FLEX CEUs

Fall Prevention

Measurement of Fall Prevention Awareness and Behaviours among Older Adults at Home*

ABSTRACT

This study surveyed awareness of, and adherence to, six national fall prevention recommendations among community-dwelling older adults (n = 1050) in Ottawa. Although 76 per cent of respondents agreed falling is a concern and preventable, fewer perceived susceptibility to falling (63%). Respondents had high awareness that home modifications and physical activity can prevent falls. Reported modifications included grab bars (50%), night lights (44%), and raised toilet seats (19%). Half met aerobic activity recommendations; 38 per cent met strength recommendations. Respondents had lower awareness that an annual medication review, annual eye and physical examination, and daily vitamin D supplementation could reduce fall risk. However, reported annual medication review (79%) and eye examination (75%) was high. Nearly half met recommendations for vitamin D intake. These findings suggest a gap in knowledge of awareness and adherence to national recommendations, highlighting the ones that may require attention from those who work to prevent falls.

RÉSUMÉ

L'étude visait à évaluer chez les résidents aînés d'Ottawa (n = 1 050) la connaissance et le respect de six recommandations nationales sur la prévention des chutes. D'abord, 76 % des répondants étaient d'avis que les chutes sont une préoccupation réelle et qu'il est possible de les éviter, mais ils étaient moins nombreux (63 %) à penser qu'ils étaient à risque de faire une chute. Ensuite, les répondants étaient très conscients que l'activité physique et l'adaptation du domicile permettent de prévenir les chutes. Parmi les adaptations mentionnées figuraient les barres d'appui (50 %), l'éclairage de nuit (44 %) et les sièges de toilette surélevés (19 %). En ce qui concerne l'activité physique, la moitié des répondants suivaient les recommandations visant à améliorer leur capacité cardiovasculaire, et 38 %, celles visant à améliorer leur force. Enfin, les répondants étaient moins sensibilisés à l'importance de la vérification annuelle des médicaments, de l'examen médical et de l'examen de la vue annuels et de la prise quotidienne de suppléments de vitamine D pour la réduction des risques de chute. Cependant, ils étaient nombreux à indiquer qu'ils faisaient vérifier leurs médicaments (79 %) et passaient un examen de la vue (75 %) tous les ans. De plus, près de la moitié respectaient les recommandations sur la prise de suppléments de vitamine D. Ces résultats font ressortir un certain écart entre la connaissance et le respect des recommandations nationales, mettant en évidence celles qui mériteraient l'attention des professionnels œuvrant dans la prévention des chutes.

Although largely preventable, falls represent a tremendous health and economic burden across Canada, particularly among older adults. Falls among older adults, aged 65 years and older, accounted for $3.4 billion (direct and indirect costs) nationally in 2010, accounting for 39 per cent of the total cost of falls in Canada (Parachute, 2015).

In Ottawa, falls are the leading cause of injury-related emergency room visits, hospitalization, and death among older adults. Every year, approximately one fifth of older Ottawa adults who live in private homes fall (Ottawa Public Health [OPH], 2015f), and those falls contribute to more than 8,200 emergency room visits (OPH, 2015c), 2,100 hospitalizations (OPH, 2015a), and approximately 90 deaths (OPH, 2015b). This will continue to be a public health concern as Ottawa's population aged 65 years and older is the fastest growing age group and is predicted to grow from 15 per cent (140,136) in 2015 to 21 per cent (247,973) in 2030 (OPH, 2015d). Of particular concern are adults aged 85 years and older, a group that has significantly higher rates of falls and the highest cost per capita for falls (OPH, 2015a, 2015c; Parachute, 2015).

Public health contributes to fall prevention using a multifaceted population health promotion approach. This type of approach focuses on improving the health status of an entire population, including groups within it (Hamilton & Bhatti, 1996). This means that public health invests in the surveillance and reporting of the burden of falls, the uptake of fall prevention strategies, health education and public awareness campaigns on fall risk and prevention, and partnerships with different sectors who play a role in the prevention or treatment of falls or those who work with populations most at-risk of falling. The Public Health Agency of Canada (2014) and others (Scott, