A User Centered Exploration of Multiple Stakeholder Requirements for Home Care Technology

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ABSTRACT

This paper describes the motivation for, and results from, multi-stakeholder user engagement work being conducted within the MATCH home care technology project (http://www.match-project.org.uk). The ageing population is leading to new ways of looking at how we deliver social and health care services and the use of technology is already playing a part in new models of care. The aim of this work is to identify and categorise the different needs and requirements of the various stakeholders in home care technology using scenario based focus groups with individual and mixed stakeholder groups. As well as identifying requirements, this work ultimately aims to develop and document methodologies to facilitate the elicitation of complex, dynamic, multi-stakeholder requirements and needs. This paper presents initial findings from four focus group sessions with stakeholders (2x Social Care, 1x Policy makers, 1x Assistive technology installation technicians). The results suggest that a scenario based focus group approach can contribute successfully to informing the design of acceptable and usable home care technologies. Furthermore, the use of a multi-stakeholder approach can reveal richer explanations of the issues arising.

Categories and Subject Descriptors

H5.2. Information interfaces and presentation: User centered design.

General Terms

Design, Human Factors.

Keywords

Home care systems, care at home, stakeholder requirements, participatory design, focus groups, framework analysis, requirements engineering.

1. INTRODUCTION

In January 2006 the British government launched the White Paper "Our health, our care, our say: a new direction for community services" [2] which identified the future importance of assistive technologies in offering support to those who had physical and/or cognitive difficulties and wished to continue living in their own home. It is both socially and economically beneficial to improve support for people managing their care within their own homes. People can remain in a familiar environment, close to family and friends, which can potentially increase their well being and reduce anxiety [7]. It is also costly and impractical to continue to provide sufficient specialized care facilities given the increasing ageing population and reducing proportion of workforce [7]. As an example, the Royal Commission of London on Long term Care (1999) report that an annual 1% increase in the number of people living independently at home could make a significant reduction to the costs involved with caring for older people.

In this paper we define *home care systems* as a potentially linked set of services of either social care, health care, or both, that provide, or support the provision, of care in the home [5]. Our focus is on technologically supported home care, in particular those that involve specialised computer systems. Such technology typically includes sensors, devices, displays, data, and networks, and computing infrastructures and can range from simple stand-alone electro-mechanical alarms installed in a person's home, perhaps to indicate a bath overflowing or a door left ajar, to systems integrated into the home's physical infrastructure that monitor patient state, perform sophisticated analyses, deliver customised information to patients and clinicians and support communication among them [6].

We refer to a 'Network of Home Care' as the wide array of people and organisations involved or interested (directly or indirectly) in a person's care at home. Advanced technologies and increased networking capabilities have increased the potential for users to send and receive important care information from the comfort of their own home to friends and family or to health and social care professionals involved in their care [5]. Furthermore, assistive technologies can also be used as a measure for preventative health care by monitoring activities of daily living over time as these measures and indicators may provide an insight into the health and wellbeing of the home occupant.

Such advanced home care technologies and home care systems have not been taken up in people's homes as eagerly as might have been anticipated [7]. Yet with an increasing ageing population and an increased drive to keep people out of hospital and support people living independently in their own homes [4], there is a continuing need for well designed, acceptable home care technologies [6]. We argue that the complex nature of home care systems and the network of home care produces many social, technological and professional interactions and issues that must be identified and resolved to realize the true potential of advanced home care technologies.

This paper describes the ongoing multi-stakeholder engagement process within the MATCH project (http://www.match-project.org.uk) and presents the initial findings from a series of focus groups with real stakeholders of home care technology. The results are presented and discussed in terms of how the identification and exploration of these issues can inform the design of effective, usable and acceptable home care technologies.

