

Addressing Barriers to Wider Adoption of Telehealth in the Homes of Older People: An Exploratory Study in the Irish Context

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Abstract—Understanding barriers to wider Telehealth adoption is vital to enable its embracement by those who could greatly benefit from the technology. The aim of this exploratory study was to identify barriers to wider Telehealth adoption in the homes of older people, particularly in the Irish context. Objectives included identifying barriers from the perspective of five groups of stakeholders, determining the most pressing barriers and suggesting possible approaches to addressing such issues. Fifteen semi-structured interviews were conducted. Findings were analysed against existing literature, current technology adoption trends and successful initiatives implemented in different countries. This study suggests that technology usability issues, implementation costs, lack of organisational willingness to change and the lack of incentive to healthcare professionals to embrace Telehealth are the most pressing barriers to wider adoption. Suggestions to address these issues are discussed.

Keywords—Telehealth; barriers to adoption; older people; chronic condition management.

I. INTRODUCTION

In line with European demographic trends, the proportion of older people in the Republic of Ireland is expected to double in the coming decades [1, 2]. As a consequence of population ageing, Ireland is expected to experience a significant increase in the prevalence of chronic conditions. By 2020 the number of people experiencing cardiovascular disease (CVD) events is expected to rise by 50%, while the number of those diagnosed with diabetes and hypertension is likely to increase by 62% and 40%, respectively [3]. At present, chronic conditions account for three quarters of the total healthcare expenditure in Ireland [4]. Projections indicate that the demand for such healthcare services will continue to grow as a consequence of population ageing, representing a significant burden to the Irish public finances [5].

The importance of shifting the focus of healthcare services from curative to preventative strategies, where patients are empowered to take active control over their health, is being recognised as the key to control costs and increase efficiency in healthcare [4]. It is amid this context that Telehealth technologies emerge as a relevant alternative to address these issues. Telehealth is here defined as the use of information and communication technology (ICT) based systems to assist the diagnosis, monitoring, management and

empowerment of patients with chronic conditions [6]. Remote vital signs monitoring systems are a common example described in the literature [6]. Emerging evidence has demonstrated the potential for Telehealth systems to reduce unnecessary hospital admission [7, 8], decrease mortality rates [6, 9], lower costs of care per patient and increase satisfaction among users [10].

Despite all such positive factors, Telehealth has not yet been widely adopted in any country [8, 11]. A complex interplay of barriers has been identified in the literature and some of those have so far proven difficult to overcome [8, 11]. Poor ICT skills [8, 11], confidentiality concerns [7, 8, 12] and lack of awareness of the available technology and its potential benefits [6, 8, 11, 13, 14] were associated with lower Telehealth acceptability among both older people and healthcare professionals. Technology issues involving usability problems [6, 14], poor system stability and reliability [8, 11] have been associated with low Telehealth up-take post pilot programmes. Moreover, limited access to broadband connections [7, 8] and lack of interoperability between various Telehealth solutions have been highlighted as significant barriers to effective information sharing amongst patients and healthcare professionals [6, 8, 12, 14, 15].

The fragmentation within the healthcare sector [6, 8, 16], absence of service ‘champions’ capable of promoting the recognition of Telehealth as part of core healthcare services [7, 11] and overall lack of willingness to innovate [6-8, 11] have been pointed as organisational obstacles to the embracement of Telehealth in the healthcare sector. The absence of clear guidelines defining roles and responsibilities of the different stakeholders involved [7, 8, 11, 17], lack of technical quality standards [7, 11] and unclear data protection legislation are also believed to hamper Telehealth adoption amid healthcare professionals. Additionally, the lack of robust evidence supporting the role of Telehealth in chronic condition management and unclear evidence for return on investment are perceived as significant barriers to its wider adoption among the medical community [7, 8, 14].

The absence of reimbursement arrangements to incentivise healthcare providers to embrace Telehealth is perceived as a fundamental barrier to its mainstream adoption [6, 11, 13, 14, 16]. Additionally, it has been pointed that existent payment systems in fact discourage healthcare providers to embrace Telehealth [8, 13, 14, 18-20]. This is because most systems remunerate professionals per in-

person contact with patients and remote contact supported by Telehealth (e.g., remote vital signs monitoring, e-mails, video-consultation) is not currently covered under most reimbursement systems.

