INNOVCARE – AAL-2014-192

Open ICT platforms and technologies to reduce and prevent the social and economic impact of elders care

Platform, Services and User Interfaces

Date of delivery: XXXX

Document Control

Title	**Platform, Services and User Interfaces**		
Project	INNOVCARE (AAL-2014-192)		
Responsible partner	ISOIN	**WP**	3
Editors	I. Carrillo, A. García		
Last updated	29/09/2017		
Doc ID / URL			

Revision History

Date	Author	Summary of Changes
16/03/2017	A. García	TOC and first version
20/03/2017	A. García	TOC modification, Added content in section 2
25/03/2017	A. García	Added table of services to section 2
04/04/2017	A. García	Added table of services to section 2
29/09/2017	I. Carrillo	Added Mockups
03/10/2017	I. Carrillo	Introduction, conclusions and figure list annex

Table of contents

Abbreviations

Term	Explanation
EH	eHealth Module
NCE	Neurological Condition Evaluation
CF	Collaborative Filtering Module
HPAM	Health and Physical Activity Monitoring Module
DMS	Decision Making System
UCD	User-centered design
ORM	Object relational Mapping

1 Introduction

This deliverable D3.1 Platform, Services and User Interfaces sets the basis that will sustain the first InnovCare integrated protoype. This document's main aim is to depict how the user requirements and functionalities identified in WP2 are going to be implemented within InnovCare.

At this stage of the project, the way to depict this is through mockups of the platform, which have a twofold purpose: on the one hand to have an early design that can be validated with the older adults; on the other hand these early designs will serve as guidelines for the implementation of the actual InnovCare system.

1.1 Structure of the Deliverable

This document resumes first the InnovCare platform, i.e., the different modules that compose InnovCare and the technologies used to implement them. The different user roles, and the functionalities accessible to each one of them are shown afterwards in order to have the whole picture of what services can InnovCare provide to each user.

Last, mockups for the interfaces that will provide access to each of these services are presented, and the design process followed to create them is explained.

While the first draft for older adults' interfaces are shown in this deliverable, the rest of the roles will be included in the next release of this deliverable, including a revision of the styles to achieve an integrated look and feel, and an improvement on the usability for older adults.

The wearables configuration interfaces are also not included in this release of the deliverable, due to the recent incorporation of Brevidius to the consortium, as a partner that will provide the hardware for InnovCare. Next version will define the services that the wearables module (and their respective interfaces) will offer to each role.

2 InnovCare Platform

2.1 The InnovCare Platform

The InnovCare platform is a web-based application composed of different modules acting as a single application, allowing the user to access the system from different devices such as laptops, tablets or smartphones. The different nature of the modules composing the InnovCare platform make this web environment the best option to integrate them into a common structure to deliver a solid and homogenous system, in which different apps, services and sensors can be integrated.

As an example of this integration of apps and sensors, the Mememtum module that is used isolated from the InnovCare system, in an Android app, is executed by the user on their smartphone and the results of the performed tests are automatically sent to the InnovCare platform. These results are displayed through a different module, the Dashboard module, which is agnostic of the data and able to display data from different sources like sensors.

2.2 InnovCare technology

As explained on deliverable D2.2, the InnovCare platform is a compilation of different technologies, each module is developed isolated from others, to make all them work together, these different technologies must be supported.

Technologies/module

The InnovCare platform as said, is a web platform combining different web modules, interconnected to allow the necessary interoperability between them since each of them has been developed using different technologies with different purposes.

- The eHealth module is a Java web application using a MySQL database, and it's the main graphical user interface and interaction point of the user with the InnovCare platform.
- The DMS is a Node.JS application for modelling the different apps and sensors connected to the InnovCare platform which contains a submodule called DIM (Data integration module). The DIM is in charge of coordinating the data synchronization between the different modules, like user registration and updates. The second submodule collects information of the users from different sources, such as keyboard, navigation, mouse, etc. All the information is stored in a MongoDB database acting as a central database of the InnovCare platform.
- The dashboard and communication center are web modules, created with Node.JS extracting information from different databases, mainly from the central MongoDB.
- Mememtum is an external module, isolated from the central system. It is an Android application that runs on the users' smartphones. it's developed on Android (Java) and

information is sent to the central database of the InnovCare platform through the DIM using the communication bus.

- The communication bus implements MQTT, which allows the DIM to coordinate the different modules and synchronize the information between them.

Hosting

Having all these different technologies working together requires creating a multi technology environment, able to support all of them. Not only that but all of them must have a backup and restore policy enough to guarantee 24/7 availability service and adapting to the changing demand of use. To achieve this challenge, we will make use of the Amazon S3 services.

2.3 Roles

The necessities and requirements are different for every kind of user; an older adult has a different view of the system than a healthcare professional. InnovCare offers different services for the different user roles using the system, user requirements were collected on deliverable D2.1 and grouped creating different user groups or roles. These roles have been formally described on deliverable D2.2. Below the list of roles is shown.

- ***OLDER ADULTS:*** Focus is on healthy older adults with mild age-related impairments such as physical limitations, sensory thinning and cognitive decline.
- ***FAMILY AND FRIENDS:*** People physically or socially close to the older adult.
- ***INFORMAL CAREGIVERS:*** Family members or a natural person who contributes to and is involved in the caretaking responsibilities.
- ***FORMAL CAREGIVERS:*** Group of professionals that support people in the health and care context.
- ***REGISTERED USER:*** Represents a user of the platform that has an account and has made a login in the system
- ***NON-REGISTERED USER:*** Represents a user that has not made a login in the platform.

The image below shows the inheritance between the users in the system, all users inheriting from “registered user” have at least the same the same privileges.

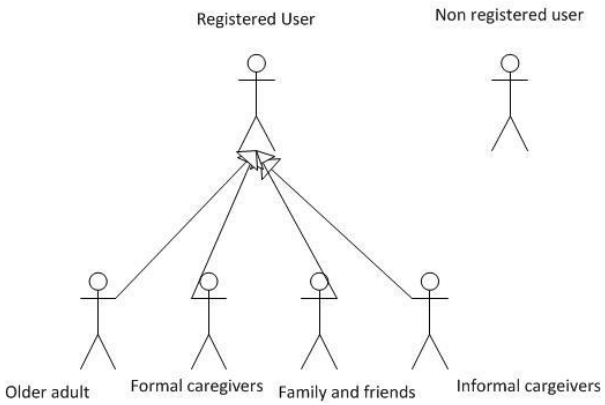

Figure 1. InnovCare roles

2.4 Services

InnovCare platform uses the different modules to bring the users an innovative ICT solution that improves the cooperation between all healthcare actors making it more effective, supporting elder people independent living, and improving their quality of life in a flexible, user-friendly way, through offering different services. These services are divided in functionalities allowing the user to interact with the system.

In the following table the InnovCare functionalities extracted from deliverable D2.2 are listed by module.

EHealth Module

Code	Name	User	Description
Func_eH_1_1	Register new user	All	Write the administrative information of a user, and create the username and password for the different users in the system
Func_eH_1_2	Legal Notice	ALL	The legal terms for using the system including privacy issues, signing it digitally by re-writing the username and password just created
Func_eH_1_3	The Sub-Project to use	Patients	What is the “InnovCare System” to be used by them for them (mainly – with a formal EMR connectivity or an individual PHR (Patient Health Record))
Func_eH_1_4	Permission Module	Patients	User choose to whom they would like to give permission rights to their

			system, and Read or Read/Write permission (Informal Caregiver – one or more) including their email The system sends a notification email to them with a link to register
Func_eH_1_5	Go to Medical Registration	Patient and I-C with R&W permission	By clicking On "NEXT" the user is forwarded to the next sub module to register the medical details and the patient's history
Func_eH_1_6	Go to "InnovCare Medical Centre"	Patient and I-C with READ permission	After the LEGAL NOTICE - By clicking On "NEXT" the user is forwarded to the "InnovCare Main Centre"

Code	Name	User	Description
Func_eH_2_1	Medical Details	Patient and I-C with R&W permission	Write Medical Details of the patient (Blood type, habits, etc.)
Func_eH_2_2	Medical History	Patient and I-C with R&W permission	Write the specific medical history of a patient (Diagnosis, Medications, Allergies, etc.)
Func_eH_2_3	GOTO "InnovCare Main Centre"	Patient and I-C with R&W permission	Transfers the Patient or I-C to the "InnovCare Main Centre"

Code	Name	User	Description
Func_eH_3_1	Write Login Details	All	Username, password and a special numeric number
Func_eH_3_1	GOTO "InnovCare Main Centre"	Patient, I-C	Transfer to the "InnovCare Main Centre"
Func_eH_3_1	GOTO "InnovCare Health Professional Page"	Formal Caregiver	Transfer to the "InnovCare Health Professional Page"

Func_eH_3_1	GOTO "InnovCare Administration Centre"	Administrator	Transfer to the "InnovCare Administration Centre" – NOT YET DEFINED

Code	Name	User	Description
Func_eH_4_1	Update Administration Details	All	Change/Update administration details of each of the users
Func_eH_4_2	Update Medical Details	Patient and I-C with R&W permission	Change/Update medical details of the patient (it opens a new log of the system keeping the old one in grey)
Func_eH_4_3	Update Medical History	Patient and I-C with R&W permission	Change/Update any part of the medical history of the patient (it opens a new log of the system keeping the old one in grey)