2. MULTI-STAKEHOLDER ENGAGEMENT METHODOLOGY

2.1 Identifying Stakeholders

Home Care Systems, by their very nature, involve a number of direct users and other stakeholders all of whom are interested in and potentially able to influence how a home care system should perform and behave [6]. In addition to the person being cared for in their home, there are likely to be: partners living in the same space, friends and family living elsewhere who are involved in care or interested in its status, visiting medical personnel such as community nurses and remotely located medical staff, such as a consultant in a clinic that the patient visits. Each person involved in the system and its development is likely to have very different needs, perspectives, and accountabilities, all possibly changing over time as the condition of the person and the possible behaviours of the system change [6,11]. This can result in complex, dynamic and potentially conflicting needs and requirements and therefore novel methods are needed for identifying and resolving requirements from the various stakeholders in home care technology design.

Seven main stakeholder groups had been identified by the MATCH project [5,6]. These are:

- People living at home with care needs – referred to as users, clients, patients, or service users

- Informal carers – often includes friends, neighbours and family

- Professional carers – health, social or voluntary sectors

- Technologists – designers, researchers, engineers and companies producing or supplying the devices, methods or infrastructure required

- Policy makers

- Social Care professionals

- Health Care professionals

Following consultation with these groups two additional key stakeholder groups have been added, namely:

- Assistive technology technicians – who install and maintain equipment

- Pharmacists

The MATCH project has access to all of these stakeholders via our commercial and health and social care partners and a cohort of around 50 older users who volunteered to contribute to the research project.

2.2 Stakeholder Engagement

We believe that the successful design and implementation of home care systems requires involvement of all stakeholders from direct users of the home care technologies to those potentially interested in the health or well being and the people concerned with designing, supplying, installing and maintaining the technologies. The technology that is available, endorsed, prescribed, and used depends on the combined needs and goals of this set of stakeholders.

Planned and systematic stakeholder engagement can be the basis for creating awareness, gathering requirements, building consensus, generating participation in processes of change and development, making informed decisions, and resolving conflicts around the needs and requirements of home care systems.

Whatever the project, neglecting stakeholder relationship management can seriously increase costs, delay project execution and/or result in services that do not meet the specific needs of the stakeholders. Furthermore, to increase the usability and acceptability of home care technologies, we believe that it is necessary to understand both the individual and combined needs and requirements of all the stakeholders of home care.

We are conducting a series of traditional and novel participatory design and requirements activities to both elicit requirements for our own technology design within the MATCH project and to develop the existing requirements methodologies to better suit the home care domain. Our stakeholder engagement activities to date have included:

- Attitudinal questionnaires
- Key informant interviews
- Case Studies
- Single and mixed stakeholder Focus groups
- Participatory workshops
- Live Interactive Theatre

Figure 1: Focus Group

2.3 Focus Group Study

2.3.1 Single v Mixed Stakeholder Focus Groups

Both single stakeholder and mixed stakeholder focus groups are being conducted to identify how home care technology may make a difference in the future management of care at home. By comparing themes and issues emerging from both single and mixed stakeholder groups, we aim to examine the quantity, quality, and nature of information obtained. It is hypothesized that in a domain with many social and professional complexities, single stakeholder focus groups will elicit issues that multi-stakeholder groups would not and vice versa.

In mixed stakeholder activities, certain groups lose confidence to convey their true opinion. In this domain for example, older users often perceive that the health and social care professionals

know more about appropriate care regimes. Another potential problem with mixed stakeholder groups is the lack of a common language to discuss the issues. A further problem with this is that some of the same language is used to mean different things within different stakeholder groups and this can result in misconceptions. Single stakeholder focus groups should allow the participants to speak in their own voice, with a common language without losing confidence in their own thoughts and opinions or conforming to categories and terminology imposed on them by others.

2.3.2 Participants
To date, we have conducted four 'Single Stakeholder' focus groups (two Social Care Professional groups, one Policy maker group, and one Assistive technology technician group). We are currently conducting equivalent focus groups with all other stakeholder groups identified in 2.1. Focus group participants were contacted through direct links with the project and using a snowballing technique until no new stakeholder groups are identified.

2.3.3 Stimulus and procedure
One of the additional aims of this work is to qualitatively compare the stimulus and methods used in the focus groups. The focus groups reported here use the same text based scenario to drive the focus group. In the longer term, we plan to compare the themes emerging from these focus groups with the themes emerging from storyboard based focus groups, video based focus groups, and live theatre based focus groups. The hypotheses could be that either (a) richer mediums (e.g. live theatre) yield richer results or (b) the medium has little or no effect on the quality or type of information elicited.

