

# Patient with Complex Needs - Experience in Implementation of LSV-Carewell Platform

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**Abstract:** The paper describes telecare procedure concerning patients aged between 65-85 years with at least 2 chronic diseases including hypertension (ICD I10), diabetes (ICD E 11), chronic obstructive pulmonary disease (ICD J44) or heart failure (ICD J50). Ultimately, the project will involve 100 patients qualified on the basis of medical history (last stay in hospital) divided in two groups. In the qualified group, each patient must have at least 60 points according to the Barthel scale. The first group comprises 50 patients taken care of by telemonitoring, which was provided to them with measuring equipment to be able to assess the selected parameters at home (depending on the chronic disease). Then, the results are transmitted automatically via mobile phone network to LSV Telecare (Lower Silesia Voivodeship Telecare) system. The other group of patients consists of those, who were not included in the home monitoring. They are provided with medical care within the current Polish health care system. In this paper we present scenarios and models of business processes, necessary to achieve the objectives of the Care Well project, which is implemented under Competitiveness and Innovation Framework Programme 2007-2013 (project "Multi-Level Integration for Patients with Complex Needs"; grant agreement no: 620983). The project involves 13 partners from 8 EU countries - project duration is 36 months. The technical parts of the project include tests and examinations of the economic and social effects, as well as indicators of the quality of life based on ICT platform for communication and exchange of medical data, that are essential in the treatment of patients qualified for Telecare.

## 1 INTRODUCTION

In Poland, among the population of people over 65 a man lives in good health, on average, to 74, and a woman to 78. All scenarios predict that by 2050 percentage of the population aged 65 years and more will double, i.e. from 15.8% in 2013 to 31.3% in the low scenario, and to 35.7% in the very high scenario. In the same period the number of the aged 85 and over, is expected to increase five times [<http://Stat.gov.pl/obszary>, 2015; Population Projection 2014-20150, Warszawa 2014].

In the last 50 years the number of people aged 60 and over has tripled and it is expected that it will arrive triple again to 2 billion by 2050. In China, there

is a region, that the increase of the proportion of people over 65 years is estimated to reach 22,7% by 2050 [Guy Pare, Mirrou, 2010]. Despite the prolongation of life expectancy, people are not healthy for longer time, on the contrary external conditions and changes of the traditional model of life are often the cause of the emergence of new and chronic diseases of civilization (diabetes, heart disease, hypertension etc.), a list of which according to the Health Minister regulation from 2009 (Dz.Uz 2009, No. 212, item. 1647) in Poland consists of 41 items. And it is estimated that these diseases cause about 60% of all deaths in almost all countries [<http://Stat.gov.pl/obszary>, 2015; Population Projection 2014-20150, Warszawa 2014].

