INSPECTLIFE – PILOT TESTING OF TELECARE AND TELEHEALTH SERVICES

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Abstract
Doctors and care providers need efficient tools to handle growing number of patients and senior people while maintaining or improving level of care. Healthcare provided out of hospitals is bringing benefits for patients and should be more cost effective. Actual trends and needs were motivation to build new IT system for telehealth and telecare.

Keywords
telehealth, telecare, assistance, smarthome

Introduction

The project has following objectives: provide assistance service for active seniors using on the market available assistance devices, provide better and more accessible care for people with chronic diseases using telemonitoring, provide better communication possibilities for medical stuff and patients in dermatology and lymphatic patients, provide assistance in home to enable more independent living of seniors.

For these purposes complex InspectLife web based information system including several telehealth and telecare services has been designed and developed.

This paper focuses on pilot (beta) testing phase of telemedicine and telecare services. It brings information on the design of the tests, number of participants and some of the results.

Telemonitoring of hypertension

17 users (possible patients) were measuring blood pressure at home during 10–14 days. They were advised to do regular morning and evening measurements.

Patients were using bluetooth device from Fora company and transmitting data using smartphone application to make it available to a cardiologist for assessment.

Some of the patients found transmission process annoying because one specific model of phone was requesting bluetooth pairing repeatedly.

Almost all patients sent enough of measurement data. Graph representation then enabled quick assessment if the patient has hypertension or not. Cardiologist was able to say if measurements regularly cross level of 135/85 mmHg, which represents hypertension at home environment.

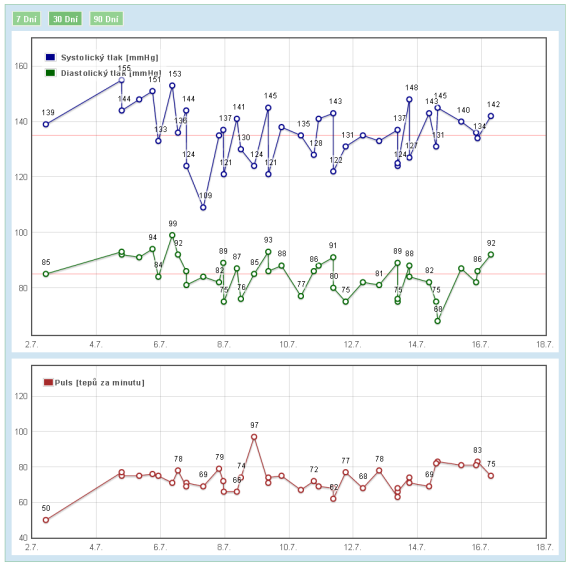

Fig. 1: Graph representation for hypertension assessment.

With selected patients it was verified that the data transmitted from measurement device to smarthpone

and to web application match and are correctly represented.

Telemonitoring of ECG

14 Patients were equipped with 8/12-lead ECG device from Aerotel for home measurements. Each patient was doing regular everyday measurements during 10–14 days.

Most of the patients were able to measure and transmit good-quality ECG data and cardiologist was able to assess the heart activity on distance.

Together the patients created 383 mesurements – from which 20 % was not good enough to be assessed (ECG baseline wandering, not recognisable ECG waves).

Fig. 2: Graph representation of ECG lead II.

Among possible reasons for not good-quality mesurements were: faulty placement of electrodes on the skin or movement of the patient.

Cardiologist concluded the service and the 12-lead variant of the device could represent equivalent for ambulatory ECG measurement at the physician‘s office.

Verification of data transmission and correct representation of ECG in web application was verified using ECG simulator. It enables to measure simulated predefined ECG curve with two different devices and to compare the amplitudes and frequencies in the printed ECG graphs.

Telemonitoring of glycemia

15 patients (diabetes mellitus type 1 - labile /during pregnancy/ treated with insuline pump) were monitored with glucose meter with wireless data transmission via bluetooth into mobile phone and InspectLife system.

Duration of monitoring was up to 6 months with up to 200 measurements per patient per month. Every diabetologist should have checked patient´s glycemic profile 2 times per month and could write notes or SMS or call to the patient.

Example: Diabetic patient treated with insuline pump. Patient appreciated immediate contact with doctor from home.

Many hypo- and hyperglycemias were identified during home monitoring, therefore doctor recommended additional continuous glucose monitoring for subsequent adjustment of insuline basal dosage and better self-education of patient.

With selected patients it was verified that the data transmitted from measurement device to smarthpone and to web application match and are correctly represented.