The researchers are interested in two main issues: (1) Whether collaborating with different stakeholder groups can identify and resolve conflicting perspectives from different stakeholder groups surrounding their system needs that would remain unchallenged in single stakeholder focus groups, and (2) Identifying better informed user requirements that can be directly fed into the development of home care technologies within the MATCH project.

The results presented here focus on text based, scenario driven, single stakeholder focus groups.

Each focus group meeting lasted for an average of one hour. Participants were presented with the text based scenario describing an older couple living at home with care needs. In a group discussion, participants are asked to identify the limitations of the couple that may eventually lead to a care home admission. Participants are then asked to think about how technology may play a role allowing them to remain at home for longer. The same (trained) facilitator and observer attended all the focus groups to balance the Hawthorne effect across the groups.

The focus groups were tape recorded on a digital audio recorder and transcribed verbatim. In addition, extensive notes were taken throughout the sessions by the observer. Each focus group participant was allocated an identifier code to ensure anonymity. This code was based on their stakeholder group, (SC = Social Care; Pol = Policy and Tech = Assistive Technology Installation Technicians). Each quote is also labeled with the chronological order of focus group within that stakeholder category and participant number within that group. Hence, SC1P3 refers to Social Care, Group 1, Participant 3

while Tech1P1, refers to the Assistive Technology Installation Technicians, Group 1, Participant 1. Anonymised transcripts and observer notes were used for data analysis.

2.4 Analysis of Data
We are using a Framework Analysis [9] approach to analyse the focus group data. The benefit of using framework analysis is that it provides systematic and visible stages to the analysis process. Although the general approach is inductive this form of analysis allows for the inclusion of 'a priori' as well as emergent concepts. This is important because there are 'a priori' issues that are rooted in the text based scenario that should be explicitly addressed as well as themes and issues that emerge due to the nature of the stakeholder group being exposed to the scenario.

Framework analysis involves the following five key stages:

1. familiarisation
2. identifying a thematic framework
3. indexing
4. charting
5. mapping and interpretation

Two researchers were involved in each focus group. Both researchers read each transcript several times to familiarize themselves with the data. Secondly, a thematic (coding) framework was identified based on both a priori themes (i.e., from the scenario) and emergent themes from the familiarization stage. Emerging themes were identified independently by the two researchers and these were agreed by discussion. This was then applied to the data to categorise and structure the data according to the themes. The final stage of analysis was data mapping and interpretation in relation to the predefined categories and emerging themes.

3. LESSONS LEARNED / EMERGING THEMES
There are many documents within the United Kingdom (for example, Our health, Our care, Our say: a new direction for community services) that highlight the new possibilities that advanced home care technologies can present to social care systems. £8 million has been made available to promote the implementation of telecare within Scotland. It is anticipated this could see an additional 19,000 people live at home for longer [4]. However, the integration of advanced technologies into the care packages of older people has not yet been realized. The current situation is that money coming from policy makers is often being used to fund alarm systems, whereas the possibilities raised by advanced technologies are much greater. If the designers and suppliers of technologies could provide devices and methods that were desirable, usable, cost effective, improved health and/or well being, and fitted into care plans and peoples' lives then the true potential of home care systems could be realised.

The initial results from this study highlight the existence of six main themes. The consideration and resolution of some of these issues should inform technology design and implementation and increase the likelihood of advanced technologies becoming part of successful routine care service delivery.

Four main themes were common to each focus group, namely:

(1) Acceptance Issues

(2) Ethical/Legal/Privacy Issues

(3) Availability of Resources

(4) Individual and dynamic user needs

There were three additional themes that emerged from both the social care focus groups and the technology installation technicians, namely:

(5) Appropriate use/prescription of technology

(6) Awareness, education, and training

Each of these themes will now be discussed in turn using stakeholder comments to support and illustrate each point.

