Title
Falls in older people: The place of telemonitoring in rehabilitation.

Author
Khim Horton
PhD, BSc(Hons), RN, RCNT, RNT, PGCEA
Lecturer

Affiliation
Centre for Research in Nursing and Midwifery Education
Division of Health and Social Care
Faculty of Health and Medical Sciences
University of Surrey
Guildford
Surrey
GU2 7TE

Contact details
Tel: +44 (0)1483 684555
Fax: +44(0)1483 686711

Email
K.Horton@surrey.ac.uk
Abstract

This article reports the qualitative element of an observational study that examines whether an extended alarm service using fall detectors and bed occupancy sensors for community-dwelling older people who had recurrent falls can reduce their fear of falling. Seventeen participants in the intervention group used the extended alarm service while 18 in the control group used a standard pendant alarm. Individual tape-recorded interviews were also conducted and transcribed. Their fall history and whether they were afraid of falling were also explored. Interviews consisted of questions that were grounded in theories relating to falls and their expectations of and experiences with the use of telemonitoring devices while those in the control group were asked if they would consider using such devices in the future. Key themes from the analysis were expectations, feeling secure, Call Centre support, barriers to using assistive devices, adherence and likelihood of using telemonitoring devices. Older people found the use of telemonitoring gave them ‘a greater sense of security’ and enabled them to remain in their home. However, some found the devices ‘intrusive’ and did not feel they were in control of alerting the call centre, which played a key role in their adherence to using the devices.

Key words [up to 10]

Bed occupancy sensor, Community setting, Falls, Fall detector, Fear of falling,
Observational study, Older People, Telemonitoring,

Funding source
Guildford and Waverley Primary Care Trust and Guildford Borough Council, England.

Project number: EC/2—3/89/EIHMS
INTRODUCTION

The United Kingdom (UK) has an ageing population that results from declines in the mortality rate and in past fertility rates, leading to an increasing proportion aged 65 and over [1]. In the past thirty years, the population aged over 65 grew by 31 per cent, from 7.4 to 9.7 million [1]. Demographic changes, social and political influences are leading to a greater number of older people living alone [2]. Among older people living in the community, people aged 64 and over, 28-35% experience a fall each year [3]. The frequency increases with age, with 32%-42% of those aged 70 or more having a fall each year [3,4]. The World Health Organisation recognises that the need to raise awareness to the magnitude of falls in older people and that the personal, family and societal impact of fall-related injuries is a fundamental health issue [4]. Further, Kronfol reported that the fear of falling is widespread and is now recognised as a risk factor in the fall prevention literature [5].

Twenty to sixty percent of older people living in the community reported a fear of falling; this was greater among older women and increased with age [6]. The impact of fear of falling on the health of older people has been documented widely; Vellas et al found a marked loss of confidence and reduction in activities [7]; Cumming et al reported a decrease in quality of life, decreased mobility and functional decline [8]. Whitehead et al found some residual handicap with a mean London Handicap Scale (LHS) of 0.067 [9]. Those who had fallen had lower self-efficacy and greater handicap (LHS), and those with slower gait speed were more handicapped (LHS), had lower self-efficacy and lower Berg Balance Scale (BBS) scores [9]. Indeed concerns of the psychological impact of falls
have led to researchers such as Tinetti and her colleagues to measure an older person’s self-perceived fear of falling using Falls Efficacy Scale (FES) [10,11]. The FES, based on Bandura’s theory of self-efficacy evaluates the individual’s confidence in engaging in several activities of daily living without falling or losing balance. These activities included cleaning the house, getting dressed and undressed and preparing simple meals.

Older people are more likely to subscribe to a social alarm device after experiencing a fall or other difficulty [12, 13]. The development of assistive technology systems to enable older people to live independently at home means that initiatives involving the use of telecare and telemonitoring equipments are in place in various parts of the UK [14]. Many studies have found that despite their awareness of new technology and its potential to support independence, the uptake by older people is often fairly low. The most widely used technologies among older people in most countries are radio, television, and telephone; and in recent years a steadily increasing use the cell phone [15]. In this article, the term ‘telecare’ refers to electronic systems and/or devices used to support social care [12, p87]. ‘Telemonitoring’ has been defined as ‘the use of information technology to monitor patients at a distance’ [16, p63]. In telemonitoring, devices such as fall detectors are used to rapidly detect and identify serious falls and ensure an efficient and dependable response according to a person’s needs.