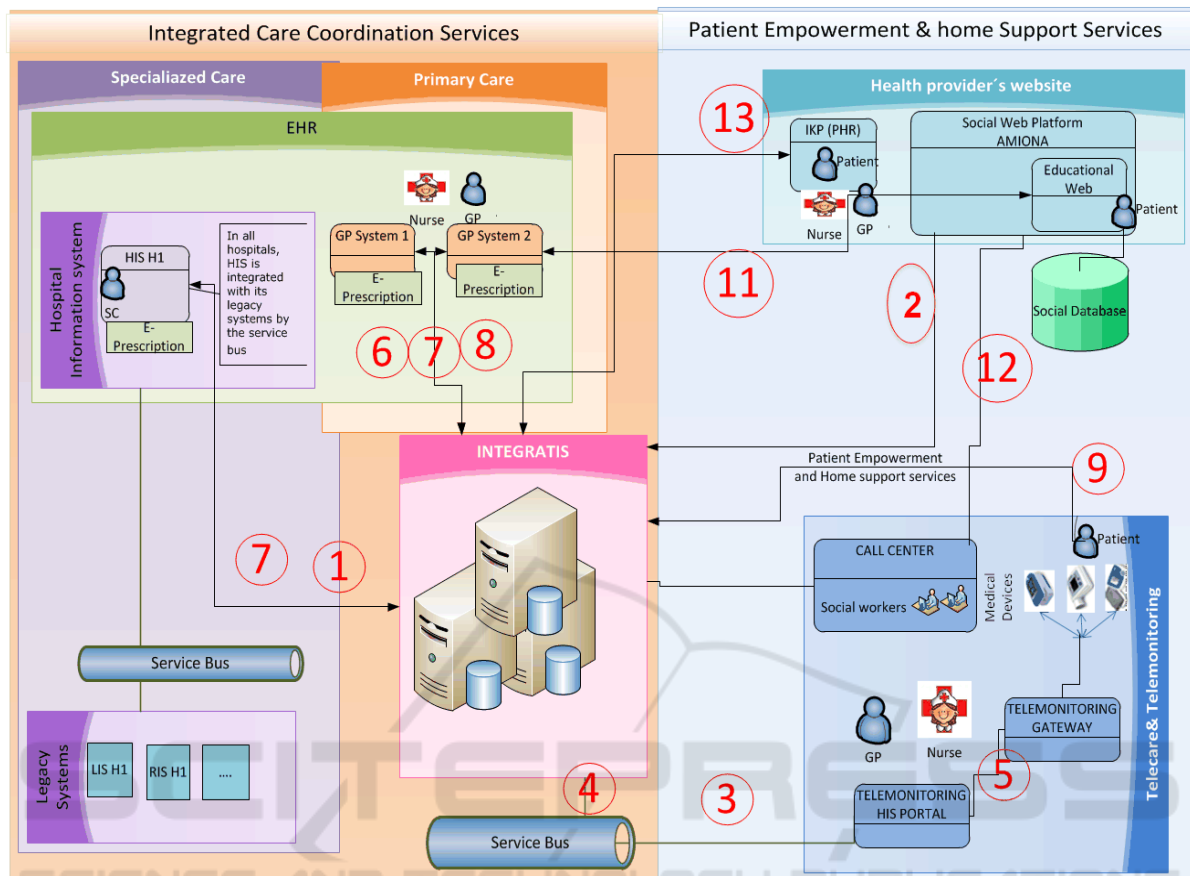


Figure 1: CareWell ICT Architecture Lower Silesia

That is why, there has been set up a number of programs supporting frail patients aged 65+ with more than one chronic disease. One of them is CareWell project, which is aimed at improving the efficiency and quality of medical care. The project is carried out in a consortium with the participation of 13 partners from 8 EU countries (Spain, the United Kingdom, Italy, Croatia, Germany, Belgium, Poland). The main objective of the CareWell-LSV project activities is to prepare ICT platform services based on the modelled business processes, which include 100 patients who are qualified on the basis of the analysis of a disease history (discharge extract from hospital). Therefore in many countries and regions in Europe there are being implemented new systems supporting telecare [Alan Wailer, Tony Maitby 2012]. A new innovative platform, created in Lower Silesia Voivodeship (LSV), for telecare is based on the integration of the already developed applications.

In LSV TELECARE the results from mobile measuring devices are collected in Monitoring Platform and automatically transmitted to the Integration Platform

To ensure a better quality of life for people aged 65+ with chronic diseases, it is needed to bear the economic burden of chronic diseases, which represents 46% of the global burden caused by these diseases. This phenomenon may be supported by information, communication technologies - mainly mobile ones, and that is an area called m-Health.

All possible questionnaires (including Bartel scale) have been in CareWell Platform within Integration Platform.

A qualified group of patients must have not fewer than 60 points by Barthel Scale. The first group of 50 patients that will be tele monitored, has been provided with measuring device for measuring the selected parameters at patients home. After the measurement is completed the results, are sent (via mobile

telephone network) to the CareWell Lower Silesia System. The other group of 50 patients is not monitored at home and they are provided with medical care within the system according to the current health care model in Poland.