3.1 Acceptance Issues

There was a strong perception across the focus groups that many older people may have 'technophobia' towards advanced home care technologies;

> **SC2P3: "**They see all these buttons and computers and different things like that. I don't know if that would frighten folk**"**

> **SC2P3:** "Most folk round that age group (70) are technophobes and sometimes to go in and start putting in pieces of assistive technology can be a wee bit fearful for them".

However, more basic pieces of technology were considered acceptable:

> **SC2P3:** "I think the basic things that we would put in just now, like the community alarm and different pieces are ok but when we start talking about, you know, something a wee bit more major this is where we start having a problem"

Our focus groups suggest that the perception of technophobia may be as a result of a lack of information about the possibilities and potentials of assistive technologies.

> **SC2P5: "**I think there needs to be more awareness raising or education, if you like, of professionals, you know, because I think there is a, kind of, mismatch of knowledge out there, em, people maybe have their own particular view, you know, about the rational about using technology, so I think there is scope there to develop some sort of training ".

Furthermore, perceptions that there may be a lack of ability in the older population to learn how to use these technologies may be preventing more advanced assistive technologies being offered to this group:

> **Pol1P2** "…training a guy in his 70's to use this (referring to home care technology) might be difficult."

Despite this, the perception that technology is feared by older people is not necessarily supported in the literature where it has been found that, if appropriately prescribed, assistive technology was welcomed by older users [10]. Therefore, it is important to identify the foundations to the belief by some professionals of 'technophobia' among older people as it may be that assistive technology is being underused simply because it is being under-prescribed. Focus groups with older users are currently underway to investigate older people's attitudes towards existing and future home care technologies.

The health status or fear of worsening health was also suggested to influence the acceptance of technology.

> **SC1P2:** "I've just recently persuaded her to have a mobile phone but she'll only have it to phone a taxi when she comes out of Marks and Spencer's….the only reason is….she thinks that she got the flu off the phone in Marks and Spencer's the last time she was there. She's got a bad chest and she's quite protective of herself".

Technologies are often perceived as acceptable only when they offer a benefit to the user. Often, assistive technologies are being prescribed without the benefits being explained or justifies in conjunction with the user and their family. This generally leads to under-use or mis-use of the technologies.

De-stigmatising home based care technologies by incorporating these developments into mainstream products may be one way of increasing the acceptance of home care technologies.

> **SC2P4:** "I think incorporating technology into mainstreaming things also, kind of, de-stigmatises it….you're not singled out as being a bit different"

The frame of reference that technology is presented within may also have an influence on acceptance. The comparison of new technologies for supporting care at home may be damaged by making comparisons with these developments to already existing technologies that are perceived for use by a group in society that they do not want to be identified with:

> **SC2P5:** "…it is about the language we use in terms of technology when there was a recent publicity about granny tagging and stuff, you know, about technology that was there to help people but because they use it to tag criminals, if you like, it was kind of seen as a very negative, em, you know if we were going to tag old people,

In addition, the policy group feared that advanced home care technology may mean:

> **Pol1P2: "**…turning their [older people's] wee family bungalow into something resembling 'Fort Knox'."

The public perception surrounding developments in technology to support care at home needs to be carefully considered. More work needs to be done on identifying misconceptions and fears and identifying strategies to ameliorate these (see 3.6).

3.2 Ethical and Legal Issues

A range of ethical and legal issues were identified. The commonly identified ethical concerns related to:

- a worry about infringing on the privacy of the individual being monitored in their home

- concern over who has access to confidential information collected by sensors in the home

- the varying capacity of the individual receiving care to provide informed consent

Several comments were made regarding misconceptions about what the current technology does and what future technology could do. Many attitudes and perceptions centered on the potential privacy issues that arise with the improved range and resolution of data (such as video streaming and still images) and the improved technology that enables a person's location and activity to be to be tracked.

> **Tech1P1:** "It can get a bit like Big Brother with satellite positioning and video cameras…"

Most of the issues regarding privacy were centered on the potential for home care technology to monitor 'everything the person does'. Monitoring was almost always referred to by these groups as a potential breach of privacy.

> **Pol1P2:** "if the system is watching what you are doing and monitoring your health…it has many uses….but there would be a strong societal opposition to it."

