



GUARDIAN

The social robot companion to support homecare nurses

D4.2 Usability and User Experience testing of GUARDIAN

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Author(s):	M. ter Stal, J. de Koning
Lead partner for this deliverable :	VIL
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1 Executive summary

This document contains the procedure and findings from the heuristic evaluation and usability testing of GUARDIAN. A heuristic evaluation will be performed with usability experts to detect and solve usability problems in an early stage, before Guardian is tested with actual end-users. Subsequently, the usability testing with end-users will be performed as a part of the (pre-)alpha & beta testing. The goal of the usability testing is to evaluate the usability, accessibility and acceptance of GUARDIAN among the intended end-users (seniors, informal carers and formal carers). Several qualitative and quantitative research methods are combined in order to answer the research questions.

This is a running document that describes the procedure of the heuristic evaluation and usability testing (combined with pre-alpha evaluation) of the first prototype. Both studies will be performed in September 2021 in three countries: Netherlands, Switzerland and Italy. The outcomes will be used to solve usability problems/errors and iteratively improve the Guardian prototype.

Acronyms used in this deliverable

VIL	Vilans
CCARE	ConnectedCare Services B.V
SRS	Smartrobot.solutions
JEF	JEF S.r.l.
TU/e	Eindhoven University of Technology
UNIGE	University of Geneva
HUG	University hospitals of Geneva
UNIVPM	Università Politecnica della Marche
INCRA	National Institute of Health and Science on Aging
ZNWV	Zorggroep Noordwest-Veluwe



2 Introduction

It is vital to iteratively evaluate and enhance a product with a wide range of potential end-users before a product is released to market. Usability tests provide a rich and large amount of input for improvements of the design of the system's User Interface (UI) and input devices. It is important to gather insight into the usability and the accessibility of the GUARDIAN system. In case of a social robot such as the GUARDIAN robot, it is also important to gather insights in the potential impacts and acceptance of the robot,, as use of the robot can both positively and negatively affect values of end-users such as privacy and trust (also see D1.7 Responsible Innovation Handbook). GUARDIAN will ideally be an unobtrusive social companion that is perceived as enjoyable and trustworthy and that supports or takes over tasks of caregivers, while supporting the senior to live independently living at home.

In order to gain as much useful insights from the evaluation of the GUARDIAN prototype, the first step is a heuristic valuation with usability experts (Nilesen, 1994; Nielsen & Molich, 1990). During this heuristic evaluation usability experts analyse the human interaction with the GUARDIAN prototype to detect usability problems. In this way, usability problems can be solved in an early stage, before evaluation with actual end-users takes place.

After performing heuristic evaluation, usability testing with end-users will be peforemd. The goal of the usability testing is to gain insight into the experiences and views of end-users, to confirm whether the system works as expected, and to find out how GUARDIAN can be further improved. The usability testing will be performed as a part of the pre-alpha evaluation. Several qualitative and quantitative research methods are combined. In the pre-alpha phase the approach will be mainly on exploratory and qualitative results.

The insights obtained during the heuristic evaluation and the usability testing help to improve the prototype of the GUARDIAN system. Eventually, the last prototype of GUARDIAN should provide at least an above scale mid-point on user experience and usability.

2.1 Research goals

The aim of heuristic evaluation and usability testing of GUARDIAN is to gather an insight in:

1. The usability & accessibility of GUARDIAN services by the end-users
2. The credibility & acceptance of GUARDIAN services by the end-users
3. Ethical considerations & responsible innovation



3 Heuristic evaluation

3.1 General procedure

Past interviews conducted as part of WP2 offered us valuable information on co-design directions to create the most relevant and feasible interfaces. The heuristic evaluation will be focused on the caregiver application and the senior's tablet application. Both applications have several screens to be assessed and to be entrusted by experts in order to obtain an accurate review of the whole interface and its components (services and screens). For evaluation, the experts simulate that they are the end-users and perform specific tasks, explained later in this document, while classifying all problems encountered in the heuristics table (see 3.4).

A total of 5 experts are expected to perform a heuristic evaluation. These experts will be distributed as equitably as possible to maintain an overall cohesion and to gather information from the three different pilot sites. Overlapping results from the Netherlands, Italy and Switzerland will highlight most of the key opportunities to improve the GUARDIAN prototype.

To assess the totality of the services and screens in a simple way, we will give specific and general tasks to the people offering their expertise through a heuristics table (see 3.4). We will firstly propose to the experts to use the caregivers' application and their task will be to create reminders or requests. Once these are created and sent to a senior (specially created for the test), we will ask the experts to log in to the senior's account and respond at it as if they were now the senior. As the evaluation of the senior application mainly requires a response to what has been previously sent by a caregiver, it is logical to proceed with this methodology. Adopting this approach across services will make the evaluation more efficient.

Table 1. User involvement for heuristic evaluation (HE)

Step	Deadline	Netherlands	Switzerland	Italy	Total
Heuristic Evaluation (HE)	M20 (August/Sept 2021)	1-2 experts	1-2 experts	1-2 experts	5 experts



3.2 Interfaces, services and screens

The experts analyses will be established regarding two different services: the caregiver application and the senior tablet application, and all their respective screens which can be found in appendix D.

Table 2. Services and screens to be assessed

Services			
The caregiver application		The senior's tablet application	
Settings Dashboard	Client Dashboard	Reminders	Requests
<ul style="list-style-type: none"> • Background login • New client dashboard • Care network overview /message • Notification email (one/multiple) • Menu structure • User profile (senior/caregiver) 	<ul style="list-style-type: none"> • Appointment's overview • Daily pattern (rest/sleep/meal/activities) • Medication (add medication/overview) • Meals (add meals/overview) • Sleep quality (add request/overview) • Wellbeing (add request/overview) 	<ul style="list-style-type: none"> • Medication (report and self-report) • Meal (report and self-report) • Appointment • Activity 	<ul style="list-style-type: none"> • Wellbeing (report, follow up question) • Sleep quality (report, follow up question) • Home (volume, appointments)

3.3 Application's access

Both applications need key registers to allow experts to perform the evaluation. The caregiver application needs to be connected to the robot - without it, it cannot function. To create an account with this application, it is necessary to have the serial numbers of the Misty II in use.

If the social robot is not available for the testing, it is still possible to use the account of UNIVPM, with username: **XXXXX** and password: **XXXXX**

The caregiver application is reachable through the following link:

<http://caregiver-guardian.onlyoneif.com/caregivers/dashboard>

The senior's tablet application is reachable through the following link:

<https://guardian-demo.jef.it/>



3.4 Bastien & Scapin's heuristic principles

All experts will be asked to base their analysis on the eight leading heuristics of Bastien & Scapin (1993). See table 3 for all the heuristics and their specific sub-criteria.

Table 3: 8 Heuristics of Bastien & Scapin (1993).

The guidance	
Serves to evaluate all the various means deployed to advise, orient, inform and guide all kind of users throughout their interactions with an interface.	
The prompting	Means available to lead the users to make specific actions whether it be data entry or other tasks and/or means that help users to know the alternatives when several actions are possible depending on the contexts.
The grouping	Distinction between items, thus creating groups. Can be related to location concerns (belong or not to a given class, differences between classes, within a class) or format concerns (graphical features)
The immediate feedback	Is about the system responses to users' actions. Computer responses must be provided, should be fast, with appropriate and consistent timing for different types of transactions and should provide information on the requested transaction and its result. It limits the possibility of use error.
The legibility	Lexical characteristics of the information presented on the screen that may hamper or facilitate the reading of this information (character brightness, contrast between the letter and the background, etc.).
The workload	
Perceptual and cognitive workload both for individual inputs and outputs and for sets of inputs.	
The brevity	Concision and minimal actions (referring to the number of actions necessary to accomplish a task) to limit, as much as possible, the steps users will go through.
The information density	Whole set of information presented to the users rather than each individual item.
The explicit control	
Concerns both the system processing of explicit user actions and the control users have on the processing of their actions by the system.	
Explicit user action	Explicit relationship between the computer processing and the actions of the users. The computer must process only the actions requested by the users and only when requested.
User control	Users should always be in control of the system processing. Every possible action by a user should be anticipated and appropriate options should be provided.
The adaptability	
Refers to its capacity to behave contextually and according to the users' needs and preferences.	
Flexibility	Means available to customize the interface allowing then to consider their working strategies, habits, task requirements. It's the capacity of the interface to adapt itself regarding to the users' needs.
User experience	Means available to consider the level of use experience.
The error management	
All prevention or action managed to reduce errors or even to recover from them when they occur. Errors are defined as invalid data entry, invalid format for data entry, etc.	
Error protection	All the possible ways to detect and prevent data entry errors, command errors, or actions with destructive consequences.
Quality of error messages	The phrasing and the content of error messages linked to relevance, readability, specificity about the nature of the errors (syntax, format, etc.) and the actions needed to be done to correct them.
Error correction	Means available and given to users to correct errors.

The consistency	
Refers on the interface design choices (codes, naming, formats, procedures) that have been implemented. The design of the information must remain consistent from one channel to another.	
The homogeneity & the contexts	The graphic must be homogeneous throughout the site, identical navigation systems on each page, action buttons with similar functions to harmonize graphically, always use the same formats for the titles, for the tables, for the captions. It is also necessary to maintain visual, hierarchical and political consistency between the different systems (web-application).
The significance of codes	
Concerns the adequacy between the object or information displayed or entered, and its referent. Codes are significant to the users when there is a strong semantic relationship between the codes and the items they refer to.	
Interface language	When the coding is meaningful, recall and recognition are better and thus prevent users from making mistakes. The dialogues must be clear and understandable to the targeted users.
Abbreviations	For abbreviations, both novice and expert users should be considered. For novices, information bubbles are useful to guide them and shorten their fields of action. For experts, shortcuts are used to give them a match.
The compatibility	
The criterion concerns the coherence between environments and between applications. It refers to the match between users' characteristics (memory, perceptions, customs, skills, age, expectations, etc.) and task characteristics on the one hand, and the organization of the output, input and dialogue for a given application, on the other hand.	

