce repetition of trials of medication already found to be poorly tolerated or ineffective. It will potentially, dramatically increase the ability of patients to participate in their care and their feedback to be recorded in a system with much greater visibility than current systems

## **6.3. Basque Country**

### ***6.3.1. Actors, settings and system factors***

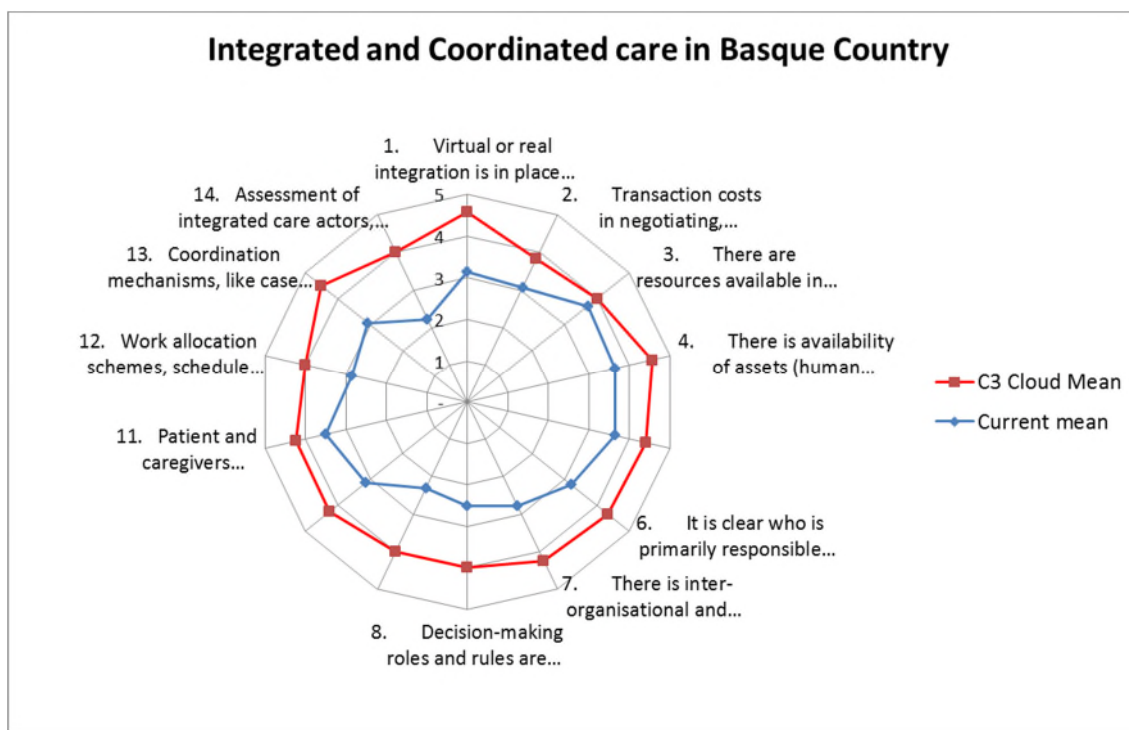
C3-Cloud will be piloted at four Integrated Care Organizations (OSIs): OSI Araba, OSI Ezkerraldea-Cruces, OSI Bibao-Basurto and OSI Donostialdea. They involve four University Hospitals and several Primary Care Health Centers. Altogether 500 patients will be recruited (250 intervention and 250 control). In each of the OSIs, MDT will be established, involving four settings (Primary Care, Hospital, Community Care and Home).



**Figure 69.** Settings in Proof of concept prototype in Basque Country



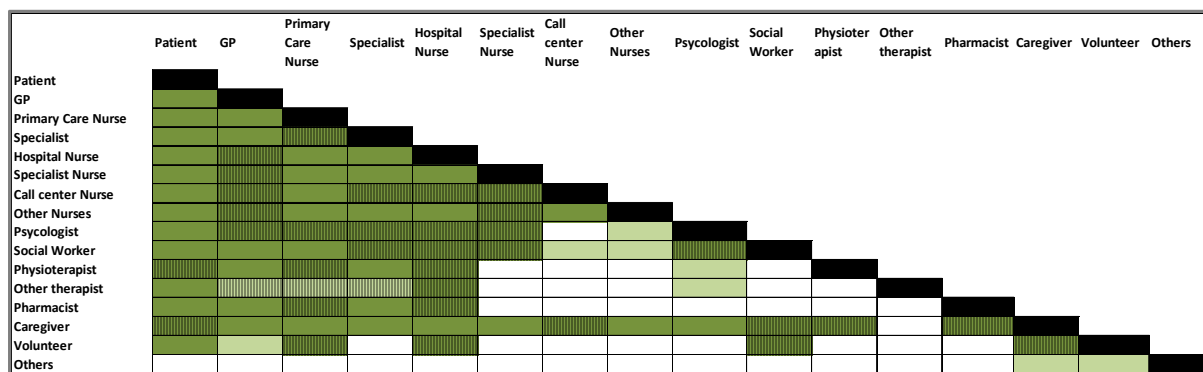
C3-CLOUD System requires changes in most domains. The biggest ones (more than 50% change) are in the decision making roles, the structure of incentives and the health professionals assessment. The only two domains, which are considered adequate (less than 25% change), are the resources available in the Community and availability of assets.



**Figure 70.** Integrated and Coordinated care in Proof of concept prototype in Basque Country

### 6.3.2. Personal intercommunication matrix

The Interpersonal communication pattern in the C3-CLOUD Basque Prototype involves a high number of bilateral relations between MDT members. Patients, GPs, Primary Care nurses Hospital Specialists and Hospital nurses are the most related in a bidirectional way, as can be seen in the matrix. Dashed cells indicate changes required for C3-CLOUD implementation, in comparison to current organizational model.



**Figure 71.** Personnel intercommunication matrix in Proof of concept prototype in Basque Country

There has been an increase in the bilateral communication between professionals. Whereas in the current scenario many professionals were connected in a one way direction, in the new one two ways are required. The relationships that have been changed or added from the current situation to the C3-CLOUD scenario are:

- Extended to Bidirectional Relations:
  - Specialist Care Doctor with Primary Care Nurse;
  - Hospital Nurse and Specialist Nurse, with General Practitioner;
  - Call Centre Nurse with GP, Specialist Care Doctor, Hospital Nurse and Specialist Nurse;
  - Psychologist with GP, Primary Care Nurse, Specialist Care Doctor, Hospital Nurse and Specialist Nurse;
  - Social Worker with Specialist Care Doctor, Hospital Nurse, Specialist Nurse and Psychologist;
  - Physiotherapist with Patient, Primary Care Nurse and Hospital Nurse;
  - Other Therapist with Hospital Nurse;
  - Pharmacist with Primary Care Nurse and Hospital Nurse;
  - Caregiver with Patient, Call Centre Nurse, Social Worker, Physiotherapist and Pharmacist;
  - Volunteer with Primary Care Nurse, Hospital Nurse, Social Worker and Caregiver.
- New One Way Relations:
  - Other Therapist with GP, Primary Care Nurse and Specialist Care Doctor.

### ***6.3.3. Activities and tasks performed by each Actor***

The C3-CLOUD Organizational Prototype requires the different member of the MDT to modify their roles, increasing the number and type of activities and tasks performed, as can be seen in the Matrix. Squared cells indicate changes required for C3-CLOUD implementation.