Although much has been debated about the barriers to Telehealth adoption, little research has been done to investigate the extent to which such obstacles apply to the Irish context [8]. Moreover, few studies have attempted to explore barriers to Telehealth adoption from the perspectives of different stakeholders [17]. Therefore, the aim of the present exploratory study was to answer the following question: “what are the main barriers to the wider adoption of Telehealth in the homes of older people, in the Irish context?” Research objectives included: 1) to identify barriers to wider Telehealth adoption from the perspective of five groups of stakeholders: Potential Consumers, Healthcare Professionals, Service Providers, Technology Providers and Irish Context Experts; 2) to determine the most pressing barriers; and 3) to suggest possible approaches to address such issues.

The remainder of this paper is structured as follows: Section II explores the study methods, while Section III presents a summary of the main barriers to Telehealth adoption identified by interviewees. Potential solutions suggested by participants are also described in this section. In Section IV findings are critically analysed against the literature, the most pressing barriers are identified and potential solutions are discussed. Conclusions are presented in Section V along with a reflection upon study limitations and opportunities for further research.

II. METHODOLOGY

After obtaining final approval from the King’s College London Ethics Committee (ref KCL/10-11_379), fifteen semi-structured interviews were conducted between February and May 2011. Potential participants were approached through convenience sampling strategy and interviewees were selected based on the assumption that they had the necessary experience to help investigating the research question.

A. Sampling and Recruitment

To verify barriers to Telehealth adoption from the Potential Consumer (PC) point of view, relatives (sons, daughters, nephews or nieces) of older people currently receiving long-term care were approached. The rationale for selecting this group was that 1) their generations are more likely to benefit from the use of Telehealth by the time they reach old age, in comparison with their older relatives and 2) they were expected to have reasonable understanding of older peoples’ needs due to their experience with relatives who require long-term care. It was assumed that this group could shed light on the research topic both from a potential user point of view and a family member / caregiver perspective. Two nursing homes in Dublin, Ireland were approached and invitation letters were made available at the reception desk. To maximise response rate, invitation was extended to visitors and staff members who met the main inclusion criteria (sons, daughters, nephews or nieces of

older people who require long-term care or suffer from chronic conditions). In total, five (n=5) PCs were recruited. Face-to-face interviews were conducted in a suitable area (e.g., visitors’ room) in the nursing homes.

To explore the views of Healthcare Professionals (HCPs), GPs who regularly visit residents in the same nursing homes above mentioned were approached. An invitation letter was made available to potential participants in one of their visits to the nursing homes. In total four (n=4) HCPs were recruited. Face-to-face interviews were conducted in a suitable area in the nursing home or, alternatively, in the participant’s private practice facility.

Service Providers (SPs) were defined in this study, as organisations concerned with the supply of Telecare / Telehealth products and services. Two SPs have been identified in Ireland. An invitation email introducing the study was sent to both companies. One of them (n=1) agreed to take part and a telephone interview was arranged.

Technology Providers (TPs) were defined as companies that develop Telehealth systems and have headquarters in Ireland. Five organisations have been identified and contacted through the same approach used with SPs. Three subjects (n=3) agreed to participate. Although in the case of two companies the appointed interviewee was not based in Ireland, this was considered acceptable since both individuals had the desired experience to contribute to the study. Depending on interviewees’ location a face-to-face or telephone interview was arranged. Face-to-face interviews took place in a suitable area of the respondents’ workplace.

Finally, Irish Context Experts (ICEs) were defined in this study as individuals who have significant knowledge of the Irish health and social care systems and are familiar with Telehealth systems. Two potential interviewees with this profile were identified through snowballing strategy (i.e., through the indication of other interviewees) and were approached via email, as described above. Both agreed to take part (n=2) and face-to-face interviews took place in a suitable area of their workplaces.

B. Data Collection and Analysis

All participants received a study information sheet and gave informed consent prior to interview. Topic guides have been used to support the semi-structured interviews and different questions have been included to suit the different stakeholders’ background. A diagram illustrating possible Telehealth configurations has been used to frame discussions about barriers to Telehealth adoption (Fig. 1). The diagram displayed technologies commonly described in the literature including remote vital signs monitors, video-consultation and electronic health record (EHR) systems. Considering the likelihood that most PCs and HCPs would not be familiar with Telehealth technologies, two videos were shown to further support the interviews. Video 1 [21] described the use of a Telehealth remote monitoring system to support patients with chronic pulmonary disease. Video 2 [22] explained the functions of a personal EHR that allows patients to organize, store, and share health information online. Both videos are freely accessible on the Internet and have been used for illustration purposes only. Moreover, an Apple iPad device

was used to display the videos. This was considered beneficial should interviewees not be familiar with touch screen interfaces, a common feature in Telehealth devices.