Table 3. Detailed heuristic from Bastien & Scapin (1993)

3.5 Nielsen 's severity ranking

For the experts to be able to classify the impact of the UI usability, it is decided to adopt the Nielsen's severity ranking scale presented in table 4.

Table 4. Nielsen's severity ranking

Score	Description
0	No usability problem
1	Cosmetic problem: fix if possible
2	Minor usability problem: fix the problem (low priority)
3	Major usability problem: fix the problem (high priority)
4	Usability catastrophe: important to fix before release



3.6 Caregiver application

3.6.1 Tasks to be performed

To assess the totality of the services and screens in a simple way, we will give specific and general tasks to the experts. For the caregiver application these tasks will mainly be to create reminders and requests. To connect to the interface, we will give the experts all the administrator rights. So, they will have access to all the features. The experts will then not have to only pretend being caregivers but also administrators of the caregivers' application which will be primarily used as a working tool on a daily basis. To this purpose, they will have to perform the following tasks in order:

1. Create own account with professional email
2. Logging in and out of the system
3. Arrive automatically on *client's overview*:
 - a. Choose a client and consult exchanged messages
 - b. Open client network
4. Go on the left side to discover the table menu:
 - a. Click on *wellbeing*, then on *overview*
 - i. Check what response has been reported on [day]
 - ii. Check what reason for ["feeling bad"] is reported
 - b. Click on *wellbeing*, then *request*
 - i. Add and save a new request
 - c. Click on *sleep quality*, then on *overview*
 - i. Check what response has been reported on [day]
 - ii. Check what reason for ["feeling bad"] is reported
 - d. Click on *sleep quality*, then on *request*
 - i. Add and save a new request
 - e. Click on *meal*, then on *overview*
 - i. Check what response has been reported on [day]
 - f. Click on *meal*, then on *reminder*
 - i. Add and save a reminder
 - g. Click on *medication*, then on *overview*
 - i. Check what response has been reported on [day]
 - h. Click on *medication*, then on *reminder*
 - i. Add medication reminder
 - i. Click on *calendar*
 - i. Set an appointment for a senior
 - j. Click on *messages*
 - i. Get in touch with another caregiver
 - k. Click on care network
 - i. Add a formal and informal member
 - ii. Edit a formal and informal member
 - iii. Delete a formal and informal member
 - iv. Click on senior's icon to personalize the service with details about the senior and his/her preferences
 - l. Click on *profile, general*
 - i. fill in the requested information
 - m. Click on *settings*
 - i. Change password



- n. Click on *access rights*:
 - i. Give and change access rights
 - ii. Set up and manage the notification flow

3.6.2 Heuristic Table to fulfil

Caregiver application					
Heuristics ¹		Screen(s) name	Description of the usability issue	Severity	Proposition for improvement or design recommendations
1	prompting				
	grouping				
	feedback				
	legibility				
2	brevity				
	density				
3	explicit user action				
	user control				
4	flexibility				
	user experience				
5	error protection				
	quality error messages				
	error correction				
6	homogeneity context				
7	language interface				
	abbreviation				
8	compatibility				

3.6.3 Questions to go further

1. Is there anything else that bothered you in the use of the interface that could have not been classified in the previous table?
2. Opened questions from CCARE
 - a. The system possibilities and their procedures are correctly understood? If not, how could we improve it?
 - b. Do you think that the functionalities can ensure quality monitoring? Are they complete?
 - c. Do you like sending your requests as closed questions? Are the answers specific enough to ensure a good follow-up?



3.7 The senior's tablet application

In order to evaluate the senior's tablet application interface, we ask experts to simulate and pretend to be seniors using the tablet application by giving them specific tasks, such as respond to the reminders and requests, but also general tasks also related to parameters. They will therefore have to perform the following tasks:

1. Logging in and out of the system
2. Receive medication reminder
 - a. Answer by *I've not taken my medication*
 - b. Answer by *Remind me later*
 - c. Indicate and *save medication intake*
3. Receive two meal reminders
 - a. First, answer by *I have not taken my meal*
 - b. Second, answer by *I have taken my meal*
4. Receive appointments reminder
5. Receive activity reminder
6. Receive two wellbeing requests
 - a. First, answer by *fairly bad*
 - b. Then select between the reasons and click on *this is why I am not feeling well*
 - c. Second, answer *very good*
7. Receive sleep quality request
 - a. First, answer *Fairly bad*
 - b. Then select between the reasons and click on *this is why I did not sleep well*
8. Go on *Home*
 - a. Check appointments of the day
 - b. Do a self-report, select the topic and click on *ok*
 - c. Set up Misty's volume

Last task is to check if the notifications sent from senior to caregiver, are successfully received or not. For example, if the senior cancels a visit, does the caregiver receive the information, and vice versa.

3.7.1 Heuristic table to fulfil

Senior's tablet application				
Heuristics ²	Screen(s) title	Description of the usability issue	Severity	Proposition for improvement or design recommendations
1	prompting			
	grouping			
	feedback			
	legibility			
2	brevity			
	density			
3	explicit user action			
	user control			
4	flexibility			
	user experience			
5	error protection			



	quality error messages				
	error correction				
6	homogeneity context				
7	language interface				
	abbreviation				
8	compatibility				

3.7.2 Questions to go further

1. Is there anything else that bothered you in the use of the interface that could have not been classified in the previous table?
2. Open questions from CCARE
 - a. The messages and reminders are correctly understood? If not, how could we improve it?
 - b. Are you feeling in control of the GUARDIAN's system?
 - c. Do you find logical that you can't respond or do anything else?

3.8 Wrap up

Thank you to all experts who took some time to check the potential problems of GUARDIAN's interface with the imposed heuristics of Bastien & Scapin. We would like to take advantage of these few lines to submit one last request: please fill the demographic's table to let us have a quality overview of all the experts who participated into those heuristic evaluations.

N°	Gender	Age	Location	Workplace	Profession	Expertise level
1						
2						
3						
4						
5						

Please send the saved file to the task leader in charge of this heuristic evaluation: H.Nap@vilans.nl
Thank you for your support!



4 Usability Testing

4.1 Methods

4.1.1 General procedure

The first usability testing will be conducted in the Netherlands, Italy and Switzerland combined with the pre-alpha evaluation session. This will be a semi-structured one-on-one session of approximately 1,5 hours. Usability testing will take place with the Caregiver Application and the Senior application. Several qualitative and quantitative research methods are combined. The usability testing will be repeated until the tool reaches a sufficient maturity.

Scenarios will be used to demonstrate the benefits of using the social robot. During the usability testing special attention will be given to test the Human-Robot Interaction with older people. The outcomes will be used in combination with the findings of the heuristic evaluation to detect and solve usability problems/errors and further develop the Guardian prototype.

First the demo video of the use case ‘medication’ of GUARDIAN will be shown to the participants after which they are asked to reflect on this. After the demo video, participants are asked to check out the application for 5 minutes. Then for another 20 minutes the researcher goes through several scenarios with the participant and is asked to perform several tasks. This way they will go through the different functionalities of the GUARDIAN system. During the entire testing period, participants are asked to say whatever comes to their mind (thinking aloud protocol). At the end an exit interview will take place. This interview focuses on the first experiences of the participant with the GUARDIAN system and also contains some more explorative questions to gather insights for further development of the prototype. See chapter 4.2 for more detailed procedure per end-user.

During the session there is one researcher that asks all the questions and goes through the scenario, while there is a second researcher who observes what the participant is doing and records this with the help of the observation guide (see appendix C).

Table 5. Usability & pre-alpha	
Months	Sept 2021
Type of test	Semi structured evaluation, one-on-one, physical (digital if there are new restrictions due to the coronavirus)
No. participants	30 (NL:10, CH: 10, IT:10)
Duration	Approx 1.5 hours
Method	Informed consent + GQ Demo & Free play Scenarios & tasks IBM Questionnaire &. Exit interview
Measurements	Background information Usability & accesibility Credibility & acceptance Ethical considerations & Responsible RI Points of improvement for alpha test



4.1.2 Evaluation topics/Measurements

Background information on participants – Open questions

To gather background information (i.e. demographic data) of the participants, the researchers will ask at the beginning of the evaluation session to fill in a short questionnaire in with several questions related to socio-demographic characteristics, experience with technology, and the care and home situation of the end-user. See appendix A for this general questionnaire.

Usability & Accessibility – observation guide, open questions & IBM usability questionnaire

Accessibility and usability will be assessed through an observation guide based on heuristics the IBM usability satisfaction questionnaire and several evaluative questions related to measurements defined in D4.1. Below the measurements are explained further.

An observation guide is created to support the observer in noting usability issues such as someone not knowing how to complete a scenario or getting confused (appendix B) The following observation topics are included in the guide and should be noted down for each scenario performed: number of expected clicks, number of actual clicks, getting stuck/being confused/none, description of (inter)action, reason of getting stuck/being confused and the corresponding heuristic. The heuristics that are considered in this evaluation are: consistency, simplicity, feedback, control, error and overload.

