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Falls in older people: The place of telemonitoring in rehabilitation

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Abstract—This article reports the qualitative element of an observational study that examined whether an extended alarm service using fall detectors and bed occupancy sensors could reduce fear of falling among community-dwelling older people who had recurrent falls. The 17 participants in the intervention group used the extended alarm service while the 18 in the control group used a standard pendant alarm. Individual interviews were tape-recorded and transcribed. The participants' fall history and whether they were afraid of falling were also explored. Interview questions were grounded in theories relating to falls and queried participants in the intervention group about their expectations of and experiences with the use of telemonitoring devices; those in the control group were asked whether they would consider using such devices in the future. Key themes from the analysis were expectations, feelings of security, call center support, barriers to using assistive devices, and adherence and likelihood of using telemonitoring devices. Older people found that 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 center, which played a key role in their adherence to using the devices.

Key words: assistive devices, bed occupancy sensor, community setting, fall detector, falls, fear of falling, observational study, older people, rehabilitation, telemonitoring.

INTRODUCTION

The United Kingdom has an aging population as a result of declines in the mortality rate and past fertility rates that led to an increasing proportion aged 65 and over [1]. In the past 30 years, the population over age 65 grew by 31 percent, from 7.4 million to 9.7 million [1]. Demographic changes and social and political influences are leading to a greater number of older people living alone [2]. Among people aged 64 and older living in the community, 28 to 35 percent experience a fall each year [3]. The frequency of falls increases with age, with 32 to 42 percent of those aged 70 and older having a fall each year [3–4]. The World Health Organization recognizes that raising awareness of the magnitude of falls in older people and 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 recognized 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 percentage 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; for example, Vellas et al. found a marked loss of confidence and reduction in activities [7] and Cumming et al. reported decreased quality of life, mobility, and function [8]. In addition, Whitehead

Abbreviations: FES = Falls Efficacy Scale, LHS = London Handicap Scale, PCT = Primary Care Trust, SD = standard deviation.

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et al. found that their sample of older people had some residual handicap, with a mean London Handicap Scale (LHS) of 0.067 [9]. Those individuals who had fallen had lower self-efficacy and greater handicap (LHS), and those with slower gait speed were more handicapped (LHS) and had lower self-efficacy and Berg Balance Scale scores [9]. Indeed, concerns about the psychological impact of falls have led researchers such as Tinetti and her colleagues to measure older persons' self-perceived fear of falling by using the 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 include 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 that enable older people to live independently at home means that initiatives involving the use of telecare and telemonitoring equipment are in place in various parts of the United Kingdom [14]. Many studies have found that, despite older people's awareness of new technology and its potential to support independence, their uptake of such technology is often fairly low. The most widely used technologies among older people in most countries are radio, television, and telephone; in recent years, use of the cell phone has steadily increased [15]. In this article, the term "telecare" refers to electronic systems and/or devices used to support social care [12, p. 87]. "Telemonitoring" has been defined as "the use of information technology to monitor patients at a distance" [16, p. 63]. In telemonitoring, devices such as fall detectors 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 for Older People advocated the need for the National Health Service to work in partnership with other agencies, such as the local councils, to implement strategies that prevent and reduce the number of falls among older people [17]. This partnership resulted in a shift in the focus of service delivery toward a more proactive, preventative model of care [18–19]. The modernization 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 resulting in serious injury and to ensure effective treatment and rehabilitation for those who have fallen. Better interagency working and partnership between the PCT and the local boroughs that provide social services to the community have resulted in close collaboration in services for older people, especially those rehabilitating in their own home. Better access by older people to the call center service has meant that the call center can respond to any alarm activation, enabling older people to seek help in events such as a fall [20].

Body-worn devices, such as fall detectors worn on the belt, recognize impacts and/or changes in orientation [13]. The advantage of such sensors is that calls can be immediately transmitted to a third party so help can be obtained. This rapid transmission 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 use of these devices, potentially improves an older person's confidence in engaging in activities that they would otherwise feel restricted from doing by fear of falling. The psychological impact of experiencing a fall can influence the rate of recovery and rehabilitation; as McKee stresses, falls can be perceived as "a sudden and catastrophic failing of the physical self . . . [which] has immediate and significant implications for the social self, and ultimately recovery from the event" [21, p. 11].