Code	Name	User	Description
Func_eH_5_1	Tools	Patient and I-C	There is a list of tools that the user can activate by clicking on the right button – **Communication Centre** (goes to a different tab), **Dashboard** (goes to a different tab), **PHR** (goes to the patient Personal Health Record Summary), **Care Watch Control Centre** (opens in a new tab and let them set up the care watch), **UPDATE** (goes to the patient "update data" pages, by choosing the right page to update), **Address Book** (let them write or update their contacts – that are connected to the InnovCare system – I-C, family members, and Health professionals), and **Calendar** (let them set meetings, as well as accept meetings referred by other users; reminders can be set and will automatically be forwarded as reminders to the Care Watch system)
Func_eH_5_2	Information	Patient and I-C	Links to interesting web pages (opens it in new tabs), "dictionary" of terms (it will be provided by any medical team), and "news"

			if the right links are provided by a medical team
Func_eH_5_3	Permission Module	Patient	Let them read or update their permission scheme
Func_eH_5_6	Logout	Patient and I-C	By clicking on it the patient or I-C is logged-out of the system If the patient or the I-C does not use the system for 5 minutes, it is logged out automatically

Code	Name	User	Description
Func_eH_6_1	Personal Details	H-P	Appears as data at the head of the page
Func_eH_6_2	List of Patients	H-P	A combo with the list of corresponding patients, that by clicking on a name a patient → the patient's EMR is opened for them (see EMR module separately)
Func_eH_6_3	Add Patient's Visit Data	H-P	Opens a page that allows the H-P to enter medical information about a patient from the visit and/or from documents brought by the patient to the visit
Func_eH_6_4	Look at New registered patient	H-P	Data about a new "InnovCare Patient" in the system (that is not included in the list), and then goes directly to the patient's EMR
Func_eH_6_5	Logout a patient	H-P	After looking at the EMR and/or entering a new visit information, they logout from the patient and can go to the next patient or logout from the system
Func_eH_6_6	Register a new patient	H-P	Can accomplish for the patient a registration process, it is good especially for the medical details
Func_eH_6_7	Alert Centre	H-P	List of alerts about patients that have been added by the system, after "an event" ("events" to be defined by the InnovCare medical team) – by clicking on each line the system automatically goes to the patient EMR to see the event
Func_eH_6_8	Logout	H-P	By clicking the H-P is logged-out of system If the H-P does not use the system for 5 minutes, it is logged out automatically

Code	Name	User	Description
Func_eH_7_1	List View	All – except administrator	View all entries of medical data including the medical details, the medical history and the H-P visits'

			documentation, clicking on each view gets the user to the full description
Func_eH_7_2	Authorship	All – except administrator	Each of the entries of the List View have the "authorship" details (who has inserted the data)
Func_eH_7_3	BACK	All – except administrator	Goes back to the InnovCare Main Centre
Func_eH_7_4	Permission Module	Patients	User choose to whom they would like to give permission rights to their system, and Read or Read/Write permission (Informal Caregiver – one or more) including their email The system sends a notification email to them with a link to register
Func_eH_7_5	Go to Medical Registration	Patient and I-C with R&W permission	By clicking On "NEXT" the user is forwarded to the next sub module to register the medical details and the patient's history
Func_eH_7_6	Go to "InnovCare Medical Centre"	Patient and I-C with READ permission	After the LEGAL NOTICE - By clicking On "NEXT" the user is forwarded to the "InnovCare Main Centre"

Mememtum

Code	Name	User	Description
Func_MM_01	Dexterity test - Alternate Typing	Older adult	The user is asked to perform alternate tapping (or typing) using two fingers each on one of the coloured zones in the smartphone screen during 20 seconds. The tapping must be done alternating fingers and as fast as possible but not so fast to produce errors in the coordination of the movements. The test must be performed twice: one with the "good" hand - that is the hand that the patient feels as the more agile - and one with the other hand. The subject doing the test can train his skills a couple of times before registering the final score.
Func_MM_02	Voice analysis	Older adult	The patient is asked to take a deep breath and say out loud "Aaaaaaaaaa" during 5 seconds. If the voice stops at some point it is important to explain to the patient that this is normal and the procedure is to take another deep breath and go on with the

			test. Training a couple of times is recommended. The score is based on several features of the signal generated by the patient gathered by the microphone of the smartphone.
Func_MM_03	Head Movement	Older adult	This test is based in the analysis of the movement of head and neck during 10 seconds while the patient is asked to behave in a specific manner. In this study the patient is seated in a relaxed state and must be quiet - no movements or speaking - during 10 seconds while the smartphone is placed in front of her using a frame, tripod or an empty glass to sustain the device.
Func_MM_04	Hand tremor	Older adult	The user is asked to extend one hand and gently grip the smartphone during 30 seconds in order to measure the potential tremors. Both hands are required,

Smartwatch

Not defined at this point.

Dashboard

Code	Name	User	Description
Func_DB_01	Measurements summary	All	Show a graphic summary of user's measurements in a single screen.
Func_DB_02	View of Alarm History	All	Show a graphic view of user's alarm history.
Func_DB_03	View of individual measurement results	All	Show a graphic view of user's individual measurements.
Func_DB_04	Research Dashboard	Health professional	Show a graphic view of information obtained by means of statistical, anonymous procedures, representing the metrics of the community (measurements and alarm history).

Func_DB_05	Dashboard settings[1]	All	Offer a flexible configuration of the information to be shown in the dashboard: timeframe.

Communication centre

Code	Name	User	Description
Func_CC_01	Contact list	All	Show a contact list of users and informal caregivers, including availability status. The list must permit searching users in the list.
Func_CC_02	User status management	All	Automatically update user´s availability status according to his/her current activity.
Func_CC_03	User status self-management	All	Offer the user the option to manually set his/her availability status.
Func_CC_04	Videoconferencing	All	Offer video call functionality: starting video calls from contact list and acceptance/rejection of incoming video calls.
Func_CC_05	Flexible real-time settings of videoconference	All	Offer flexible settings even during the call (switch on/off camera; invite new users)
Func_CC_06	Missing calls list	All	Show a list of missing calls for the user: rejected calls and non-attended calls. Call back.
Func_CC_07	Messaging	All	Send/receive messages to other users in the contact list, whether if they are online or not, so that they are received when available.
Func_CC_08	Chat	All	Instant messaging with users in the contact list, considering they are online.

[1] Dashboard administration panel (where administrators can grant users to access another user´s dashboard) is out of scope in this module, as this functionality is considered to be implemented in a global administration panel.

DMS

Code	Name	Description
Func_DMS_01	Notify information collection	Send a notification to the user to consent to be tracked by the system to collect information
Func_DMS_02	Interface personalization notification	Notify to the user that a personalized optimization of the interface can be performed
Func_DMS_03	Service personalization notification	Notify to the user that a personalized optimization of the services can be performed changing the layout
Func_DMS_04	Service suggestion	Shows a list of suggestions personalised for the user based on interactions and usage
Func_DMS_05	Tutor service	Shows an element highlighting based step by step guide to help to perform the desired action
Func_DMS_06	Task recording	Let the user record his/her actions and save the steps as a **private** task for the tutor
Func_DMS_07	Fatigue detection	Analyse user tracking data to detect if he/she might be feeling tired or bored and notify giving options or suggestions
Func_DMS_08	User lost detection	Detect is the user is looking for something or trying to perform a task and offer help

3 InnovCare Services and Interfaces

This section contains the interfaces that provide access to InnovCare services, and the design process followed to create them.

3.1 Design process

User-Centred Design (UCD) aims to involve users through the entire development process. The concept of User-Centred System Design was originally suggested as a method to promote the understanding of potential users in the different phases of a product's design process (Draper). Nowadays the term UCD is often used interchangeably with other similar approaches, such as Participatory Design (Namioka, 1993), to refer to products being designed with the involvement of users at the different stages of the design process. This process is often iterative and can include different methods to consider end users' goals and needs. The result of employing UCD to a system design is a product that offers a more efficient, satisfying, and improved user experience (UX), which is likely to increase sales and customer loyalty.

The International Usability Standard, ISO 13407, specifies the principles and activities that underlie user centered design (Userfocus):

- The design is based upon an explicit understanding of users, tasks and environments.
- Users are involved throughout design and development.
- The design is driven and refined by user-centered evaluation.
- The process is iterative.
- The design addresses the whole user experience.
- The design team includes multidisciplinary skills and perspectives.

Within InnovCare project, the UCD methodology is implemented through an iterative design process illustrated in **¡Error! No se encuentra el origen de la referencia.**, where the grade in which the interfaces fulfill the user requirements is validated along the development process through evaluation with the users on each release.

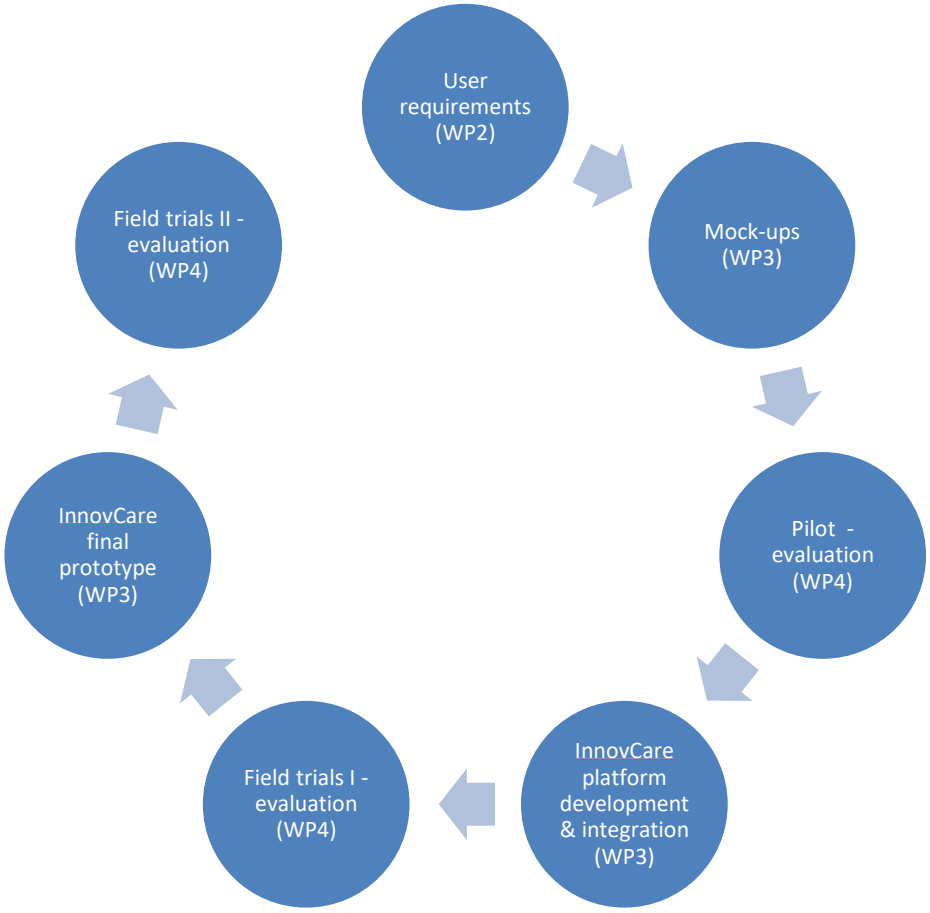

Figure 2. UCD approach in InnovCare

3.2 Older adults interfaces

This section contains the interfaces that provide access to the different services available for older adults.

