Prior evidence shows that senior people accept technology and enjoy self-monitoring. Home telehealth support increases their confidence and sense of security. The use of communication technologies plays an important role avoiding isolation and loneliness. This paper presents a qualitative study of 7 seniors, 4 nurses, 2 physicians and the program manager of a nation-wide senior telehealth program. The program targets the follow-up of senior people aged over 70 years old with about 24.000 participants. In order to minimize social isolation and promote healthy behaviours, nurses contact seniors through periodical phone-calls, applying a comprehensive geriatric assessment to evaluate their physical, mental and social wellbeing. Our findings show and compare the perspectives from the several program stakeholders, evaluating their interest in the adoption of a complementary web channel with an integrated personal health record. We present user experience concerns and directions that derive from the interviews’ outcomes of our study to design senior telehealth multi-channel platforms.

1. INTRODUCTION

Europe is facing an important demographic shift due to the dramatic growth of the population over 65 years old. Importantly, the number of elderly is expected to increase further in the next decades. Undoubtedly this asks for the development of customized health care programs for older people. In addition, by 2020 there will be a considerable decline in the number of the nursing staff and in the specialized geriatric workforce (Pinto, 2014; Ziefle, 2013), thus demanding for new measures to ensure that this fast growing group receives proper care (United Nations, 2011). In fact, the European Innovation Partnership on active and healthy aging aims to promote active and healthy aging. One way to achieve this goal is by developing tailored technologies for seniors. These technologies have proven to positively impact on quality of life, by reducing costs, readmissions and the length of hospital inpatient episodes (Khosravi and Ghapanchi, 2016). Interestingly, older adults are favourable to the collection of health monitoring data and recognize the utility of telehealth systems (Demiris et al., 2012). Moreover, the elderly accept well technology and enjoy self-monitoring, and home telehealth increases their confidence and sense of security (Botsis and Hartvigsen, 2008; Ludwig et al., 2012; Price, et al., 2013). However, it is necessary to study the socio-economic disparities among the elderly (Pinto, 2014), because this will affect their ability to use a system or device. Furthermore, despite the benefits that home telecare can bring, there are organizational, ethical, legal and usability matters that need to be addressed (Botsis and Hartvigsen, 2008). Alongside, the framework, guidelines and standards for the design of telehealth monitoring applications should also be regarded under special consideration (Ludwig et al., 2012). The availability of personal data obtained within telehealth systems also supports the concept of a personal health
record (PHR) (Demiris et al., 2012), yet these have still made limited use of patients’ access to medical records and the integration with community services. The combination of several telehealth services might be advisable in order to support elderly people in a holistic way (Ludwig et al., 2012). The fact that personal health information is often incomplete, fragmented and scattered creates a need to develop a new typology of patient-controlled system, designated by “Integrated PHR”. The purpose of such systems is to gather information from multiple health-related sources combined with the patients’ self-collected data.

This paper presents a case study of the Portuguese senior nation-wide telehealth program, launched in April 2014. The program follows-up a total of 24,000 individuals over 70 years old. The overall health status and dimensions (environmental and individual) related to the well-being state is accessed. This telehealth program comprises regular follow-ups (shifting from weekly to monthly) conducted by phone. The program aims at identifying and preventing frailty, risk behaviours, minimizing social isolation, promoting healthy behaviours and contributing to a feeling of self-control and confidence among the elderly. The program is based on a biopsychosocial approach developed to include an innovative and comprehensive geriatric assessment of physical, mental and social wellbeing and their complex interactions (Rodrigues, 2014). Assessment algorithms for each macrodimension are stratified in microdimensions (e.g., the health macro dimension is subdivided in health status, presence of chronic diseases, medication, nutritional status, smoking, alcohol and other addictive drug habits) giving rise to an individual care plan (ICP), automatically displayed as a diagram that identifies frailties and even selects an appropriate set of recommendations, when necessary. Exclusion criteria for the program are: (1) hearing loss, (2) language constraints and (3) inability to answer phone-calls due to severe disability. As aging is associated with the prevalence of such conditions (Arch, 2010), it can raise barriers for seniors to enrol in the program. As such, the goal of our research is to extend accessibility to those currently excluded and to foster the awareness and engagement of the overall senior population to the program, through a complementary online channel that consists on an integrated PHR. The system aims to: (1) enable seniors to access their ICPs and recommendations; (2) provide health educational material; (3) enable self-tracking tools such as symptom or mood diaries that may help to monitor daily health adverse events (between the follow-up calls); (4) enable reminders and motivational messages for practicing the recommendations; and (5) explore cognition features that are not possible by phone.