The IBM questionnaire contains nineteen usability items that has to be rated on a Likert scale, running from one to seven with the lower the score, the better the usability. The participants are also asked to list the three most negative and most positive aspects of the GUARDIAN system. Four different constructs can be measured with this questionnaire: overall satisfaction, system usefulness, information quality and interface quality. The IBM questionnaire can be repeated during the Alpha and Beta evaluations.

Credibility & Acceptance – open questions

Several explorative questions will be asked at the end of the evaluation session related to perceived credibility & acceptance of GUARDIAN. Questions are related to the usefulness/helpfulness of GUARDIAN, to what extent GUARDIAN offers tailored services and the enjoyment.

Ethical consideration & Responsible Innovation – open questions

Several explorative questions will be asked during the different evaluation sessions related to the effect of the GUARDIAN services for all users in terms of social connectedness, trust, control, privacy, and dependency.

4.1.3 Participants

In total, 30 end-users from the end-user organizations (UNIGE/HUG, INCRA, ZNWV/Vilans) will participate in usability testing. Each country will include 10 participants, of which 5 informal carers and 5 formal carers for the usability testing and pre-alpha evaluation. In a later phase also 5 seniors per country will be recruited for evaluation.



4.1.4 Setting

To have a proper and relevant usability test, participants should take part and be assessed in a controlled environment, e.g., a testing room or a dedicated space with all infrastructures and details like real life's context. For the senior and informal care this might be a living room like-setting, and for the formal carer their workplace. Each country can decide for themselves what is the best location for testing. Also, we have to follow the corona guidelines in each country. If physical testing is not possible, we will perform a digital procedure (show videos and mock-ups of the different applications and reflect on usability).

4.1.5 Preparations

Before end-users participate in evaluation sessions they are asked to sign an informed consent form. The informed consent ensures pseudonymized analysis, announces that audio and video are being recorded and makes clear to participants that they can withdraw their consent and cooperation at any time during the study. A unique participant's code is assigned to every participant. Together with the informed consent form, participants were asked to fill in a general questionnaire (GQ see appendix A) in order to gather knowledge about the participant-pool. The questionnaire focuses on personal information in relation to caring for someone, gender, caretaking experience etcetera.



4.2 Formal caregiver

4.2.1 Introduction (10 min)

- Check if informed consent & General questionnaire are filled in
- Introduction text

Thank you for participating in this study, which is part of the international research project GUARDIAN. We design and develop a social robot that supports seniors in their daily lives. The idea is that GUARDIAN provides companionship and can be the eyes, ears and communication channel for the senior. The care network can monitor how the senior is doing via the robot.

Today we will evaluate the usability of GUARDIAN system as it currently is. First, I will ask you a couple of questions as an introduction and then I will show you a demo of GARDIAN and you can have a look around. After that I will ask you to perform [x] tasks and we will end the study with some evaluative questions to hear your opinion and ideas about the product. I would like to encourage you to be critical and think aloud, because it will help us develop the product so that it fits with your needs and wishes.

Before we start just, you are aware that we will record this meeting and that you are allowed to stop your participation at any moment. Before we go to the different tasks, I would like to know a little bit more about you.

- Could you tell me something about yourself and your work as a nurse?
 - What does your workday look like?
- What kind of people do you take care of?
 - What are their challenges?
 - What are your challenges when taking care of them?

4.2.2 Demo (10 min)

Now imagine, you work as a home care nurse and have to provide care to 20 different clients in a large district and your time per client is limited. You feel responsible for you clients but find it challenging to keep an eye on them. One of your clients is 'Jan' and together with his informal caregiver, his daughter 'Birgit', you decided to introduce GUARDIAN to 'Jan'. The robot is like a friend that helps 'Jan' with his daily routine. You as a caregiver can keep an eye on Jan from a distance by logging into the caregiver app and set reminders and communicate through the robot.

The GUARDIAN system consists of the robot (Misty) and a tablet to be able to control the robot and a caregiver app for the (informal) caregiver to be able to set reminders and to monitor the senior.

SHOW THE DIFFERENT APPLICATIONS

To make this session not too long, we will only test a selection of the functionalities of GUARDIAN today. However, it is good to take into account that GUARDIAN has more functionalities.

I will show you a video of GUARDIAN, this way you will have an idea about the robot we developed so far.

- Show demo video of GUARDIAN; you can find the video [here](#) (in the folder WP5 → Dissemination -> Video Guardian)



Questions afterwards:

- What are your first thoughts after watching this video and trying out the GUARDIAN system?

4.2.3 Scenarios/tasks (20 min)

I will present you [x] tasks one by one. I will ask you to perform the task to see if Guardian is understandable and of added value. Therefore, I will not explain how you could 'complete' the task, however, if you are completely lost, I will help you. I would like to ask you to think aloud when performing an action, for example when pressing a button. Let's start with the first task.

Task 1: Setting up daily pattern (to make sure that the requests and reminders can be linked to patterns)

You are worried that Jan is becoming lonely, less active and that he starts to forget medication etc. Based on his regular daily pattern, you want to set reminders and requests.

Information related to daily activities

Sleep: 23:00-08:00

Breakfast: 09:00-09:30

Dinner: 18:00-18:30

- Could you define the daily pattern for a week for 'Jan' What would you do?

Notes observer:

- Minimal number of clicks: 12
- Observe what the participant does when performing this task, do they get stuck in the process, is everything clear?
- How did you think it went?
- Based on observations: ask a few questions if someone was stuck or confused, e.g. *I noticed you were hesitating [describe step], why was that?; where there any steps you got confused? Etc.*

Task 2: Setting up wellbeing request

One of your clients, 'Jan', mentioned last week that he has had a headache for a couple of days now. You would like to monitor this using GUARDIAN. You want to remind him every morning after he wakes up that he can let GUARDIAN know how he is feeling and whether he has a headache or not.

- Could you show me what you would do?

Notes observer:

- Minimal number of clicks: 8
- Observe what the participant does when performing this task do, they get stuck in the process, is everything clear?
- How did you think it went?
- Based on observations: ask a few questions if someone was stuck or confused, e.g. *I noticed you were hesitating [describe step], why was that?; where there any steps you got confused? Etc.*

Task 3: Adding a medication reminder

One of your clients, 'Maria', has been suffering from a bladder infection for 2 days. After a visit to the doctor, Maria was prescribed antibiotics. To make sure she takes her medication on time you want to



send medication reminders through Guardian and you would like to know if she actually did take the medication.

Information related to medication:

Name: amoxicilline

Instruction: 2 times a day, during meals (breakfast and dinner), together with half glass of water

Duration: 5 days

- Could you show me how you would do that?

Notes observer:

- Minimal number of clicks: 22
- Observe what the participant does when performing this task do they get stuck in the process, is everything clear?
- How did you think it went?
- Based on observations: ask a few questions if someone was stuck or confused, e.g. *I noticed you were hesitating [describe step], why was that?; where there any steps you got confused? Etc.*

Task 4: Wellbeing and medication overviews

Every week you check the overview of all your clients and today you specifically focus on Jan who was suffering from the headache and Maria who had to take her antibiotics. What would you do?

- Could you show me how you would do that?
- How would you use this information?

Notes observer:

- Minimal number of clicks: 5
- Observe what the participant does when performing this task do they get stuck in the process, is everything clear?
- How did you think it went?
- Based on observations: ask a few questions if someone was stuck or confused, e.g. *I noticed you were hesitating [describe step], why was that?; where there any steps you got confused? Etc.*

4.2.4 Evaluation (30 min)

Let participant fill in the IBM Questionnaire (10 min).

Think about all the tasks that you have done with the GUARDIAN system while you answer the following questions. Please read each statement and indicate how strongly you agree or disagree with the statement by circling a number on the scale. If a statement does not apply to you, circle N/A. In addition, please answer the following questions:

- Can you list the three most **negative** aspect(s) of the GUARDIAN system and/or interface?
- Can you list the three most **positive** aspect(s) of the GUARDIAN system and/or interface?

Interview questions (20 min)

- What is your first impression of the GUARDIAN system?
 - What do you think of the robot? What do you think of tablet?



- Did you find GUARDIAN **easy to use**?
 - o Was everything clear? Could you do and find everything you wanted to do?
 - What was unclear?
 - Were icons and text self-explanatory?
- Do you believe that the GUARDIAN system that we have presented today will be **useful** in your daily work?
 - o What do you expect to gain from GUARDIAN?
 - o Which functionalities you think would be useful for you? And which not?
 - Medication
 - Meal
 - Wellbeing
 - Sleep quality
 - Activity suggestions
 - o Do you miss anything?
- How do you expect your daily work routine would change when using GUARDIAN for a longer time? - what would a typical workday with GUARDIAN look like?
- What are your expectations about the response of clients/informal carers on the use of GUARDIAN?
 - o How can we stimulate their acceptance of GUARDIAN?
- In general, do you expect GUARDIAN to have an effect on the mental or physical wellbeing of the senior? In what way?
- To what extent do you feel that using GUARDIAN will be **enjoyable**?
 - o What would you like to add to the robot to support the need for fun and pleasure in daily life?