3.2.1 General services

Log in

The user will be presented with this login form to grant him access to the whole InnovCare system.

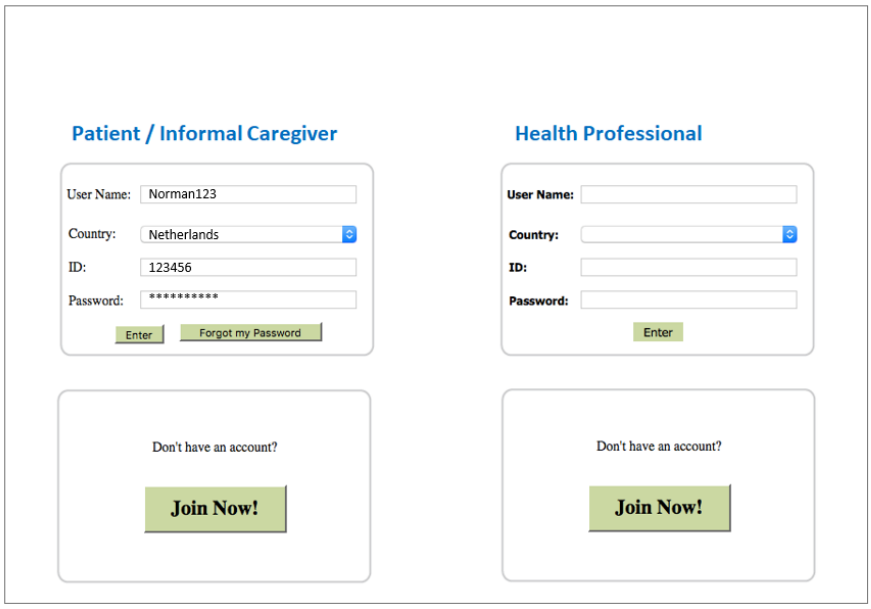

Figure 3. Login

Navigate modules

The user can access the different submodules of the system through this landing page.

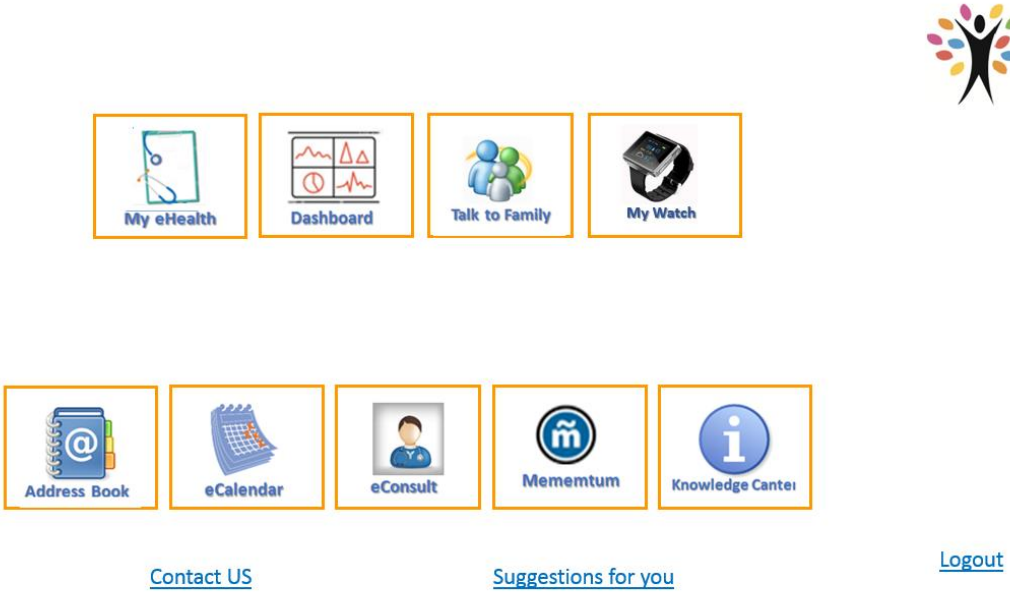

Figure 4. Landing page

Contact management

The user can add and remove contacts from his address book.

Address Book

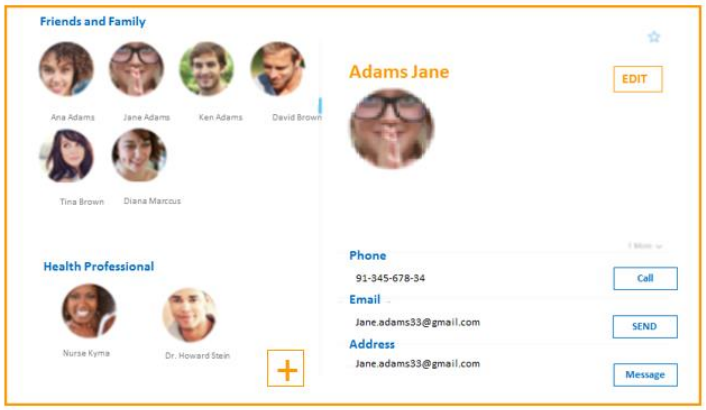

Figure 5. Contact management

Check personal agenda

The user can check their agenda and see any appointments, events, etc.

eCalendar

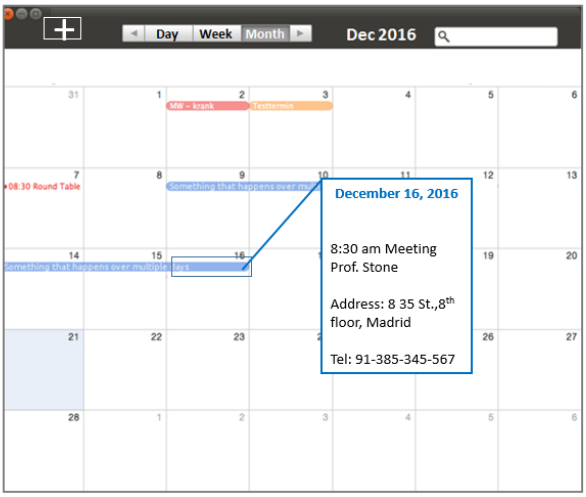

Figure 6. Personal agenda

The user can also add an activity to their agenda by clicking the "+" button, or check the details of any appointment in the agenda by clicking on it.

Knowledge center

The user can obtain additional information about eHealth related topics in this section.

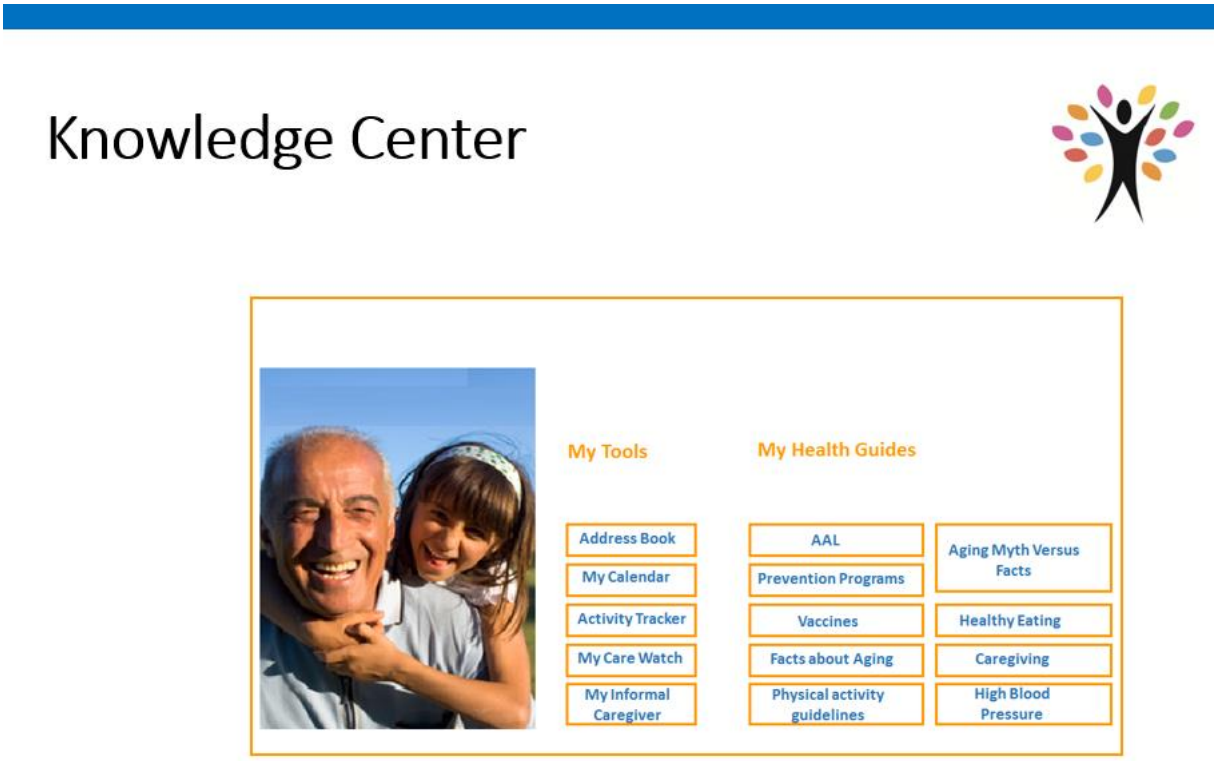

Figure 7. Knowledge center

3.2.2 eHealth services

Consult EMR

The user can see their electronical medical record in this interface.