The detailed qualitative study conducted included representatives from the stakeholders in the nationwide senior telehealth program: seniors (followed participants), nurses (phone-call communicators), physicians (conceptual team) and the program manager. We report their current experience with the program, their interest in adopting a web channel and how both channels (phone and web) could be integrated into a more effective service experience. Other concerns are also addressed, such as how access to the ICPs should be displayed to seniors and how PHR data can complement the nurses’ patient decision support.

The present study represents a relevant scientific contribute by providing valuable information regarding a senior telehealth program, which may lead to better programs and can inspire the design of integrated PHRs for senior telehealth multi-channel platforms.

2. RELATED WORK

Social isolation is exacerbated by ageing, as growing old makes people more vulnerable (Pedell et al., 2010). Interestingly, just as social isolation is growing, so too is the use of the Internet by elders (Chisnell, 2006). Older adults are a fast growing group of Internet users that use communication features (e.g., Skype), also demonstrating other online interests (Arch, 2010; Hodges and Lindberg 2002). Prior evidence shows that senior people accept technology and self-monitoring, as assessments performed through home telehealth increased their confidence and sense of security (Botsis and Hartvigsen, 2008; Ludwig et al., 2012; Price, et al., 2013). Telehealth communication has the ability of connecting seniors from a wide range of socio-economic statuses (Pinto, 2014) with healthcare providers, with the possibility of also involving their families (Steele and Amanda, 2013).

As reported in a literature review study investigating the effectiveness of technologies applied to assist seniors (Khosravi and Ghapanchi, 2016), the major age care problems targeted by researchers in the senior assistive care are: dependent living, fall risk, chronic disease, dementia, social isolation, depression, poor well-being and poor medication management. Telemedicine is the only technology to assist seniors with chronic disease showing significant improvements in health condition; sensor technology improved fall risk and Information and Communication Technology was shown to have better results in reducing social isolation and enhancing wellness.

Studies address how older adults’ wellness can be assessed and visualized. Physiological and functional wellbeing can be captured using vital signs. Quality of life and instrumental activities of
daily life as markers of social wellbeing can be measured using social support networks and perception of isolation (Huh et al., 2007). However, despite seniors’ awareness of their emotional wellbeing is proven to be beneficial, measuring “emotional wellbeing” is often overlooked by technology design for older adults (Doyle et al., 2012). Integrated visualization tools are needed to allow holistic assessments of the individual’s health and wellbeing. As older people have complex healthcare problems, they need comprehensive interventions that take into account the biopsychosocial components of health. As such, comprehensive geriatric assessment is a clinical practice developed for this purpose that needs to be adopted. It consists of a process that determines the person’s medical, psychosocial, functional, and environmental resources and problems, creating an overall plan for support and follow-up (Stuck and Iliffe, 2011). Related work shows the challenging task of instrumenting these holistic assessments, through integrated visualization tools that deal with the complexity of healthcare data and which can be incorporated through visual displays, into personal health records (PHR) (Le et al., 2012). At the present, healthcare information is increasingly having a bidirectional flow between PHRs and electronic healthcare records (EHRs), through integrated PHRs (Detmer, 2008), ensuring portability of medical records and incorporation of patient self-reported data (Tang et al., 2006). Noteworthy, the integrated PHR model is still a theoretical framework for patient-centred care, which should be further explored (Detmer, 2008; Rodolfo, 2014; Sunyaev et al., 2010), including how it should be applied in telehealth care.

3. THE STUDY

This is a nation-wide qualitative study. It includes a sample of the several stakeholders from the Portuguese senior nation-wide telehealth program: 7 seniors, 4 nurses, 2 physicians and the program manager. In Portugal, only 9.5% of individuals above 65 years old have completed secondary education. Since low levels of education are quite often associated with low computer and Internet literacy, we did not use a representative sample for the seniors. Thus, we recruit a sample of well-educated seniors, as representative of the potential users of the integrated PHR.

Recruitment was led by the nurses during the routine phone-calls conducting the following pre-defined inclusion criteria: educated people with at least a high school degree, computer and Internet regular users. All participants were voluntary and agreed to participate in the study. During the interviews the majority of the seniors answered all the questions openly and went beyond the provided questions by sharing related life episodes and experiences. Interviews lasted approximately 40 minutes.