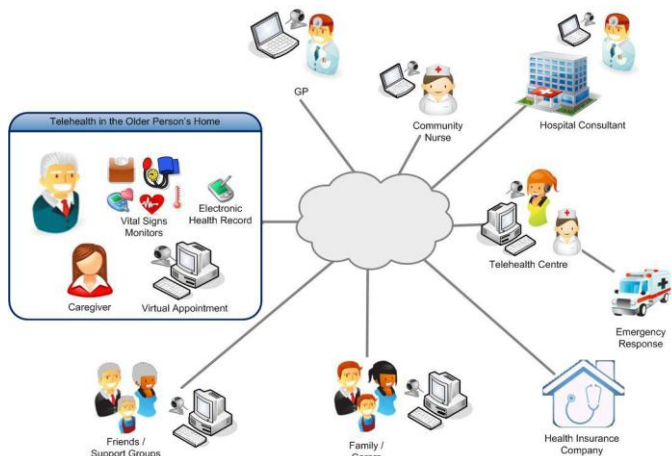


Figure 1. Diagram representing possible Telehealth configurations (source: self)

Interviews were audio recorded and manually transcribed. Based on interview transcripts, a thematic content analysis was carried out. The use of the qualitative analysis software NVivo 9 (www.qsrinternational.com/products_nvivo.aspx) greatly facilitated this process. In order to determine the most pressing barriers to Telehealth adoption in the Irish context, findings were critically analysed and compared to the literature. Current technology adoption trends and successful initiatives implemented in different countries have been also considered in this analysis.

III. RESEARCH FINDINGS

The most significant barriers identified by interviewees are explored below. Participants also suggested possible strategies to promote Telehealth adoption, and these can be found at the end of this section.

A. Acceptance Barriers

1) *Poor ICT skills*: PCs, SP1, TPs and ICEs suggested that at present the lack of technology skills is a barrier to Telehealth adoption among older people. Nevertheless, these participants acknowledged that this should not be a barrier to Telehealth adoption in the near future. PCs believed that their generations will be more familiar with electronic devices by the time they reach old age and will have greater understanding of the advantages the technology can offer.

“My aunt had a panic button but she never wore it. I think she was afraid of the technology. I don’t think older people adapt well to change. (...) I would think now we are more open, I’m only 70, I would be more open than she was. She was probably 90 when she got it. I think as the time goes on people will be more receptive to these things.” (PC5)

HCPs were less optimistic about this matter. The group pointed that older patients often demonstrate decreased ability to learn new skills, posing an important barrier to

wider Telehealth adoption. Two HCPs also believed that this will continue to be an issue for future generations of older people.

2) *Lack of face-to-face contact*: HCPs suggested that the lack of face-to-face contact with patients may represent an important barrier to Telehealth adoption among medical professionals. It was pointed that remote contact could negatively impact doctors’ decision making capacity, since relying on hard data, without clinical observation, could potentially increase the risk of medical errors.

“I think baseline details like blood pressure, fine, but when you go into more details like breathlessness, wheeze, chest tightness, you can’t actually see “are they cyanosed?”, “what is their chest actually like?”. You know, would you be able to rely on the data that much?” (HCP2)

TPs agreed that the lack of face-to-face contact may increase liability concerns among medical professionals. SP1 added that remote contact with patients may also raise fears of decreased business among physicians.

“[Doctors’] biggest drive for business is the repeated visits they receive from this demographic. So I find they are absolutely reluctant to engage with anything that may possibly reduce the amount of visits, which will happen, in their practice. That is a huge obstacle to overcome.” (SP1)

Lack of face-to-face contact has not been seen as an issue to any PCs interviewed in this study.

3) *Confidentiality concerns*: Two PCs demonstrated apprehension about their health information travelling online. This was not a concern for the remainder PCs who acknowledged that, at some extent, most people already share sensitive information electronically (e.g., bank transactions).

“I know there would be people that wouldn’t like to put their information in like that. (...) I wouldn’t see a problem with that. I presume that would all be securely done, like bank accounts would be the same.” (PC5)

Confidentiality concerns were perceived as a barrier to Telehealth implementation among HCPs. Interviewees were suspicious about how to ensure that only authorized professionals have access to EHRs and who would be ultimately liable for maintaining patient data protection.