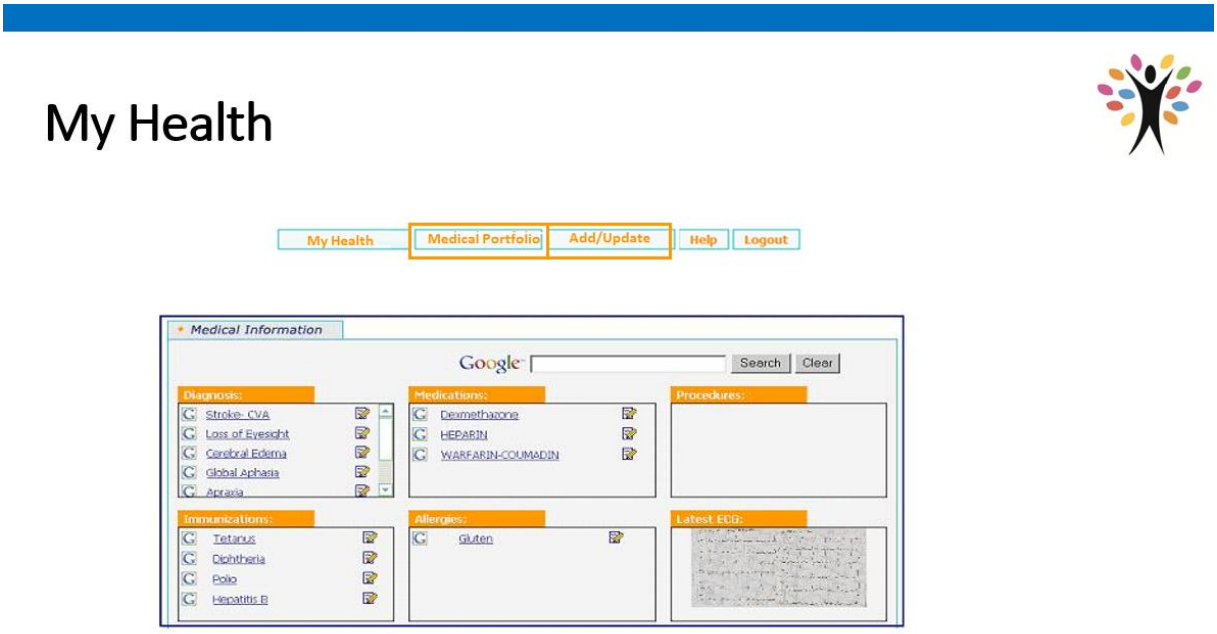

Figure 8. Electronic Medical Record

The user can also obtain information about their allergies, medications, etc. by clicking on them.

Medical portfolio

The user can check their medical portfolio in this screen.

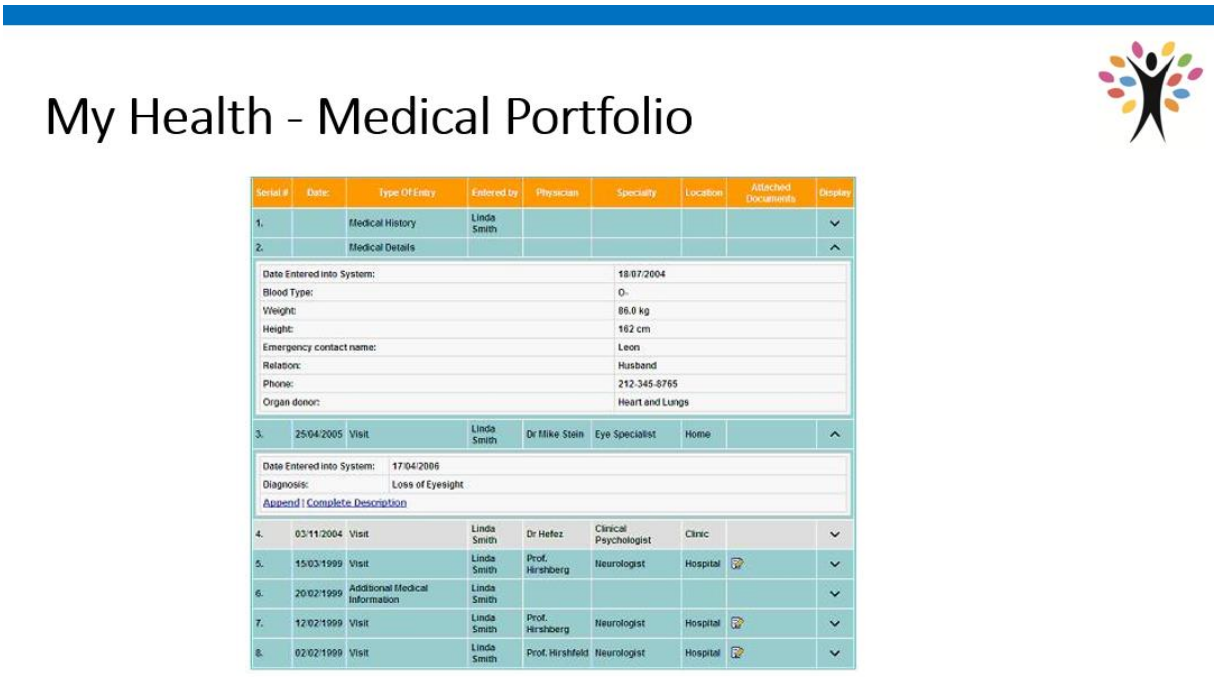

Figure 9. Medical portfolio

The user can also update their portfolio by adding additional information.

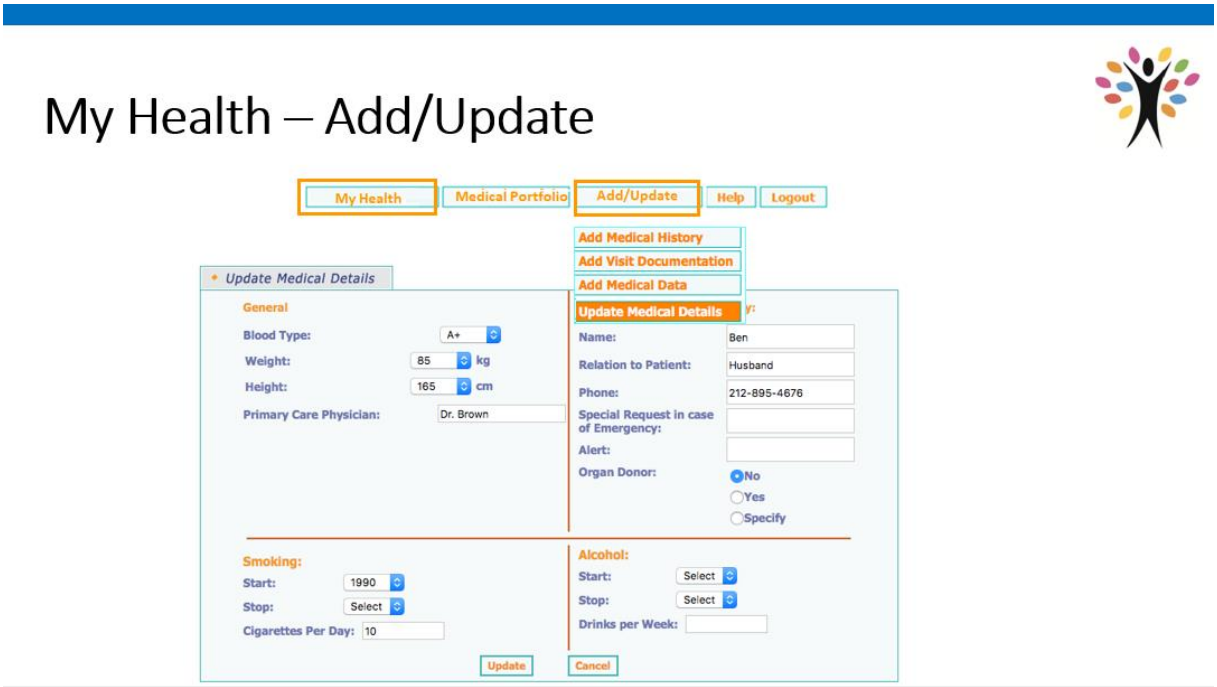

Figure 10. Medical portfolio (add/update info)

3.2.3 Dashboard services

Consult measurements

The user can check his measurements in the measurements tab of the dashboard.