## 2 SYSTEM ARCHITECTURE AND FUNCTIONAL EXPERIENCE

Key aspects in the design of a modern system of telecare is the integration of technological solutions, and the existing information systems, as well as the applicable procedures of patient care with mobile technologies in telecare. These issues are the subject of numerous works on computer systems and their clinical effects [Guy Pare and all, 2010, Guy Pare and all 2010, Spyros Kitsiou and all 2015]. These actions should find a way to show the benefits and how to teach the end user, that is a patient, how to operate mobile measuring devices at home. Therefore, the platform building design involves the integration of three sub platforms:

- Educational - Information Platform (Social)
- Integration Platform (Service Buss)
- Monitoring Platform

As Lower Silesia currently does not have many IT systems implemented to support the delivery of care or share information, both CareWell pathways will be significantly improved with the proposed ICT-enabled services and functionality.

The development of a platform, presented in Figure 1, is to provide interoperability between different IT systems used in primary and secondary care. It will enable information to be shared by various care practitioners and patients within new functionalities:

1. Registration of patient referrals for home care and telemedicine. This is the first task in the LSV Telecare platform.
2. Logged user access to the Information - Education Portal and to Integration Platform.
3. Patients Registry Update Service in HIS by Integration Platform.
4. Service of research results transfer by HIS Patient Portal to Integration Platform.
5. Registration of the performed patient results in HIS Portal.

6. GPs access to EHR and their tasks supporting LSV Telecare procedure.
7. Nurses access to EHR, and their tasks supporting LSV Telecare procedure.
8. Patients access to their own EHR and their tasks supporting the process of LSV Telecare procedure.
9. Implementation of developed services at the country level, like e-Prescription (P1 Project) within LSV Telecare procedure.
10. Call Centre staff access to their own tasks supporting LSV Telecare procedure. - receiving e-mail and SMS alerts.
11. Doctor, nurse and patient access to the Education – Information Portal.
12. Call Centre staff access to the and Education-Information Portal.
13. Some of the developments and changes which will revolve around the new interoperability of Integra TIS system.

Each of the above mentioned systems functionally meets the requirements of the identified key aspects. The Monitoring Platform is responsible for operation of measurement devices. The most important issue is the reliability of measurements in the context of user authentication. It is unacceptable to assign mistaken measurements to a patient. On the one hand, suitable authentication, authentication and data security, and on the other hand, greater ease of use and reliability. To meet these requirements it is necessary to take these constraints into account at the stage of designing a subsystem, which is supposed to manage its tasks.

The next subsystem is an Integration Platform whose main task is to integrate all the subsystems and enable their use to cover specific requirements which are put before the health care system in the region (country). At the stage of preparation for implementation there are identified requirements, which are then transferred into the BPM process model.

This model is consulted with specialists and then their approval is followed by the implementation of telecare process. The Integrated Platforms mainly task is to take care of the implementation of telecare in accordance with the modelled procedures and allow for an adequate response in any situation. Another task of the Integration Platform is the storing, processing and sharing of EHR.