“There are huge safety issues with having all that information accessible, and who will have access to it. Because it could just get into the wrong hands, and suddenly you are in major trouble for not protecting your patient’s information. (...) At present GPs own the information to a certain extent, so if you share that with the community nurse, who owns that? And who is ultimately responsible for that if it is used inappropriately?” (HCP3)

SP1, TPs and ICEs did not believe confidentiality concerns are a significant barrier to Telehealth adoption. These groups shared the perception that this issue may be

easily solved through adequate regulation and awareness raising.

4) *Lack of familiarity with Telehealth and its benefits:* SP1, TP1, TP2 and ICE1 agreed that the overall lack of awareness among healthcare professionals and patients about Telehealth existence and benefits is an important barrier to its wider adoption in Ireland.

“The big difficulty here in Ireland (...) in terms of the healthcare professionals is (...) the ignorance of what is the actual equipment that is out there. (...) Predominantly, they will go with what they know works, and it can be a real challenge to break that down sometimes.” (SP1)

B. Technology Barriers

1) *Technology usability:* When asked if they would like to have a device to cater specifically for their health needs most PCs expressed that they would prefer if this could be done through the devices they already have at home, such as laptops and mobile phones. The reasons supporting these views included privacy concerns and practical issues such as appliance size, mobility, ease to use and level of disruption to users' lifestyle.

“I wouldn't like to have a specific health device at home. (...) I think it is the whole thing about privacy, you know, you can have as many people on the computer and they've got their own password so it remains private.” (PC2)

“I would rather have something small like that (pointing to an iPhone). Something like that would be easier to use, that you could have beside the bed, rather than sitting up (...) People don't have space for all these stuff, do they?” (PC5)

“I would like to have something in my pocket which could do it more or less automatically. Personally I don't think people are prepared to sit down, well, I wouldn't do that. People get tired; you don't have the same drive all the time. I think if it was automatic, that would be better.” (PC3)

SP1, TP1 and ICE1 acknowledged that existent Telehealth systems are still in early stages of development and many issues around technology usability must be further explored. ICE1 added that the frequent lack of gerontological expertise among Telehealth designers is an issue that must be addressed.

“Design challenges are huge because you are dealing with unwell people and older people. So it is much easier to get a bunch of young engineers to go crazy over the iPhone and do all kinds of this jazzy stuff (...). Somebody who is sick with COPD just needs to press the button and make it work. That is all they want to know. (...) But yet, there are innovative ways of doing that. (...) And fit with life style is a big factor. So if the system is not in tune with the person's daily rhythm, they will not use it.” (ICE1)

Usability issues have also been identified as a barrier to Telehealth embracement by healthcare professionals. TP1 suggested that the views of healthcare providers may not be sufficiently considered by technology designers, resulting in

systems that are not in tune with providers' workflow. HCPs also demonstrated concerns about how realistic it would be to incorporate Telehealth into their usual practice, as they may not have time to interpret the additional information generated.

“I had a patient today who brought me a reading of his diabetes in a graph, so it makes it much easier to review. (...) But it can be quite time consuming, that consultation took over 30mins (...) sometimes it is just too much information, you know?” (HCP4)

PCs also expressed disbelief that doctors would have the time to analyse large amounts of data generated by Telehealth and suggested that many doctors may choose not to consider it when making patient-related decisions.

2) *Other technology barriers:* SP1, TP1 and ICE1 agreed that lack of access to broadband is an important obstacle to reach older people in Ireland. Incompatibility among Telehealth devices and lack of interoperability amongst EHR systems were also identified as important barriers to wider implementation. Nevertheless, the role of organisations such as the Continua Health Alliance (<http://www.continuaalliance.org/>) has been acknowledged as a significant movement pushing towards system compatibility.

C. Organisational Barriers

1) *Low levels of trust among stakeholders:* PC4, SP1 and TP1 suggested that low levels of trust from medical professionals in their patient's ability to measure their readings appropriately, as well as in the accuracy of devices and security of connections used may pose obstacles to wider Telehealth implementation. TP1 challenged this argument since data collected by patients should be considered as trustworthy as the subjective information reported by them during medical appointments.

“What you see a lot is that the professionals can't really trust the data that is coming from the patient. I don't think that sort of barrier holds much weight. Because ultimately, when the patient walks into a doctor's office and tells them about their condition, that is no more or less trustworthy than the patient recording it and sending. (...) I think [this attitude] is making it harder for this type of data emigration to penetrate in the industry, but I think it will go away at some point.” (TP1)

2) *Increased professional responsibility and lack of organisational willingness to change:* SP1, TP1 and ICE1 acknowledged that wider adoption of Telehealth requires healthcare professionals to significantly adapt their professional practice. Interviewees explained that, for example, Telehealth enables professionals to look after a much larger number of patients and to provide more continuous care than they would through traditional methods. It was suggested that an overall lack of willingness to embrace such changes may be a significant barrier to Telehealth implementation.