From the 7 selected participants, 4 were female and 3 were male with a range of ages from 72 to 89 (mean age=77.7); 3 had secondary school and 4 had a graduate degree; 3 were married, 3 were widows and 1 was single. All of them lived in urban areas, either cities or towns, 3 lived alone, 4 lived with their partners and 3 did not have any children. Their occupations before retirement were varied, ranging from physician, social security employee or army officer. Despite being retired, most of them were still active in their daily life activities. They expressed their interest in looking for information regarding health, taking in university courses and in political activism.

We conducted semi-structured interviews using Skype, except for two face-to-face interviews. All interviews were audio recorded and transcribed. We applied an inductive approach for qualitative data analysis (Thomas, 2003). We provide interview insights based on the evident raw data gathered from participants that report the current program experience and evaluate the interest of adopting a web channel with an integrated PHR, exploring which information is meaningful to seniors and how it should be displayed to them.

The interviews with the other groups (nurses, physicians and the program manager) were ran individually, at the agency office, lasting about one hour each. All nurses interviewed showed enthusiasm to collaborate with the goal of this research. We wanted to understand the difference between the nurses’ perspectives who have been in the program for a long time, are more knowledgeable and have stronger relationships with the seniors, compared to nurses who had recently joined the team, who are expected to be more concerned with understanding the senior’s needs. We thus selected nurses who have been working in the program for different durations.

Physicians’ interviews were focused on analysing how the geriatric assessment tool previously developed to the phone call channel for a telehealth environment, could be applied in the integrated PHR, for seniors. The interviews were conducted following a “brainstorming” approach, questioning the current operation of the program. We challenged participants to think about the integration of the phone channel with the potential online-channel, also analysing which PHR tools could provide better data to the service providers.

The program manager interview was mainly focused in the specialized phone-line initiative, strategic goals and integration with other services of the Portuguese National Healthcare System (NHS). Moreover, we also asked the participant to
think about the outcomes that could result from the online channel that was nearly aligned with the future strategy of the programs’ roadmap.

4. FINDINGS

We present our interviews’ findings grouped by several categories built upon a detailed analysis that aimed to: understand how the program was defined and what has been its performance and telehealth experience until the time this study was initiated; evaluate the adoption of an online channel, gathering ideas for creating the integrated PHR; analyse how both channels (phone and web) could be integrated into a multi-channel telehealth platform; how the care plans assessment data should be displayed to the seniors; and finally how the PHR tools could complement the patient decision support, engaging seniors in a more complete user experience. The results are grouped according to the relevancy of the roles of the participant groups, for each category.

4.1 Creating a specialized nation-wide telehealth phone-line for senior citizens

Program manager
According to the manager, the program was created initially as an inbound line. That means that if someone called with a symptomatic situation, depending on its severity level, it could be forwarded either to a hospital or to a primary care centre. However, the program manager explained the need for creating a new line for senior people:

In the screening process we found out that there was a group of major importance that represents 1/3rd of the population who regularly called us and who did not require any of our services. Instead, they asked for clarification about self-care procedures, so they could deal with their symptoms at home. As such, we thought it was worth it to have a more preventive attitude for the population risk groups and for that reason we created the Health 24 Senior, the first specialized line of our program.

This new phone line, is an outbound line (the phone calls are made by the program’s personnel) and has established protocols with other services of the NHS such as the community units’ care centres spread across the country that can support seniors in vulnerable situations. Currently, the program is following-up a cohort of 24,000 seniors and has been performing an average of 1500 calls per day and receiving an average of 150 daily registrations.

Nurses
Initially, nurses invited people through phone-calls that were already part of the initial database. Afterwards, they evaluated if the individual’s condition could fit in the program: they need to have some autonomy, being able to manage their basic daily activities, use the phone, not being bedridden and have some level of mobility (people in wheel chairs are also excluded). After an assessment of the cognitive status, they also check eating habits, physical activities, and health history. If the individual fulfils the requirements, he/she is followed within a periodicity time of 15 days.

4.2 Identifying senior user groups

Nurses
Participants mentioned the contrasting senior profiles they attended, which can vary either between people with low literacy (group A) or high literacy (group B) levels. In what concerns group B, CN2 states that they are usually married, living with their partner and have children. Many of them (both women and men) use computers and social networks like Facebook, which they like to mention. CN4 estimated that this group is about 25% of the total amount of the program attendees. The majority stated that group A does not have any family support, lives with financial needs and in complete isolation. CN1 commented:

There are people that because of their isolation or mobility constraints do not leave their homes and are in a very depressive mood. CN2 also commented: We get many people living in rural areas between 75 and 80 years of age. Some of them are halting about the program and say: “Are you reminding me that I am old every two weeks?” CN1 continued: by the end they value a lot our contact, in many cases those 10 to 15 minutes are the only contact they have in a space of 15 days. To them, it makes all the difference.