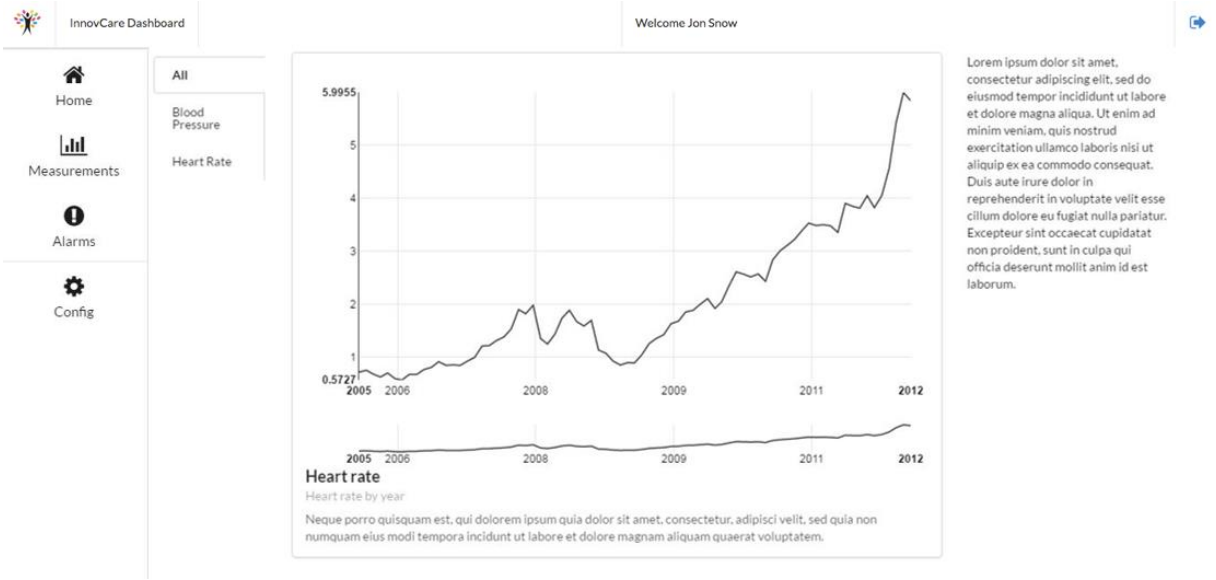

Figure 11. Consult measurements

Alarm history

Alarm history and configuration can be modified in the Alarms tab in the dashboard.

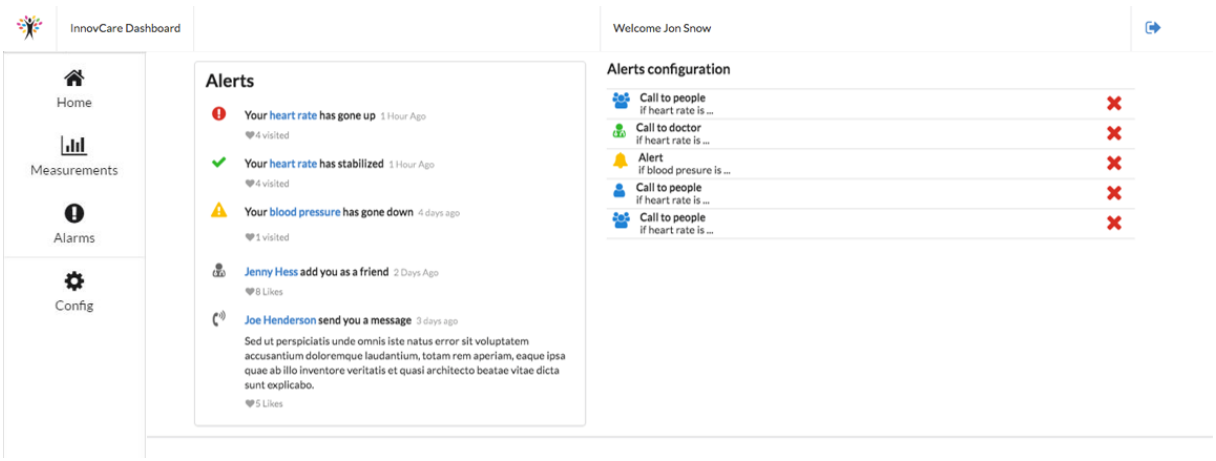

Figure 12. Alarm history

3.2.4 Communication centre services

Contact list

The user can see their contact list at any time at the left side of the screen.

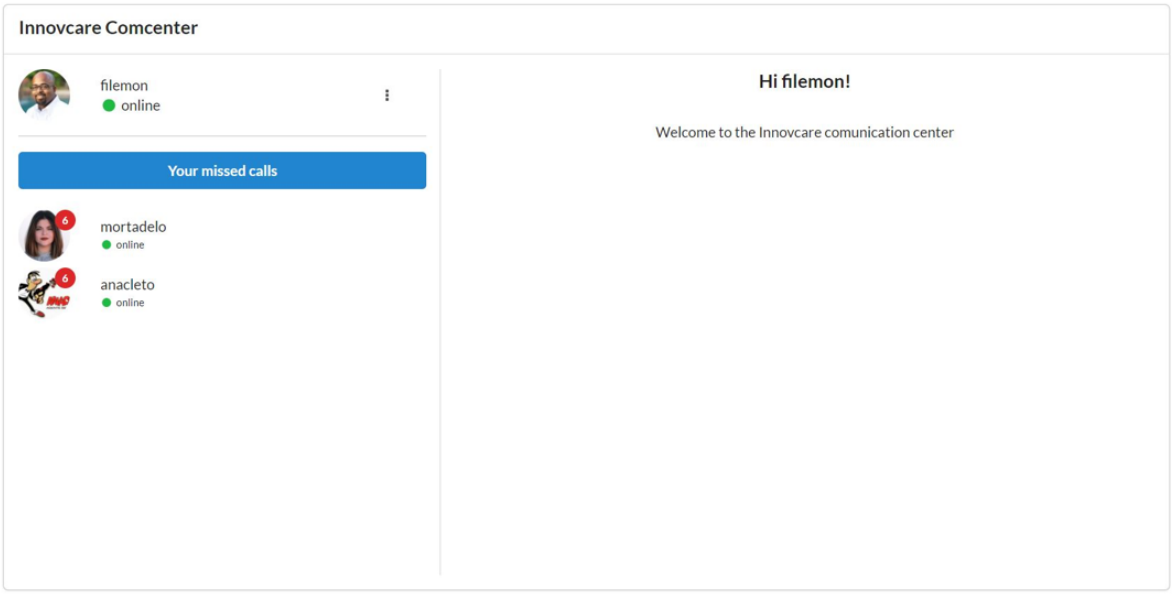

Figure 13. Contact list

Settings

The user can access the settings at any time to edit their online status, zoom, etc.

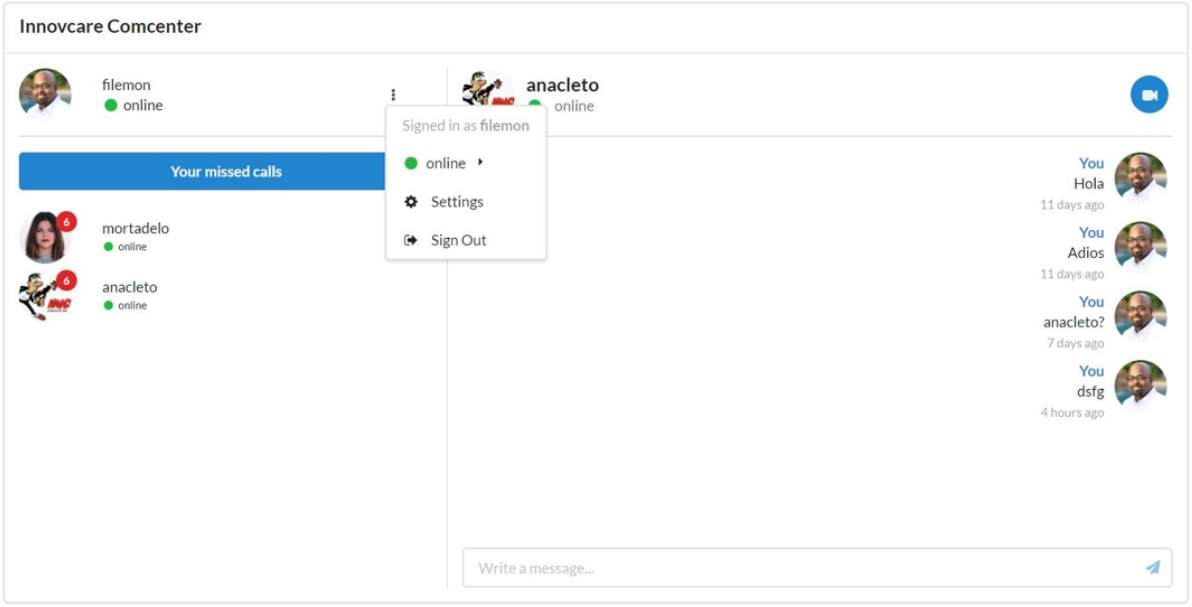

Figure 14. Communication centre settings

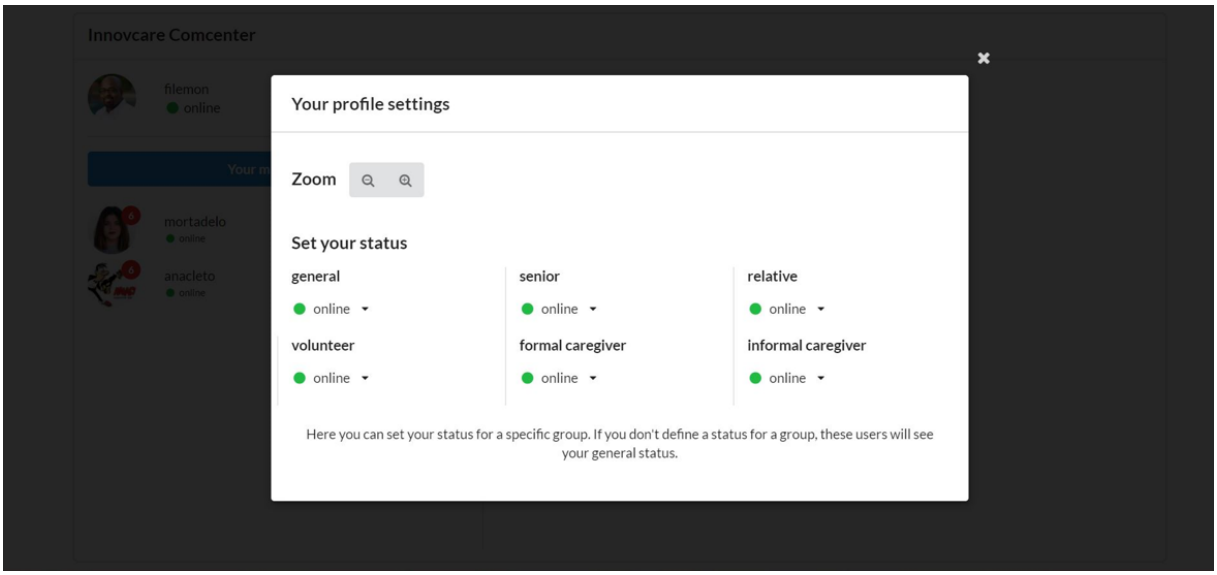

Figure 15. Communication centre settings (detail)

Send message

Clicking on a contact will open the chat, where the user can either read and write messages to their contact, or open a video call.