Among HCPs, one interviewee clearly expressed he would not be willing to change his usual practice in order to adopt Telehealth.

"This my own perspective, I've studied medicine to deal with people, I didn't study medicine to look at their computer printouts, or blood pressure going up and down. (...) that might work, but that wouldn't be for me. I mean, it would wreck my head now if I would spend half of my day looking at printouts, or people emailing me stuff about it, I just don't do that, you know?" (HCP1)

3) *Lack of 'champions' in the healthcare system:* SP1, TPs and ICEs suggest that the lack of strong 'champions' in the healthcare system may be one of the reasons for the virtually inexistent movement towards Telehealth adoption in the Irish context.

"We still need a champion here in Ireland. It needs a good reference site, a strong pilot in order to achieve what it can achieve." (SP1)

D. Policy and Legislation Barriers

SP1 and ICEs argued that it is still largely unclear how data protection legislation applies to Telehealth. They suggested that this issue is an obstacle to different stakeholders to become involved with Telehealth.

Most HCPs suggested that Telehealth would not achieve wider adoption in Ireland without a clear Government led strategy. They believed that this would be necessary to address data protection concerns.

"I think [data protection legislation] would have to be determined by the government, there would have to be policies in place in terms of safety, informed consent (...) because if it is just done through the private companies I think it will be perceived as too ad-hoc or that there is something in it for the individual company." (HCP3)

E. Evidence Base Barriers

TPs and ICE1 acknowledged that despite a significant number of successful pilots, Telehealth still lacks robust studies, such as large randomized controlled trials (RCTs), to support its efficacy and cost-efficiency. Nevertheless, they pointed that the lack of RCTs may be also used as an excuse for non adoption among medical professionals. It was suggested that Telehealth may instead require different scientific evaluation methods to demonstrate its value.

"(...) you can argue that [careful patient selection] is exactly what you have to do with Telehealth, that there is no point in randomly selecting people in the same way that you won't randomly give people drugs to treat their conditions. (...) I think quite often, evidence is used as an excuse for inaction rather than being the real reason why they won't invest. There are lots of other things happening in medicine that doesn't have evidence base." (TP2)

F. Financial Barriers

SP1, TPs and ICEs acknowledged that the high costs of establishing the necessary infrastructure, staff training, processes reconfiguration, etc., may be a major barrier to the

adoption of Telehealth by healthcare systems that are already under economy strain (which is the case of the HSE, the national healthcare agency in Ireland). It was pointed, however, that this would largely depend on the level of government involvement in the implementation process.

"High costs of establishing infrastructure [is a barrier] only if the Government decides to do it. There is already lots of infrastructure out there for other reasons, we can piggyback on existing mobile networks or smart meters, and other things that are happening around us." (TP2)

HCPs also pointed that the costs of system implementation could prevent small GP practices to engage in Telehealth. Interviewees demonstrated disbelief that wider adoption would be achieved without government financial incentive.

ICE1, HCPs and two PCs also expressed that many older people may not have the resources to afford Telehealth if this is provided through out of pocket purchasing, therefore, hindering wider adoption.

"I just don't see it becoming a big thing if it is done privately (...) it wouldn't be standardised enough. There would be only certain people that would be able to avail of that service then." (HCP2)

G. Lack of Incentive to Healthcare Professional

According to SP1, TPs and ICEs the lack of clear incentives to healthcare professionals to embrace Telehealth may be one of the most significant barriers to its uptake. Interviewees suggested that, even if other obstacles are addressed, Telehealth will struggle to be widely adopted if healthcare professionals do not perceive clear advantages over traditional practice.

1) *Absence of reimbursement arrangements:* The fact that Telehealth is not currently covered by reimbursement arrangements was seen by HCPs, SP1, TPs and ICEs as a significant disincentive to the involvement of healthcare professionals. They argued that even though Telehealth may represent cost-savings to the wider healthcare system, healthcare professionals will be reluctant to engage unless reimbursement systems are created.