Questions related to responsible RI

- Social connectedness
 - o How do you perceive the interaction with the robot?
 - Is the interaction meaningful to you?
 - Why(not)? Do you miss anything?
- Trust
 - o What should the robot definitely not do? Why?
 - Are there certain limits in what you do not like the robot to do (i.e. in terms of tasks (not) to perform, or activities (not) to support)? Why?
 - *Eventually explain:* What kind of actions do you trust the robot to perform, and for what kind of actions do you want you or another human to be involved? Why?
- Dependency
 - o Do you expect yourself and the senior to rely on the robot on the long term?
 - For example: 'Oh I forget the medicine, it is no problem because the robot will tell me, so I do not have to think that much'
 - If so, what do you think of that?
 - o And what about the your own dependency, or the informal carer's dependency on the robot?

End of interview

- Do you have any further suggestions for improvement of the GUARDIAN system?

Thank you for all your input. After seeing and using GUARDIAN today, would you recommend GUARDIAN to a colleague or a family member/friend? And why?



Is there something you haven't shared yet, but would like to? Or do you have any questions for me? Otherwise this was it for today and again thank you for participating. We will keep you updated on the developments within the GUARDIAN project and if you are okay with it, we would like to contact you again in a later phase of the project.



4.3 Informal caregiver

4.3.1 Introduction (10 min)

- Check if informed consent & General questionnaire are filled in
- Introduction text

Thank you for participating in this study, which is part of the international research project GUARDIAN. We design and develop a social robot that supports seniors in their daily lives. The idea is that GUARDIAN provides companionship and can be the eyes, ears and communication channel for the senior. The care network can monitor how the senior is doing via the robot.

Today we will evaluate the usability of GUARDIAN system as it currently is. First, I will ask you a couple of questions as an introduction and then I will show you a demo of GARDIAN and you can have a look around. After that will ask you to perform [x] tasks and we will end the study with some evaluative questions to hear your opinion and ideas about the product. I would like to encourage you to be critical and think aloud, because it will help us develop the product so that it fits with your needs and wishes.

Before we start just, you are aware that we will record this meeting and that you are allowed to stop your participation at any moment. Before we go to the different tasks, I would like to know a little bit more about you.

- Could you tell me something about your role as an informal caregiver?
 - What kind of actions do you do?
- Could you tell me something about the task division between you, other informal caregivers and formal caregivers?
 - How do you experience the current care you provide?

4.3.2 Demo (10 min)

Now imagine, you go to work and feel uncertain about the well-being of your father 'Jan' who lives alone at home. He usually forgets to take his medication during noon and can feel lonely during the day. Therefore, you introduced GUARDIAN together with the home care nurse to him. The robot is like a friend that helps him with his daily routine. Together you can set reminders and you can also log into the GUARDIAN at your work monitor him and communicate with him through the robot.

The GUARDIAN system consists of the robot (Misty) and a tablet to be able to control the robot and a caregiver app for the (informal) caregiver to be able to set reminders and to monitor the senior.

SHOW DIFFERENT APPLICATIONS

To make this session not too long, we will only test a selection of the functionalities of GUARDIAN today. However, it's good to take into account that GUARDIAN has more functionalities.

I will show you a video of GUARDIAN, this way you will have an idea about the robot we developed so far.

- Show demo video of GUARDIAN; you can find the video [here](#) (in the folder WP5 → Dissemination -> Video Guardian)

Questions afterwards:

- What are your first thoughts after watching this video and trying out the GUARDIAN system?



4.3.3 Scenarios/tasks

I will present you [x] tasks one by one. I will ask you to perform the task to see if Guardian is understandable and of added value. Therefore, I will not explain how you could 'complete' the task, however, if you are completely lost, I will help you. I would like to ask you to think aloud when performing an action, for example when pressing a button. Let's start with the first task.

Task 1: Setting up a reminder

You and 'Jan' have decided to try the GUARDIAN system. You have explained to him that Guardian can help him in his daily live and he is willing to try it out. He lives alone and tends to forget his heart medication that he has to take every day right after breakfast. To make sure he takes his medication on time you want to send medication reminders through Guardian and you would like to know if he actually did take the medication.

Information related to medication:

Name: bloodthinner- acenocooumarol

Instruction: Once a day 2 pills, at 10:00AM

Duration: everyday

- Could you show me what you would do?

Notes observer:

- Minimal number of clicks: 8
- Observe what the participant does when performing this task, do they get stuck in the process, is everything clear?
- How did you think it went?
- Based on observations: ask a few questions if someone was stuck or confused, e.g. *I noticed you were hesitating [describe step], why was that?; where there any steps you got confused? Etc.*

Task 2: Creating a daily pattern

You are afraid that Jan is becoming lonely and less active. You noticed that after his afternoon nap he doesn't go out anymore and just watches tv. Also regularly skips his cup of tea after lunch and dinner, so he is not drinking enough. You want to try to create several reminders and suggestions linked to these moments so Jan becomes more active and drinks more.

Information related to daily activities

Afternoon nap: 15:00-15:30

Lunch: 12:30-13:00

Dinner: 18:00-18:30

- Could you define the daily pattern for a week for 'Jan' What would you do?

Notes observer:

- Minimal number of clicks: 12
- Observe what the participant does when performing this task, do they get stuck in the process, is everything clear?
- How did you think it went?



- Based on observations: ask a few questions if someone was stuck or confused, e.g. *I noticed you were hesitating [describe step], why was that?; where there any steps you got confused? Etc.*

Task 3: Wellbeing and medication overviews

You are at home or at work and are wondering how Jan is doing, because lately you have had the idea that he is not feeling very well each morning and you think it's because he's forgetting to take his medication regularly. Two weeks ago, you set up GUARDIAN to send him reminders about the medication and to ask him how he's feeling every day. Now you want to check the overview of the last two week.

- Could you show me how you would do that?
- How would you use this information?

Notes observer:

- Minimal number of clicks: 4
- Observe what the participant does when performing this task, do they get stuck in the process, is everything clear?
- How did you think it went?
- Based on observations: ask a few questions if someone was stuck or confused, e.g. *I noticed you were hesitating [describe step], why was that?; where there any steps you got confused? Etc.*

4.3.4 Evaluation (30 min)

Let participant fill in the IBM Questionnaire (10 min).

Think about all the tasks that you have done with the GUARDIAN system while you answer the following questions. Please read each statement and indicate how strongly you agree or disagree with the statement by circling a number on the scale. If a statement does not apply to you, circle N/A. In addition, please answer the following questions:

- Can you list the three most **negative** aspect(s) of the GUARDIAN system and/or interface?
- Can you list the three most **positive** aspect(s) of the GUARDIAN system and/or interface?

Interview questions (20 min)

- What do you think of the robot? What do you think of tablet?
- Did you find GUARDIAN **easy to use**?
 - Was everything clear? Could you do and find everything you wanted to do?
 - What was unclear?
 - Were icons and text self-explanatory?
- Do you believe GUARDIAN we have presented today will be **useful** in your current situation?
 - What do you expect to gain from GUARDIAN?
 - Which functionalities you think would be useful for you? And which not?
 - Medication
 - Meal
 - Wellbeing
 - Sleep quality
 - Activity suggestions
 - Do you miss anything?



- How do you expect your daily routine would change when using GUARDIAN for a longer time?
- Do you think Misty would suit your loved one? Do you think he/she would use it?
 - How will he/she respond?
 - How can we assure he/she accepts GUARDIAN?
- In general, do you expect GUARDIAN to have an effect on the mental or physical wellbeing of the senior? In what way?
- Do you think such a system could give you peace of mind or what should it do to give you peace of mind?
- To what extent do you feel that using GUARDIAN will be **enjoyable**?
 - What would you like to add to the robot to support the need for fun and pleasure in daily life?

Questions related to responsible RI

- Social connectedness
 - How do you perceive the interaction with the robot?
 - Is the interaction meaningful to you?
 - Why(not)? Do you miss anything?
- Trust
 - What should the robot definitely not do? Why?
 - Are there certain limits in what you do not like the robot to do (i.e. in terms of tasks (not) to perform, or activities (not) to support)? Why?
 - *Eventually explain:* What kind of actions do you trust the robot to perform, and for what kind of actions do you want you or another human to be involved? Why?
- Dependency
 - Do you expect yourself and the senior to rely on the robot on the long term?
 - For example: 'Oh I forget the medicine, it is no problem because the robot will tell me, so I do not have to think that much'
 - If so, what do you think of that?
 - And what do you think about your own potential dependency on the robot?

End of interview

- Do you have any further suggestions for improvement of the GUARDIAN system?

Thank you for all your input. After seeing and using GUARDIAN today, would you recommend GUARDIAN to a family member/friend? And why?

Is there something you haven't shared yet, but would like to? Or do you have any questions for me? Otherwise this was it for today and again thank you for participating. We will keep you updated on the developments within the GUARDIAN project and if you are okay with it, we would like to contact you again in a later phase of the project.



4.4 Senior

Depending on how far the prototype is developed we will ask the senior to perform several tasks or we just ask them several explorative questions.

4.4.1 Introduction (10 min)

- Check if informed consent & General questionnaire are filled in
- Introduction text

Thank you for participating in this study, which is part of the international research project GUARDIAN. We design and develop a social robot that supports seniors in their daily lives. The idea is that GUARDIAN provides companionship and can be the eyes, ears and communication channel for you. The care network can monitor how the senior is doing via the robot.

Today we will evaluate the usability of GUARDIAN system as it currently is. First, I will ask you a couple of questions as an introduction and then I will show you a demo of GARDIAN and you can have a look around. After that I will ask you to perform [x] tasks and we will end the study with some evaluative questions to hear your opinion and ideas about the product. I would like to encourage you to be critical and think aloud, because it will help us develop the product so that it fits with your needs and wishes.