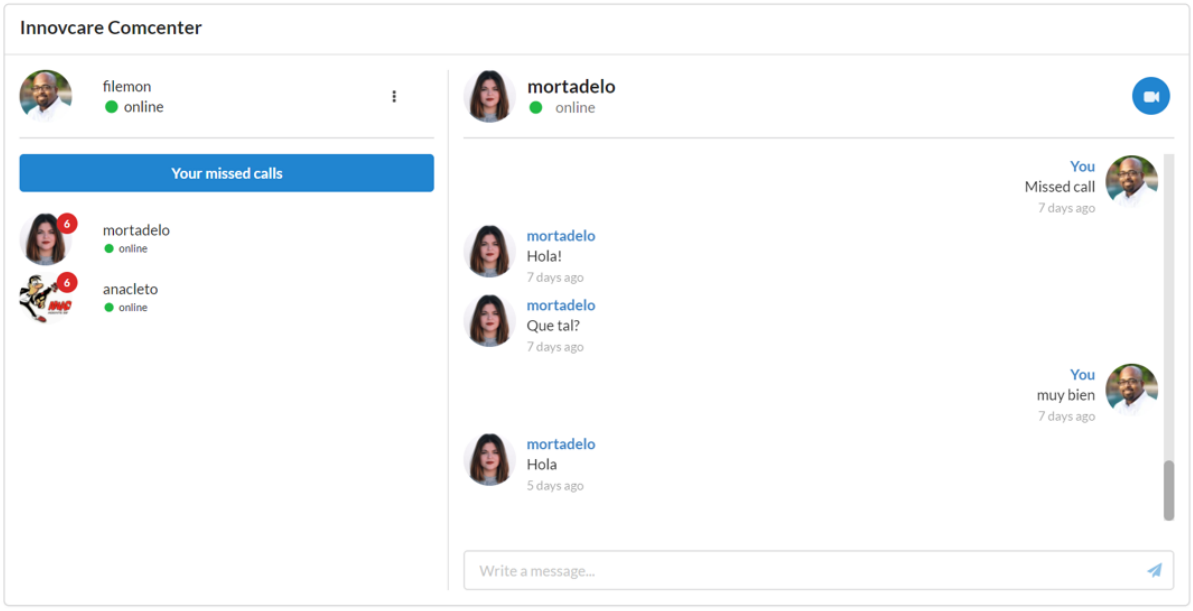

Figure 16. Send message

Video call

The user can call their contacts by clicking the camera button at the top.

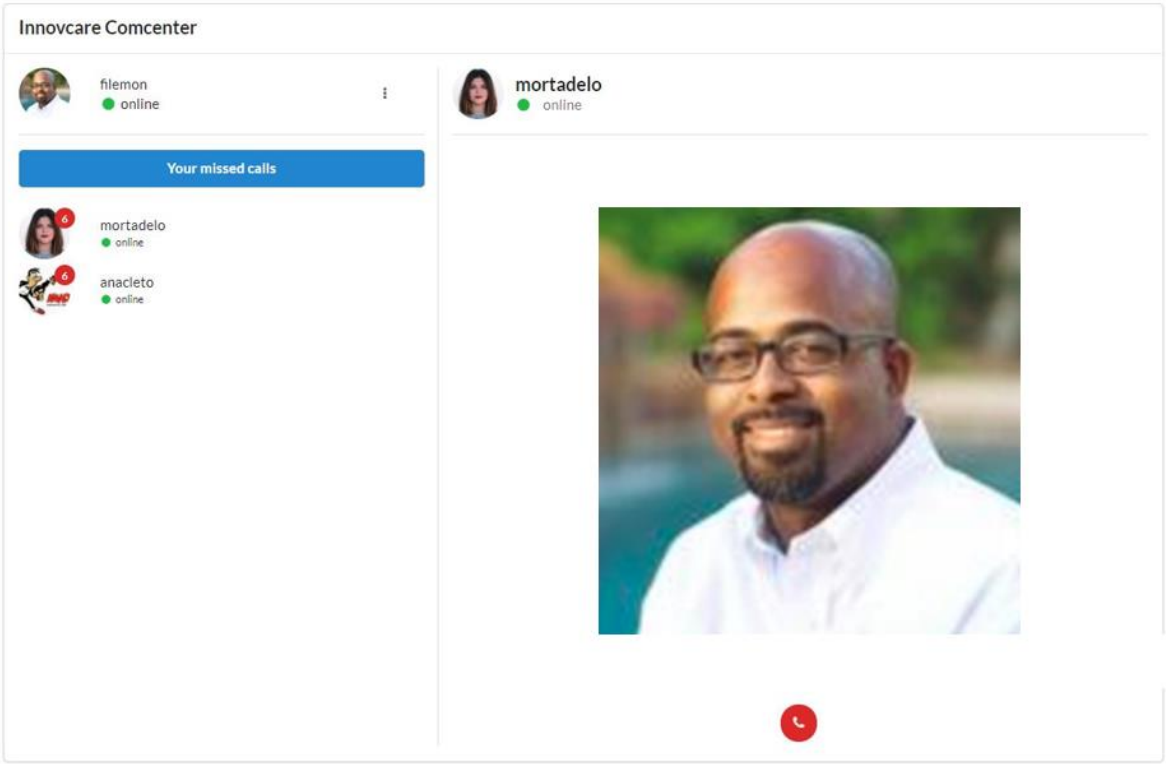

Figure 17. Video call

Check missing calls

The user can obtain a list of missed calls by clicking “Your missed calls” on top of the contact list.

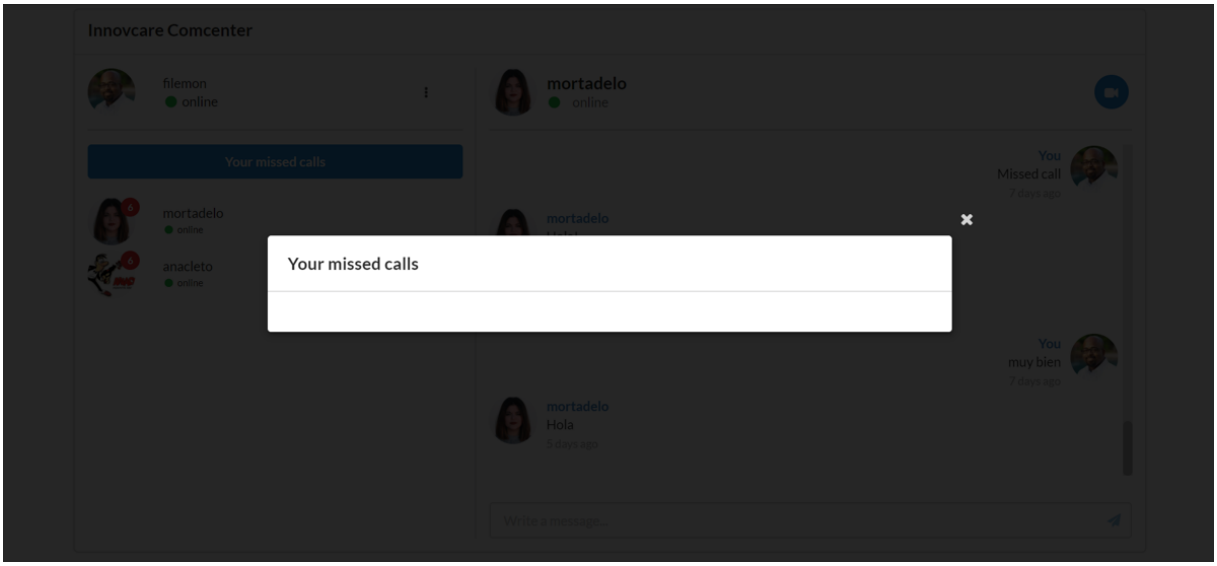

Figure 18. Check missed calls

3.2.5 DMS services

Interface adaptation

Based on their profile, users will be presented with an adapted version of the interfaces to minimize any difficulties they might find to use the platform. Different elements, like font size or contrast, might also be optimized without completely adapting the layout, based on the user condition. Depending on their usage, different services will be suggested to the users as well.