On another hand, CN1 also describes a significant group of active older adults (including people between 90 and 100 years old) who work, go to the gym, travel and have an independent life:

In this group we apply a more preventive approach, promoting healthy habits. Our goal here is to act in advance and detect critical events that they usually do not give attention to, e.g., chest pain. We have forwarded some of these to emergency dispatch. On a subsequent contact they thank us because they were underestimating their symptoms and verbalize that we have saved their lives.

4.3 Potential users of the online channel

In order to gather senior mental models to explore the creation of a web channel, we choose to work with group B (seniors with high literacy levels) who are familiar with technology and are willing to contribute to the goal of this study by sharing their findings regarding the interaction with the program.
Seniors
All participants mentioned they used the computer every day. Men used the computer to work, check the news, access bank accounts, check email or Facebook, but not as often as women. S6 mentioned: “I use Facebook but I’m not a slave of it”. Women acknowledged they were very interested in using Facebook and Skype to talk with their children on a daily basis. Interestingly, only women also reported they like to play games in the computer. S5: “I play a lot of card games, especially when I am more anxious or depressed, it helps me to relax.” One of the other women, showed a high level of computer use expertise: “I use the computer to research several topics and curiosities like to know about treatments and healthy habits. I check train schedules and book flights and hotels in the Internet.” Consensually, all participants searched the Internet for healthcare topics.

4.4 What has been the phone-line experience

Nurses
Depending on the communicator nurse (CN), phone-calls with initial evaluations have an average of 5 min but they can last until 15 min. If it is a follow-up phone-call, durations can be completely different because some people have the need to talk for longer periods. All participants shared their difficulties about the interaction with the seniors during the phone-calls. CN1 focused her concern on hearing loss problems that many seniors face, which can be a hurdle during the phone-call assessments. She mentioned in this situation, the need for talking loud and slowly (the call can last 20m instead of 5).

In what concerns how the seniors perceive the program, all CNs reported that they have very positive feedback. On a scale of (1-5) where 1 is less motivated and 5 most motivated, 2 of the CN gave 4 and the other 2 gave 5. CN1 commented “We have a very positive feedback, mostly from the ones who are isolated. They recommend us to their friends”. CN2 asserted that women like it more than men, who usually tend to say they do not need any help.

According to the participants, program dropouts are residual. The main reasons are natural causes (deceased), the fact that the younger participants do not see the need to continue and others think the program is not adapted to them. Most of the seniors follow the programs’ recommendations, report improvements (mobility, life habits changes) and negotiate with CNs new goals. However, many say they forget recommendations. Furthermore, as the CNs follow-up is performed randomly, they do not have a way of validating if the recommendations are being followed. Finally, the most reported needs of the seniors to the CNs include the need for contact (CN1 suggested more periodical calls to the ones who are lonelier); speak with the same communicator (when they recognize their voices they express happiness); having more adapted questions according to their context.

Seniors
All the participants joined the program by a contact call from a CN. They have been followed in average for 4 months. Several mentioned they need to reschedule the contact very often because they are usually busy with their daily affairs. All seniors valued the importance of the program and its impact in the senior community. They mostly highlight the psychological support that the program offers, which they refer to be of major importance to isolated people. S4 commented:

The impact is mainly psychological. We have a feeling of support that when we need, we have someone to rely on.

When questioned about what would be their preferential contact means, most of them preferred face-to-face contact and three suggested videoconference like Skype. Most of them agree that the recommendations given by the CNs have been useful. When asked about if either they memorized or registered the recommendations, 6 answered they memorized and only one said he used the computer. On a scale of (1-5) to measure what has been their experience in the program, where 1 is less positive and 5 very positive, 71.4% scored 5.

Program manager
When asked about what can be improved in the program’s current performance, the manager expressed concerns about integrated care, intercommunication of services and healthcare information handoffs between the program and primary health care centres:

We have people that at the 7th call, start asking: This is it? And if an appointment needs to be scheduled, you don’t schedule? And if someone is needed to come to our home, it will not come?

4.5 Moving towards personalized care

Nurses
When asked about the experience of applying the health assessment tool over the phone, all participants reported the need to adapt the language according to the senor’s social-economic and educational status. They all try to simplify the questions and make a conversation instead of a survey. CN1 said: “We keep restructuring our language and questions according to the feedback we get from the person while we complete the survey”. CN4 expressed concerns about the tool, stating that it is very standardized. According to the
participant, the tool does not apply equally well to people from group B:

We should not try to standardize and instead get to know the person. I try to adapt the questions to their context. One lady with 81 years old took me wrong when I questioned her if she could count soup letters. She was actually very independent, helped the others and even had a tablet and used the Internet. There should be more flexibility in the questions and in other ways of evaluating cognition.

CN2 and CN4 showed agreement with the concern of calling randomly to seniors without previously knowing their profile and history. CN4 explains:

We need more information about the person like its literacy level and the way they like to be treated.

Both suggest that it should be always the same communicator calling the senior, having the concept of “family nurse”.

Seniors
Although the majority of the seniors find the phone conversations with the CNs pleasant, pointing out their sympathy, many of them asserted that the questions are very standardized, not matching their problems:

S3: The people who contact us only follow the guidelines. Some recommendations don't make much sense and are theoretical. For example, there are many people who do not have any friends or just can't go to a cinema or theatre. There is a gap between the question and the real knowledge of the person who is calling.

S7: People who contacted me do not seem to know my profile and situation as they ask the same questions several times. It doesn't make much sense as we could get into other issues and we lose time with the repetition.

S3 also suggested that the program should differentiate seniors into different groups according to their literacy level to adapt the questions to the person’s profile. The majority of the participants prefer to be contacted by the same CN. As they describe, the same person can have more knowledge about their profile and evolution, also helping to create empathy.

4.6 Enabling provider's data access to seniors

Nurses
All participants showed agreement about the possible benefits that a complementary web channel could bring. CN4 and CN2 suggested system functionalities that could bring useful data to CNs, also engaging seniors in managing their health:

CN4: It would be beneficial for the seniors to access their results and recommendations; monitor health habits and weight, e.g., for the diabetics; have system reminders; have a chat when in doubt and provide health education with reliable material.

CN2: On a next call assessment we could try to understand through the system if the senior has applied the recommendations. Our starting point would be different. We could also understand if the evaluations and recommendations are being meaningful to them.

Seniors
Every senior wishes to have access to the results and recommendations online in a secure way. One of the participants commented:

When visualizing the information that the person collected, I can interact, acquire knowledge and eventually correct the notes that the nurse wrote about our conversation. Another participant alerted: It is of great utility. Listening the recommendations does not mean I will memorize or practice it.

4.7 Enabling self-assessments to the seniors

Nurses
When asked about if it could be relevant for the senior’s to be able to perform self-assessments, the majority of CNs did not find it very useful, only if they could further validate it on a subsequent call. Despite that, some of the seniors may prefer the online channel to answer the assessment in a more private way. The majority of CNs argues that, currently, seniors seem happy with the phone calls, which is already a way of not feeling so exposed to sensitive questions.

Physicians
When asked if the online channel could be a more reserved way for seniors to answer the assessment questions, P1 agrees with the majority of CNs, explaining that one of the reasons for the phone call channel to exist is to maintain an active conversation with the seniors. The voice is important to understand if the person is well and to comfort seniors, knowing that there is a person on the other side that is willing to help. However, the web channel can complement and improve the calls if we can find ways of engaging seniors into the platform: “For example, we can motivate the senior to value what the CNs recommends during calls or enable cognitive activity tools that can improve memory through games”. On the other side, P2 said the web can be a better way to answer some more private questions.

Seniors
When questioned about if they were able to make self-reporting of their evaluations through the Internet all participants answered yes. When
questioned about if self-reporting could be a more comfortable way to answer the evaluation, all participants but one answered yes. The most mentioned reason was flexibility. As S2 mentioned:

I do not feel comfortable using the phone because I do not know who the other person is. I would prefer the Internet also because in this way I could have more time to think about the answers.

Despite answering that he would not mind to perform the assessment online, S7 preferred face-to-face meetings. The other two participants both highlighted that the online self-reporting could definitely be a good idea to convince their wives to join the program.

4.8 The role of family participation: concerns on perception

Nurses
Several participants mentioned that an online channel could be valuable for family members. However, reporting health data in the system, on behalf of the senior might not be a good idea as CN1 explains:

Sometimes the answers of the seniors are different from their relatives. Their perception is different from one another. The senior may emphasize the symptoms, while their relatives tell a different story.

Physicians
Both physicians agree that it is preferable to be the seniors themselves to perform the proposed online self-assessments. P1 expressed concerns about the quality of the reported data, stating that the seniors should be the only ones to provide it:

If it is the person himself, the evaluation is more focused on their needs and in what the person wishes to communicate... with another person we can lose the specificity of information.