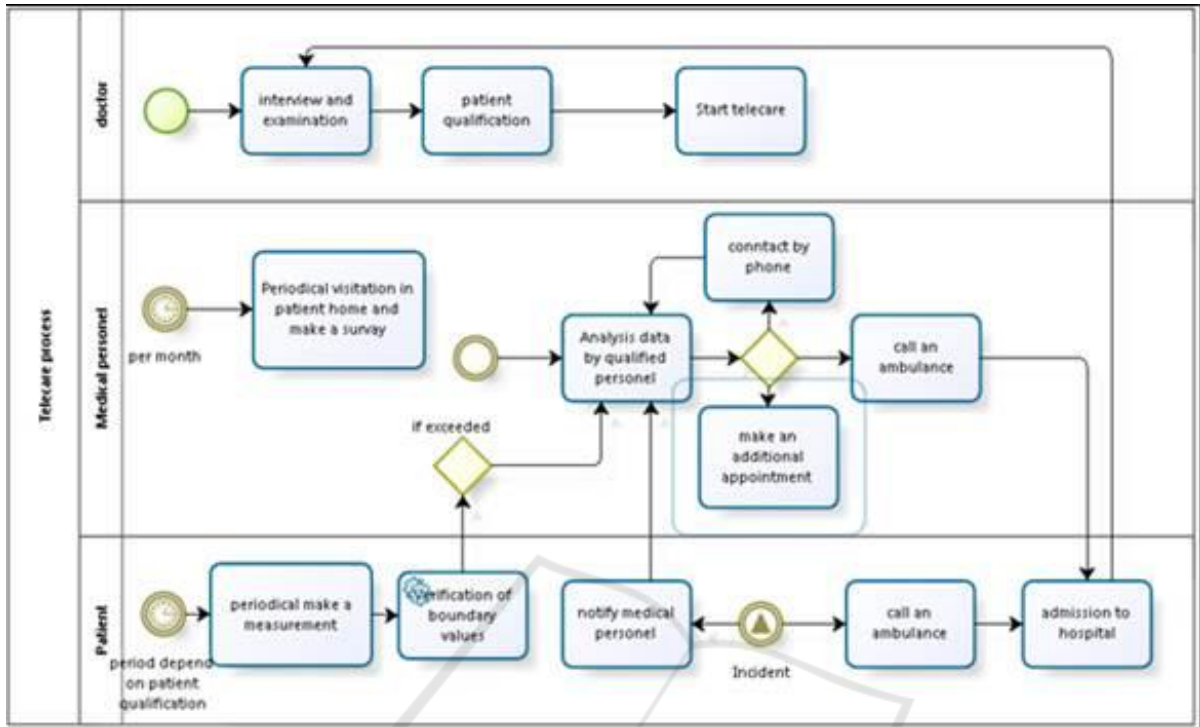


Figure 2: CareWell Homecare process model

Another aspect, which is equally significant as the previous ones, is to enable patients to benefit from telecare services in a safe way that they can understand. Facing the problem of an aging population and the fight against social exclusion, it becomes increasingly important to educate the public, create the opportunity for people to learn about and understand a model of telecare and the benefits it brings. The most important task, as well as most difficult one to be completed by that sub platform is to educate patients make them aware that the use of telecare increases their safety and a quality of life. Confronted with the standard model of health care, telecare give you more benefits. Social portal functionality also means to patients an easy access to their care history (of the disease), the possibility of being kept informed with their results and the feeling of having more control over the process of health care.

## 2.1. BUSINESS PROCESS MODEL FOR LSV - TELECARE

The first step in implementation of *LSV - TELECARE* is suitable qualification of patients and, then

depending on its outcome configuration of the appropriate telecare procedure. This is important because the process of telecare which is implemented in the system, described crucial flow of information and tasks, but does not define how various steps have to be performed by individual patient

The telecare process of the Lower Silesia CareWell System assumes that at fixed intervals a patient will perform life parameters measurements at home and the results will be transferred to a healthcare unit. In contrast to the old style home care, the telecare results have to be checked by a doctor who has to determine what specific tests and at what intervals the patient should pursue. Of course, during the process there may be a need to change some details such as measurements distance.

While the results of the patients' measurements flow into the central system, algorithms analyze the results and examine whether they exceed the thresholds, and check if their behaviour is similar to the expected one. If there is a record of a departure from the norm, in the system appears a task of analyzing these results by hospital staff - in our case, by a nurse.

Her task is to verify whether the test was carried out in a correct way, whether the patient at that time

may have taken any medicine responsible for the distortion of the results or if his behaviour did not affect their values (e.g. increased physical activity). When the observed anomaly is an erroneous measurement or it is caused by a human error, the patient is recommended to repeat the test. If it is a worrying signal which may endanger the patient's health a nurse can contact a doctor or intervene immediately by calling an ambulance to the patient.