		Patient	GP	Primary Care Nurse	Specialist Care Doctor	Hospital Nurse	Specialist Nurse	Call center Nurse	Other Nurses	Psychologist	Social Worker	Physiotherapist	Other therapist	Pharmacist	Caregiver	Volunteer	Others
ASSESSMENT	Risk assessment																
	Clinical appraisal																
	Functional assessment																
	Social needs																
	Other needs (emotional, spiritual, etc.)																
DIAGNOSIS	Medical																
	Nursing																
	Social																
TREATMENT	Drugs prescription																
	Nursing interventions																
	Surgery (includes minor) treatment																
	Life style interventions																
	Counseling																
INVOLVING OTHER STAKEHOLDERS	Referrals																
	Consult (discuss with, confer with)																
	Share, delegate, assign or entrust tasks																
	Setting a stable MDT																
REHABILITATION	Physical																
	Cognitive and other neurological functions																
	Occupational																
	Others																
MONITORING AND REVIEW	Symptoms																
	Biomarkers (Blood results, x-rays, Vital signs, etc.)																
	Medication adherence																
	Lifestyles																
	Patient/family's experience																
	Health Outcomes																
PATIENT EMPOWERMENT	Health coaching programs																
	Patient involvement promotion programs																
	Training (patient education)																
	Health advice (short/brief)																
	Self-care/management materials																
	Others																
CARE PLAN DRAFTING	Create a new care plan																
	Review and reconcile multiple plans																
	Update existing care plan																
	Discard care plan																
	Share care plan																

**Figure 72.** Activities and tasks by actor in Proof of concept prototype in Basque Country

There is a significant increase in the activities performed by patient and caregivers. They are asked to participate in a wide variety of new tasks. The other significant change has to do with teamwork. Setting a MDT has been added as a responsibility to several professional roles.

The following tasks have been added or driven out from the current situation to the C3-CLOUD prototype:

- Assessment
  - Social Needs and Other Needs, both are added for Patient and Caregiver, and Other Needs for Social Worker.
- Diagnosis
  - All the Diagnosis tasks are added for Patient, and Caregiver, whereas Nursing is removed for GPs.
- Treatment
  - Drugs prescription, Nursing interventions, Surgery, Life style interventions and Counselling are added for Patient. Regarding to them, Patient is a participant stakeholder, not the performer.
  - Life style interventions and Counselling for Caregiver.
- Involving Others
  - Setting a stable MDT is added for GP, Primary Care Nurse, Specialist Care Doctor, Hospital Nurse, Specialist Nurse, Social Worker and Pharmacists.
- Rehabilitation
  - All the Rehabilitation tasks are added for Patient. GP, Specialist Care Doctor and Caregiver. Patient is a participant stakeholder, not the performer.
  - Physical and Occupational are added for Primary Care Nurse and Hospital Nurse.
  - “Others” is added for Other therapist.
- Monitoring and Review
  - Health Outcomes is added for Patient.
  - Medication adherence added for Hospital Nurse.
  - Lifestyles for the latter (Hospital Nurse) and Social Worker.
  - Patient/family’s experience added for Social Worker.
- Patient Empowerment, added tasks:
  - Patient Involvement Promotion Programs and Training for GPs.
  - Health Coaching Programs, Patient Involvement Promotion Programs and Training for Secondary Care Doctor.
  - Health Coaching Programs for Specialist Nurse.
  - Health Coaching Programs, Patient Involvement Promotion Programs for Psychologist and Social Worker, adding also Health Advice to the latter.
- Care Plan Drafting
  - All the tasks but Discard Care Plan (previously included in the current scenario) are added for Patients.

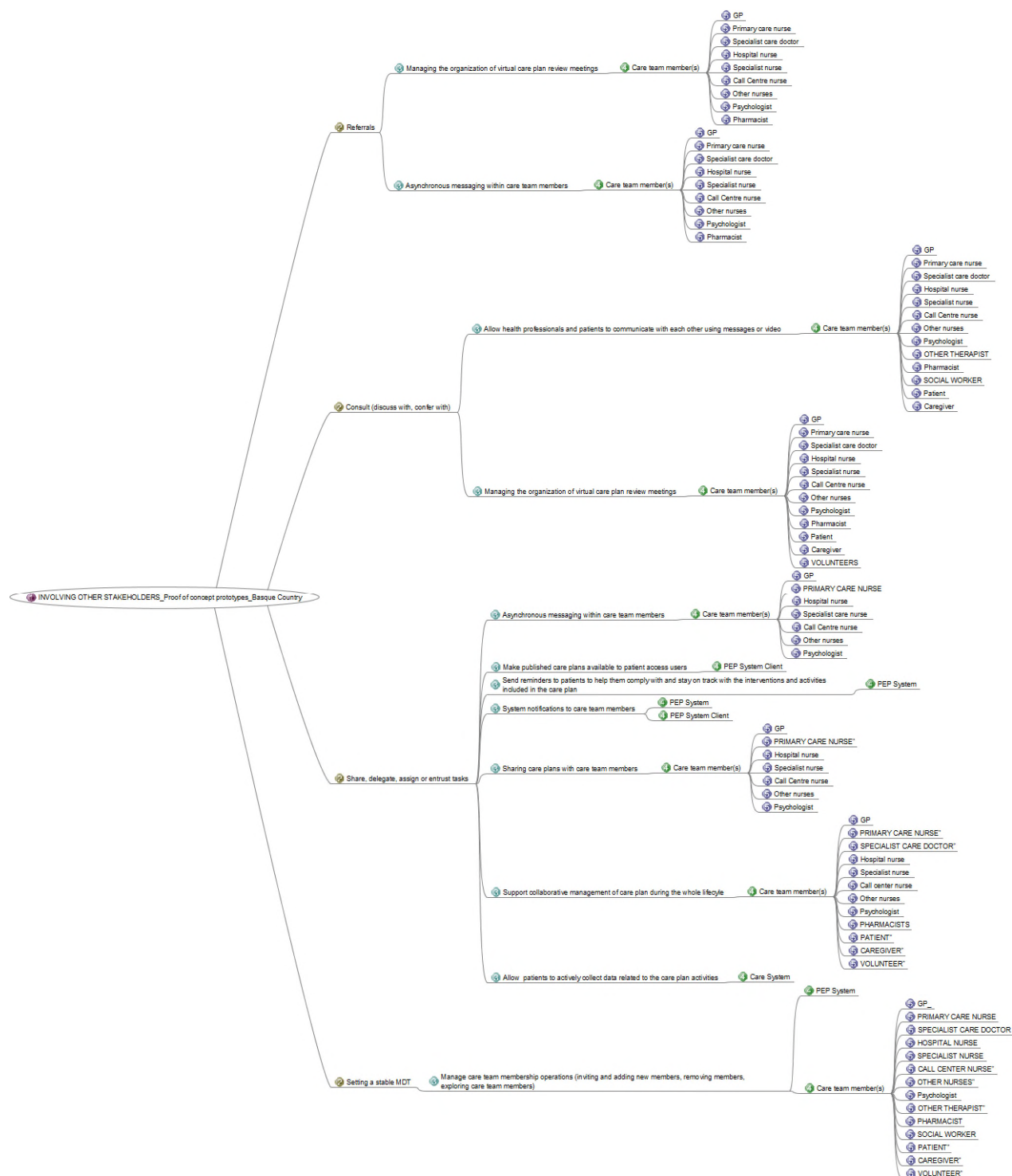
#### ***6.3.4. Relationship between the functionalities of High Level Components (HLC) with activities, subtasks and actors***

Mind Maps summarize the organizational models supporting the High Level Component (HLC) in the Basque Country.

The diagrams depict the composition of the care teams (node 5) in the three activities that will be drastically influenced by the C3-CLOUD project: Involving other stakeholders, patient empowerment and care plan drafting.

##### **a) Involving other stakeholders**

This Mind Map summarizes the organizational models supporting the “involving other stakeholders” activity” (node 1). The tasks are defined in the nodes 2 level: referrals, consult or discuss with others, share delegate, assign or entrust tasks, setting a stable MDT). They have been associated to the specific functionalities of HLC (node 3 level): manage the organization of virtual meetings, sharing care plans with others, etc. New Actors (node 5) have been associated to the specific functionalities of HLC (node 3), in addition to those previously identified based on the current organization and on the new C3-CLOUD communication and activities requirements described in the above sections.



**Figure 73.** Involving other stakeholders in Proof of concept prototype in Basque Country

In the diagram referred to the C3-CLOUD organizational prototype, the names of the new actors are written in capital letters in order to be differentiated from the actors referred to the current organization. When GPs are incorporated as new actors, they are named as GP\_.

In Basque Country, C3-CLOUD will reinforce the coordination and collaboration among health and social care stakeholders, enabling a collaborative and continuity of care. The use of one single platform for the development and execution of Personalised Care Plans managed by the MDT will support it.