In this article, the focus is on the qualitative element of the observational study conducted in southeast England; in particular, I explore older people's experiences with and expectations of the use of telemonitoring devices such as fall detectors and bed occupancy sensors. Included in the discussion will be this element's implication for the rehabilitation of older people who have experienced falls.

METHODS

Participants

After approval from both the university and local ethics committees, I performed an initial search of the call center database for participants meeting the criteria and identified 213 eligible participants. An invitation letter with written information about the study was sent to them. This letter was followed up with a telephone call a week later by staff from the call center. 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 their confidentiality, participants were identified only by a code number or a pseudonym in all subsequent records, data, and documents.

Potential participants were eligible for study if they met all the following criteria: (1) were 65 years of age or older; (2) had had two or more falls in the past 6 months; (3) were living alone in the community, either in their own home or with a carer who was away part of the day, or in sheltered housing; and (4) were registered with the call center. The person might also have any of the risk factors for falls, including Parkinson disease, degenerative joint disease, visual impairment, prescriptions for four or more daily medications, and a history of blackouts. Excluded were persons who had a Mini-Mental State Examination score [22] of less than 24 and thus were considered cognitively impaired. For this study, a "fall" was 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 will trigger contact with the warden or call center beyond their control, and thus they would rather manage on their own [7]. In another study, Brownsell and Hawley invited community alarm users living in the community to participate in their study on the use of fall detectors [20]. Of those approached, they were able to recruit only 31 percent. The main reason that persons gave for declining participation was that they were happy with their existing technology.

Procedures

This section describes the context in which participants were involved in the study. In practice, those in the control group already had a standard pendant alarm. Those in 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 the person could 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 center. The Lifeline home units received a radio signal from the fall detector. This unit then raised a secure call for help that was guaranteed to reach the call center and receive a response. A powerful speaker ensured clear, hands-free communication with the call center from anywhere in the home or garden.

The bed occupancy sensor used in this study consisted of a 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 hardwired connection, whenever the occupant left the bed. It automatically alerted the call center when the curfew time was exceeded. This feature would be particularly useful, because if an older person got up during the night to use the toilet and an incident occurred during this event, the bed occupancy sensor would activate an alarm. Upon receiving a call, the call center would take one of these actions: (1) contact the user to determine the cause; (2) if no response, contact the next of kin or neighbor; or (3) alert the emergency services. This approach could potentially reduce the length of a long lie after a fall. 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]. Participants also received a free key safe. The safe was installed outside the house and stored a spare house key, thus enabling emergency staff to gain entry to the house.

Of the original sample recruited by March 2004, 35 participated in the postintervention phase of the study. Five (three males and two females) did not complete the post-FES phase in late September. The reasons that these five subjects did not continue their participation, respectively, were (1) relocation to a nursing home, (2) death during the second period, (3) disruption caused by "faulty" devices, (4) financial reasons, and (5) improved medical condition such 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 lived alone. Five (14%) lived in sheltered housing. Two (6%) were living with their spouses, who were out part of the

Table 1.
Participant (N = 35) characteristics by treatment group in study on use of telemonitoring devices.

Characteristic	Control (n = 18)	Intervention (n = 17)
Sex		
Male	6	7
Female	12	10
Age		
65–69	2	6
70–74	3	4
75–79	2	2
80–84	5	0
≥85	6	5
Living Situation		
Own Home Alone	14	14
Sheltered Housing	4	1
With Other(s)/Spouse	0	2

day. All were retired. All participants were Caucasian, reflecting the demography of the geographical area where the study occurred.

I twice visited each participant: at baseline in March and 6 months postintervention 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 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 the 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 related to the participants' views on the use of telemonitoring. All participants were also asked about the number of falls they had had in the previous 6 months and whether they were afraid of falling. Three pilot interviews were conducted to test the validity of the questions. An analysis indicated the need to modify the interview guide to explore questions on the usability of the telemonitoring devices.

Analysis

As described by Fielding and Thomas [24], qualitative data analysis consists of systematic consideration of the data in order to identify themes and concepts. I systematically read and coded the data, then identified broad emergent themes before subsequently coding 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

Afraid of Falling

Participants were asked at baseline and at 6 months whether 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 the 35 participants is summarized in **Table 2**. Note that 8 out of 17 (47%) in the intervention group reported they were no longer afraid of falling, compared with only 3 out of 14 (21%) in the control group. Of the remaining four participants in the control group who were not afraid of falling at baseline, one (25%) was afraid at 6 months and the other three (75%) were not afraid.