Before we start just, you are aware that we will record this meeting and that you are allowed to stop your participation at any moment. Before we go to the different tasks I would like to know a little bit more about you.

- How would you describe yourself?
- Could you describe a typical day in your life?
- Could you tell me if you have a formal and/or informal caregiver and who they are?
 - What is their role?
 - How do you feel about that? How would you like them to take care of you?

4.4.2 Demo & Free play (10 min)

Now imagine, you live at home, but have difficulties walking and start to forget things. You receive home care once a day and your daughter helps out regularly. You really want to live at home, but your daughter is worried about your well-being. Therefore she introduces GUARDIAN to you. The robot is like a friend that helps you with daily routine. Your daughter can this way log into GUARDIAN when she is at work and see how you are doing and communicate with you through GUARDIAN.

The GUARDIAN system consists of the robot (Misty) and a tablet to be able to control the robot and a caregiver app for the (informal) caregiver to be able to set reminders and to monitor the senior.

SHOW DIFFERENT APPLICATIONS

To make this session not too long, we will only test a selection of the functionalities of GUARDIAN today. However, it's good to take into account that GUARDIAN has more functionalities.

I will show you a video of GUARDIAN, this way you will have an idea about the robot we developed so far.

- Show demo video of GUARDIAN; you can find the video [here](#) (in the folder WP5 → Dissemination -> Video Guardian)

Questions afterwards:

- What are your first thoughts after watching this video and trying out the GUARDIAN system?



•

4.4.3 Scenarios/tasks (20 min)

Task 1: Receiving a meal reminder and reporting to have eaten

- Quickly introduce Misty and show the senior app

I will now present you [x] tasks one by one. However, I will ask you to perform the task to see if Guardian is understandable and of added value. Therefore I will not explain how you could 'complete' the task, however, if you are completely lost, I will help you. I would like to ask you to think aloud when performing an action, for example when pressing a button. Let's start with the first task.

Together with your daughter, you have set reminders for breakfast, lunch and dinner and she would like to know if you are eating well. The GUARDIAN robot is standing on your side table in the living room. Imagine that it is 6pm and you receive the following message: [dinner reminder].

- Could you show me what you would do?

Notes observer:

- Minimal number of actions: still to try out
- Observe what the participant does when performing this task do they get stuck in the process, is everything clear?
- How did you think it went?
- Based on observations: ask a few questions if someone was stuck or confused, e.g. *I noticed you were hesitating [describe step], why was that?; where there any steps you got confused? Etc.*

Task 2: Reporting wellbeing

The day before yesterday, you mentioned to the home care nurse that you were not feeling well lately and that you have a headache every now and then. The nurse told you she would like to monitor it to see if something should change in your medication. This morning you woke up with a headache and want to let home care know that you are not feeling well.

- Could you show me how you would do that?

Notes observer:

- Minimal number of actions: 4
- Observe what the participant does when performing this task do they get stuck in the process, is everything clear?
- How did you think it went?
- Based on observations: ask a few questions if someone was stuck or confused, e.g. *I noticed you were hesitating [describe step], why was that?, where there any steps you got confused? Etc.*

Task 3: Activity suggestion

Your daughter is afraid you are becoming lonely and less active. Two weeks ago, together you have thought of some activities you enjoy doing. After your afternoon nap you sit on the couch and Misty gives you the following message [activity suggestion]. How would you respond?

Notes observer:

- Minimal number of actions: still to try out



- Observe what the participant does when performing this task do they get stuck in the process, is everything clear?
- How did you think it went?
- Based on observations: ask a few questions if someone was stuck or confused, e.g. *I noticed you were hesitating [describe step], why was that?, where there any steps you got confused? Etc.*

4.4.4 Evaluation (30 min)

Let participant fill in the IBM Questionnaire (10 min).

Think about all the tasks that you have done with the GUARDIAN system while you answer the following questions. Please read each statement and indicate how strongly you agree or disagree with the statement by circling a number on the scale. If a statement does not apply to you, circle N/A. In addition, please answer the questions:

- *Can you list the three most **negative** aspect(s) of the GUARDIAN system and/or interface?*
- *Can you list the three most **positive** aspect(s) of the GUARDIAN system and/or interface?*

Interview questions (20 min)

Notes observer:

- Use the answers given in the IBM questionnaire in this interview

Questions related to usability and user experience

- What is your first impression of the guardian system.
 - What do you think of the robot? What do you think of tablet?
- Did you find GUARDIAN **easy to use**?
 - Was everything clear? Could you do and find everything you wanted to do?
 - What was unclear?
 - Were icons and text self-explanatory?
- Do you believe GUARDIAN we have presented today will be **useful** in your daily life? Why?
 - What do you expect to gain from GUARDIAN?
 - Which functionalities you think would be useful for you? And which not?
 - Medication
 - Meal
 - Wellbeing
 - Sleep quality
 - Activity suggestions
 - Do you miss anything?
 - How do you expect your daily life would change when using GUARDIAN for a longer time? - how would a typical day with GUARDIAN look like
- Do you think such a system could give you peace of mind or what should it do to give you peace of mind?
- To what extent do you feel that using GUARDIAN will be **enjoyable**?
 - What would you like to add to the robot to support your need for fun and pleasure in daily life?
- In general, do you expect GUARDIAN to have an effect on your mental or physical wellbeing? In what way?

Questions related to responsible RI

- Social connectedness
 - How do you perceive the interaction with the robot?



- Is the interaction meaningful to you?
- Why(not)? Do you miss anything?
- Trust
 - What should the robot definitely not do? Why?
 - Are there certain limits in what you do not like the robot to do (i.e. in terms of tasks (not) to perform, or activities (not) to support)? Why?
 - *Eventually explain:* What kind of actions do you trust the robot to perform, and for what kind of actions do you want you or another human to be involved? Why?
- Control/privacy
 - Do you have the feeling of being in control over the actions taken by the robot in your home?
 - Do you have the feeling that you would lose some of your privacy when using the GUARDIAN robot?
 - If so, why?
 - And if so, do the expected benefits of using GUARDIAN outweigh this loss of privacy?
- Dependency
 - Do you expect yourself to rely on the robot on the long term?
 - For example: 'Oh I forget the medicine, it is no problem because the robot will tell me, so I do not have to think that much'
 - If so, what do you think of that?

End of interview

- Do you have any further suggestions for improvement of the GUARDIAN system?

Thank you for all your input. After seeing and using GUARDIAN today, would you recommend GUARDIAN to a family member/friend? And why?

Is there something you haven't shared yet, but would like to? Or do you have any questions for me? Otherwise this was it for today and again thank you for participating. We will keep you updated on the developments within the GUARDIAN project and if you are okay with it, we would like to contact you again in a later phase of the project.



5 References

Bastien, C., & Scapin, D. L. (1993). *Ergonomic criteria for the evaluation of human-computer interfaces* (Doctoral dissertation, Inria).

Nielsen, J., and Molich, R. (1990). Heuristic evaluation of user interfaces, Proc. ACM CHI'90 Conf. (Seattle, WA, 1-5 April), 249-256.

Nielsen, J. (1994). Heuristic evaluation. In Nielsen, J., and Mack, R.L. (Eds.), *Usability Inspection Methods*, John Wiley & Sons, New York, NY.



Appendix A – General Questionnaire GUARDIAN study

Thank you for participating in the GUARDIAN study. This questionnaire contains a number of general questions about you and your experience with technology. Your answers will be treated confidentially and cannot be traced back to you as a person. The results of this questionnaire will be used for scientific research and internal reports.

General questions

1. Gender: male female other
2. Age:
3. What is your function? * question only for formal carer

Role as informal caregiver * questions only for informal carer

4. What is your relationship with the person you care for? He/She is my...

<input type="checkbox"/> Partner	<input type="checkbox"/> Son/Daughter
<input type="checkbox"/> Father/Mother	<input type="checkbox"/> Friend/Acquaintance
<input type="checkbox"/> Brother/Sister	<input type="checkbox"/> Grandpa/Grandma
<input type="checkbox"/> Other, namely:.....	
5. Do you live together with the person you care for?
 Yes No
6. How many hours of support do you provide to your loved one on average per week?
_____ hours per week
7. How long have you provided care/support to your loved one?
_____ years
8. Does your loved one receive professional care?
 - a. If yes, how many hours on average per week?



Appendix B – Observation guide

Instructions

Please fill in one observation sheet per scenario.

Explanation of heuristics

1. Consistency

Icons, labels, buttons, and menus (i.e., elements) displayed on screen should be consistent in, location, terminology and meaning.

2. Simplicity

Elements displayed on screen should not contain functionalities or information which is rarely needed or irrelevant.

3. Feedback

Elements displayed on screen should keep you informed about the past, current, and future system status.

4. Control

Elements displayed on screen should provide you with control and freedom.

5. Error

Elements displayed on screen should help you recognize, diagnose, and recover from an error.

6a. Overload

The elements displayed on screen should minimize the memory load of the user.