In England and Wales, the National Service Framework (NSF) for Older People advocates the need for the National Health Service to work in partnership with other agencies such as the local councils to implement strategies to prevent and reduce the number of falls among older people [17]. This partnership resulted in a shift in the focus
of service delivery towards a more proactive, preventative model of care [18, 19]. The modernisation of health and social services expects agencies working together to yield better outcomes for service users [19]. Such policies have led to a more integrated approach to falls services in the local area, led by the Primary Care Trust (PCT) to reduce the number of falls, which resulted in serious injury and to ensure effective treatment and rehabilitation for those who have fallen. Better inter-agency working and partnership between the PCT and the local boroughs that provide social services to the community has resulted in close collaboration in services for older people, especially those who were rehabilitating in their own home. Better access by older people to the call centre service has meant that the call centre can respond to any alarm activation, enabling an older people to seek help in events such as a fall.

Body worn devices, such as fall detectors worn on the belt, recognise impacts and/or changes in orientation [13]. The advantages of such sensors are that calls can be immediately transmitted to a third party so help can be obtained. This can potentially reduce the period in which an older person spends on the ground while waiting for assistance. In terms of rehabilitation, telemonitoring such as using these devices potentially improves an older person’s confidence in engaging in activities that they would otherwise feel restricted by a fear of falling. The psychological impact of experiencing a fall can influence the rate of recovery and rehabilitation as McKee stresses that falls can be perceived as ‘a sudden and catastrophic failing of the physical self… has immediate and significant implications for the social self, and ultimately recovery from the event’ [21 p.11].
In this paper, the focus is on the qualitative element of the observational study conducted in southeast England; in particular what are older people’s experience and expectation on the use of telemonitoring devices such as fall detectors and bed occupancy sensors. Included in the discussion will be its implication for the rehabilitation of older people who experienced falls.

**METHODS**

**Participants**

Following approval from both the University and local Ethics Committees, an initial search of the call centre database for participants meeting the criteria identified 213 eligible participants. An invitation letter with written information about the study was sent to them. This was followed up with a telephone call a week later by staff from the call centre. Potential participants were given the opportunity to discuss any part of the project in greater detail. They were assured that the only document containing their name was the consent form. To preserve confidentiality each participant was identified only by a code number or a pseudonym in all subsequent records, data and document.

They were eligible for study if they met all of the following criteria: 1) 65 years of age or more; 2) had at least two or more falls in the six months; 3) lived in the community alone either in their own home, or with a carer, who was away part of the day, or sheltered housing; and 4) were registered with the Call Centre. The person might also have any of the risk factors for falls including Parkinson’s Disease, degenerative joint disease, visual impairment, prescribed takes four or more medications per day, or had a history of blackouts. Excluded were those with a Mini-Mental State Examination score [22] of less
than 24 who were considered as cognitively impaired. For the purpose of this study, a fall is defined as ‘unintentionally coming to rest on the ground floor or other lower level’ [23].

A great proportion of participants [65%] declined to participate, giving one of these reasons:

- ‘I am too old to be bothered’
- ‘I’m quite happy with what I’ve got’
- ‘My family don’t want me to do it’
- ‘No. It’s not for me’.

Older people might be wary that the devices would trigger contact with the warden or call centre beyond their control and that they would rather manage on their own [7]. In another study, Brownsell and Hawley approached community alarm users living in the community to take part in their study using fall detectors [20]. Of those approached, they were able to recruit only 31%. The main reason for declining participation was that they were happy with existing technology.

**Procedures**

This section provides the context on which participants were involved in the study. In practice, those in the control group already had a standard pendant alarm. The intervention group were allocated each a fall detector, a bed occupancy sensor and a key safe. An integrated trigger could activate the fall detector manually so that it could help a person feel more confident and live independently. The fall detector and the bed occupancy sensor worked with the Lifeline home unit, which was linked to a local
community alarm monitoring service managed by the Call Centre. The Lifeline home units would receive a radio signal from the fall detector. This unit would raise a secure call for help that was guaranteed to reach the Call Centre and be responded to. A powerful speaker ensured clear handsfree communication with the Call Centre from anywhere in the home or garden.