In comparison to the as-is organizational models, the Proof of concept prototypes incorporate more actors as members of the care team performing “Involving other stakeholder” activity, to ensure the adequate operation of C3-CLOUD HLC:

- a. Task: ***Referrals***:
  - i. *Managing the organization of virtual care plan review meetings*:
    - New Care Team Members: No one.
  - ii. *Asynchronous messaging within care team members*:
    - New Care Team Members: No one.
- b. Task: ***Consult (discuss with, confer with)***:
  - i. *Allow health professionals and patients to communicate with each other using messages or video*:
    - New Care Team Members: OTHER THERAPIST, SOCIAL WORKER.
  - ii. *Managing the organization of virtual care plan reviews meetings*:
    - New Care Team Members: VOLUNTEERS.
- c. Task: ***Share, delegate, assign or entrust tasks***:
  - i. *Asynchronous messaging within care team members*:
    - New Care Team Members: PRIMARY CARE NURSE.
  - ii. *Make published care plans available to patient access users*:
    - New Care Team Members: NA.
  - iii. *Send reminders to patients to help them comply with and stay on track with the interventions and activities included in the care plan*:
    - New Care Team Members: NA.
  - iv. *System notifications to care team members*:
    - New Care Team Members: NA.
  - v. *Sharing care plans with care team members*:
    - New Care Team Members: PRIMARY CARE NURSE.
  - vi. *Support collaborative management of care plan during the whole lifecycle*
    - New Care Team Members: PATIENT, GP, PRIMARY CARE NURSE, SPECIALIST CARE DOCTOR, HOSPITAL NURSE, SPECIALIST NURSE, CALL CENTRE NURSE, OTHER NURSES, OTHER THERAPIST, PHARMACIST, CAREGIVER, VOLUNTEER.
  - vii. *Allow patients to actively collect data related to the care plan activities*:
    - New Care Team Members: NA.
- d. Task: ***Setting a stable MDT***:

- i. *Manage care team membership operations (inviting and adding new members, removing members, exploring care team members:*
  - New Care Team Members: NA.

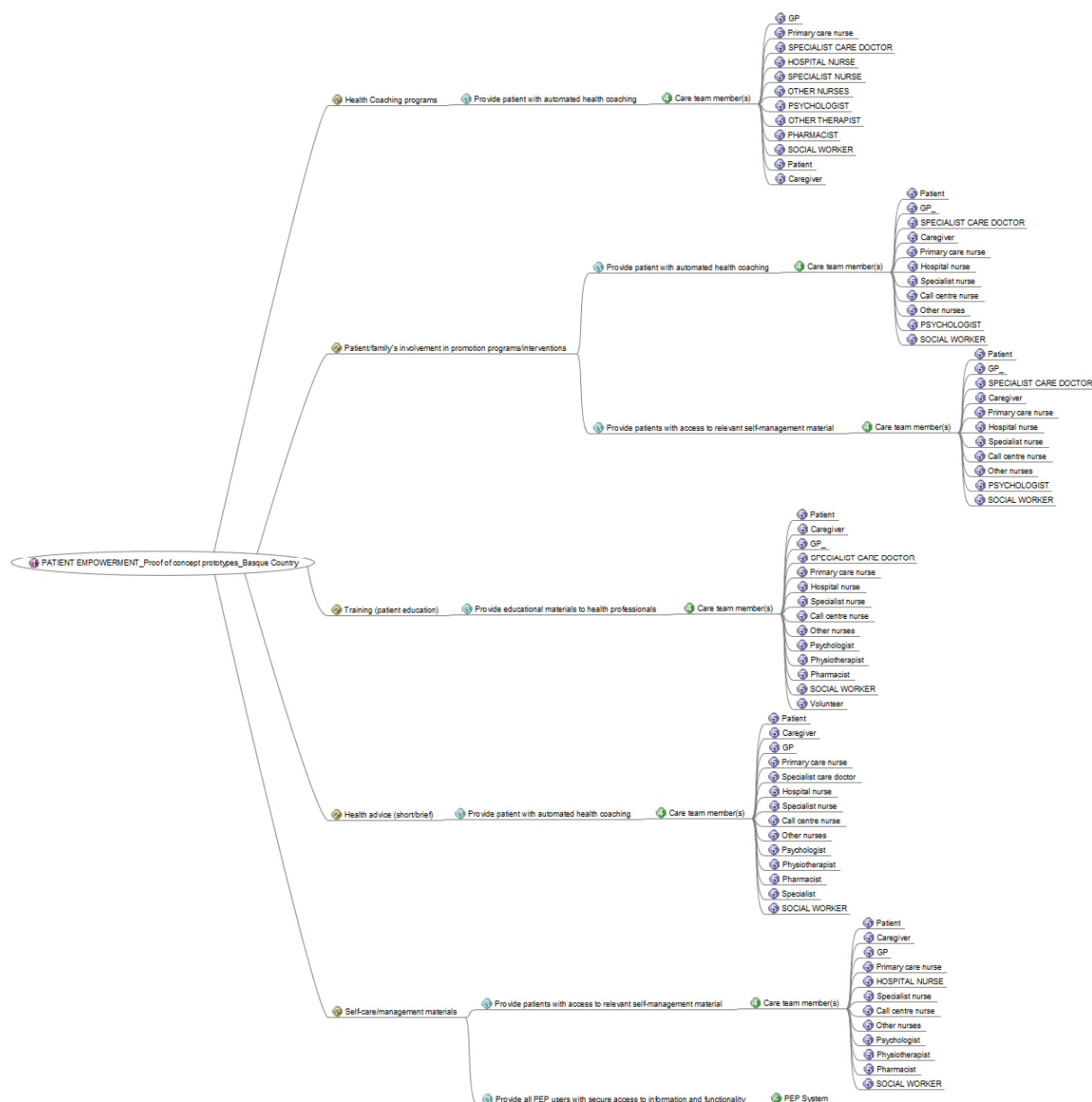
#### b) **Patient Empowerment**

This Mind Map summarizes the organizational models supporting the “Patient Empowerment” activity” (node 1). The tasks are defined in the nodes 2 level: Health coaching programs, Patient/family’s involvement in promotion program/interventions and others. They have been associated to the specific functionalities of HLC (node 3 level): Provide patient with automated health coaching or provide patient with access to relevant self-management material, amongst others. New Actors (node 5) have been associated to the specific functionalities of HLC (node 3), in addition to those previously identified based on the current organization and on the new C3-CLOUD Patient Empowerment requirements described in the above sections.

In the Mind Maps diagrams referred to the C3-CLOUD organizational prototype, the names of the new actors are written in capital letters in order to be differentiated from the actors referred to the current organization. When GPs are incorporated as new actors, they are named as GP\_.

Currently in Basque Country, the patient is already involved in the tasks related to Patient Empowerment. On top of that, C3-CLOUD will enable to strengthen their involvement. In addition, the project will reinforce the further actively participation of those actors that up to now only had a small share in this activity, as Social Worker and Psychologist.