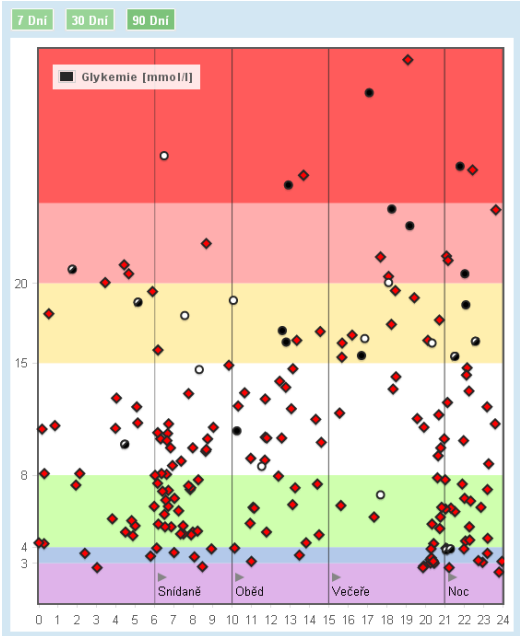

Fig. 3: Graph representation of glycemias – variations during day intervals.

Outdoor assistance for seniors

Portable device Laipac Lola designed to help elderly people in emergency situations was tested by trained surveillance center operators with the aim to estimate usability for seniors and operators.

The device was transmitting data using TCP protocol to server which was designed to detect several events including emergency button alarm and exit of a safety zone.

It was concluded the service is able to provide communication between senior and operator and localization in an emergency.

At the same time the technology proved usual limitations: dependency on GPS and GSM availability, not enough powerful loud speaker or not very useful possible fall detection.

Home Care – lymphatic patients

A service for sharing images between home care nurse and doctor was tested in real scenario together with center taking care of patients with lymphatic diseases.

One nurse was visiting up to 5 patients at homes per day. These patients have difficulties to leave their homes and the nurse is working out of the doctor‘s office.

The nurse was instructed how to make photographs using a tablet and a special mobile application which contained a list of the patients participating in the trial.

On a sample of 9 patients it was created 87 photographs from which 92 % were acceptable good-quality. The bad quality pictures were mostly not focused.

Fig. 4: Mobile application user interface for capturing and sharing of images.

Doctor was alerted by email when a new collection of images was stored at the web application where he could see images in big resolution.

The doctor confirmed the advantage of regular distant consultation when he could see and compare condition of patient‘s legs and prevent possible complications soon. This kind of service is able to improve efficiency of the healthcare for the facility because neither patients nor the nurse need to consult doctor in person.

Assistance at Home

Technology can make living at home easier and more safe.

Test scenarios were designed in a simulated home environment to cover selected situations of seniors living alone. The situations included bathroom emergency and surveillance of house appliances and equipment.

Example 1: Surveillance operator is alerted when emergency button in bathroom was pushed.

To be able to provide help the operator was able to see blurred picture and talk to the senior from surveillance center.

Fig. 5: Operator was able to communicate with person in bathroom using IP camera with audio.

Example 2: Surveillance operator is alerted after a senior forgot to close the fridge or to switch off the lights. The operator could either contact the senior, his/her relatives or to switch off the lights on distant from surveillance center.

Fig. 6: Surveillance operator was able to see plan of a testing flat including status indication of doors, windows, lights, fridge, emergency button, temperature or movement in rooms.

IP cameras with audio together with WebRTC technology were used to enable direct communication from web browser to the distant camera.

In house assistance tests helped to demonstrate specific requirements needed in assistance for seniors, to discuss extent of necessary services and who should provide them, and to address missing regulatory and ethic framework.

Conclusion

Feedback gathered from pilot projects showed technology is helping to provide better care and assistance on distance.

Individually tested telemonitoring services enabled to verify data integrity in transmission and system usability. Surveillance devices were compared and pros and cons of the service were detected. Consultation service tested with lymphatic patients helped doctors to assess situation on distance and helped nurse to make decisions.

All the services were using same web platform to access and visualise data and to communicate between participants.

It was identified IT systems combining both telecare and telehealth services might bring even more benefits for their users.

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References

[1] Woodward B. at.al., Design of a telemedicine system using a mobile telephone, Publication of the IEEE Engineering in Medicine and Biology Society, Vol. 5(1), pp. 13-15, 2001.

[2] Using information technology to improve the management of chronic disease, Branko G. Celler, MJA Vol. 179, 2003.

[3] Home based telemedicine intervention for patients with uncontrolled hypertension: a real life nonrandomized study, Palmira Bernocchi, Simonetta Scalvini, Fabio Bertacchini, Francesca Rivadossi and Maria Lorenza Muiesan, BMC Medical Informatics and Decision Making 2014.

[4] ECG telemonitoring during homebased cardiac rehabilitation in heart failure patients, Ewa Piotrowicz at al., Journal of Telemedicine and Telecare, vol. 18, 2012.

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