The bed occupancy sensor used in this study consisted of the sensor care pressure pad that was placed under the bed mattress and could be programmed with both curfew times (like during holidays) and out of bed times (e.g. getting up in the night). The time limit was set following an assessment of the person’s living pattern. It was also programmed to activate the bedside lamp by means of a hard wire connection, whenever the occupant left the bed. It automatically alerted the call centre when the ‘curfew’ time was exceeded. This would be particularly useful when an older person got up during the night to use the toilet and if an incident occurred during this event, the bed occupancy sensor would activate an alarm. The Call Centre would take one of these actions: a) contact the user to determine the cause b) if no response, contact the next of kin/ neighbour or c) alert the emergency services. This could potentially reduce the length of a long lie after a fall had taken place. Essentially, this approach could reduce any delay in medical treatment required because of an injurious fall, and reduce medical complications [13]. Indeed, Tinetti et al maintain that ‘the most successful approach to prevention, rehabilitation… and management may combine simultaneous attempts to improve both efficacy (i.e. people’s perceptions of their own capabilities) and physical skills’ [11, p.M146]. A keysafe was given free to the participants. This was installed outside the house, and
provided storage of a spare key to the house, thus enabling emergency staff to gain access to the house.

Of the original sample recruited by March 2004, 35 participated in the post-intervention phase of the study. Five (three male and two female) did not complete during the post FES phase in late September. The reasons were: one subject had relocated to a nursing home, another died during the second period, one person declined to continue because of the disruption caused by ‘faulty’ devices, the fourth person because of financial reason, and the last opted out because his improved medical condition meant that he felt he no longer required the call alarm service. The resultant sample included 35 participants: 18 in the control group and 17 in the intervention group (Table 1). The mean age of the participants was 78.2 years. Twenty-eight (80%) of the participants (n=35) lived alone. Five (14%) lived in sheltered housing. Two (6%) were living with their spouse, who were out part of the day. All were retired. All participants were Caucasians, reflecting the demography of the geographical area where the study took place.

The researcher twice visited each participant at baseline in March and six-month post-intervention in late September/ early October. Although the baseline and follow-up visits were made during spring and autumn respectively, these could maximally be prone to a seasonal bias. However, the rationale for choosing these seasons was the mild weather generally experienced in the south of England resulting in no significant variation. For the qualitative aspect of the study, all participants were invited to be interviewed individually.
In-depth interviews

In-depth interviews were conducted in participants’ own home during the follow-up visit. Each interview was tape-recorded and transcribed. Interviews consisted of exploratory questions that were grounded in theories relating to falls and their views on the use of telemonitoring. All participants were also asked about the number of falls they had in the previous six months and if they were afraid of falling. Three pilot interviews were conducted to test the validity of the questions. An analysis was undertaken which indicated the need to modify the interview guide to explore questions on the usability of the telemonitoring devices.

Analysis

As described by Fielding & Thomas [24], qualitative data analysis consists of systematic consideration of the data in order to identify themes and concepts. The author systematically read and coded the data; broad emergent themes were identified and before subsequent coding of all the transcripts. Thematically similar segments of text both within and between interviews were then identified. Consideration was given to the internal consistency of responses, the frequency and extensiveness of participants’ responses and also the specificity of responses.

RESULTS

Are you afraid of falling?

Participants were also asked at baseline and at six months if they were afraid of falling. At the outset, all 17 (100%) participants in the intervention group reported they were afraid of falling. In the control group, 14 (78%) said they were afraid of falling. The response to this question for these 31 participants is summarised in Table 2. It is noted
that eight out of 17 (47%) in the intervention group reported they were no longer afraid of falling, compared to only three out of 14 (21.4%) in the control group. Of the remaining four participants in the control group who were not afraid of falling at baseline, one (25%) continued to be afraid at six months and the other three (75%) were not afraid.

‘How many falls have you had in the past six months? 

One of the key questions asked concerned the older person’s fall history including the number of falls they have experienced in the previous six months. The total number of reported falls at baseline was 51 in the control group, compared with 46 in the intervention group, with a mean of 2.8 and 2.7 falls respectively. The mean number of falls in each group fell at the end of the intervention period to 1.1 falls in both groups, with fewer falls reported, 20 and 19 falls respectively. Eleven participants in the control group and nine in the intervention group had no falls during the intervention period; none had taken up any fall interventions offered locally by their PCT.

Participants in the intervention group were asked about their expectations of and experiences with the use of telemonitoring devices while those in the control group were asked if they would consider using such devices in the future. Six key themes emerged from the analysis and these included expectations, feeling secure, Call Centre support, barriers to using assistive devices, adherence and likelihood of using telemonitoring devices.
The monitoring period

The monitoring period during which the intervention group adhered to using the devices lasted a mean of 15 weeks (S.D 4.2). This is less than the mean monitoring period of 17 weeks (S.D 3.1) reported by Brownsell and Hawley [20]. Feedback from older people in my study indicates that adherence period was influenced by various factors that posed as barriers. This will be explored later.