OBSERVATION TOPIC	DESCRIPTION OBSERVATION TOPIC	OBSERVATION NOTES
# expected clicks	<i>Lowest number of clicks necessary to complete the task</i>	
# actual clicks	<i>Actual number of clicks needed to complete the task – does not have to be extremely precise. An estimation would be enough.</i>	
Participant was stuck/confused	<i>Fill in: stuck/confused/none Stuck: couldn't complete the task Confused: got lost but figured it out</i>	



<p>Description of (inter)action where someone got stuck or confused</p>	<p>Please describe or screenshot the specific action or interaction where someone got stuck or confused.</p> <p>If there are multiple, add them all and number them.</p> <p>Description could be for example:</p> <ul style="list-style-type: none"> - the transition between the following screens (screenshots of 2 screens) - The add-button when adding a reminder 	
<p>Reason of getting stuck or confused</p>	<p>Pease describe the reason why someone got stuck or confused at the previously mentioned action/interaction. If there are multiple, add them all and use the same numbers as before.</p>	
<p>Heuristic</p>	<p>Try to categorize the above described issues in one of the following categories:</p> <p>Consistency</p> <p>Simplicity</p> <p>Feedback</p> <p>Control</p> <p>Error</p> <p>Overload</p>	
<p>Notes</p>	<p>If you have any additional notes, you can write them down here.</p>	



Appendix C – IBM Questionnaire

Think about all the tasks that you have done with the GUARDIAN system while you answer the following questions. Please read each statement and indicate how strongly you agree or disagree with the statement by circling a number on the scale. If a statement does not apply to you, circle N/A.

Note for researcher: You are allowed to use the opposite scale as well if that works better in your country but please make clear which scale is used.

1. Overall, I am satisfied with how easy it is to use the GUARDIAN system.

strongly agree 1 2 3 4 5 6 7 strongly disagree N/A

2. It was simple to use the GUARDIAN system.

strongly agree 1 2 3 4 5 6 7 strongly disagree N/A

3. I could (effectively) successfully complete the tasks and scenarios using the GUARDIAN system.

strongly agree 1 2 3 4 5 6 7 strongly disagree N/A

4. I was able to complete the tasks and scenarios quickly using the GUARDIAN system.

strongly agree 1 2 3 4 5 6 7 strongly disagree N/A

5. I was able to efficiently (quickly) complete the tasks and scenarios using the GUARDIAN system.

strongly agree 1 2 3 4 5 6 7 strongly disagree N/A

6. I feel comfortable using the GUARDIAN system.

strongly agree 1 2 3 4 5 6 7 strongly disagree N/A

7. It was easy to learn to use the GUARDIAN system.

strongly agree	1	2	3	4	5	6	7	strongly disagree	N/A
-----------------------	----------	----------	----------	----------	----------	----------	----------	--------------------------	------------

8. I believe I could become productive quickly using the GUARDIAN system.

strongly agree	1	2	3	4	5	6	7	strongly disagree	N/A
-----------------------	----------	----------	----------	----------	----------	----------	----------	--------------------------	------------

9. The GUARDIAN system gave error messages that clearly told me how to fix problems.

strongly agree	1	2	3	4	5	6	7	strongly disagree	N/A
-----------------------	----------	----------	----------	----------	----------	----------	----------	--------------------------	------------

10. Whenever I made a mistake using the GUARDIAN system, I could recover easily and quickly.

strongly agree	1	2	3	4	5	6	7	strongly disagree	N/A
-----------------------	----------	----------	----------	----------	----------	----------	----------	--------------------------	------------

11. The information (such as online help, on-screen messages, and other documentation) provided with the GUARDIAN system was clear.

strongly agree	1	2	3	4	5	6	7	strongly disagree	N/A
-----------------------	----------	----------	----------	----------	----------	----------	----------	--------------------------	------------

12. It was easy to find the information I needed.

strongly agree	1	2	3	4	5	6	7	strongly disagree	N/A
-----------------------	----------	----------	----------	----------	----------	----------	----------	--------------------------	------------

13. The information provided for the GUARDIAN system was easy to understand.

strongly agree	1	2	3	4	5	6	7	strongly disagree	N/A
-----------------------	----------	----------	----------	----------	----------	----------	----------	--------------------------	------------

14. The information was effective in helping me complete the tasks and scenarios.



strongly agree 1 2 3 4 5 6 7 strongly disagree N/A

15. The organization of information on the GUARDIAN system screens was clear.

strongly agree 1 2 3 4 5 6 7 strongly disagree N/A

Note: *The interface includes those items that you use to interact with the GUARDIAN system. For example, the language, buttons, text-boxes, etc.*

16. The interface of the GUARDIAN system was pleasant.

strongly agree 1 2 3 4 5 6 7 strongly disagree N/A

17. I liked using the interface of the GUARDIAN system.

strongly agree 1 2 3 4 5 6 7 strongly disagree N/A

18. This GUARDIAN system has all the functions and capabilities I expect it to have.

strongly agree 1 2 3 4 5 6 7 strongly disagree N/A

19. Overall, I am satisfied with the GUARDIAN system.

strongly agree 1 2 3 4 5 6 7 strongly disagree N/A



20. List the most **negative** aspect(s) of the GUARDIAN system and/or interface:

1.
2.
3.

21. List the most **positive** aspect(s) of the GUARDIAN system and/or interface:

1.
2.
3.

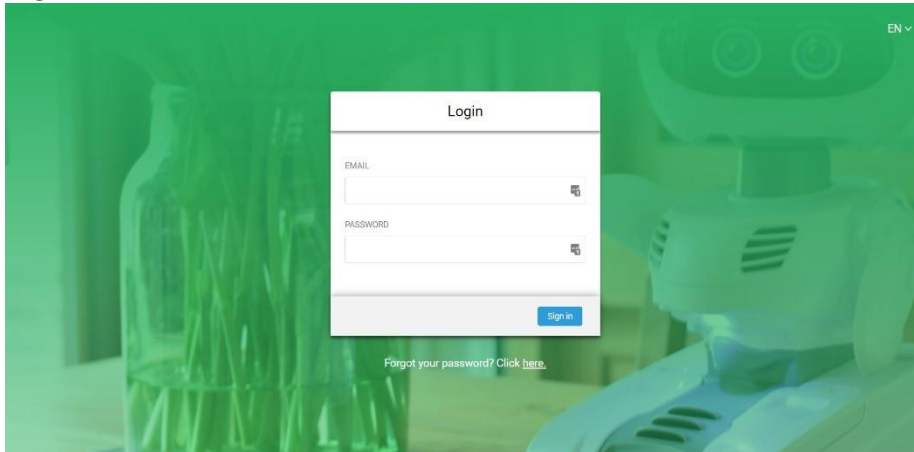


Appendix D – Services and related interfaces

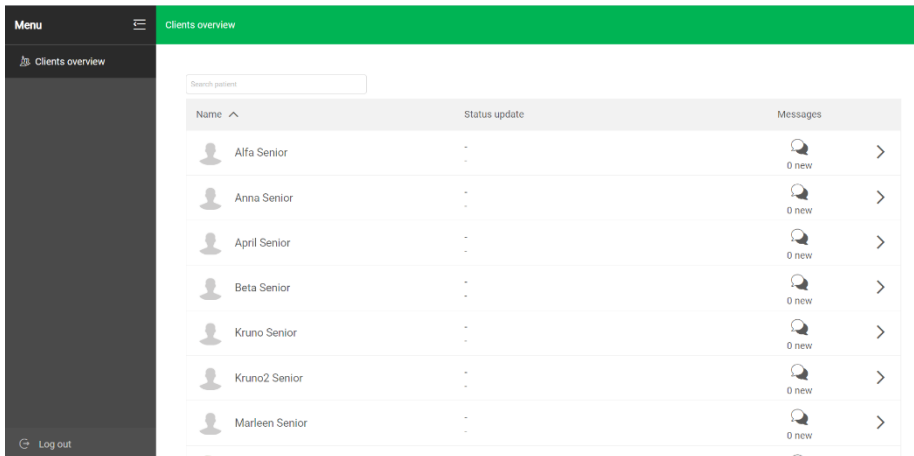
As the heuristic evaluations were carried out on the first prototype and are in the early stages of the project, only two services will be analyzed. Below screenshots of the design are available which might slightly differ from the implementation at the moment when the evaluation is conducted.

The caregiver application

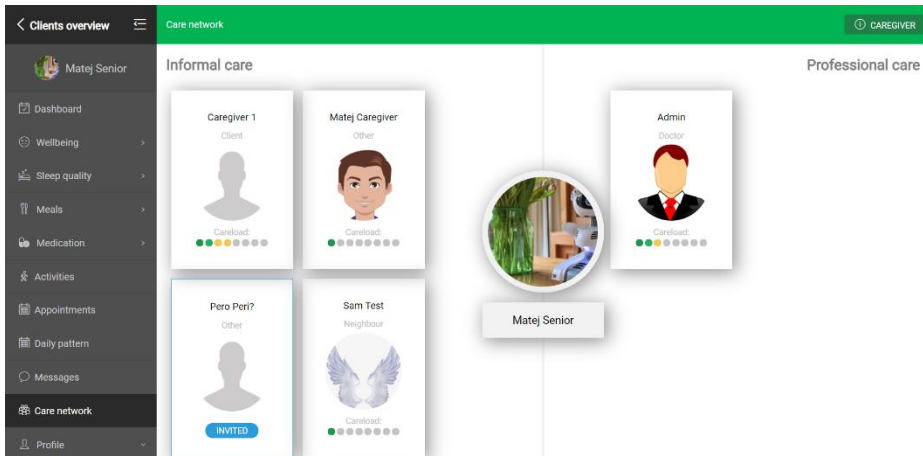
Login



Clients overview



Care network





Messages

The screenshot displays the 'Messages' section of the Guardian application. On the left, a sidebar menu lists various features: Dashboard, Wellbeing, Sleep quality, Meals, Medication, Activities, Appointments, Daily pattern, Messages (highlighted), Care network, and Profile. The main content area shows a message thread for 'Matej Senior'. The messages are as follows:

- 24.02.2021**: A message from 'Matej Caregiver' with the text '00000'.
- 24.02.2021, 14:46**: A message from 'Matej Caregiver' with the text 'Hi'.
- 01.03.2021**: A message from 'Admin' with the text 'Hello :)'. The timestamp '01.03.2021, 15:39' is also visible.
- 15.03.2021**: A message from 'Caregiver 1' with the text 'gfdsgdf'.
- 21.03.2021**: A message from 'Admin' (no text visible).