"You have to look at what incentives does a GP have to offer vital signs to his or her patients? Not much, because they are not under reimbursement systems, it doesn't exist in the HSE so it would be up to the GPs to do it privately. So they don't really have a huge incentive to do it." (ICE1)

2) *Disincentives caused by existent payment system:* TPs and ICEs pointed that, different than other technologies that have successfully penetrated in the healthcare industry, Telehealth does not fit into the existent procedure-driven model. Interviewees argued that technology diagnostic solutions, for example, clearly allowed professionals to increase their income streams, what is not the case of Telehealth. There was a common perception that unless the focus of reimbursement arrangements shifts from procedures to health outcomes, Telehealth will hardly penetrate in the healthcare system.

“The reasons why radiology was adopted so fast are quite simple. On the one hand it allowed you to generate more income, because you could get more patients through the radiology department more quickly. It also didn’t interfere with the status quo and the workflow in the hospital in a fundamental way (...). So if the doctor gets paid to see you, but doesn’t get paid to look after you when you are out of the room, why would they invest in it and pay attention to it? (...) I guess a lot of doctors will not like this because they prefer the system whereby you are paid by the appointment, because they can see an obvious way to increase their income, by increasing number of appointments.” (TP2)

“The answer to that is really simple. Our healthcare system is based on a model that incentivises poor health. (...) Nothing will change until we change that model.” (TP3)

H. Suggested Actions for Wider Adoption of Telehealth

PCs suggested that in order to achieve wider adoption, Telehealth technologies must be flexible enough to match different user’s lifestyles and preferences. Participants added that devices should be small, portable and easy to use, what could be more easily addressed if Telehealth systems could run in devices people already own, such as mobile phones.

TPs and ICEs agreed that in the future technology developers should focus on the design of Telehealth software applications, as oppose to hardware. Overall, they highlighted that the input of gerontologists and healthcare professionals is critical to successful Telehealth technology design.

PCs suggested different strategies to promote awareness among older people and family members. This included mass media advertisement (television, newspapers, Internet), availability of information leaflets in medical practices and the creation of a government approved website, with “neutral” and up-to-date information that could facilitate informed consumers’ choice.

Most interviewees indicated that government-led Telehealth implementation could address several of the barriers discussed. Government legislation could, for example, address data protection and medical liability issues. National policies were seen as necessary to endorse a standardised adoption of Telehealth across the country and to promote educational support through undergraduate training and continuous professional development. Interviewees in all groups indicated that State provision would be important to ensure that older people with lower incomes have access to Telehealth. TPs also pointed that government initiatives could stimulate the establishment of the required infrastructure to allow Telehealth data sharing. This could include the subsidy of broadband for older people and financial incentives for the adoption of interoperable EHR systems by healthcare providers and organisations.

Considering the current Irish system configuration, ICE1 suggested that it may be easier to start the implementation of Telehealth through the secondary sector. She explained that chronic disease support teams are currently based in

hospitals and Telehealth could offer cost-saving advantages for such departments.

The establishment of reimbursement schemes has been the most suggested measure to incentivise Telehealth adoption among healthcare professionals. Considering the fact that Ireland has a public health system in place, reimbursement policies were also expected to be determined by government policies.

Finally, in order to avoid barriers associated with healthcare professional reluctance to embrace Telehealth, TPs and ICEs suggested that a possible strategy to achieve wider adoption of Telehealth in the homes of older people would be focusing on the development of Telehealth solutions that do not necessarily require healthcare professional involvement. Interviewees indicated that the platform created by Telehealth devices could be used to promote education, motivation and social support to patients and caregivers. As well as being a channel for accurate information and advice, Telehealth systems could promote treatment compliance among users through clear goal setting and feedback tools. Moreover, interviewees suggested that future developments should explore the capacity of Telehealth technologies to connect older people in equivalent disease stages and caregivers in similar situations. Participants argued that this approach could promote knowledge sharing and tackle social isolation, a frequent problem among chronic disease patients and caregivers. Additionally, this could address some of the business model and reimbursement issues previously mentioned, since Telehealth would be no longer seen as a medical device that is prescribed by a doctor, but a consumer device, which older people and family members could be interested in purchasing privately.

IV. DISCUSSION

In line with international literature, interviewees in this study suggested that the lack of clear incentives for healthcare professionals to engage in Telehealth is one of the most pressing barriers to its wider adoption [8, 14, 20, 23]. It has been acknowledged that the absence of reimbursement arrangements significantly discourages healthcare professionals to offer this service [6, 11, 13, 14, 16]. Moreover, the fact that Telehealth does not fit into the existent procedure-driven healthcare model was seen as another barrier to its penetration in the healthcare sector [8, 13, 14, 18-20]. Past experiences in healthcare show that the introduction of new technologies is not an issue when its adoption model is aligned with existing incentive schemes. The rapid adoption of computed tomography and magnetic resonance imaging scanners in the healthcare sector in many countries is an example [24].