Expectations

From the perspective of older people, their expectations of what telemonitoring devices would do for them were mixed. In general, they expected the fall detector and/or bed occupancy sensor to activate in the event of a fall, thus providing them with more security that someone at the call centre would know what to do to seek help on their behalf. Among those in the control group, there was the expectation that fall detectors and bed occupancy sensors were more suitable for those ‘frailer’ and who had fallen about:

‘I think it would certainly be helpful to those who are frailer and fall about. I am happy with my pendant here, and I have it on all the time apart from bedtime. Yes, I think they [fall detector and bed occupancy sensor] will suit them nicely.’

Researcher: ‘What about yourself? Do you think you would benefit from them?’

‘I don’t know. I am not that bad really. I mean I do have falls every now and then but I haven’t had a bad one.’ [Male, aged 87]
‘It would appeal to someone who falls a lot. I’m quite lucky really, only had 2 small falls, and if I can get up myself I don’t bother about asking for help. Just get up and try to get on with life. There’s no need to alarm anyone.’ [Female, aged 73]

Older people perceived others to be worse off than them despite their reported number of falls. Interestingly, those who had had many falls did not perceive themselves as likely users for the extended service because their falls were ‘small’ or not ‘bad’ enough. Among those in the control group only frailer older people with history of severe falls were perceived to benefit from an extended alarm service.

**Feeling secure**

Some older people were positive about the use of telemonitoring devices since these devices provided them with the added security in the event of a fall when some help would be instigated, for example:

‘It makes me more secure. I feel that it will know when I had a fall. From my past experience from that point of view, it was nice to know that you have something to fall back on.’ [Female, aged 79]

‘But yes, it does give you a sense of security. I mean, if I fall and could not press my pendant, I know someone at the centre will know something has happened, wouldn’t they? That in itself must be a good thing.’ [Female, aged 72]
‘To be honest with you, I daren’t venture out into the garden. I mean come and look at my back garden. See that bit over there. I daren’t do any gardening for a couple of years, literally, you know. I was scared that I might fall and no one would know that. It does worry me you know. Then with this thing [fall detector] it sort of, you know, made me feel I could risk it.

Researcher: Risk it? What do you mean?

Yes, risk it. You know, wearing this thing, I know that if I fall someone at the Call Centre would know what to do... I mean, I haven’t done any bit of gardening. I had to rely on my son whenever he comes round. But now, I feel safe enough to venture out and dig up that corner. See for yourself. I have weeded it. It makes a difference, you know.’ [Female, aged 85]

As the above quotes illustrate, older people who received the extended alarm service in the community felt that they were very much supported to remain in their own homes, and that they knew help would be available if they encounter any difficulties, as also found in Bowes and McColgan’s work [12]. As illustrated above, the use of telemonitoring devices could enrich an individual’s quality of life. This in some ways could be seen as a positive contribution to the rehabilitation of those who were ‘recovering’ from the experience of falls.

Call Centre support
The introduction of an extended service by the Call Centre to include fall detectors and bed occupancy sensors meant that staff support had to be available. In this study, such support and help were valued by older people as illustrated below:

‘The call centre has been very helpful. I don't know what I’ll do if they weren't at the end of the telephone. They were ever so patient with me, even when there were false alarms. They just dealt with it well, they were shall we say nothing is too bothersome for me. Yes, I am pleased with the help given’. [Male, aged 68]

‘The responses from the centre were very quick. No complaints at all. Periodically they phoned to say that my battery needs changing’. [Female, aged 88]

The use of these devices not only brought about speedy responses in the event of falls or other urgent situations but also gave older people ‘a greater sense of control at a time of recovery and/or coming to terms with some loss of control over their physical selves, and perhaps redefining their view of independence’ [13, p.211].

**Barriers to using assistive devices**

Although there were several benefits to telemonitoring, the manner in which it operated could lead to help being given, and in response to false alarms when help is not required [13 p.213]. However, in this study there were several reasons why some older people chose not to continue with the use of the fall detector and bed occupancy sensor in the future and raised the issue of ‘adherence’. For some, the devices became a ‘nuisance’
because of the physical aspect of having to wear the fall detector on their waist, and when the detector triggered false alarms:

‘I just think it’s not going to work properly if it gives a false alarm. I don’t want it to become a nuisance to people’.