Falls in Past 6 Months

One of the key questions concerned the older person's fall history, including the number of falls experienced in the previous 6 months. The total number of reported falls at baseline was 51 in the control group and 46 in the intervention group, with a mean of 2.8 and 2.7 falls, respectively. The mean number of falls in each group dropped at the end of the intervention period to 1.1 falls in both groups, with fewer total 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.

Table 2.
Participants (N = 35) who responded "yes"' to question, "Are you afraid of falling?" before and after intervention with telemonitoring devices.

Group	Baseline, n (%)	6 Months Postintervention, n (%)
Control	14 (40)	12 (34)
Intervention	17 (49)	9 (26)

Participants in the intervention group were asked about their expectations of and experiences with the telemonitoring devices, while those in the control group were asked whether they would consider using such devices in the future. Six key themes emerged from the analysis: expectations, feelings of security, call center support, barriers to using assistive devices, and adherence and likelihood of using telemonitoring devices.

Monitoring Period

The monitoring period during which the intervention group adhered to use of the devices lasted a mean ± standard deviation (SD) 15.0 ± 4.2 weeks. This period is less than the mean ± SD monitoring period of 17.0 ± 3.1 weeks reported by Brownsell and Hawley [20]. Feedback from older people in my study indicates that the adherence period was influenced by various factors that posed barriers. These factors 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 the security that someone at the call center would know what to do to seek help on their behalf. Those in the control group expected that fall detectors and/or bed occupancy sensors were more suitable for those who were "frailer" and fell often.

> 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, age 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, age 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 a 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 that in the event of a fall, 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, age 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 center will know something has happened, wouldn't they? That in itself must be a good thing."
>
> —Female, age 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 center 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, age 85

As these 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

encountered any difficulties, results also found in Bowes and McColgan's work [12]. As just illustrated, the use of telemonitoring devices can enrich an individual's quality of life. This finding, in some ways, could be seen as a positive contribution to the rehabilitation of those who were "recovering" from the experience of falls.

Call Center Support

The call center's introduction of an extended service that included 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 subsequently illustrated.

> The call center 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, age 68

> The responses from the center were very quick. No complaints at all. Periodically they phoned to say that my battery needs changing.
>
> —Female, age 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 several benefits to telemonitoring existed, the manner in which it operated could lead to help being given in response to false alarms, when help is not required [13, p. 213]. However, in this study, several reasons existed why some older people chose not to continue with the use of the fall detector and bed occupancy sensor in the future and these reasons 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 because 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, age 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, age 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, age 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%) the participants in the intervention group preferred to use the standard pendant alarm because it meant that they were in control of when to activate the alarm and because they 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 neighbors. 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, age 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 center. I don't want it to go off whenever it feels like it.
>
> —Female, age 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 center. 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, age 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 finding was supported by Brownsell et al. [25], affirming that in relation to a wide range of technologies that could be used to improve healthcare, older people "dislike the thought that the technology is in control of them, rather than the other way round."

Intrusion

As well as feeling like they were not in control, some older people in the intervention group found using a fall detector and a bed occupancy sensor to be 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 center but you can argue that what I do in my bed is my business—no one else's.
>
> —Female, age 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, age 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

I felt that it was important to explore with the participants 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 as a result of 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, age 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, age 69

The negative experience brought about by false alarms might explain why the mean length of time the older people in the intervention group used the telemonitoring service was only 15 weeks.

Technical Support

Although the participating older people found the support from the call center very helpful, those in the intervention group had expected that the technical support would include provision of information about the devices and any technical backup 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 8 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, age 74

I wasn't aware. She [call center 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, age 76

This study shows the importance of clear explanations and reinforcement of information. Indeed, Butler had argued that "a few older people have failed to have the alarm system explained to them" [27, p. 15].

Recommendation

In planning for the future uptake of telemonitoring service such as this, participants in the intervention group were asked whether 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 the service 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, age 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, age 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, age 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, age 90

The decision about whether to recommend the use of these devices had much to do with older people's sense of not being in control, which was 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 [her] friends." This was because she fell out of bed one night and the sensor activated, providing her with the added sense of security highlighted earlier.