P2 says that if the individual is not able to perform it, a family member could answer on their behalf even if the reported data may suffer from bias. According to the physician, seniors can also benefit from this tool without using it themselves. However, P2 mentions the same as CN1: “Because of their lack of autonomy, they may not have the correct perception of their status.”

Seniors
We also asked seniors if they would like their family to have access to their evaluation results. Only three of them would like to share their results with their family, like S7 who explains:

Speaking on behalf of the senior community, it would be convenient having someone that could follow and be aware of the person evolution. It is of total convenience that family members have knowledge.

On the other side, S2 expressed her feeling like:

I don’t think it is of much value. Sometimes I wonder if my family is like Google, they only ‘search me’ when they need.

4.9 The web as a continuous follow-up channel

Nurses
We evaluated with participants, ways of engaging seniors with the new channel. CN2 suggested: “We can try to understand who uses the computer during our phone-calls, if they have access to the Internet or if their children would use it for them. Currently, many of them are receptive to new technologies like tablets.” CN4 suggested the idea of presenting the opportunity to seniors of giving online feedback after the phone conversations. A very important reason for adoption would be for people who have severe hear loss problems.

Physicians
According to the participants, the online channel has the ability to enrich patient knowledge, through the collection of health data by the seniors between the phone-calls. This data should be related to the treatment and be self-collected by the senior as a way to improve the quality of the phone calls follow-up. P1 suggested:

The online channel can complement the phone channel as a tool that monitors events of the senior’s daily living that usually people don’t recall during the calls, mainly at the emotional level.

As a suggestion for the channel engagement, P1 mentions that it is necessary to give time for seniors to interact with the new channel so the program can understand their behaviour and create motivational reminders and messages according to their profile and interaction patterns.

In a similar way as CN4 previously mentioned, the online channel could be a way to include people with hearing loss. P2 reinforces this issue by thinking on the potential of involving this target group through the web:

In this case we would act with a different kind of follow-up care: firstly, the channel could screen the person’s profile, providing personalized online material like advisements according to the individual needs, having the potential of forwarding them to other services of the NHS. This way we could start including this target senior group in our program.

P2 presents two ways of promoting channel awareness among the seniors: (1) From the phone to the web: after the first contact, CNs can mention
seniors that educational material can be provided to them online; (2) from the web to the phone: promote the program so people can get to know the service and join the phone calls follow-up.

**Seniors**

All participants showed interest on interacting with a web channel in a complementary way to the program. One of them highlighted:

> One thing does not replace the other. Both can complement each other, the web can offer a continuous follow-up, for example, receiving material in our online personal area, when the CNs are not able to call us on a certain day.

**Program Manager**

For the manager, the possibility of creating a platform where senior people can reflect and know more about their healthcare status is a channel for promoting awareness to the program. The most highlighted benefit is the possibility of seniors sharing their data with healthcare professionals. The participant showed interest on connecting wearable and sensor devices with the web channel:

> Our program wishes to evolve to healthcare monitoring procedures in life risk situations of the seniors e.g., monitor a chronic disease like diabetes, fall events or high blood pressure, so we can act immediately.

### 4.10 How can both channels (phone and web) be integrated

**Physicians**

Both physicians explained that a validation of the service would be required after the senior performed self-evaluation. P1 suggests how both channels could be integrated: "This open access of the initial assessment could attract people to the program by giving the opportunity for seniors to answer the question, how is my condition?" According to their self-assessment results, they could register online, by sending a message that would trigger an alert into our service to contact them. A further validation by the CNs would be required on an initial conversation to include the person in the program.

After the initial assessment validation, the subsequent follow-up calls that are usually scheduled with the seniors according to their preferences, could then be enabled in the senior’s online personal area, sending alerts to them by the time of the phone meeting, as suggested by P2. Both of the participants asserted that only the initial evaluation should be enabled in the online channel. The subsequent follow up evaluations (different questionnaires that depend on specific health domains, according to the initial evaluation results) should be limited to the phone calls. Furthermore, they suggest that people could be notified by the time for reevaluation.

**Program manager**

According to the manager, a bridge can be created between channels. The ideal integration between the two channels would be the ability to search for a certain topic and advise the person to clarify its needs, together with a healthcare professional.

### 4.11 Displaying individual care plan’s results to the seniors in the PHR

Currently, the program sends the individual care plan (ICP) results by mail or through the senior’s general practitioner.