Researcher: ‘What about yourself’?

‘Oh, me too. I found it a nuisance, no doubt about it’. [Male, 86]

‘Taking my trousers off was a nuisance with them thing [fall detector] round my waist. I don’t like it round my waist, it kept moving round to my front’. [Male, 90]

‘I’ve not been very successful with it. I don’t think it really worked for me, it kept giving these false alarms and they became quite a nuisance that I’d never bothered to wear it after a while. They kept ringing me up to say my alarm had sounded. I don’t know why but it does mean I can’t move easily without causing it to bleep. I know I shouldn’t be moaning about it but I think you should know if it worked for me’. [Female, aged 74]

The number of false alarms reported by older people varied, ranging from a couple to 30. Older people also felt restricted in their daily activities for fear of triggering an alarm when they did not fall. The physical aspect of wearing the alarm also posed a problem for those whose body ‘shape’ meant that the fall detector worn on the waist could not be held in one position as needed. These negative experiences have implications for the rehabilitation of older people who experienced falls and may be recovering from the physical and/or emotional impact.
**Not being in control**

Just over half (n=9, 53%) in the intervention group expressed a preference to using the standard pendant alarm because it meant that they were in control of when they wish to activate the alarm and felt that it alone would have provided an adequate service. With the use of the fall detector, they did not feel in control:

‘I don’t feel in control with these devices. I cannot hear a thing. I woke up at 2 am with a room full of people. It [bed occupancy sensor] has activated, and everybody turned up- the Ambulance and neighbours. My bedroom was full of people. Straight away, I rang up the first thing in the morning and said to them “you’d better take it away”. You need to feel in control. I just don’t feel in control if it [bed occupancy sensor] can’t work properly. Same thing with that detector- it’s no good if it gives false alarm.’ [Male, aged 90]

‘I mean, with the pendant alarm you feel you are in control of what happens. I only have to press the button to ask for assistance. With this new thing, the detector, it’s different. You are really not in control of when it is going to send a signal to the Call Centre. I don’t want it to go off whenever it feels like it’. [Female, aged 68]

‘I’ve had 2-3 false alarms but that’s enough to put you off wearing it. It’s like you’re having to explain things, I mean, that I hadn’t fallen. You rather lose control all of a sudden. Before, you have to press this button [pendant alarm]. Now, with this fall detector you don’t have to do that. It does it for you and you
sort of can’t do anything about it when it phones through to the centre. Don’t get me wrong, I do appreciate what the council is trying to do. But it’s no good to me if it gives the signal too often. I am happy with my button thing [pendant alarm] here.’ [Female, aged 86]

Both older men and women reported a feeling of not being in control; this played a key role in the adherence to the ‘new’ regime. This was supported by Brownsell et al [24] affirming that in relation to a wide range of technologies that could be used to improve healthcare, that older people ‘dislike the thought that the technology is in control of them, rather than the other way round’.

**Intrusion**

As well as not being in control, some older people in the intervention group found using a fall detector and a bed occupancy sensor an ‘intrusion’:

‘I’m a restless sleeper, and I think all I have to do to trigger that thing off [bed occupancy sensor] is wriggling in bed. No, it hasn’t restricted my lifestyle but I feel it somehow intrudes if you understand what I’m trying to say. I’m not expressing myself clearly. It’s like, when the alarm goes you feel you ought to explain to the Call Centre but you can argue that what I do in my bed is my business- no one else’s.’ [Female, aged 69]

‘I hope I don’t come across as awkward here. What I’m trying to say to you is that I’m thankful for what you and the others are trying to do for me. I am pleased I can help to try them out. But, but it’s a bit awkward, if you know
what I mean. I cannot do anything private like going to the toilet without it
[fall detector] going off. I was only trying to lower my trousers. Then when
they phone through you have to say what happened. [Male, aged 86]

This sense of intrusion could potentially undermine their confidence in the use of
telemonitoring devices. This concurs with Demiris et al’s finding concerning a sample of
32 older people in a supported housing scheme and a church community in Minnesota
[26 p.281]. Nearly a third of their sample voiced concern about the violation of their
privacy when using technologies in their home.