Although these barriers have so far proven more difficult to overcome, several countries have been successfully employing strategies to stimulate Telehealth adoption amongst healthcare professionals. Many countries use government mandates to achieve broad ICT adoption in the health sector. In Denmark and Norway, for example, high rates of electronic prescriptions have been achieved since the

Governments made this practice mandatory for primary care providers [25].

The establishment of reimbursement structures is also considered vital to incentivise Telehealth adoption among healthcare professionals. Studies show that the reimbursement structure adopted will vary depending on the country's healthcare financing model and governments play a key role in defining this [8, 25]. In Sweden and the UK the existing (small scale) provision of Telehealth has been publicly funded. In Germany, regulatory changes have enabled Telehealth reimbursement through health insurers. In the Netherlands phone and e-mail consultations are reimbursed via fixed prices by the health insurance companies [8].

Innovative reimbursement frameworks, such as pay-for-performance schemes, are also being introduced in different countries in an attempt to shift away from procedure-driven models. In the UK around 15% of GPs' salaries is based on their performance against a set of quality measures [26].

Finally, government financial incentives have been used in Australia, Denmark, the Netherlands and the UK as effective policy tools to incentivise technology adoption among healthcare professionals [8, 25]. In the US the Medicare and Medicaid EHR Incentive Program offers financial stimulus of up to \$44,000 / \$63,750 to physicians and hospitals that demonstrate meaningful use of EHR systems certified by the Government. The scheme has registered over 77,000 professionals and hospitals in only seven months since its implementation [27]. This is particularly significant considering that the fragmentation of the US American health sector is usually pointed as a barrier to the implementation of any measures in large scale [12].

Technology usability issues have been highlighted by virtually all interviewees, in agreement with several studies [6, 11, 14, 16]. It has been pointed by interviewees that devices specifically designed to cater for healthcare needs may not be well accepted by users. Leveraging devices that people already have, such as mobile phones or laptops, was pointed as a better strategy for Telehealth adoption, since people are already familiar with such devices and these fit more readily into their lifestyles. Participants added that this could make Telehealth more affordable and readily accessible to the public. This perception is in large agreement with trends towards the use of mobile platforms for Telehealth provision (e.g., smartphones, computer tablets). Projections indicate that smartphone applications will enable the mobile health industry to reach 500 million users in 2015 [28].

The lack of organisational willingness to conform to changes is considered a pressing barrier to wider Telehealth implementation [6-8, 11]. While the role of 'champions' in promoting change in the healthcare system has been acknowledged by interviewees and the literature [7, 11] achieving wider adoption of Telehealth will require more than individual leadership. May et al. [17] argue that in order to overcome intra-organisational inertia, coherent policies promoting an organisational vision are needed. According to Castro [25] strong national-level leadership has been essential to countries like Denmark, Finland, and Sweden to

successfully drive and coordinate wider adoption of ICT in the health sector. Comprehensive national strategies, as suggested by several interviewees, are required to address this and other pressing barriers to wider adoption of Telehealth as discussed below.

The strategies above explored indicate that a high level of government involvement may be necessary to transform healthcare provision and allow wider adoption of Telehealth. Interviewees in this study point, however, that the high initial costs of establishing the infrastructure and incentivising healthcare professionals is an important barrier to government led Telehealth implementation in Ireland. Financial challenges have also been acknowledged by different studies [11, 12, 14, 15, 25].

Issues involving poor ICT literacy among older people pointed by other studies [8, 11] were perceived by most interviewees as a trivial barrier. Recent evidence show that the interest of older people in technology has grown at a fast pace in the last decade [29, 30]. In Ireland, the percentage of people aged between 65 and 74 years accessing the Internet at least once a week has increased more than five times between 2003 and 2010 [31]. The use of the Internet for health purposes has also increased among the older population [29] indicating that this barrier may gradually become insignificant.