**Physicians**

Both physicians see benefits of displaying the ICP results to the seniors. P1 describes that, from a qualitative perspective, the senior should be able to perceive to which health domains they are more vulnerable and could be improved. Associated to that qualification, a simple diagnosis should be provided. The recommendations should be associated with an option for seniors to report if they can put them in practice. For P2, accessing the data about their records and seeing that their answers had a visual feedback can be very helpful:

> This way there is a quick feedback about their integrated healthcare evaluation. The seniors would understand what would be their strengths and weaknesses and the next scheduled phone calls for the follow-up.

**Nurses**

The majority of CNs expressed concerns about giving seniors access to the ICPs. CN2 alerts: "We should be careful. The data results should be presented with care and adapted to the seniors.”

CN3 commented that it should be possible to select which visible data should be displayed in the ICP like the notes they write about the seniors, while CN4 suggests that the online view of the ICP by the senior could reinforce their positive side. Motivational messages should be given to the seniors according to their most positive evaluation results.

**Program manager**

The participant also alerts to sensitive information when it comes to present the results of the ICPs. If a given score in a health domain is very critical, a system message should alert a CN to call, instead of presenting it to the senior.

### 4.12 Identifying which PHR tools can better support seniors

By the end of the interviews, we focused on evaluating both seniors and providers (nurses and
physicians) perspectives of what the web channel, in the case an integrated PHR, should include. According to the existing features of integrated PHRs in literature review (Archer et al., 2011; Kaelber et al., 2008; Detmer et al., 2008; Johnston et al., 2007; Pagliari, Detmer and Singleton, 2007), we firstly studied the possibility of associating educational material, to the ICPs. Secondly, we analysed which health behaviour data collection tools could complement them, enabling more knowledge to all the different profiles. The set of feature options in both categories were defined according to: literature review (Rodolfo, 2014); the relevancy to this case study; and previous research findings that show the adoption of PHR tools by seniors (Demiris et al., 2012; Ludwig, 2012). All the results are presented below and the answers between the several groups can be compared in Figure 1 and Figure 2. When seniors were asked if they wished to have access to educational material, provided by the program, all answered yes, with their preferences as displayed in Figure 1. All seniors stated they already performed online searches on healthcare topics and valued the possibility of having access to trustworthy material. The most desired features for all the senior participants were (A), (B), (F) and (H). Four seniors highlighted (C) as one of the most wanted features, which is controversial with the nurses and one of the physicians who showed concerns on the senior’s access to clinical terms. Some participants also showed interest in the feature (E), as S6 mentioned: “My wife would like to participate in medical research because she had a cancer… she has already asked me how she could participate.” Moreover, S7 also mentioned that the proposed material content should be enabled according to the capabilities of each senior. The most wanted features both for nurses and physicians were (A) and (F). Participants from all the groups showed consensus in (A) and (F).

For the nurses, feature (A) could work as “a reinforcement” of the recommendations given to seniors, during the calls. In (B) both nurses and physicians reported that the access to credible information might be very useful to the seniors. CN2 commented, “They search a lot in the Internet but the information is not the most accurate and sometimes they get frightened.” P1 alerts: “We should enable content only created by the NHS or by a certified entity.” CN3 also valued feature (D), mainly for diabetic people.

In what concerns the preferential behaviour and health data collection tools that the integrated PHR could have, we did not get into great detail with the senior group. We mostly wanted to know about their interest in self-monitoring, so the healthcare providers of the program could have more information over time. They all showed interest, except for one.

Figure 1: Educational material to complement the individual care plans, by groups.

In Figure 2, we can compare the preferences of nurses and physicians regarding the self-tracking PHR tools. The most consensual was feature (E): all participants showed most interest in the symptom diary. CN3 explained, “It can help to identify a health problem prematurely through reported symptoms like chest pain, difficulty in breathing or fatigue.” CN4 also suggested the system to ask periodically “How do you feel today?” CN1 and CN2 also commented the importance of biometric measurements, features (A), (B), (C) and fall detection (D), mainly to people with chronic problems like hypertensive or diabetic people. Nurses find these tools very useful also as a way of forwarding to other NHS services in case of emergency.

Figure 2: Preferential behaviour data collection tools

Finally, we asked physicians and nurses to think if enabling online self-assessment could support other types of answer editing that could not be performed over the phone and could be an asset to the comprehensive assessment. All the participants from both groups saw the opportunity of having a more detailed evaluation through the web. The
most frequent suggestion was the ability to test the cognitive status of the individual, through visual exercises or cognitive scales that could test, for example, memory or hearing. P1 also explained:

We could include images and calculations. We had to use sub-optimal cognition scales because of the phone. Here it could be possible to use more robust scales.