Adherence

It was felt important to explore with older people their adherence to using the devices.
For the majority, the level of adherence appeared to be influenced by the number of false
alarms triggered by the sensitivity of the devices and by their own forgetfulness due to a
change in routine:

‘I usually have it on a belt, after I’ve got dressed and when I go to bed. I had it
for about 3-4 months’.

Researcher: ‘Where is it now?’

‘Oh, over there, up on the mantelpiece.’

Researcher: ‘Why aren’t you wearing it now?’

‘To be honest, I just don’t remember. I was good for the first few months, then
I went away for a few days, and I couldn’t have it with me because it wouldn’t
work in my daughter’s house. Then I came home and I suppose it’s like most
things, you try it for a while and then you forget it.’ [Female, aged 77]
'I must confess I hadn’t got on very well with it. I was in the bedroom getting dressed, bend down to put my socks on and it was a false alarm. I would get a false alarm at least once a week... Even my cat knocks it over and it triggers it [fall detector].'

Researcher: How long did you wear it for?’

‘During the day, when I got dressed. Mind you, sometimes I forgot to put it on.’

Researcher: Where is it now?’

‘By my bedside [laughs]. I know I should have it on all the time, but it becomes a joke after a while because of the wretched alarms.’

Researcher: ‘If you hadn’t had those false alarms, would you have remembered to put it on all the time apart from bed time?’

‘I might have made more of an effort, I think’. [Male, aged 69]

The negative experience brought about by false alarms might explain why the mean of length of time older people had made use of the telemonitoring service was only 15 weeks.

**Technical support**

Although older people found the support from the Call Centre very helpful, there was an expectation among those in the intervention group that the technical support would
include information-giving about the devices and any technical back up when devices were thought to be ‘faulty’.

‘I don’t know if the range would be sufficient to pick up, you know, the signal. I don’t remember them telling me anything about that. I had a fall eight weeks ago in my daughter’s presence. Then it was outside in the garden. Luckily my daughter was around and she helped me. Nothing serious you know but I would have liked to know if this thing [fall detector] would work’. [Female, aged 74]

‘I wasn’t aware. She [Call Centre staff] showed me how to put it [fall detector on a belt] on. It’s only when I have to do it myself that I thought it was awkward to put on.’ [Male, aged 76]

This study shows how important it was to have clear explanations and information reinforced. Indeed Butler had argued that ‘a few older people have failed to have the alarm system explained to them’ [26 p.15].

**Would I recommend it?**

In planning for the future uptake of telemonitoring service such as this, the intervention group were asked if they would recommend the use of a fall detector and a bed occupancy sensor to someone else. Despite some positive feedback, the majority (n=10, 58%) expressed reservations in recommending to their friends and family:

‘Would I recommend it? No, I’ve recommend it to my friend, but she’s not having it after what I’ve been through. [Female, aged 68]
‘Oh no, I certainly wouldn’t be recommending it to my friends. They [manufacturers] have to fine-tune it first before I would dare say ‘yes.’” [Female, aged 88]

‘Not sure really. They really have to sort out the false alarms. It would certainly put people off... To me, they are not reliable enough or should I say, they are just too sensible for my liking, and I am positive my friends would think the same. So I think no.’ [Male, aged 72]

‘I won’t recommend it to anybody. I have to be in control, and then I feel safe. It makes me a damn sight careful about what I do. I have to think about every movement I make in case that damn thing [fall detector] makes a false call. So, on that basis, I won’t recommend it to anyone.’ [Male, aged 90]

The decision on whether to recommend the use of these devices had much to do with older people’s sense of not being in control brought about by the false alarms. However, one 88-year-old woman in the intervention group expressed great satisfaction with the devices and would ‘recommend it to my friends’. This was because she fell out of bed one night and the sensor had activated. It provided her with the added security as highlighted earlier.

**Likelihood of using fall detector and bed occupancy sensor**

Participants in the control group were asked if they would consider using a fall detector and a bed occupancy sensor. Although few expressed an interest, the majority were not in
favour of using them and some voiced concern about the cost implications. Like those in the intervention group, they perceived that those who fall 'badly' would benefit from using such devices.