**Figure 74.** Patient Empowerment in Proof of concept prototype in Basque Country

In comparison to the as-is organizational models, the Proof of concept prototypes incorporate more actors as members of the care team performing “Patient empowerment” activity, to ensure the adequate operation of C3-CLOUD HLC:

f. Task: **Health coaching programs:**

i. *Provide patient with automated health coaching:*

- New Care Team Members: SPECIALIST CARE DOCTOR, HOSPITAL NURSE, SPECIALIST NURSE, OTHER NURSES, PSYCHOLOGIST, OTHER THERAPIST PHARMACIST, SOCIAL WORKER.

g. Task: **Patient/family's involvement in promotion program/interventions:**

i. *Provide patient with automated health coaching:*

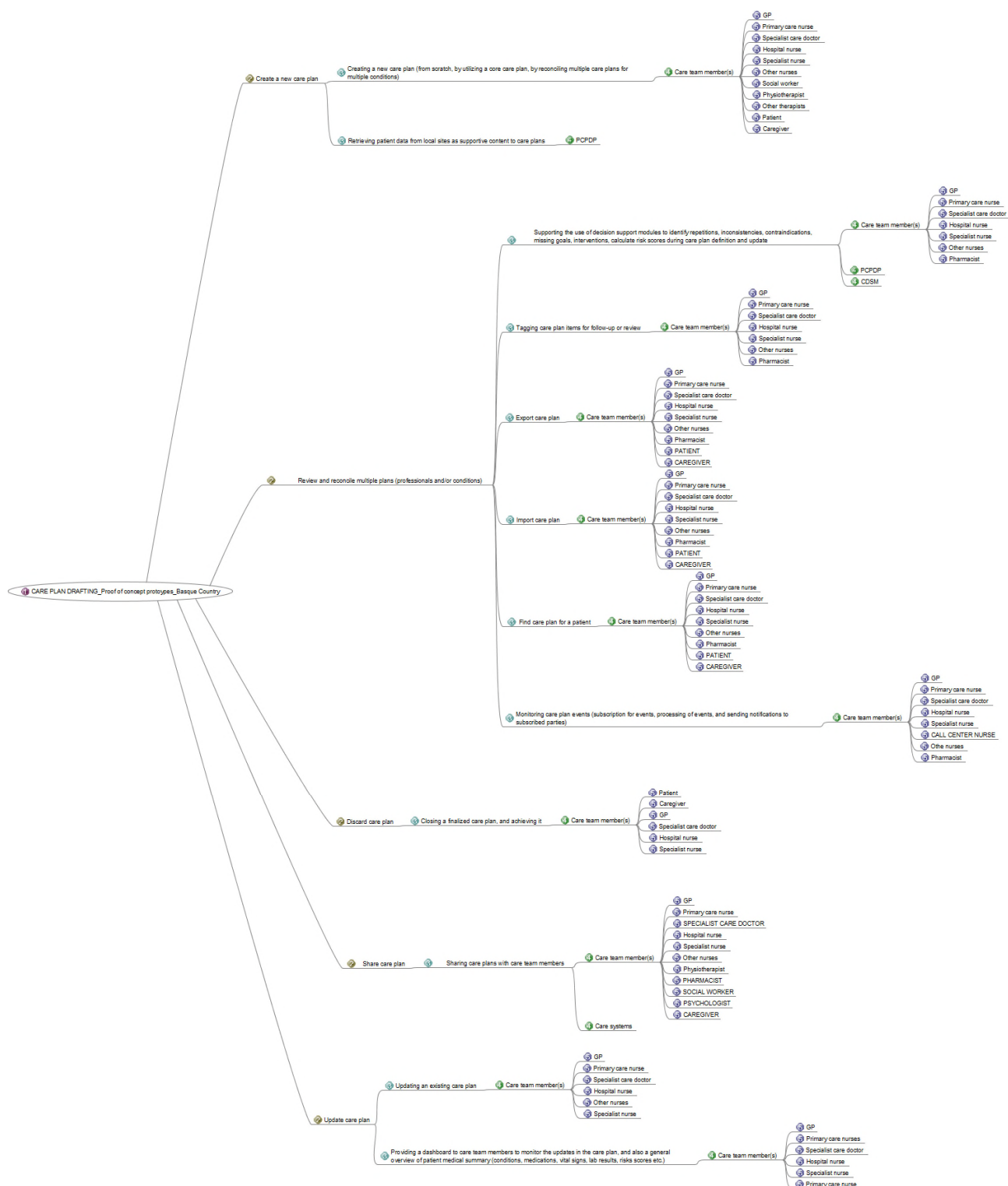
- New Care Team Members: GP, SPECIALIST CARE DOCTOR, PSYCHOLOGIST, SOCIAL WORKER.
- ii. *Provide patient with access to relevant self-management material:*
  - New Care Team Members: GP, SPECIALIST CARE DOCTOR, PSYCHOLOGIST, SOCIAL WORKER.
- h. Task: **Training (patient education):**
  - i. *Provide patient with automated health coaching;*
    - New Care Team Members: GP, SPECIALIST CARE DOCTOR, SOCIAL WORKER.
- i. Task: **Health advice:**
  - i. *Provide patient with automated health coaching.*
    - New Care Team Members: SOCIAL WORKER:
- j. Task: **Self-care management materials:**
  - i. *Provide patient with access to relevant self-management materials:*
    - New Care Team Members: SOCIAL WORKER, HOSPITAL NURSE.
  - ii. *Provide all PEP users with secure access to information and functionality:*
    - New Care Team Members: NA.

### c) Care plan drafting

This Mind Map summarizes the organizational models supporting the “Care Plan Drafting” activity (node 1). The tasks are defined in the nodes 2 level: Create a new care plan and others, Review and reconcile multiple plans, Discard care plan and others. They have been associated to the specific functionalities of HLC (node 3 level): Supporting the use of DSM to identify repetitions inconsistencies, contraindications, missing goals, interventions calculate risk scores during care plan definition and update, Find a care plan for a patient or Sharing care plans with care team members amongst others. New Actors (node 5) have been associated to the specific functionalities of HLC (node 3), in addition to those previously identified based on the current organization and on the new C3-CLOUD Care Plan Drafting requirements described in the above sections.

In the Mind Maps diagrams referred to the C3-CLOUD organizational prototype, the names of the new actors are written in capital letters in order to be differentiated from the actors referred to the current organization. When GPs are incorporated as new actors, they are named as GP\_.

In Basque Country, no significant changes in the multidisciplinary team members are observed in the C3-CLOUD scenario. However, a higher involvement of patient and caregiver is needed as key contributors for the care plan drafting. The real change derived from the project will be based on the deployment of a coordinated, collaborative and integrated care among all professionals involved, supported by the C3-CLOUD High Level Components.



**Figure 75.** Care Plan Drafting in Proof of concept prototype in Basque Country

In comparison to the as-is organizational models, the Proof of concept Prototype incorporate more actors as members of the care team performing “Care Plan Drafting” activity, to ensure the adequate operation of C3-CLOUD HLC:

- f. Task: **Create a new care plan:**
  - v. *Creating a new care plan:*
    - New Care Team Members: No one.
  - vi. *Retrieving patient data from local sites as supportive content to care plans:*
    - New Care Team NA.
- g. Task: **Review and reconcile multiple plans (professionals and/or conditions):**
  - xiii. *Supporting the use of DSM to identify repetitions inconsistencies, contraindications, missing goals, interventions calculate risk scores during care plan definition and update:*
    - New Care Team Members: No one.
  - xiv. *Tagging care plan items for follow-up of review;*
    - New Care Team Members: No one.
  - xv. *Export care plan:*
    - New Care Team Members: PATIENT, CAREGIVER (The participation of both patient and caregivers relates to a contribution, not the execution).
  - xvi. *Import care plan:*
    - New Care Team Members: PATIENT, CAREGIVER (The participation of both patient and caregivers relates to a contribution, not the execution).
  - xvii. *Find a care plan for a patient:*
    - New Care Team Members: PATIENT, CAREGIVER (The participation of both patient and caregivers relates to a contribution, not the execution).
  - xviii. *Monitoring care plan events (subscription for events, processing of events and sending notifications to subscribed patients):*
    - New Care Team Members: CALL CENTER NURSE.
- h. Task: **Discard care plan:**
  - v. *Closing a finalized care plan and achieving it:*
    - New Care Team Members: No one.
- i. Task: **Share care plan:**
  - iii. *Sharing care plans with care team members:*
    - New Care Team Members: SPECIALIST CARE DOCTOR, PSYCHOLOGIST, SOCIAL WORKER, PHARMACIST.
- j. Task: **Update care plan:**
  - iii. *Updating an existing:*
    - New Care Team Members: No one.
  - vi. *Providing a dashboard to care team members to monitor the updated in the care plan, and also a general overview of patient medical summary (conditions, medications, vital signs, lab results, risks scores etc.):*
    - New Care Team Members: No one.