> **Tech1P1:** "They [the service users] are frightened because [they think] hidden cameras behind them…they think they are being watched".

Strategies for reducing these concerns were suggested. They usually concerned awareness raising and providing clients with accurate knowledge so they understood what the system was doing with their data and why.

> **Tech1P2:** "…so they know what is being monitored…who is seeing the information…and well, why they are monitoring it I suppose".

Some of the concerns were not rooted in assistive technologies themselves but rather the storing of their health data electronically.

> **Pol1P1:** "people are prickly about keeping personal data and how it is stored etc."

> **Pol1P2:** "the opposition would be in the security and safety of their health information."

The issues of storing people's health information safely and securely is ongoing and not restricted to the study of home care technologies. Again, this is something that increased knowledge and awareness might be used to reduce the perceived risk of storing and sharing of health information within and beyond the home.

There were concerns across all focus groups about the robustness of home care technology systems and who had the legal responsibility for ensuring the equipment was working correctly and safely:

> **SC1P2:** "…there is a lot of fear still…..like for example the fear of what happens if the equipment breaks or fails?..."

> **SC2P1:** "…the sort of blame culture that there is now, you know, if something goes wrong it's someone's fault when its not necessarily the case but there is always looking for someone to blame as opposed to, right, lets just move forward".

Maintenance and accountability is an ongoing issue that presents a possible barrier to the uptake of advanced home care technologies. It is crucial that these technologies are seen as support for the management of care rather than replacements for either professional care or self management of health and well being. It is important to educate people on the role the technologies play in the care model (see 3.6).

The technicians group also highlighted two additional considerations

- the conflict between providing care to support one situation and potentially reducing safety in another:

> **Tech1P3:** "Dementia is a problem…you can't automatically lock doors to stop wandering…what if there was a fire…"

- the importance of ensuring that each stakeholder is fully informed about what technology has been placed in the home and the implications that this may have on supporting care:

> **Tech1P3:** "When we went to change the battery in the door contacts…the carer was just leaving…they hadn't seen it…they didn't know what it was…"

The use of technology to support the care of vulnerable people living at home has many legal and ethical implications, some of which have to be acknowledged or overcome before the technology can be successfully implemented. In addition, these issues are subject to change as technology advances.

3.3 Availability of Resources

Participants across all types of focus groups were concerned with how much a home based care service with technology would cost to provide and how care provision would be resourced and organised.

Response times and how call centres currently operate definitely have to be taken in to consideration when implementing new technologies. Any technologies that assume a connection with emergency services or current call centres would have to ensure that they conform to current practices and do not increase the maximum allowed response times.

> **Tech1P3:** "Response times can be a problem…up to half an hour all in for some cases. It depends how many people are on and their locality"

> **Tech1P4:** "It varies…not sure…it depends on the area and the time of year… and the budget etc".

Therefore, if resource restrictions have an impact on call centre target response times then this may conflict with the expectations of carers who have a relative with technology installed in the home:

> **SC1P5:** "My experience of assisted living technology is, my clients are predominately over 75 and it tends to be their families that have heard about it and they want every piece of equipment in the house but their expectations if you put in a piece of equipment is that if that buzzer goes off a member of the council to respond to it immediately".

Furthermore, maintenance of the technology has cost implications:

> **SC1P1:** "I think one of the implications of technology as well is that it's all powered… if a piece of technology breaks down you are relying on an engineer to come out and fix it."

The Policy focus group expressed concerns with maintaining any current cost benefits. They pointed out that technology can be a way to save money in the long run.

> **Pol1P2**: "putting someone in care can cost a lot of money – care packages can be cheaper"

> **Pol1P1**: "you would need to find out if it was cost effective."

> **Pol1P2:** "if it [technology solutions] is cost effective and done properly then it is good and preferable to home care."

Pol1P2: "it all comes down to cost…you have to say no to some people…there has to be a cut off point [for services]."