‘I think it must be a good thing if it’s going to help the Centre know that you’ve fallen. But it must cost a lot and I suppose they’ll [the call centre] want to charge us more than this [pendant alarm].’ [Female, aged 79]

‘I wouldn’t say I would jump for it, if you know what I mean. I know I’d had a few falls but they’re OK. I haven’t hurt myself much. But to have to wear one of those things, well, that would be for those who need it. I’m sure Vera [friend], she falls around a bit, and gets herself bruised. Not long ago she broke her wrist, her left one. Now she would benefit from it. But it’s not for me. I shouldn’t think so.’ [Female, aged 85]

‘I shouldn’t say this, but I don’t think I’ll keep them on. I have trouble remembering to wear my pendant as it is, and I don’t see how it’s going to benefit me. I might have to use one of those if my doctor thinks I need it, like if I broke my arm or leg [laughs]. But, I honestly can’t see how it would help me. As for that bed thing [bed occupancy sensor] I don’t know how it’s going to work. I do move about a bit in bed and I don’t want any bother if something should go wrong.’ [Male, aged 83]

The data generated from the qualitative interviews helped extend understanding of the perceptions of older people’s experience and expectations of telemonitoring. As found in other studies [25], older people were reluctant to use fall detector and bed
occupancy sensor for fear of causing inconvenience to others, as well as to safeguard their independence or control. However, the number of false alarms generated by the faulty devices did impact on the adherence by older people in the use of these devices. It would appear that with the pendant alarm, an older person is able to maintain his or her independence by deciding whether to activate their pendant. This gave them a sense of being in control.

DISCUSSION

To further extend an understanding of the experience of older people with a history of falling, it was important to explore with them whether they were afraid of falling. In this study, 31 (89%) participants reported being afraid of falling at baseline. This changed over a six month period with 21 (60%) remaining afraid of falling. This comprised 25% in the intervention and 34% in the control group. It is unclear why this change had occurred. Studies have shown that up to half of those who have fallen become fearful, but fear of falling is not solely determined by physical vulnerability [9]; many people with poor balance or a history of falls remain confident, while fear of falling is not uncommon among those who have never fallen [20].

The total number of falls fell during the follow-up period, with both groups having a mean of 1.1 per person, compared to 2.8 and 2.7 in the control and intervention group respectively. What is surprising was the number of participants in both groups who reported having no falls at the end of the intervention period (n=11, 61% in the control group, n=9, 53% in the intervention group). It was possible that an initial visit from the researcher [also a qualified nurse] had provided participants an opportunity to ‘talk’
about their falls and the post 6-month visit might have provided them with the additional ‘support’. Although speculative, this might account for why many more reported that they were not afraid of falling. Further investigation into the impact of regular contact with health professionals would be needed to test this hypothesis.

In this study, the expectations of and experience with the use of telemonitoring among older people were mixed. There is a consciousness of the role of such devices as being important for personal security and responded to concerns about the vulnerability of older people [13]. Positive aspects including older people feeling a greater sense of security could enhance their quality of life, as found in Brownsell and Hawley’s study [20], in which most of the users who wore their fall detector felt more confident and independent, and reported that the device improved their safety. An issue arising from this current study stems from the question: could an improvement in being safe result in older people becoming more independent and therefore, take more risk in the way they conduct their activities of daily living?

As found in other studies [6] older people could be reluctant to use fall detector and bed occupancy sensor for fear of causing inconvenience to others, as well as to safeguard their independence or control. This reluctance could be further compounded by the number of false alarms generated that in turn could have an impact on older people’s adherence to using the devices. To increase the period of adherence in the future, it is imperative that service providers ensure that information giving is seen as an important aspect of the telemonitoring service. Written information about how to use the devices
and the technical support available can be helpful reminders for older users and their carers.

Considerations of costs could be a key driver for future implementation in the community. Because of the pilot study, those who participated in the intervention group were provided with the free telemonitoring service. However, subscriptions to this extended service would have to be met by older people themselves. Given the rising numbers expected in the ageing population, the number of those who experience falls is likely to increase. This would have cost implications for service providers. However, Magnusson and Hanson suggest that the key issue is about the quality of life and enhancing care and support for older people and their family, and that emphasis on costs could detract from the potential savings that such services could offer [28].

The current study has some limitations. First, the study was limited in its sample size to make its finding generalisable. Second, there was a degree of selection bias. While attempts were made to match sample by age, the number of participants who agreed to participate and use the devices meant that it could lead to potential bias. Third, the limited available fund was insufficient to enable a larger procurement of devices for the pilot that in turn, had an impact on the size of sample.

**CONCLUSIONS**

The qualitative element of this observational descriptive study provided a user perspective of their expectation of and experience with the use of telemonitoring devices. It is vital that any service involving older people includes a user-perspective. This study
has ensured that older people’s experiences have been valued in order to formulate future policies on this type of service provision.