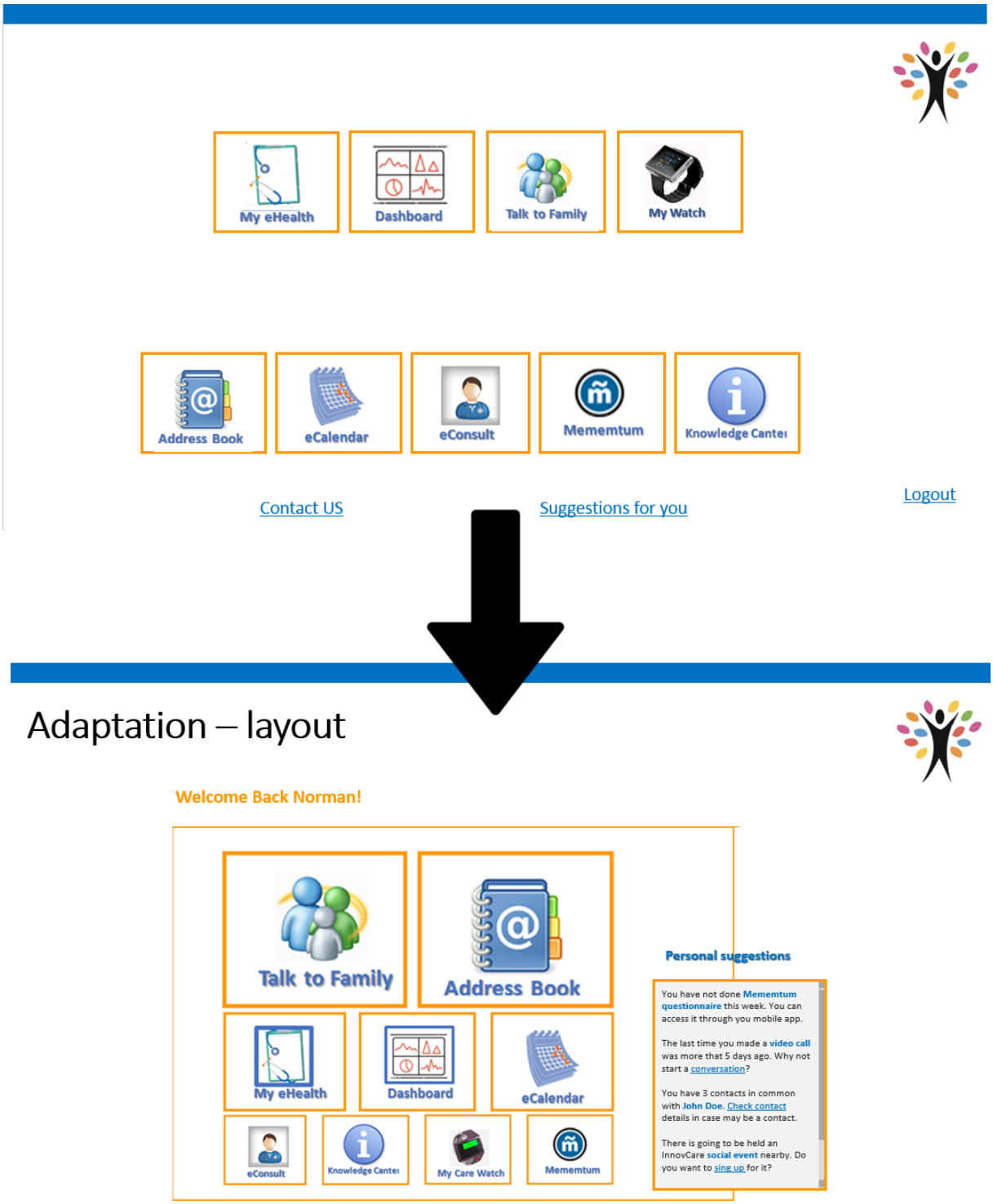

Figure 19. Interface adaptation

Task recording

Tasks can be recorded as a set of steps with a description each, so the user can select them later as a guide to use the different functionalities.

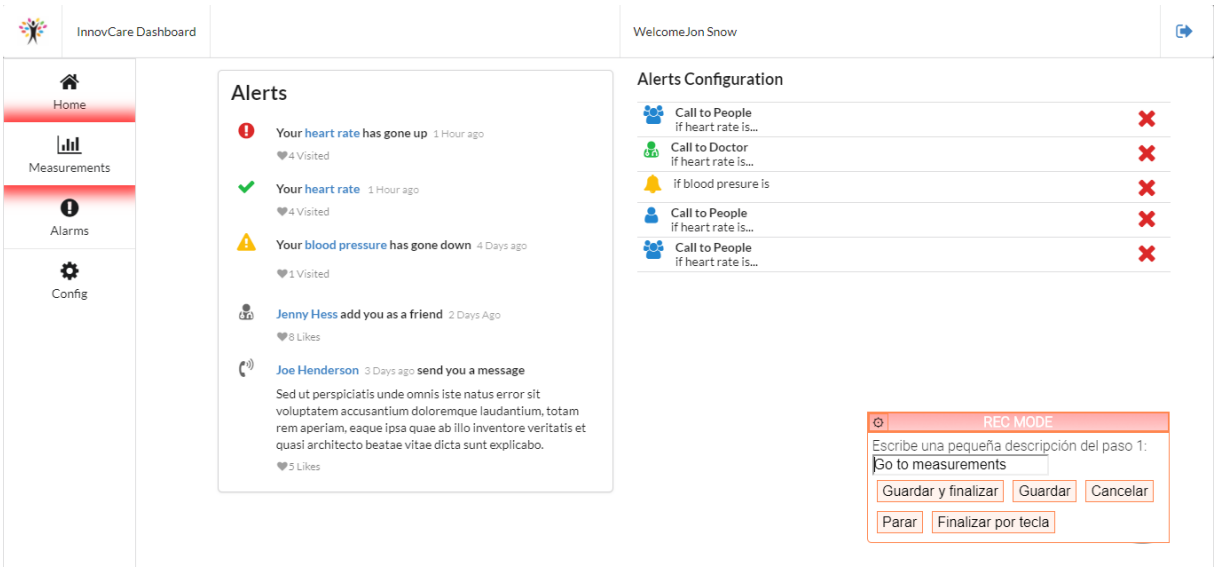

Figure 20. Task recording

User assistance

When the DMS detects the user is having trouble using the platform (due to them feeling lost or erratic navigation for example), the system will offer help to the user. The tutor will then guide him to perform one of the pre-recorded tasks.

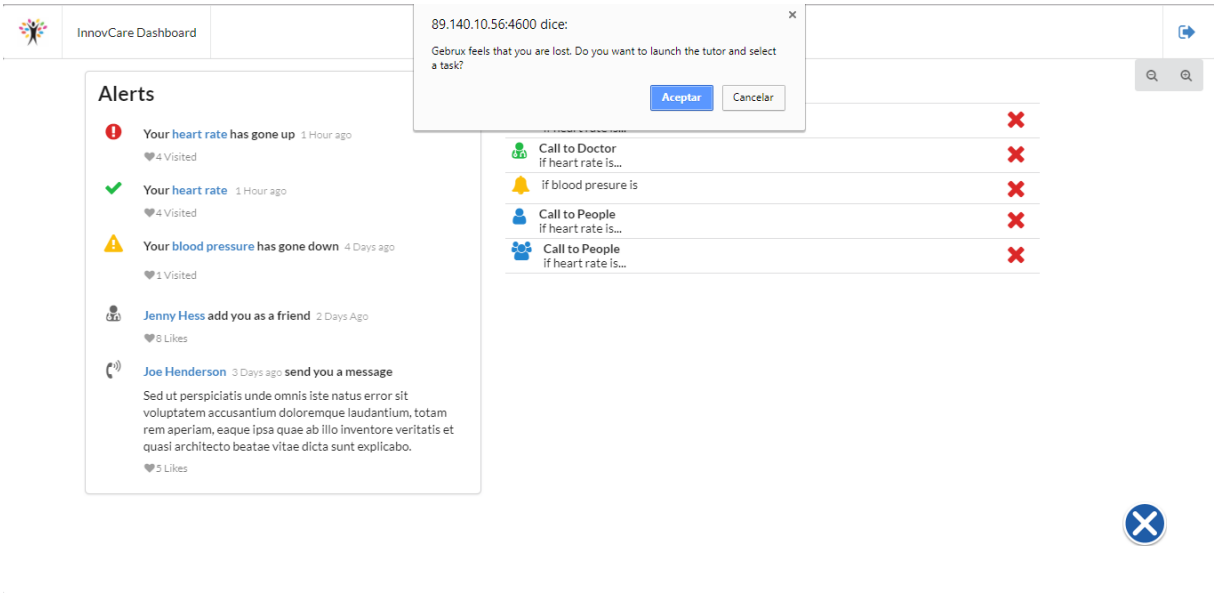

Figure 21. User assistance

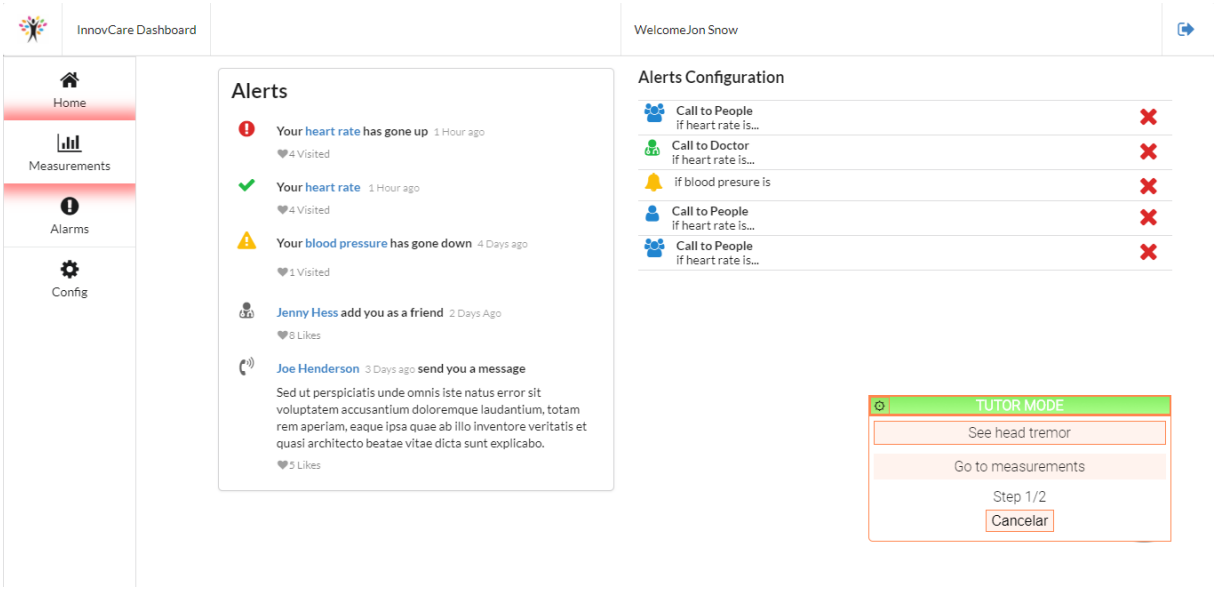

Figure 22. User assistance (tutor)

3.2.6 Mememtum services

Chatbot questionnaires

A conversation-like interface will ask the user different questions about his life habits to learn more about his routine and overall health. This chat bot will periodically ask the user to perform different tests as well.