And here we meet another phenomenon described in telecare procedure that is intervention, which we understand as the situation, that is caused by an undesired phenomenon (e.g. accident) or it is a significant deviation from the standard implementation of the procedure. The incident may be reported by the patient in two ways. In the first the patient using the supplied phone numbers call the Call Center (in hospital conducting this procedure), where he can obtain help from a nurse. In some situations, a nurse may consult it with the doctor. She can also arrange a home visit earlier, or in special situations call an ambulance to the patient. The situation in which a patient calls the emergency room directly is considered to be an incident. Then he is admitted to hospital according to standard procedures that he undergoes, and after their completion (after begin discharge) the patient record is supplemented with an extract from hospital.

In the course of the procedure there are also anticipated periodic visits by a nurse in the patient home. Normally this is done once a month. Although in case of incidents appearance, their frequency can be increased.

Once the telecare goal is reached, a patient visits a doctor, who may decide to continue the treatment or end the procedure. In the case of telecare procedure termination, there is generated an automatically record of results and doctor prepares a detailed report for the whole period covered by telecare.

## **2.2 Stable Patients – out of hospital care**

The implementation of the LSV teleCare integrated pathway will enable the following developments to the service model:

Better understanding of the roles and responsibilities of the different care practitioners involved in delivering services and interventions within the care pathway.

Integrating the hospitalisation of those patients who require it as part of the care pathway to provide better patient care transition experiences across the different sectors and professionals.

Introduction of telemonitoring for patients who require this service.

Easier access to healthcare response service for patients through the platform.

Electronic Case Record (ECR) will provide an improved communication mechanism through an email box, and thus enhance the co-ordination of a patient's care.

The platform will provide a directory of services for patients, family members and informal care givers, as well as professionals, to search for appropriate quality of the assured health and wellbeing services that are available.

Patients will be able to access the e-Prescription and choose their dispensing pharmacy.

### **2.2.1 Unstable Patients – out of hospital care**

The above enhancement for the 'stable' patient will also be relevant for the 'unstable' patient. In addition, virtual consultations will be able to be activated, if necessary, among hospital specialists, nurses and GPs via email box when a patient's health and wellbeing deteriorates.

### **2.2.2 Inpatient - hospital care**

The hospital information system (HIS) should be integrated by the ECR; healthcare professionals will have access to the information (anonymised) in the Platform if a patient gets admitted. Selected doctors involved in CareWell will have access not only to the information in HIS, but also to LSV CareWell Platform. If a doctor is interested in the information uploaded by the patient, they will ask permission from the patient to look at this data. This should provide improved information on the patient's medical history and the events leading up to hospital admission.

The educational platform in this phase of the project is not targeted at hospital doctors, but they will be able to access the information in the platform if they are interested in it.

### **2.2.3 Inpatient – hospital discharge preparation**

The hospital will be able to refer the patient for telemonitoring if they are not already receiving the intervention according to the defined CareWell criteria, and determine their physiological parameters and frequency accordingly. In addition, patients will be signposted to appropriate patient empowerment services and educational content through the platform.



For patients who were receiving telemonitoring prior to their admission, it is expected that they will return to receive the telemonitoring service upon being discharged from hospital.

### 3 MATERIAL AND METHOD

The main Project action was preparation of the material for the Ethics Committee, which was supposed to agree on a research project. At the meeting of the Ethics Committee, in accordance with the applicable legislation, it was requested to prepare a proposal to the Bioethical Committee containing:

1. CV of the principal researcher
2. A detailed description of the project
3. A written acceptance of managers of the centers where the examinations are performed
4. Consent of a trustee of archival material to its use (each center)
5. An assessment card of assessment of a service beneficiary directed to a care / staying in a care unit (rating performed by service provider according to the Barthl scale)
6. The information model for the participants of the examination-doctor
7. The information model for the participants of the examination-patient
8. Specimen of the informed consent of participants or legal representatives to participation in the examination and data processing related to this participation (in the study).
9. Statement of the applicant about the knowledge of principles of medical confidentiality
10. Submit a policy of obligatory liability insurance of the entity engaged in medical activities.