Another theme that emerged across all groups was the need to continue to invest money in both the human and technological aspects of care. There is a lack of time available to qualified social care professionals and this may act as a barrier to them being able to increase their knowledge on technologies:

Tech1P1: "the staff need to be trained….there isn't enough money invested in this…"

SC2P3: "our case loads are extremely high and we don't have time".

3.4 Individual and dynamic user needs
The text based scenario given to all focus group participants to read prior to the focus group discussion described a couple who had individual care needs (one needing support with physical tasks and the other needing support with cognitive (memory) function). The potential for conflict in the acceptance of technology into the home when there is more than one person living in the home was raised:

SC1P1: "The fact that as a couple, they are still two individuals and they have got different needs and they may have different expectations to what's available and what they'll agree to accept or be able to accept."

SC1P1: "…best to have two care workers to handle this….the needs of one person might conflict with the other person's needs."

SC2P4: "…need for a full assessment. Not assumed needs but real needs….of both the individuals and of their joint needs together…..they are two individuals but they share the same space…"

The solutions being designed within our project acknowledge the home as a shared interaction space and as such provide options for personalization, negotiated configuration and alternative modalities of interaction tailored to user capabilities, preferences, and location. Several comments across all the focus groups supported this design aim:

SC1P2: "…offering new ways to do things if they have a stroke for example or start to lose their hearing…"

Pol1P1: "beeping and noises and high-tech are not the best for people with dementia"

Pol1P1: "different people have different needs…how can it work for everyone?"

Pol1P2: "things like autism might be too individualised. Care packages need to be tailored."

Adaptation and tailoring care and technology to peoples varying needs was also discussed explicitly in the focus groups.

Pol1P1: "it could be adaptable…but this could be tricky…"

Pol1P2: "Mind you…this is also true of existing [non AT] care packages as well."

This confirms our belief that home care technologies need to offer term configuration choices to tailor devices and interaction methods to the user(s). Furthermore, our solutions also aim to examine methods for supporting longer term configuration of home care systems over time as the available

devices or services change, or as a persons living circumstances or care needs change.

3.5 Appropriate use/prescription of technology
Several comments were made regarding the assessment protocols currently in use for prescribing technology. It emerged that much of the technology and technicians' time could be better utilized if the service users and those prescribing the technology knew exactly what was available and what it is that they wanted,

Tech1P1: "OTs [Occupational therapists] need to assess what they actually need first."

Furthermore, it was believed that low tech solutions should always be considered first, and then if appropriate, the matching of the right technology to the right person for the right purpose needs to take place.

Tech1P2: "Matching the right equipment to the users [is important]"

A lack of knowledge was suggested by the technology technicians to lead to mis-prescription or over prescription.

Tech1P1: "If they [social care professionals] are not well trained they tend to go over the top and fit things that are not required to cover every possible scenario".

Tech1P1: "Sometimes we fit things and I think 'why am I fitting this here'?...when you go back you can't find it…it's often in a drawer…".

One way to monitor if technology is being both prescribed and used successfully is to include some form of audit or evaluation of the technology in use.

Pol1P2: "put in some technology and then revisit to assess how it is working."

This may help to identify to further understanding about the factors that lead to the use, non-use or mis-use of technology for supporting social and health care at home. The policy maker's also wanted to have clear information about the cost-effectiveness of prescribing home care technologies and how this would compare with other care options. It was clear from the focus groups that this does not currently happen.

Furthermore, the practicality of implementing home care technology packages within Scotland was considered and lessons learned from previous national Scottish initiatives:

Pol1P2: "Free personal care…has been a big issue in Scotland and..…certain local authorities cant afford it and are digging themselves into holes because of what was expected of them…so it comes down to the dynamics…..the area of Glasgow that I work has the highest population of pensioners compared with anywhere in Western Europe so you know there are big demands, in sort, of areas like that."

The limitations of technology in supporting all the care needs of an individual living at home were highlighted by the policy group:

Pol1P1: "…any system would [still] need help from social care workers coming in…for example with cleaning and cooking."

Furthermore, there was reluctance to prescribe technology routinely:

SC2P3 "I would see in the community before I'd look at technology"

However, for there to be a successful implementation of government documents such as the White Paper, 'our health, our care, our say' [2] Social care professionals need to acquire knowledge and confidence in technology and understand how it can be used to support current care packages and not replace them.