5. DISCUSSION

The reported findings highlight aspects that need to be addressed in the design of future integrated PHR systems. The three main aspects related to the system's information are: usefulness, adequacy and collaboration.

Information provided by nurses to seniors is only useful if acted upon. Seniors frequently forget recommendations, and do not employ any strategy for prevent this from happening. An integrated PHR needs to have adequate reminding mechanisms so that the overall result is more than regular assessments, and can move to a prevention program with verifiable long-term effects. The online channel could be a way for both seniors and nurses to provide feedback on how recommendations are applied.

To improve the program's efficacy, information should be tailored to the senior as much as possible. This applies not only to the questionnaires current applied through the phone channel, but also to other content that might be distributed through the online channel. Still, there are other ways to improve efficacy and other qualities of service. Consistency, should be strived for in all dimensions, even consistency in the person that contacts the same senior. When this is not possible, the system should provide a quick overview of the senior's history and condition to avoid the need to collect the same information.

The online channel can enable collaboration between stakeholders to explore the increase in available data. The two most obvious ways are: 1) giving seniors the possibility to "validate" some of the information nurses collect about after a phone call; and 2) give nurses the ability to validate in phone calls self-reports provided by the seniors between phone calls through the online channel.

6. CONCLUSIONS

This paper studies the perspectives of the different stakeholders of the Portuguese nation-wide senior telehealth program, with the aim of evolving it to a multi-channel (combining phone and web) experience. A qualitative analysis of seniors, nurses, physicians and the program’s manager interviews supported the identification of the major issues in the current service, and the more promising paths towards the envisioned integration.

Both nurses and seniors expressed that currently the service calls were very standardized, requiring an adaptation of language and discourse. Some nurses highlight the importance of restructuring the questions in order to provide a conversation instead of a survey, whilst seniors ask for a more personalized evaluation of their condition. Both groups mentioned they would prefer to always contact with the same person, as prior knowledge can benefit the interaction. The nurses group who were in the program for a longer time felt this particular need.

Among the findings, the complementary nature of the phone and web offerings must be highlighted. While the phone channel promotes an active voice with the seniors, important to avoid loneliness, the web can enrich patient knowledge to providers and engage seniors in the program through a continuous follow-up care with the ability to track events of the senior’s daily living that usually people do not recall during the calls.

Furthermore, the web can extend accessibility to those who are prevented from attending calls due to severe hear loss disability and inform providers on how seniors are addressing recommendations. Challenges arise when considering the validity of self-reported data and the privacy concerns that emerge in Internet data exchanges. Whilst seniors showed interest on performing online self-assessment, one of the physicians alerted to the need of supervision in the recorded data. Furthermore, both nurses and physicians questioned the role of family participation in the PHR reporting data, as their perception may highly contrast from senior’s self-awareness, especially in depressive clinical situations. This reluctance, both from doctors and care personnel, has also been highlighted in previous studies revealing that telehealth monitoring can include not only a higher probability of false alarms, but also data security issues (Ziefle, 2013).

All seniors wished to visualize and interact with their individual care plans over the web. However, whilst physicians suggested that visual feedback about their holistic assessments could be very useful for them, the nurses and the program manager advised that the data should be carefully displayed, only reinforcing the positive side.

For future work, we hope the topics from the presented study can inform the design of integrated personal health records for telehealth, moving towards a perspective of patient-centred care.
7. ACKNOWLEDGEMENTS

We are thankful to Rita Machado de Oliveira for critical reading and scientific and English editing of the manuscript. This work was partially funded by NOVA Laboratory for Computer Science and Informatics (NOVA LInCS) through grant PEst/UID/CEC/04516/2013 and by grant SFRH/BD/51819/2012 of the UT Austin | Portugal Program both from Fundação para a Ciência e Tecnologia, Portugal.

8. REFERENCES


Kaelber, D. C. et al. (2008). The value of personal health records. CITL.


Ludwig, W. et al. (2012). Health-enabling technologies for the elderly—an overview of services based on a literature review. Computer methods and programs in biomedicine, 100(2), 70-78.


Pinto, J. et al. (2014). Educational effects of telehealth implementation on older adults with socio-economic disparities. In Systems, Applications and Technology Conference (LISAT), 2014 IEEE Long Island (pp. 1-6). IEEE.