Another element of the work in the project design was based on modelled telecare processes presented in Figure 2 and then selection of the suppliers of technical solutions, ie. Platform, which is shown in Figure 1. The integration and implementation work followed by training of medical staff - doctors and nurses, lasted until 15.06.2015r. Individual technical means for patients include a set of 50 mobile phones, smartphones L65 LG (LG-D280n) for each patient. And in addition:

- A Diabetic set - glucometer- ProfiLine Blutzucker-Messsystem - 20 pcs.
- B. COPD set - pulse oximeter PC-60NW - 5 pcs. and peakflow meter - Asma-1 Vitalograph company
- C. Hipertension set - Blood pressure meter -

SeniorLine BT model TD-3128- 15 pcs.  
D. Set heart failure – pulse oximeter PC-60NW, weight scales - 10 pcs.

- Patients of Group A (diabetes) receive the glucometer.
- Patients of Group B (POHP) will receive peakflowmeter and pulse oximeter.
- Patients of Group C (hypertension) will receive blood pressure meter.
- Patients of Group D (heart failure) receive pulse oximeter and a weight scales.

Ultimately, the care will be provided for 100 people. The criteria for inclusion of patients into the follow-up observation are age 65-85; combination of not fewer than 2 types of diseases: hypertension (ICD I10), diabetes (ICD E11), chronic obstructive pulmonary disease (ICD J44), heart failure (ICD I50). Another required condition is to obtain at least 60 points according to Barthl scale.

Among the exclusion criteria involved in the project there were established: age below 65 and above 85 years, obtaining fewer than 60 points on a Barthl scale, previous myocardial infection or stroke, ischemic or haemorrhagic, in the last three months, an active process of cancer of any location, mental illnesses and unintentional loss of body weight: BMI <19, or weight loss ascertained by a doctor.

Qualifying took place on the basis of analysis of the information card of hospital stay. Patients qualified for observation were divided into two groups. The target size of both groups is 50 people. In Group I there were qualified persons covered by telemonitoring, who were provided with measuring devices depending on the disease entity. In Group II there were enrolled patients who were not covered by telemonitoring and who received no measuring devices.

Both in Group I and Group II there are patients with a similar disease profile, age group and degree of disability. In the next stage, persons qualified for the observation will be evaluated by a nurse (assessment of vital signs, including efficiency by Barthl scale) and a Primary Care physician during scheduled visits in the clinic. The estimated time of follow-up for individual patients is 18 months.

Until 06.30.2015 in the Project there were enrolled 75 people, including 39 women representing 52% of the respondents, and 36 men respectively, 48% of respondents. The average age being 73.96 years. The most commonly diagnose disease entity is hypertension (ICD I10) 73 persons (97.3% of the respondents). 45 patients (60%) were diagnosed with

diabetes (ICD E11), and respectively in 15% (12 individuals) – with COPD chronic obstructive pulmonary disease, patients and 9 patients (12%) - chronic heart failure.

## 4 CONCLUSIONS

Key experiences and lessons that we gained at this stage of the project include:

1. Difficulty in understanding and reaching consensus on telecare model, which was then mapped in the implemented user interface
2. Integration of telemedicine devices to be available to patients with the platform (two providers of technical components Germany and Poland) to solve the problems of interpretation.
3. Overcoming the resistance in terms of a new type of telecare service - both on the side of the organization (main beneficiary) and the method of patient enrolment for the project.
4. Difficulties at the level of patient care in a hospital - lack of willingness to understand the scale of the problem, potential benefits for the geriatric patient resulting from the "no standard" way of medical care
5. Difficulties in convincing patients to the unknown and so far not processed of providing medical assistances to geriatric patients in Polish conditions
6. We observe and share the opinions of other researchers that it is necessary to make further to make the technology and service of measuring devices in patients home easier, more intuitive and requiring minimal action on the part of the patient.

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