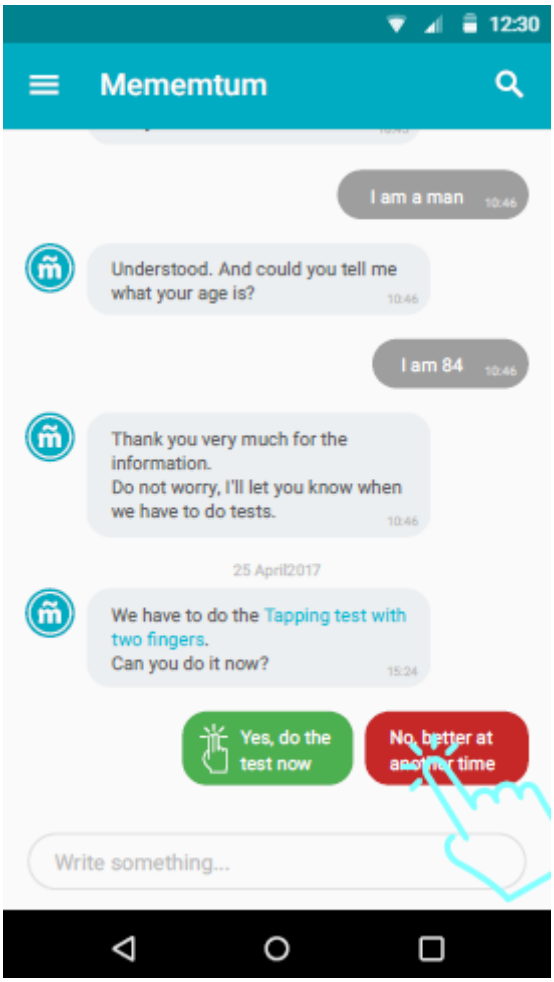

Figure 23. Chatbot questionnaires

Perform dexterity test

The user must tap his index and middle finger alternatively as fast as possible while the counter is running. The results will be shown to the user and stored in the database.

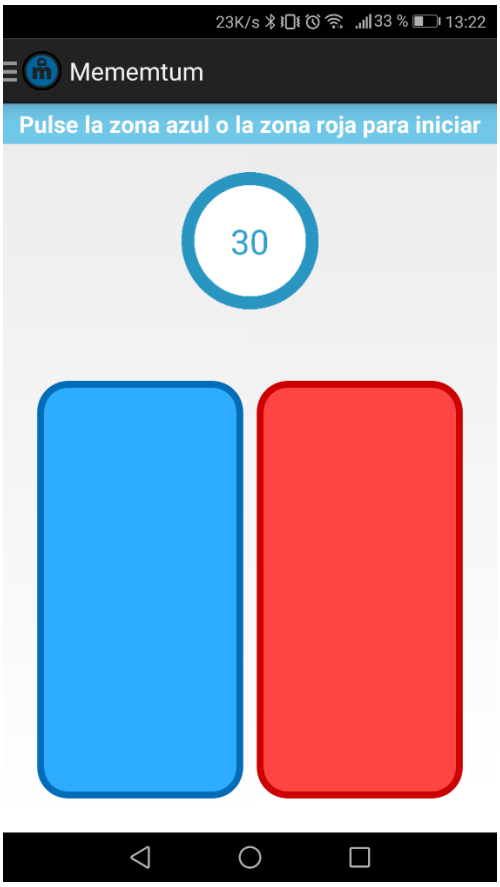

Figure 24. Perform dexterity test

Figure 25.Perform dexterity test (results)

Perform head movement test

The user must stay still while the counter is running. The results will be shown to the user and stored in the database.

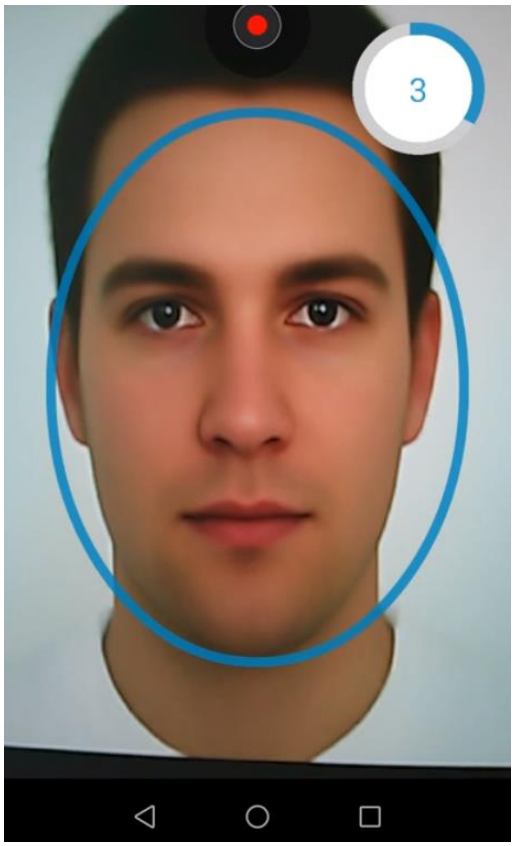

Figure 26. Perform head movement test

Figure 27. Perform head movement test (results)

Perform hand tremor test

The user must hold the phone in the palm of his hand while the counter is running. The results will be shown to the user and stored in the database.

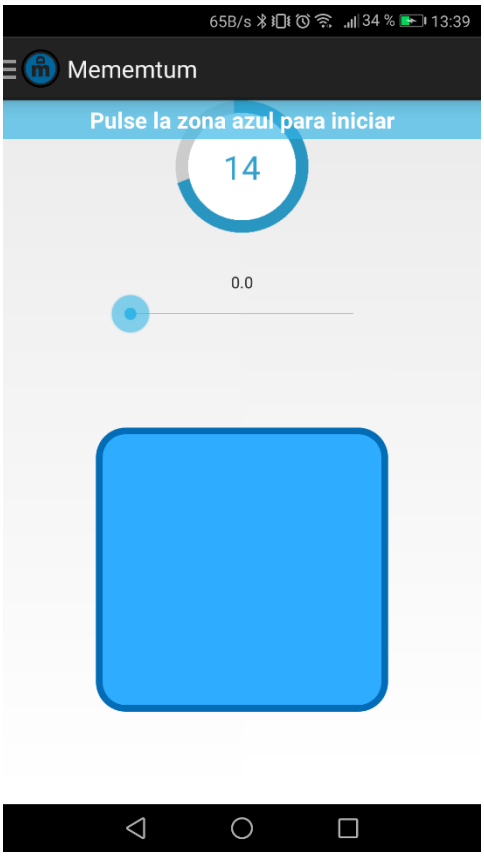

Figure 28. Perform hand tremor test

Figure 29. Perform hand tremor test (results)

Perform voice analysis test

The user must say “aaa” while the counter is running. The results will be shown to the user and stored in the database.

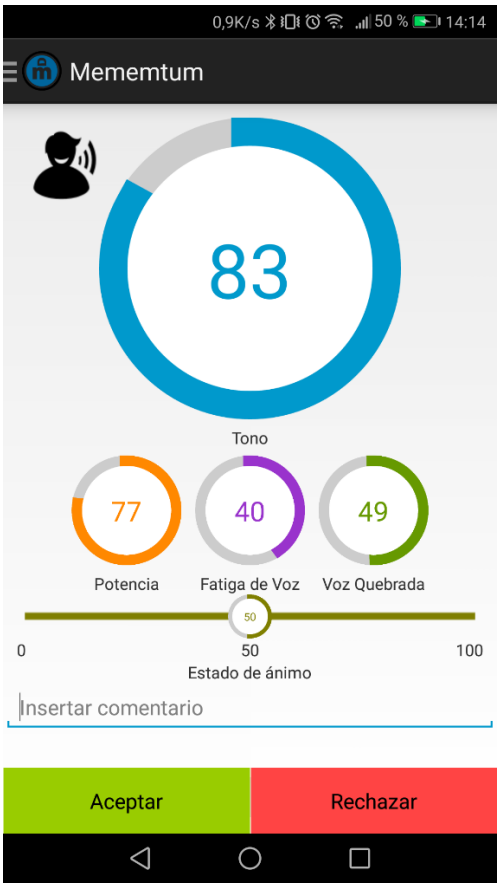

Figure 30. Perform voice analysis test (results)

4 Conclusions

This deliverable D3.1 Platform, Services and User Interfaces depicts an initial draft version of the InnovCare platform, i.e., the platform and technologies involved, and the different user interfaces which allow InnovCare users to make use of the different services.

The mockups presented in this document will pass a usability test with the older adults in order to get feedback and improve the design. On the other hand, these will serve as input for InnovCare's first integrated prototype.

Due to the late inclusion of Brevidius as a member of the consortium, the mockups for the services related with the wearables are not ready at this point. These designs, along with an updated look and feel based on the user's feedback, and the remaining roles interfaces will be included in the next version of this deliverable.

Annex I: List of figures