At the bottom of the message thread, there is a text input field labeled 'Type a message...' and a 'Send' button.

Notification e-mail one notification



Dear <name caregiver>
<name senior> has not taken the medication [name medication] for [x] times in a row

Best regards,
The GUARDIAN team.



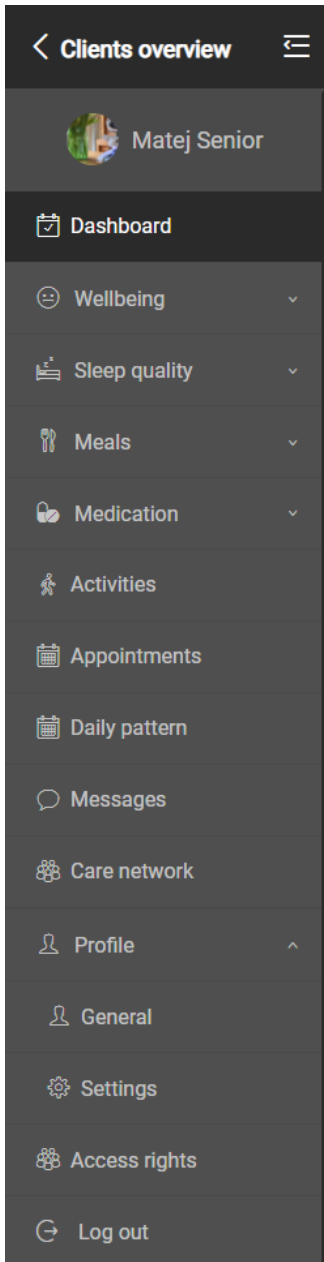
Notification multiple notifications



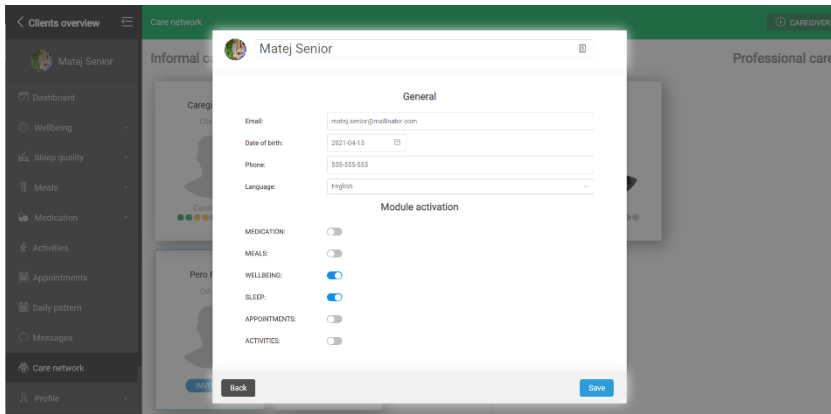
Dear <name caregiver>
<name senior> has:
- not taken the medication [name medication] for [x] times in a row
- reported [x] [wellbeing] reports with [very bad] in a row.
- reported [x] [sleep quality] reports with [fairly bad] in a row.

Best regards,
The GUARDIAN team.

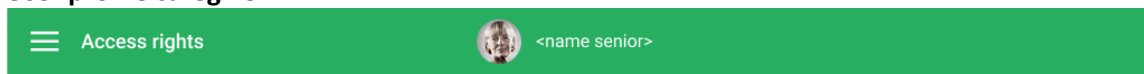
Menu structure



User profile senior



User profile caregiver



Define which caregiver can access the different functionalities for <name senior>.

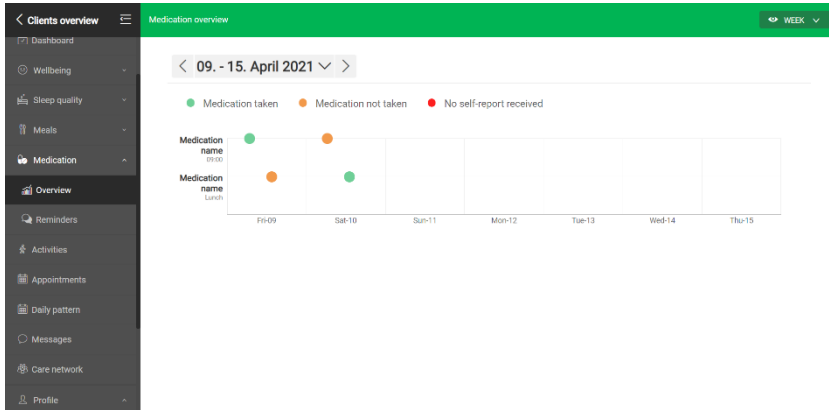
Caregivers	Modules	Overview	Setup	Notifications
<Name caregiver X>	Medication	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Meals	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Wellbeing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Sleep quality			
	Appointments	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Activities			
<Name caregiver Y>	Medication	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Meals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Wellbeing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Sleep quality		<input checked="" type="checkbox"/>	
	Appointments	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Activities			
<Name caregiver n>	Medication	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Meals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Wellbeing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Sleep quality		<input checked="" type="checkbox"/>	
	Appointments	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Activities			

Pagina-einde

Appointments overview



Medication overview



Add meal

Overview meal reminders for Matej Senior. ADD REMINDER

Add meal reminder

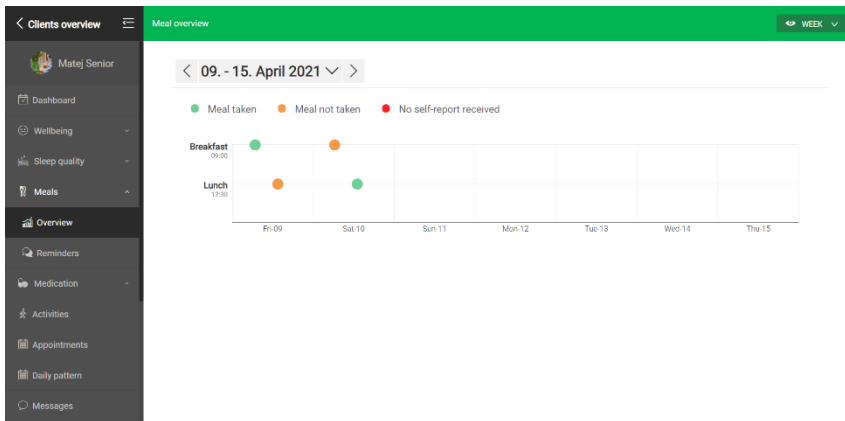
Meal: Breakfast

Send a reminder:

Send a self-report request:

CANCEL SAVE

Meal overview



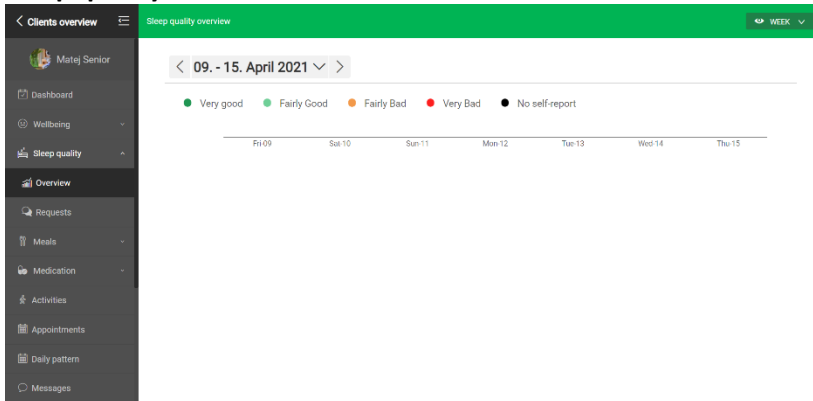


Add sleep quality request

The screenshot shows a dialog box titled "Add request to report sleep quality" overlaid on a blurred background of the application interface. The dialog box contains the following fields and options:

- Select the sleep moment:** A dropdown menu with "SLEEP" selected.
- Asking days:** A row of seven colored circles representing days of the week, with "MO" (Monday) selected.
- Recurrence:** A dropdown menu with "Weekly" selected.
- Start date:** A date picker showing "2021-04-15".
- End date:** A date picker with "Select" text.
- Ask follow up question when Senior's report is negative:** A toggle switch that is currently turned off.
- Send me notifications for Senior's sleep quality:** A toggle switch that is currently turned off.
- Buttons:** "CANCEL" and "SAVE" buttons at the bottom right.