Other acceptance barriers mentioned in the literature such as lack of face-to-face contact [7] and confidentiality concerns [7, 8, 12] have also been cited by interviewees. However, it is possible to suggest that these issues are not significant barriers to Telehealth adoption for several reasons. According to Darkins et al. [10] patient satisfaction was significantly high among older participants in the VHA Telehealth programme and lack of face-to-face contact with healthcare professionals has not been observed as a barrier to Telehealth adoption. This may indicate that the benefits offered by the technology may outweigh such concerns. Similarly, Castro [25] suggests that confidentiality concerns should not be a barrier to ICT penetration in the healthcare industry, considering that technical controls (e.g., encryption, electronic identification, audit logs) are available to ensure personal health data security. In Denmark, for example, health data is securely shared through an official e-health portal. In this context patients have access to this website and can easily control privacy functions, including monitoring who has accessed or modified their personal medical records. In Ireland the recently implemented National HealthLink Project (<http://www.healthlink.ie/>) is another example of how patient data (e.g., laboratory results) can be securely shared over the Internet.

Interviewees in this study challenged several authors [7, 8, 14] suggesting that lack of RCTs is not a significant barrier to Telehealth adoption. Participants argued that careful patient selection is desired to achieve Telehealth benefits, thus alternative study designs should be used to evaluate Telehealth value. This has been previously observed by other authors [11, 13]. The MAST is an example of a new model for Telehealth evaluation which has been developed to support decision making in European countries [32].

There are indications, therefore, that evidence base barriers should not be of major significance.

The interviews supported the main findings of the literature in relation to certain technology barriers including limited access to broadband connections by older people [7, 8] and lack of integration between various Telehealth technological solutions [6, 8, 12, 14, 15]. It is important to acknowledge, however, that several initiatives are being undertaken and such barriers may not be significant in the long-term. The Irish government has recently implemented a national scheme which aims to achieve extensive broadband coverage by 2012 [33]. Moreover, with the increasingly fast adoption of smartphones, the native broadband Internet connection capabilities of those devices may in practice address the connectivity infrastructure requirements for Telehealth, as opposed to government-led, residence-based broadband connection programmes [34]. Similarly, interoperability issues are being tackled by both private and public sectors. Through the Continua Health Alliance, over 240 healthcare and technology companies worldwide are working together to set quality and interoperability standards for Telehealth solutions [35]. Studies by Anderson [12] and Castro [25] indicate that in the UK and Denmark government agencies are setting such standards.

V. CONCLUSION

The research findings point to a number of direct and indirect obstacles, which largely correspond to those discussed in the international literature. Issues involving evidence base, technology interoperability and broadband access were not considered to be of major significance, given that important initiatives are already addressing these barriers. Similarly, based on interviewees' perceptions and technology adoption trends, older people's acceptance is not believed to be a pressing barrier to wider Telehealth implementation in the medium term.

The findings indicate that technology usability issues may significantly hinder Telehealth adoption. The use of devices that people are familiar with such as mobile phones, laptops and computer tablets is supported by this study as a strategy to promote Telehealth use. Another important barrier is the lack of organisational willingness to change, currently perceived in the healthcare sector. While implementation costs were seen as a challenge to government action in Ireland, strong national-level leadership is considered essential.

Finally, the lack of incentive to healthcare professionals to embrace Telehealth is considered a pressing barrier to its wider adoption. The absence of arrangements to reimburse healthcare providers and the incongruence with the present procedure-driven healthcare model are believed to significantly discourage professionals to offer this service. Possible approaches to address healthcare professional incentive barriers have been suggested and include government mandates, the establishment of reimbursement schemes and the use of government financial incentives.

The imminent population ageing and epidemiologic trends indicate that new forms of healthcare provision are urgently needed. Shifting away from the current disease-

centric healthcare model towards a health-centric system is not only an economic necessity but also a moral obligation. The adoption of Telehealth technologies is believed to contribute towards these issues by allowing more efficient service provision in a patient-driven model. However, the disruption to traditional healthcare practices caused by the introduction of Telehealth represents a major challenge, one that requires the support from all stakeholders involved. Governments around the world are gradually implementing strategies to promote a new vision in the healthcare sector and significant changes are envisaged in the long-term.

Even though interview findings indicate large agreement with the literature, the small scope of this study does not allow for the generalisation of these results. Also, this research project would have greatly benefited from the participation of representatives of the Irish Government, what was initially intended. The fact that Potential Consumers and Healthcare Professionals interviewed in this study did not have personal experience with Telehealth technologies indicate that one has to cautiously consider their contributions.

While identifying barriers to wider Telehealth adoption is an important starting point to promote its implementation, it seems possible to suggest that future research should focus on clear and practical strategies to increase Telehealth adoption in the homes of older people. Investigating innovative ways of incentivising healthcare professionals and organisations to embrace Telehealth in their usual practices seems to be one of the most needed areas for research.

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