## 6.4. Prototypes deployment next steps

“Prototypes” are representations of design ideas created before final artifacts exist. Prototyping is a method regularly employed in the design and development of products and services. It is a powerful means to facilitate organizational development and change. It involves moving from the world of abstract ideas, analysis, theories, plans, and specifications to the world of concrete, tangible, and experiential things. It allows to explore and communicate evolving ideas and potential solutions.<sup>138</sup> It is an approach to service development that encourages low cost, low-risk, iterative experimentation.<sup>139</sup>

The three Pilot Sites have good health system that comply with most of the Prototypes requirements. Organizational and geographical settings and place of service for interventions are defined. Care coordination actors, activities and interpersonal communication are in place. There are however some areas identified in the above Sections that require actions. Task 4.3 Change Management for New Ways of Care Delivery will take the results of this Report (D4.2), and examine the implications for health care provider organisations, and larger-scale delivery entities such as healthcare regions. They will need to develop the capability identified (infrastructure, skills and organisational practices) to provide the person-centred integrated care that properly addresses multi-morbidity. This task will work with a cross stakeholder advisory group comprising representatives from the pilot sites and selected experts from outside the consortium, to examine the implications and highlight the educational and training gaps that need to be filled, and incentives needed for different stakeholder groups to adapt to new ways of working. It will closely work with Task 8.3 to secure the physical/logical infrastructure for the deployment.

## 7. REFERENCES

- <sup>1</sup> WHO – World Health Organization (2010), “Global Status Report on Noncommunicable Diseases”, World Health Organization, available at [http://apps.who.int/iris/bitstream/10665/44579/1/9789240686458\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/44579/1/9789240686458_eng.pdf)
- <sup>2</sup> Wagner EH. Meeting the needs of chronically ill people. *BMJ* 2001; 323: 945–946.
- <sup>3</sup> Pham HH, Schrag D, O’Malley AS, Wu B, Bach PB. Care patterns in Medicare and their implications for pay for performance. *N Engl J Med* 2007;356:1130-9
- <sup>4</sup> Warner M, Gould N. Integrated care networks and quality of life: linking research and practice. *International Journal of Integrated Care*. 2003;3:e23.
- <sup>5</sup> Busse R, Stahl J. Chronic Care: Integrated Care Experiences And Outcomes In Germany, The Netherlands, And England. *Health Aff* September 2014 33:91549-1558; doi:10.1377/hlthaff.2014.0419
- <sup>6</sup> WHO – World Health Organization (2010), “Global Status Report on Noncommunicable Diseases”, World Health Organization, available at [http://apps.who.int/iris/bitstream/10665/44579/1/9789240686458\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/44579/1/9789240686458_eng.pdf)
- <sup>7</sup> Wagner EH, Davis C, Schaefer J, Von Korff M, Austin B. A survey of leading chronic disease management programs: are they consistent with the literature? *Managed Care Quarterly*. 1999;7(3):56–66.
- <sup>8</sup> Wagner EH, Austin BT, Davis C, Hindmarsh M, Schaefer J, Bonomi A. Improving chronic illness care: translating evidence into action. *Health Aff (Millwood)* 2001 Nov–Dec;20(6):64–78.
- <sup>9</sup> <http://smallbusiness.chron.com/organizational-model-22014.html>
- <sup>10</sup> [https://en.wikipedia.org/wiki/Organizational\\_structure](https://en.wikipedia.org/wiki/Organizational_structure)
- <sup>11</sup> <https://www.ahrq.gov/professionals/prevention-chronic-care/improve/coordination/index.html>
- <sup>12</sup> <https://www.hl7.org/fhir/careplan.html>
- <sup>13</sup> <https://www.modeliosoft.com/technologies/bpmn.html?lang=en-GB>
- <sup>14</sup> <http://www.mindmapping.com/>
- <sup>15</sup> OECD. Health reform: Meeting the challenge of ageing and multiple morbidities. OECD Publishing; 2011.
- <sup>16</sup> Heyeres M, McCalman J, Tsey K, Kinchin I. The Complexity of Health Service Integration: A Review of Reviews. *Front Public Health*. 2016 Oct 17;4:223.
- <sup>17</sup> Delnoij D, Klazinga N, Glasgow IK. Integrated care in an international perspective. *Int J Integr Care*. 2002; Apr-Jun;2:e04.
- <sup>18</sup> Raleigh V, Bardsley M, Smith P, et al. Integrated care and support Pioneers: Indicators for measuring the quality of integrated care. Final report. PIRU April 2014 accessed july 2016 <http://www.piru.ac.uk/assets/files/IC%20and%20support%20Pioneers-Indicators.pdf>
- <sup>19</sup> Curry N, Ham C (2010). Clinical and service integration: the route to improved outcomes. London: The King’s Fund. Available at: [www.kingsfund.org.uk/publications/clinical-and-service-integration](http://www.kingsfund.org.uk/publications/clinical-and-service-integration)
- <sup>20</sup> Burns LR, Pauly MV (2002). ‘Integrated delivery networks: A detour on the road to integrated health care?’ *Health Affairs*, vol 21, pp 128–43.
- <sup>21</sup> Leutz WN. Five laws for integrating medical and social services: lessons from the United States and the United Kingdom. *Milbank Q*. 1999; 77(1):77–110, iv–v
- <sup>22</sup> Leutz WN. Five laws for integrating medical and social services: lessons from the United States and the United Kingdom. *Milbank Q*. 1999; 77(1):77–110, iv–v

- 
- <sup>23</sup> Burns LR, Pauly MV (2002). 'Integrated delivery networks: A detour on the road to integrated health care?' *Health Affairs*, vol 21, pp 128–43.
- <sup>24</sup> Robinson JC, Casalino LP (1996). 'Vertical integration and organizational networks in health care'. *Health Affairs*, vol 15, no 1, pp 7–22.
- <sup>25</sup> Mays N, Hand K (2000). A Review of Options for Health and Disability Support Purchasing in New Zealand. New Zealand Treasury Working Paper.
- <sup>26</sup> Robinson JC, Casalino LP (1996). 'Vertical integration and organizational networks in health care'. *Health Affairs*, vol 15, no 1, pp 7–22.
- <sup>27</sup> NHS Confederation. Building integrated care. Lessons from the UK and elsewhere. <http://www.nhsconfed.org/~media/Confederation/Files/Publications/Documents/Building%20integrated%20care.pdf> (accessed 13 January 2017)
- <sup>28</sup> Chapter 3. Care Coordination Measurement Framework. Content last reviewed June 2014. Agency for Healthcare Research and Quality, Rockville, MD. <http://www.ahrq.gov/professionals/prevention-chronic-care/improve/coordination/atlas2014/chapter3.html>
- <sup>29</sup> Chapter 3. Care Coordination Measurement Framework. Content last reviewed June 2014. Agency for Healthcare Research and Quality, Rockville, MD. <http://www.ahrq.gov/professionals/prevention-chronic-care/improve/coordination/atlas2014/chapter3.html>
- <sup>30</sup> Knai C, Nolte E, Conklin A, Pedersen JS, Brereton L. The underlying challenges of coordination of chronic care across Europe *International Journal of Care Coordination* 2014, Vol. 17(3–4) 83–92
- <sup>31</sup> Institute of Medicine (U.S.). Committee on the Crossing the Quality Chasm: Next Steps Toward a New Health Care System. The 1st annual crossing the quality chasm summit: a focus on communities. Washington, D.C.: National Academies Press; 2004.
- <sup>32</sup> Wagner EH. Care for chronic diseases. *BMJ* 2002; 325: 913–914.
- <sup>33</sup> Curry N, Ham C (2010). Clinical and service integration: the route to improved outcomes. London: The King's Fund. Available at: [www.kingsfund.org.uk/publications/clinical-and-service-integration](http://www.kingsfund.org.uk/publications/clinical-and-service-integration)
- <sup>34</sup> Mays GP, Au M, Claxton G. Convergence And Dissonance: Evolution In Private-Sector Approaches To Disease Management And Care Coordination. *Health Affairs* 26, no. 6 (2007): 1683–1691;
- <sup>35</sup> Singh D (2005b). Which Staff Improve Care for People with Long-term Conditions? A rapid review of the literature. Birmingham: Health Services Management Centre. Accessed 17/1/2017 at [www.download.bham.ac.uk/hsmc/pdf/transforming\\_chronic\\_care.pdf](http://www.download.bham.ac.uk/hsmc/pdf/transforming_chronic_care.pdf)
- <sup>36</sup> Bott, D., M. Kapp, L. Johnson and L. Mango (2009), Disease Management for Chronically Ill Beneficiaries in Traditional Medicare, *Health Affairs*, Vol. 28, No. 1, pp. 86-98.
- <sup>37</sup> Mays GP, Au M, Claxton G. Convergence And Dissonance: Evolution In Private-Sector Approaches To Disease Management And Care Coordination. *Health Affairs* 26, no. 6 (2007): 1683–1691;
- <sup>38</sup> Bodenheimer T. Coordinating care--a perilous journey through the health care system. *N Engl J Med*. 2008 Mar 6;358(10):1064-71. doi: 10.1056/NEJMp0706165.
- <sup>39</sup> Curry N, Ham C (2010). Clinical and service integration: the route to improved outcomes. London: The King's Fund. Available at: [www.kingsfund.org.uk/publications/clinical-and-service-integration](http://www.kingsfund.org.uk/publications/clinical-and-service-integration)
- <sup>40</sup> Bodenheimer T. Coordinating care--a perilous journey through the health care system. *N Engl J Med*. 2008 Mar 6;358(10):1064-71. doi: 10.1056/NEJMp0706165.
- <sup>41</sup> Gazendam HWM, Coordination Mechanisms in Multi-Actor Systems. In: *Planning in Intelligent Systems: Aspects, Motivations, and Methods*. John Wiley & Sons; 2006. <https://pdfs.semanticscholar.org/3f16/68a32987b2ffecf2294f5e7cecd40569a6d.pdf>
- <sup>42</sup> <http://www.hl7.org/Special/committees/patientcare/index.cfm>