Sleep quality overview



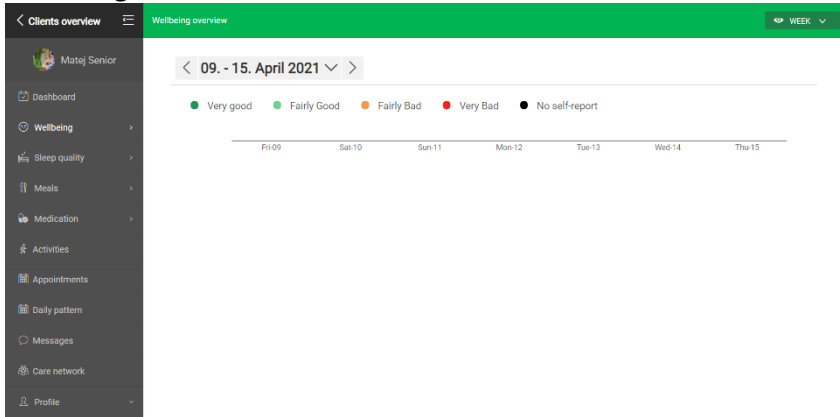
Add wellbeing request

The screenshot shows a dialog box titled "Add request to report wellbeing" overlaid on a blurred background of the application interface. The dialog box contains the following fields and options:

- Select the request moment:** A dropdown menu with "SLEEP" selected, and sub-options "Before" and "Rest" visible.
- Asking days:** A row of seven colored circles representing days of the week, with "MO" (Monday) selected.
- Recurrence:** A dropdown menu with "Weekly" selected.
- Start date:** A date picker showing "2021-04-15".
- End date:** A date picker with "Select" text.
- Ask follow up question when Senior's report is negative:** A toggle switch that is currently turned off.
- Send me notifications for Senior's wellbeing:** A toggle switch that is currently turned off.
- Buttons:** "CANCEL" and "SAVE" buttons at the bottom right.



Wellbeing overview



The senior's tablet application

Medication reminder and report

BACK 18:30

Hello <name senior>, during <name meal> it is time for your medication.

<name medication>

<name medication>

I'VE NOT TAKEN MY MEDICATION I'VE TAKEN MY MEDICATION



Medication reminder

< BACK 18:30

Hello <name senior>, during <name meal> it is time for your medication.

<name medication>

<name medication>

REMIND ME LATER

Medication self-report

< BACK 18:30

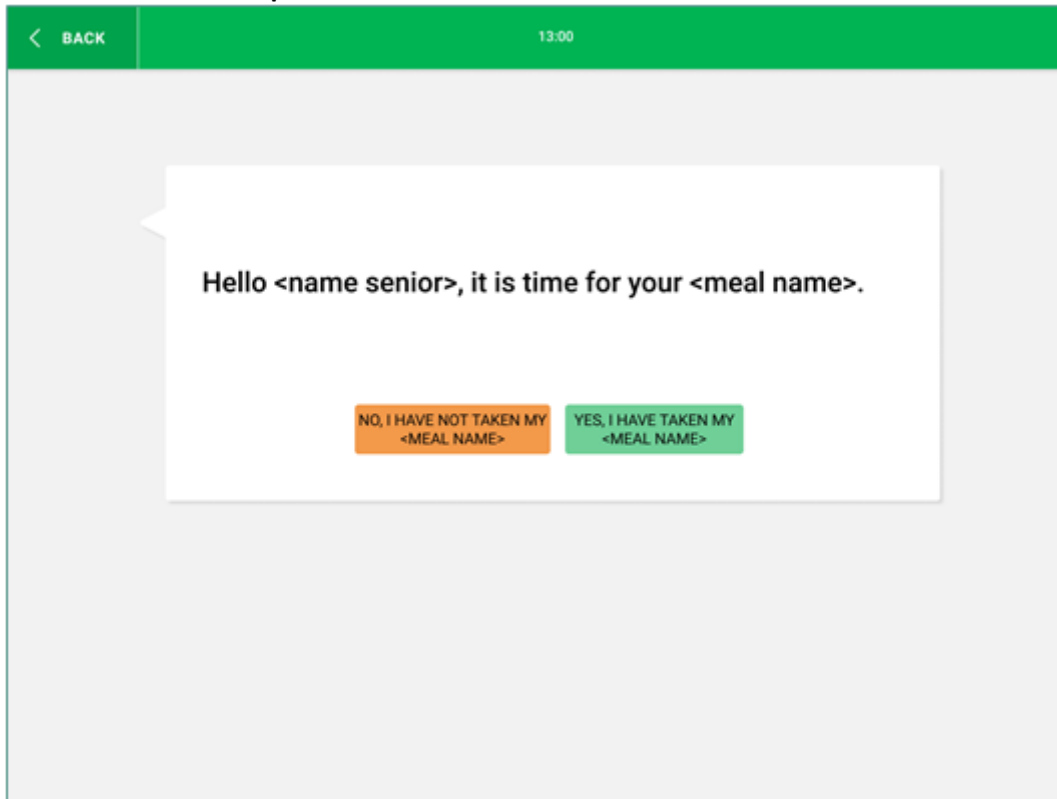
Medication

The following medication should have been taken. Could you indicate which medication you have taken?

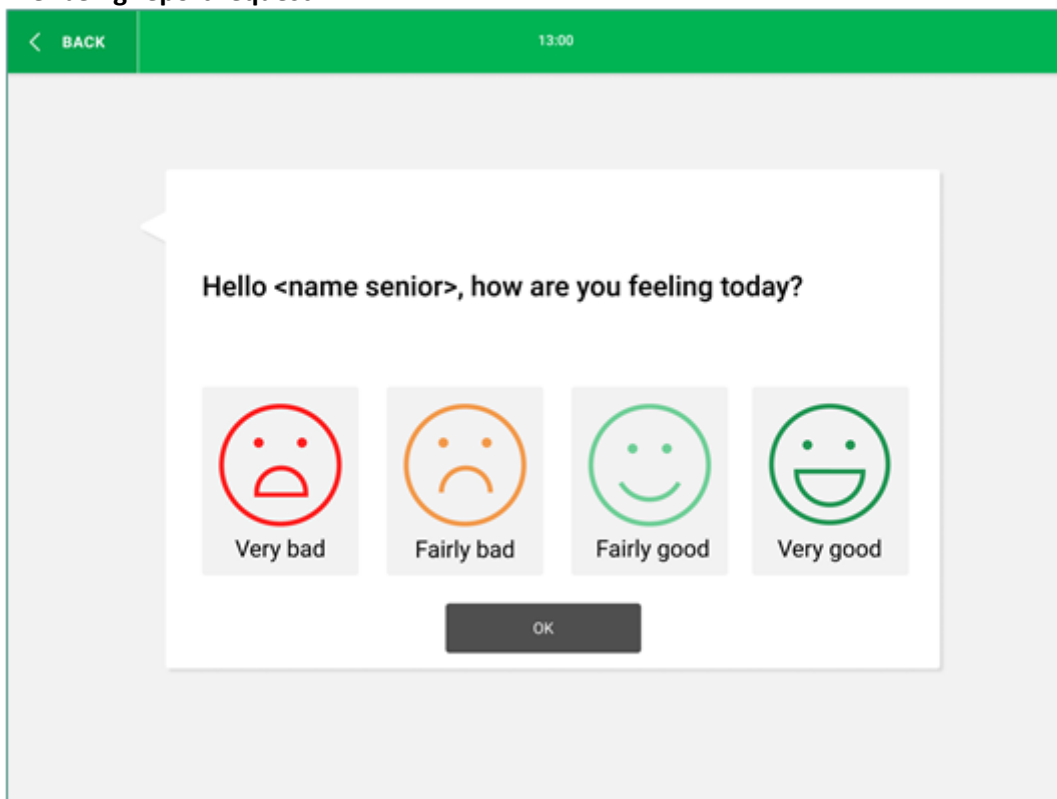
<name medication>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<name medication>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<name medication>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<name medication>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

SAVE MEDICATION INTAKE

Meal reminder and report



Wellbeing report request





Wellbeing follow-up question

< BACK 13:00

What is or are the reason(s) you are not feeling well?

Pain Headache Nauseous Loneliness

Worry Boredom Tension Other

THIS IS WHY I AM NOT FEELING WELL

Sleep quality report request

< BACK 13:00

Hello <name senior>, could you tell me how you have slept?

Very bad Fairly bad Fairly good Very good

OK



Sleep quality follow up question

< BACK 13:00

What is or are the reason(s) you have not slept well?

Couldn't sleep within 30 min.	Couldn't sleep through the night	Had to use the bathroom
Couldn't breath comfortably	Had to cough or snore loudly	Felt too cold
Felt too hot	Was in pain	Other

THIS IS WHY I DID NOT SLEEP WELL

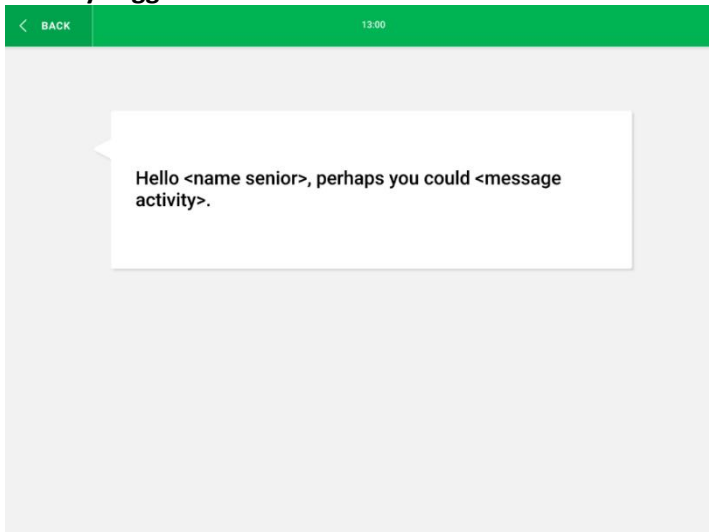
Appointment message

< BACK 13:00

Hello <name senior>, <reminder message>.



Activity suggestion



Home