3.6 Awareness, Education, and Training

There is strong evidence from the social care and assistive technology technician's focus groups that demonstrates an urgent need for training, awareness raising, independent and supplier-neutral information, and the procedures required for effective use of assistive technologies into the care packages of older people:

> **SC2P2:** I think there is variance in understanding of it [referring to home care technologies] and I think that is something that needs to be addressed".

> **SC2P2:** "…when I'd spoke to the workers [referring to prescribing technology for a client] they were like, they panicked slightly, they don't know who to speak to about it…the reaction was oh I don't know how to do this, is that not for old people and there was that kind of reaction."

At present the main source of training opportunities in assistive technology are limited to:

> **SC2P5:** "We have with the Tunstall case here now, you know, that has all the different bits and pieces and we have a DVD from Sensorium".

It is important that every practicing care professional should have access to detailed, accurate, objective and consistent information on assistive technologies. There was a general feeling from all focus group participants that they wished to increase their knowledge in assistive technologies. However, there was a belief that:

> **SC2P4:** "because technology changes so fast and because there's, kind of, multiplicity of need out there, you know, it would be really hard to, kind of, if it wasn't your mainstream job to keep abreast of technology and to be able to attend, whether its national or local conferences, look at developments and how they would apply in a local context so I think, you know, probably it does need to be somebody's job".

In addition, there is a lack of time available to qualified social care professionals that may act as a barrier to them being able to increase their knowledge:

> **SC2P3:** "our case loads are extremely high and we don't have time".

However, if there is to be a successful integration of advanced technologies into the care packages prescribed by social care professionals:

> **SC1P2:** " we need to know what is available and actually see it working for ourselves"

The desire for hands on demonstration showing the possibilities of new available technologies, allowing time for interaction with these technologies is paramount.

SC2P3: "I've got to see it physically working, you know, and I hate reading from books or whatever…"

Furthermore, previous misconceptions about or negative attitudes towards technology may also be resolved by improving education, training and awareness of home care technologies:

> **SC2P5:** "a, kind of, small presentation with some equipment there for demonstration purposes coz I think that's an opportunity for people to be able to raise things that they're concerned about and, you know, maybe where they've thought about technology in the past and, you know, em, had some issues maybe with some of the alarm stuff or that so I think it's a good opportunity or forum to be able to feed that back"

The technology technician's focus group highlights a possible lack of knowledge may also account for the frequent non-use of installed technologies in the homes of older people.

> **Tech1P1:** "A big proportion of the equipment isn't used…it's hard to tell if they don't know it's there or if they know about it and don't want to use it

It is important to identify whether a lack of knowledge has led to the mis-use of these technologies or if there are attitudinal beliefs that prevent these technologies being used appropriately. Therefore, interventions that would be appropriate to increase the uptake of technology use among these older people can be identified.

In addition, a lack of knowledge about home care technology was suggested by the technology technicians group to have a negative affect on the quality of life of the older person.

> **Tech1P1:** "They [the service users] are frightened because [they think] hidden cameras are behind them…they think they are being watched."

> **Tech1P2:** "…when he saw [a man with an epilepsy monitor] the light…he called the centre to say he was okay every time….he thought the flashing light indicated he was having a fit and he wasn't".

Furthermore, it was highlighted that the expectation of technology can sometimes be unrealistic:

> **SC1P3:** "[the technology] is not going to stop particular problems occurring and I think that's where some people think it's the miracle – we'll put something in and their elderly parent will stop falling or stop trying to get out and wander down the street."

This demonstrates the importance of a protocol to asses if the person prescribed technology and the other stakeholders involved have clearly understood the purpose of any technology in their home and know where they can get any additional information.

> **SC2P5:** "…people have a lack of understanding so I think you need to pitch the publicity right about what you are doing".

It is clear from our stakeholder engagement work that this issues is one which needs to be addressed to increase the successful uptake of home care technologies. We believe if this is addressed, many of the existing barriers discussed here (perceived technophobia, mis-prescription of technology, mis-use and non-use of technology, ethical concerns etc.) will be reduced.