The findings suggest that although there were positive benefits from using telemonitoring devices resulting in older people feeling more secured and being able to live in their own home, there were some disadvantages. These included the intrusive aspect of telemonitoring which older people reported not being able to get along with their personal life without the fall detector triggering an alarm and the feeling of not being in control as the devices were recording an event had occurred as opposed to an older person having to activate the alarm. It is worthwhile remembering that a key feature of using these devices is automation- there is no need for an older person to press a button or pull a cord for a signal to be passed on to a third party [13]. Obviously ethical dilemmas relating to this would need to be considered when introducing telemonitoring.

The use of telemonitoring in the community to assist older people in the management and prevention of falls requires careful and sensitive implementation. Although older people were cautious about using the fall detectors and bed occupancy sensors, there were clearly some positive aspects arising from their use, in particular how their fear of falling had been reduced. Since the completion of the study, feedback to the manufacturers of the devices has been provided so that older people’s voices can be taken seriously for future refinement. This is particularly important as increasingly, with the use of a wider range of sensors linked to social alarms and in the context of life style monitoring,
responding to falls will be seen as just one important aspect of services that will be featured in social and health care [13].

It is argued that if older people are to be persuaded to subscribe to this type of service there is a need to decrease the sensitivity of the alarm system to minimise the number of false ‘positives’ [generally understood in relation to social alarms as false alarms] so that reliable alert calls are made immediately or soon after a problem occurred [20]. This pilot study shows that continued refinement of the service and system to reduce technical hiccups will be essential to increase acceptability to users [20].

The findings of this study have vast implications for those concerned with the rehabilitation of older people. All health professionals (nurses, therapists, physicians, and other health and social care professionals) have a concern to balance the need for older people’s safety and progress with comprehensive risk assessment, support and encouragement [29]. When referring older people for telemonitoring, health professionals should consider how to create or facilitate an environment that would assist older people to benefit from telemonitoring. By applying specialist knowledge and skills in the use of telemonitoring devices, health professionals have a great deal to offer to the process of rehabilitation in older people who have had falls.

The wider use of social alarms such as fall detectors and bed occupancy sensors will require new working practices at the interfaces between housing, social welfare and healthcare services [26]. This depends on the extent of commitment to user-centred
perspectives and the way in which tensions and conflicts between services and different professional perspectives could be addressed. Fisk argued that the impact of technologies would depend ‘on the outcome of battles between the key actors (health, social welfare and housing professionals) and the extent to which they will take account of user-focused perspectives’ [13, p.18]. He further highlights that with demographic changes, coupled with political agendas concerned with cost cutting, will mean that social alarm provision is more likely to focus on those whose needs are greatest or who buy such services privately (ibid.)
ACKNOWLEDGEMENTS

I would like to acknowledgement Dr Peter Williams for his statistical advice and Professor Pam Smith for reviewing the manuscript.

This material was based on work supported by the Surrey County Council, the Guildford Borough Council, and the Guildford and Waverley Primary Care Trust grant, EC/23/89/EIHMS -RE4010.

The author has declared that no competing interests exist.

REFERENCES

   http://www.statistics.gov.uk/CCI/nugget.asp?ID=06


4. World Health Organisation. Falls Prevention in Older Age: What is WHO doing? Source:
   Accessed 10 September 2007
5. Kronfol N. Biological, Medical and Behavioral Risk Factors on Falls. World Health Organisation.

http://www.who.int/ageing/project/falls_prevention_older_age/en/inded.html


12. Bowes AM, McColgan G.M. Smart Technology and Community Care for Older People. 2006; Edinburgh: Age Concern Scotland.


### Table 1.
Characteristics of participants for the observational study

<table>
<thead>
<tr>
<th>No. of participants (n=35)</th>
<th>Groups</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control (n=18)</td>
<td>Intervention (n=17)</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>12</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-69</td>
<td>2</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>70-74</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>75-79</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>80-84</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>85 and over</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Living situation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Own home alone</td>
<td>14</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Sheltered housing</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>With others (spouse)</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Table 2.

Those who responded ‘yes’ to the question ‘Are you afraid of falling?’

<table>
<thead>
<tr>
<th>Group</th>
<th>Baseline</th>
<th>Six months post-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>14 (40%)</td>
<td>12 (34%)</td>
</tr>
<tr>
<td>Intervention</td>
<td>17 (49%)</td>
<td>9 (26%)</td>
</tr>
</tbody>
</table>