- 
- <sup>43</sup> [http://wiki.hl7.org/index.php?title=Care\\_Coordination\\_Service](http://wiki.hl7.org/index.php?title=Care_Coordination_Service)
- <sup>44</sup> [http://wiki.ihe.net/index.php?title=Patient\\_Care\\_Coordination\\_Technical\\_Committee](http://wiki.ihe.net/index.php?title=Patient_Care_Coordination_Technical_Committee)
- <sup>45</sup> <http://wiki.siframework.org/LCC+Longitudinal+Care+Plan+%28LCP%29+SWG>
- <sup>46</sup> [http://wiki.siframework.org/file/view/CDAR2\\_IG\\_CCDA\\_CLINNOTES\\_DSTUR2\\_D1\\_2013SEP\\_V2\\_Templates\\_and%20Supporting.docx/447240888/CDAR2\\_IG\\_CCDA\\_CLINNOTES\\_DSTUR2\\_D1\\_2013SEP\\_V2\\_Templates\\_and%20Supporting.docx](http://wiki.siframework.org/file/view/CDAR2_IG_CCDA_CLINNOTES_DSTUR2_D1_2013SEP_V2_Templates_and%20Supporting.docx/447240888/CDAR2_IG_CCDA_CLINNOTES_DSTUR2_D1_2013SEP_V2_Templates_and%20Supporting.docx)
- <sup>47</sup> [http://www.hl7.org/Special/committees/tsc/BallotManagement/Reports/ActBallots\\_by\\_wgid.cfm?wg\\_id=33](http://www.hl7.org/Special/committees/tsc/BallotManagement/Reports/ActBallots_by_wgid.cfm?wg_id=33)
- <sup>48</sup> [http://www.arkitekturledningen.se/undermappar/Dokument/V-TIM\\_v2\\_091013\\_English\\_attributes.pdf](http://www.arkitekturledningen.se/undermappar/Dokument/V-TIM_v2_091013_English_attributes.pdf)
- <sup>49</sup> Modeling shared care plans using CONTsys and openEHR to support shared homecare of the elderly, by Maria Hagglund, Rong Chen, Sabine Koch; Karolinska Institutet, Stockholm, Sweden; J Am Med Inform Assoc. 2011;18:66e69. doi:10.1136/jamia.2009.000216; jamia.bmj.com.
- <sup>50</sup> [hl7.org/fhir](http://hl7.org/fhir)
- <sup>51</sup> <https://www.hl7.org/fhir/careplan.html>
- <sup>52</sup> Cash-Gibson L, Rosenmuller M. Project INTEGRATE – a common methodological approach to understand integrated health care in Europe. *Int J Integr Care*. 2014; Vol.14, Oct-Dec
- <sup>53</sup> Burns LR, Pauly MV (2002). ‘Integrated delivery networks: A detour on the road to integrated health care?’ *Health Affairs*, vol 21, pp 128–43.
- <sup>54</sup> Robinson JC, Casalino LP (1996). ‘Vertical integration and organizational networks in health care’. *Health Affairs*, vol 15, no 1, pp 7–22.
- <sup>55</sup> NHS Confederation. Building integrated care. Lessons from the UK and elsewhere. <http://www.nhsconfed.org/~media/Confederation/Files/Publications/Documents/Building%20integrated%20care.pdf> (accessed 13 January 2017)
- <sup>56</sup> Heyeres M, McCalman J, Tsey K, Kinchin I. The Complexity of Health Service Integration: A Review of Reviews. *Front Public Health*. 2016 Oct 17;4:223.
- <sup>57</sup> Curry N, Ham C (2010). Clinical and service integration: the route to improved outcomes. London: The King’s Fund. Available at: [www.kingsfund.org.uk/publications/clinical-and-service-integration](http://www.kingsfund.org.uk/publications/clinical-and-service-integration)
- <sup>58</sup> Curry N, Ham C (2010). Clinical and service integration: the route to improved outcomes. London: The King’s Fund. Available at: [www.kingsfund.org.uk/publications/clinical-and-service-integration](http://www.kingsfund.org.uk/publications/clinical-and-service-integration)
- <sup>59</sup> WHO Regional Office for Europe (2016) The European Framework for Action on Integrated Health Services: An Overview, WHO Regional Office for Europe, Copenhagen. Available at: <http://www.euro.who.int/en/health-topics/Health-systems/health-services-delivery/publications/2016/the-european-framework-for-action-on-integrated-health-services-delivery-an-overview-2016>
- <sup>60</sup> World Health Organisation (2016) WHO Framework on Integrated People-Centred Health Services. WHO, Geneva, Available at: <http://www.who.int/servicedeliverysafety/areas/people-centred-care/en/>
- <sup>61</sup> Knai C, Nolte E, Conklin A, Pedersen JS, Brereton. The underlying challenges of coordination of chronic care across Europe. *International Journal of Care Coordination* (2014) Vol: 17 issue: 3-4, page(s): 83-92
- <sup>62</sup> R. Bengoa Transforming health care: an approach to system-wide implementation *Int J Integr Care*., 13 (2013), pp. e039
- <sup>63</sup> Mur-Veeman I, van Raak A, Paulus A. Comparing integrated care policy in Europe: does policy matter? *Health Policy*, 85 (2) (2008), pp. 172–183
- <sup>64</sup> Bodenheimer T. Coordinating care--a perilous journey through the health care system. *N Engl J Med*. 2008 Mar 6;358(10):1064-71. doi: 10.1056/NEJMp0706165.