Likelihood of Using Fall Detector and Bed Occupancy Sensor

Participants in the control group were asked whether they would consider using a fall detector and a bed occupancy sensor. Although a few expressed an interest, the majority were not in favor 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 center know that you've fallen. But it must cost a lot and I suppose they'll [the call center] want to charge us more than this [pendant alarm].
>
> —Female, age 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, age 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, age 83

The data generated from the qualitative interviews helped extend understanding of the perceptions of older people's experiences with and expectations of telemonitoring. As found in other studies [25], older people were reluctant to use fall detectors and bed occupancy sensors because they feared causing inconvenience to others, as well as because they wanted to safeguard their independence and control. However, the number of false alarms generated by the faulty devices did affect the participants' adherence to the use of these devices. Apparently, with the pendant alarm, older persons are able to maintain their independence by deciding whether to activate their pendant. This independence gave them a sense of being in control.

DISCUSSION

To further extend my understanding of the experience of older people with a history of falling, exploring with them whether they were afraid of falling was important. At baseline, 31 (89%) participants in this study reported being afraid of falling. This changed over the 6-month period, with 21 (60%) remaining afraid of falling. This result comprised 25 percent of the intervention and 34 percent of the control groups. Why this change occurred is unclear. Studies have shown that up to half of individuals 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 decreased during the follow-up period, with both groups having a mean of 1.1 per person, compared with 2.8 and 2.7 per person at baseline in the control and intervention groups, respectively. What is surprising is 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). As I am both a researcher and qualified nurse, my initial visit possibly provided participants an opportunity to "talk" about their falls and the post-6-month visit might have provided them with additional support. Although speculative, this personal contact and support 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 is needed to test this hypothesis.

In this study, the expectations of and experiences 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 as responding to concerns about the vulnerability of older people [13]. The positive aspects, including older people feeling a greater sense of security, could enhance their quality of life, as was 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 improved safety make older people more independent and, therefore, more likely to take more risks in the way they conduct their activities of daily living?

As found in other studies [6], older people could be reluctant to use fall detectors and bed occupancy sensors for fear of causing inconvenience to others, as well as out of a desire to safeguard their independence and control. This reluctance could be further compounded by the

number of false alarms generated that, in turn, could affect older people's adherence to use of the devices. To increase the period of adherence in the future, service providers must ensure that the provision of information is seen as an important aspect of the telemonitoring service. Written information about how to use the devices and the available technical support 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 this was a 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 paid for by older people themselves. Given the rising numbers expected in the aging population, the number of those who experience falls is likely to increase. This increase would have cost implications for service providers. However, Magnusson and Hanson suggest that the key issues are quality of life and enhanced care and support for older people and their families 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's sample size limited the generalizability of its findings. Second, a degree of selection bias existed. While attempts were made to match samples by age, the number of participants who agreed to participate and use the devices could have led to bias. Third, the limited available funds were insufficient to enable a larger procurement of devices for the pilot, which, in turn, had an impact on the size of the sample.

CONCLUSIONS

The qualitative element of this observational descriptive study provided a user perspective on the expectations for and experiences with telemonitoring devices. It is vital that any service involving older people includes the users' 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 the use of telemonitoring devices had benefits resulting in older people feeling more secure and able to live in their own homes, some disadvantages existed. These disadvantages included the intrusive aspect of telemonitoring, because of 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, because the devices were recording any event that occurred as opposed to the older person having to activate the alarm. Worthwhile remembering is that a key feature of the use of 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 telemonitoring is being introduced.

The use of telemonitoring in the community to help older people manage and prevent falls requires careful and sensitive implementation. Although older people were cautious about using the fall detectors and bed occupancy sensors, clearly some positive aspects arose from their use, in particular, that their fear of falling was reduced. After the study, the manufacturers of the devices were provided with feedback so that older people's voices could be taken seriously in the future refinement of the devices. This consideration is particularly important because, with the use of a wider range of sensors linked to social alarms and in the context of lifestyle monitoring, responding to falls will be increasingly seen as just one important aspect of services 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, the sensitivity of the alarm system needs to be decreased to minimize 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 occurs [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) are concerned with balancing 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 will help older people 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]. The success of these new practices will depend on the extent of commitment to user-centered perspectives and the way in which tensions and conflicts between services and different professional perspectives are 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 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 buy such services privately [13].

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