4. CONCLUSIONS

Home care is a complex domain with many characteristics making it difficult to apply any one standard existing design methodology [6]. The 'users' can cross many stakeholder groups from the person receiving the care themselves, to friends and family to health and social care professionals prescribing the equipment, configuring it for their clients, or sending or retrieving data from the system within the home or remotely in their office or on the move. Each of these stakeholders has their own set of goals and needs and as such has either a different set of requirements or at least a set which is described and prioritized in a manner unique to their own group,

If home care technology is to become an integral part of future home care support packages the technology must gain acceptance from all stakeholders. The focus group discussions have indicated a number of potential areas where conflict may arise when considering technology to support care at home:

- The technology design and function should consider that the person with care needs may not be living alone.

- The acceptance levels may vary for people who live in the same dwelling where technology is prescribed.

- The technology should allow for personalization, customisation, and adaptation where appropriate

- The technology should achieve a balance between being unobtrusive yet not hidden entirely from the users

- Different users will want different levels of visibility of the systems' behaviour and capabilities

- Different users will want different levels of knowledge and control over the system

An awareness of these conflicts may, in fact, bring about better services that have been developed with an understanding and an appreciation of all stakeholder needs so that technology developers have designed the technologies in a way that can be easily tailored to suit individual requirements.

In addition, the service user groups often have complex care needs, impairment, or disabilities which can dramatically affect the nature and stability of their needs and requirements over time. Finally, new services and devices are becoming available all the time which mean that requirements methods should be flexible enough to capture these complex and dynamic needs, and allow them to be monitored and revisited over time if required. Only when these requirements are identified and explored in detail can they inform the design and implementation of home care technologies in practice.

The successful implementation of advanced home care technologies into routine care assessments requires the 'buy in' from social care professionals involved in the assessment for a care package. Staff who are responsible for making the assessments for the appropriate care packages for older people need to hold positive beliefs towards such technology.

It could be that certain social care professionals do not consider home care technology until other care options have been considered because there are sufficient resources within that area to meet demand. However, Scotland has an ageing population and increases in age are typically associated with increases in impairment and disability. Therefore, as life expectancy increases, the potential impact on health and social care services is likely to be an increase in the numbers who require long term care resources. In addition, population demographics have also shifted in that families are not living as close to one another as in the past reducing the availability of informal carers. Furthermore, the birth rate in Scotland has declined and coupled with increasing life expectancy there is likely to be a shortage of carers to care for the ageing population in the future. Therefore, alternative models of care need to be in place before a crisis point is reached.

One of the most prevalent findings from our focus groups is that there is a clear demand for awareness raising and knowledge building on the range, scope and capabilities of current assistive technologies and the assessment protocols and procedures that exist within the care organizations. Examples include:

- What technology is available?
- Where is the technology available from?
- How is the technology prescribed?
- What is the organisational funding procedure?
- What permissions are required (e.g. informed consent and other ethical aspects)?
- What are the advantages and disadvantages of particular choices?
- What are the privacy and security issues that increased connectivity of home care systems introduces?
- How do client preferences, attitudes and situation affect the choice of technology support?

The evidence to support the use of advanced assistive technologies for the provision of social and health care at home remains sparse. This is partly because these services are still in their early days but it is also appears to be because of attitudinal issues, resource constraints, ethical concerns, a lack of training and information and a lack of evaluation of these kinds of services. It is important that appropriate evaluations are conducted to investigate all of these issues and dissemination of the lessons learned is made widely available.

In conclusion, it is important to provide methods that support multiple and distributed stakeholders in the design and ongoing use of home care systems. Our methodologies thus far have focused on bringing together the various stakeholders of home care to singularly or collaboratively identify and negotiate requirements or designs for home care technology. Future work will extend this work to include all the stakeholder groups identified and to compare the themes emerging from the single and mixed stakeholder groups. The results from all of this work is currently being used to inform the design of future home care technologies that are acceptable, usable, and fit in to current and emerging care models.

5. ACKNOWLEDGMENTS

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