- 
- <sup>65</sup> Kaplan SH, Greenfield S, Gandek B, Rogers WH, Ware JE Jr. Characteristics of physicians with participatory decision-making styles. *Ann Intern Med* 1996;124:497-504.
- <sup>66</sup> Anderson G, The latest disease burden challenge: People with multiple chronic conditions; in OECD (2011), *Health Reform: Meeting the Challenge of Ageing and Multiple Morbidities*, OECD Publishing. <http://dx.doi.org/10.1787/9789264122314-en>
- <sup>67</sup> Warner M, Gould N. Integrated care networks and quality of life: linking research and practice. *International Journal of Integrated Care*. 2003;3:e23.
- <sup>68</sup> Delnoij D, Klazinga N, Glasgow IK. Integrated care in an international perspective. *Int J Integr Care*. 2002; Apr-Jun;2:e04.
- <sup>69</sup> [https://ec.europa.eu/eip/ageing/about-the-partnership\\_en](https://ec.europa.eu/eip/ageing/about-the-partnership_en)
- <sup>70</sup> European Innovation Partnership on Active and Healthy Ageing, Action Plan on ‘Replicating and tutoring integrated care for chronic diseases, including remote monitoring at regional levels’. [http://ec.europa.eu/research/innovation-union/pdf/active-healthy-ageing/b3\\_action\\_plan.pdf](http://ec.europa.eu/research/innovation-union/pdf/active-healthy-ageing/b3_action_plan.pdf)
- <sup>71</sup> [https://ec.europa.eu/eip/ageing/repository\\_en](https://ec.europa.eu/eip/ageing/repository_en)
- <sup>72</sup> Pavlickova A. European Innovation Partnership on Active and Healthy Ageing (EIP on AHA) European Public Health Conference, 9-12 November 2016, Vienna
- <sup>73</sup> Shaw S, Rosen R, Rumbold B. *An Overview of Integrated Care in the NHS: What Is Integrated Care?* London, England: Nuffield Trust; 2011.
- <sup>74</sup> Fulop N, Mowlem A, Edwards N. *Building Integrated Care: Lessons From the UK and Elsewhere*. London, England: NHS Confederation; 2005.
- <sup>75</sup> Ham C, Curry N. *Integrated Care: What Is It? Does It Work? What Does It Mean for the NHS?* London, England: The King's Fund; 2011.
- <sup>76</sup> Schäfer W, Kroneman M, Boerma W, van den Berg M, Westert G, Devillé W, van Ginneken E. The Netherlands: health system review. *Health Syst Transit*. 2010;12(1):v-xxvii, 1-228.
- <sup>77</sup> Marin Gemmill, The London School of Economics and Political Science. “Research note: Chronic Disease Management in Europe”
- <sup>78</sup> Nolte E, Knai C, Hofmarcher M, et al. Overcoming fragmentation in health care: chronic care in Austria, Germany and the Netherlands. *Health Econ Policy Law*. 2012;7(1):125-146.
- <sup>79</sup> Schmidt-Kraepelin C, Janssen B, Gaebel W. Prevention of rehospitalization in schizophrenia: results of an integrated care project in Germany. *European Archives of Psychiatry and Clinical Neuroscience*, 259 (2) (2009), pp. 205–212
- <sup>80</sup> Busse R, Stahl J. Chronic Care: Integrated Care Experiences And Outcomes In Germany, The Netherlands, And England. *Health Aff September* 2014 33:91549-1558; doi:10.1377/hlthaff.2014.0419
- <sup>81</sup> Hildebrandt H, Schulte T, Stunder B. Triple Aim in Kinzigtal, Germany: improving population health, integrating health care, and reducing costs of care—lessons for the UK? *Journal of Integrated Care*. 2012;20(4):205–22.
- <sup>82</sup> Milsteina R, Blankarta CR. The Health Care Strengthening Act: The next level of integrated care in Germany. *Health Policy* 2016, 120, 5: 445–451
- <sup>83</sup> Schäfer W, Kroneman M, Boerma W, van den Berg M, Westert G, Devillé W, van Ginneken E. The Netherlands: health system review. *Health Syst Transit*. 2010;12(1):v-xxvii, 1-228.
- <sup>84</sup> Mur-Veeman I, van Raak A, Paulus A. Comparing integrated care policy in Europe: does policy matter? *Health Policy*, 85 (2) (2008), pp. 172–183

- 
- <sup>85</sup> Ahgren B Is it better to be big? The reconfiguration of 21st century hospitals: responses to a hospital merger in Sweden. *Health Policy*. 2008 Jul; 87(1):92-9.
- <sup>86</sup> Ahgren B, Axelsson R. A decade of integration and collaboration: the development of integrated health care in Sweden 2000-2010. *Int J Integr Care*. 2011;11(spec issue):e007.
- <sup>87</sup> Ahgren B Chain of care development in Sweden: results of a national study. *Int J Integr Care*. 2003 Oct 7; 3():e01.
- <sup>88</sup> Ahgren B, Axelsson R Determinants of integrated health care development: chains of care in Sweden. *Int J Health Plann Manage*. 2007 Apr-Jun; 22(2):145-57.
- <sup>89</sup> Ahgren B. Mutualism and antagonism within organisations of integrated health care. *J Health Organ Manag*. 2010; 24(4):396-411.
- <sup>90</sup> Andersson G, Karlberg I. Integrated care for the elderly: the background and effects of the reform of Swedish care of the elderly. *Int J Integr Care*. 2000 Nov 1; 1():e01.
- <sup>91</sup> Department of Health. Improving integration of services—the Health and Social Care Act 2012. London: The Department; accessed 2017/02/08. Available from: [http://www.legislation.gov.uk/ukpga/2012/7/pdfs/ukpga\\_20120007\\_en.pdf](http://www.legislation.gov.uk/ukpga/2012/7/pdfs/ukpga_20120007_en.pdf)
- <sup>92</sup> NHS England, Care Quality Commission, Health Education England, Monitor, Public Health England, Trust Development Authority. Five year forward view. London: NHS England, 2014.
- <sup>93</sup> <https://www.gov.uk/government/policies/improving-quality-of-life-for-people-with-long-term-conditions>
- <sup>94</sup> <http://www.networks.nhs.uk/nhs-networks/commissioning-for-long-term-conditions/>
- <sup>95</sup> A Narrative for Person-Centred Coordinated Care <http://www.england.nhs.uk/wp-content/uploads/2013/05/nv-narrative-cc.pdf>
- <sup>96</sup> The Health Foundation. ‘Does improving quality save money?’. <http://www.health.org.uk/publications/does-improving-quality-save-money/>
- <sup>97</sup> Nuño R, Sauto R, Toro N. Integrated care initiatives in the Spanish Health System/ *International Journal of Integrated Care*, 2012 (12), 1-3
- <sup>98</sup> Bengoa Rentería R. The challenge of chronicity in Spain: better transform rather than ration. *Gac Sanit*. 2015 Sep-Oct;29(5):323-5.
- <sup>99</sup> R. Nuño, R. Sauto, N. Toro. Integrated care initiatives in the Spanish Health System. Abstracts from the Third Spanish Conference on Chronic Care, San Sebastián, 19-20 May 2011 *Int J Integr Care*., 12 (2012), pp. e35
- <sup>100</sup> R. Bengoa Transforming health care: an approach to system-wide implementation. *Int J Integr Care*., 13 (2013), pp. e039
- <sup>101</sup> Waibel S, Vargas I, Aller MB, Coderch J, Farré J, Vázquez ML. Continuity of clinical management and information across care levels: perceptions of users of different healthcare areas in the Catalan national health system. *BMC Health Serv Res*. 2016 Sep 2; 16:466. Epub 2016 Sep 2.
- <sup>102</sup> AIDA. Best practice: the programme VALCRONIC-CARS, improving the process of chronic care [accessed 2017 feb 8]. Available from: <http://www.projectaida.eu/wp-content/themes/thunderbolt/docs/Valcronic.pdf>
- <sup>103</sup> García-Armesto S, Begoña Abadía-Taira M, Durán A, Hernández-Quevedo C, Bernal-Delgado E. Spain: Health system review. *Health Syst Transit*. 2010; 12(4):1-295, xix-xx.
- <sup>104</sup> Burns LR, Pauly MV (2002). ‘Integrated delivery networks: A detour on the road to integrated health care?’ *Health Affairs*, vol 21, pp 128–43.

