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Older adults' perceptions of technologies aimed at falls prevention, detection or monitoring: A systematic review

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ABSTRACT

Background: Over recent years a number of Information and Communication Technologies (ICTs) have emerged aiming at falls prevention, falls detection and alarms for use in case of fall. There are also a range of ICT interventions, which have been created or adapted to be pro-active in preventing falls, such as those which provide strength and balance training to older adults in the prevention of falls. However, there are issues related to the adoption and continued use of these technologies by older adults.

Objectives: This review provides an overview of older adults' perceptions of falls technologies.

Methods: We undertook systematic searches of MEDLINE, EMBASE, CINAHL and PsychINFO, COMPENDEX and the Cochrane database. Key search terms included 'older adults', 'seniors', 'preference', 'attitudes' and a wide range of technologies, they also included the key word 'fall*'. We considered all studies that included older adults aged 50 and above. Studies had to include technologies related specifically to falls prevention, detection or monitoring. The Joanna Briggs Institute (JBI) tool and the Quality Assessment Tool for Quantitative Studies by the Effective Public Health Practice Project (EPHPP) were used.

Results: We identified 76 potentially relevant papers. Some 21 studies were considered for quality review. Twelve qualitative studies, three quantitative studies and 6 mixed methods studies were included. The literature related to technologies aimed at predicting, monitoring and preventing falls suggest that intrinsic factors related to older adults' attitudes around control, independence and perceived need/requirements for safety are important for their motivation to use and continue using technologies. Extrinsic factors such as usability, feedback gained and costs are important elements which support these attitudes and perceptions.

Conclusion: Positive messages about the benefits of falls technologies for promoting healthy active ageing and independence are critical, as is ensuring that the technologies are simple, reliable and effective and tailored to individual need. The technologies need to be clearly described in research and older peoples' attitudes towards different sorts of technologies must be clarified if specific recommendations are to be made.

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1. Introduction

Falls are an important public health issue. Each year, 35% of over-65s experience one or more falls. About 45% of people aged over 80 who live in the community fall each year. Between 10 and 25% of such fallers will sustain a serious injury [1]. This has implications in terms of independence, quality of life and also cost to health services [1]. Hip fracture is the most common serious injury related to falls in older people and death rates are continuing to rise [2]. Each year approximately 10% of the elderly population (65+) will be treated by a doctor for an injury and approximately 100,000 older people in the EU27 (countries within the European Union) and European Economic Area countries will die from injury from a fall [3].

Over recent years a number of Information and Communication Technologies (ICTs) have emerged aimed at falls prevention, fall detection and alarms for use in case of fall. There are a range of ICT interventions that have been adopted to monitor falls and alert professionals or carers [4] if a fall occurs, including home automation systems. To date these technologies tend to be re-active, which help to reduce a long lie (lying on the floor for long periods of time can cause serious health complications) and allow help to be brought quickly to the person who has fallen. There are also a range of ICT interventions which have been created or adapted to be pro-active in preventing falls, such as those which provide strength and balance training to older adults in the prevention of falls e.g. exergames, Wii-fit, Kinect [5,6]. There is increasingly strong evidence that exercise programmes that include specific strength and balance exercises can significantly reduce the risk and rate of falls [7,8]. Therefore, ICT innovations that can deliver exercise programmes in the home have the potential to reduce costs and increase adherence by providing regular feedback and motivation to older adults.

One of the main issues with use of ICT devices in the home is related to adoption and use of the systems. We know very little about older adults' attitudes towards falls interventions that use technologies. There is some general evidence around a range of intrinsic and extrinsic factors which motivate older adults to adopt the use of ICT devices [9,10]. However, work has not been done to examine the specific evidence related to falls interventions. Maintaining independence has been previously cited as a key reason for why people engage in falls prevention activities and also home exercise [11–13]. Independence has also been found to be a key factor in promoting older adults' adoption of general ICT devices in their homes. This is often because they do not want to be a burden, have a fear of being put in long-term care, or because they feel it will promote their social life [9,14].

This review aims to provide guidance related to the attractiveness of specific ICT interventions and monitoring equipment, which is directly related to falls prevention and detection. Previous reviews of ICT [15] found that there is a lack of eligible randomised controlled trials (RCTs) in this area. As part of a broader European project (farseeingresearch.eu) we intend to draw together the literature that does exist (RCT, case studies, cohort studies, quasi experiments, qualitative and other methods) to provide a summary of existing knowledge and to identify gaps for future research.

Table 1 – Search terms for ICT interventions/applications/technologies.

Activity monitoring	Intelligent environment
Accelerometer	Interactive multimedia
Alarm button	Interactive technology
Alert system	Internet
Ambient assisted living	Internet-based intervention
Assistive technology	Keyboard
Audio visual	Message
Camera	Microphone
CD-ROM	Mobile
Cell phone	Monitoring
Cell-phone	Mouse
Cellular phone	Notebook
Communication network$	Personal digital assistant
Computer	PDA
Computerised	Persuasive technology
Computerised reminder$	Phone-based intervention
Databases	Reminder system
Detection	Remote consultation$
Electronic	Smart phone
Email	Smart Technology
E-mail	Tablet
eHealth	Technology
Fall alarm	Telecare
Fall detector	Telehealth
Gyroscope	Telemedicine
Headphone	Telenursing
Headset	Tele-rehabilitation
Home alarm	Touchscreen
Home automation	Video
Home nursing	Video-phone intervention
Home care	Virtual
Home-telecare intervention	Web
Home interactive	Website
ICT	Wireless
Informatics	World wide web
Information Services	www

2. Methods

2.1. *Search strategy*

We undertook systematic searches of MEDLINE, EMBASE, CINAHL and PsychINFO. We also undertook a systematic search of the engineering database COMPENDEX and the Cochrane database. No date restrictions were placed on the searches and all relevant evidence was included if in the English language. Search terms were both free-text and MESH headings and were combined with Boolean operators. Key search terms included the key words 'fall*' and 'older adults', 'seniors', 'preference', 'attitudes' and a wide range of technologies (Table 1). The MEDLINE search is available as supplementary material. The electronic searches are up to date at 01 April 2013.

2.2. *Inclusion/exclusion criteria*

All types of study designs were included, since most studies in this area of research are exploratory and there are few RCTs.

This review considers all studies that include older adults aged 50 and above. This is to reflect the attitudes and