- 
- <sup>105</sup> Curry N, Ham C (2010). Clinical and service integration: the route to improved outcomes. London: The King's Fund. Available at: [www.kingsfund.org.uk/publications/clinical-and-service-integration](http://www.kingsfund.org.uk/publications/clinical-and-service-integration)
- <sup>106</sup> Raleigh V, Bardsley M, Smith P, et al. Integrated care and support Pioneers: Indicators for measuring the quality of integrated care. Final report. PIRU April 2014 accessed July 2016 <http://www.piru.ac.uk/assets/files/IC%20and%20support%20Pioneers-Indicators.pdf>
- <sup>107</sup> Raleigh V, Bardsley M, Smith P, et al. Integrated care and support Pioneers: Indicators for measuring the quality of integrated care. Final report. PIRU April 2014 accessed July 2016 <http://www.piru.ac.uk/assets/files/IC%20and%20support%20Pioneers-Indicators.pdf>
- <sup>108</sup> Armitage GD, Suter E, Oelke ND, Adair CE. Health systems integration: state of the evidence. *International Journal of Integrated Care*. 2009;9(2). DOI: <http://doi.org/10.5334/ijic.316>
- <sup>109</sup> Bautista MA, Nurjono M, Lim YW, Dessers E, Vrijhoef HJ. Instruments Measuring Integrated Care: A Systematic Review of Measurement Properties *The Milbank Quarterly*. 2016 Dec 19; 94(4): 862-917
- <sup>110</sup> Ouwens M, Wollersheim H, Hermens M et al. Integrated care programmes for chronically ill patients: a review of systematic reviews. *International Journal for Quality in Health Care* 2005; (17) 2:141-146
- <sup>111</sup> Heyeres M, McCalman J, Tsey K, Kinchin I. The Complexity of Health Service Integration: A Review of Reviews. *Front Public Health*. 2016 Oct 17;4:223.
- <sup>112</sup> Nolte E, Pitchforth E. What is the evidence on the economic impacts of integrated care? [Internet]. Copenhagen: World Health Organization; 2014. Available from: [http://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0019/251434/What-is-the-evidence-on-the-economic-impacts-of-integrated-care.pdf](http://www.euro.who.int/__data/assets/pdf_file/0019/251434/What-is-the-evidence-on-the-economic-impacts-of-integrated-care.pdf)
- <sup>113</sup> Curry N, Ham C (2010). Clinical and service integration: the route to improved outcomes. London: The King's Fund. Available at: [www.kingsfund.org.uk/publications/clinical-and-service-integration](http://www.kingsfund.org.uk/publications/clinical-and-service-integration)
- <sup>114</sup> Singh D (2005b). Which Staff Improve Care for People with Long-term Conditions? A rapid review of the literature. Birmingham: Health Services Management Centre. Accessed 17/1/2017 at [www.download.bham.ac.uk/hsmc/pdf/transforming\\_chronic\\_care.pdf](http://www.download.bham.ac.uk/hsmc/pdf/transforming_chronic_care.pdf)
- <sup>115</sup> Soran O, Piña IL, Lamas GA et al., "Randomized Clinical Trial of the Clinical Effects of Enhanced Heart Failure Monitoring Using a Computer-Based Telephonic Monitoring System in Older Minorities and Women," *Journal of Cardiac Failure* 13, no. 9 (2007): 793.
- <sup>116</sup> Harrold LR, Field TS, Gurwitz JH. Knowledge, patterns of care, and outcomes of care for generalists and specialists. *J Gen Intern Med*. 1999;14:499-511.
- <sup>117</sup> Bott, D., M. Kapp, L. Johnson and L. Mango (2009), Disease Management for Chronically Ill Beneficiaries in Traditional Medicare, *Health Affairs*, Vol. 28, No. 1, pp. 86-98.
- <sup>118</sup> Damery S, Flanagan S, Combes G. Does integrated care reduce hospital activity for patients with chronic diseases? An umbrella review of systematic reviews. *BMJ Open*. 2016 Nov 21;6(11):e011952.
- <sup>119</sup> Busse R, Stahl J. Chronic Care: Integrated Care Experiences And Outcomes In Germany, The Netherlands, And England. *Health Aff September* 2014 33:91549-1558; doi:10.1377/hlthaff.2014.0419
- <sup>120</sup> Robinson JC, Casalino LP (1996). 'Vertical integration and organizational networks in health care'. *Health Affairs*, vol 15, no 1, pp 7-22.
- <sup>121</sup> Curry N, Ham C (2010). Clinical and service integration: the route to improved outcomes. London: The King's Fund. Available at: [www.kingsfund.org.uk/publications/clinical-and-service-integration](http://www.kingsfund.org.uk/publications/clinical-and-service-integration)
- <sup>122</sup> Curry N, Ham C (2010). Clinical and service integration: the route to improved outcomes. London: The King's Fund. Available at: [www.kingsfund.org.uk/publications/clinical-and-service-integration](http://www.kingsfund.org.uk/publications/clinical-and-service-integration)
- <sup>123</sup> Ouwens M, Wollersheim H, Hermens M et al. Integrated care programmes for chronically ill patients: a review of systematic reviews. *International Journal for Quality in Health Care* 2005; (17) 2:141-146

<sup>124</sup> Chapter 3. Care Coordination Measurement Framework. Content last reviewed June 2014. Agency for Healthcare Research and Quality, Rockville, MD. <http://www.ahrq.gov/professionals/prevention-chronic-care/improve/coordination/atlas2014/chapter3.html>

<sup>125</sup> Chapter 3. Care Coordination Measurement Framework. Content last reviewed June 2014. Agency for Healthcare Research and Quality, Rockville, MD. <http://www.ahrq.gov/professionals/prevention-chronic-care/improve/coordination/atlas2014/chapter3.html>

<sup>126</sup> McDonald KM, Sundaram V, Bravata DM, et al. Closing the Quality Gap: A Critical Analysis of Quality Improvement Strategies (Vol. 7: Care Coordination). Rockville (MD): Agency for Healthcare Research and Quality (US); 2007 Jun. (Technical Reviews, No. 9.7.) 3, Definitions of Care Coordination and Related Terms. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK44012/>

<sup>127</sup> HL7 Care Plan Initiative Project [http://wiki.hl7.org/index.php?title=Care\\_Plan\\_Project](http://wiki.hl7.org/index.php?title=Care_Plan_Project)

<sup>128</sup> McDonald KM, Sundaram V, Bravata DM, et al. Closing the Quality Gap: A Critical Analysis of Quality Improvement Strategies (Vol. 7: Care Coordination). Technical Reviews, No. 9.7. Rockville (MD): Agency for Healthcare Research and Quality (US); 2007 Jun.

<sup>129</sup> <https://www.ahrq.gov/professionals/prevention-chronic-care/improve/coordination/atlas2014/chapter3.html>

<sup>130</sup> <https://www.hl7.org/fhir/valueset-care-plan-activity.html>

<sup>131</sup> <http://www.businessdictionary.com/definition/diagnosis.html>

<sup>132</sup> <http://www.who.int/topics/rehabilitation/en/>

<sup>133</sup> Mur-Veeman I, van Raak A, Paulus A. Comparing integrated care policy in Europe: does policy matter? Health Policy, 85 (2) (2008), pp. 172–183

<sup>134</sup> Kutzin J. Bismarck vs. Beveridge: is there increasing convergence between health financing systems? 1<sup>st</sup> annual meeting of SBO network on health expenditure 21-22 November 2011 Paris, OECD. Available at <https://www.oecd.org/gov/budgeting/49095378.pdf>

<sup>135</sup> <http://medical-dictionary.thefreedictionary.com/gatekeeper>

<sup>136</sup> NESTA, Prototyping Public Services An introduction to using prototyping in the development of public services November 2011. Available at [https://www.nesta.org.uk/sites/default/files/prototyping\\_public\\_services.pdf](https://www.nesta.org.uk/sites/default/files/prototyping_public_services.pdf)

<sup>137</sup> Coughlan P, Suri JF, Canales K. Prototypes as (Design) Tools for Behavioral and Organizational Change. A Design-Based Approach to Help Organizations Change Work Behaviors. The Journal of Applied Behavioral Science, Vol. 43 No. 1, March 2007 1-13

<sup>138</sup> Coughlan P, Suri JF, Canales K. Prototypes as (Design) Tools for Behavioral and Organizational Change. A Design-Based Approach to Help Organizations Change Work Behaviors. The Journal of Applied Behavioral Science, Vol. 43 No. 1, March 2007 1-13

<sup>139</sup> NESTA, Prototyping Public Services An introduction to using prototyping in the development of public services November 2011. Available at [https://www.nesta.org.uk/sites/default/files/prototyping\\_public\\_services.pdf](https://www.nesta.org.uk/sites/default/files/prototyping_public_services.pdf)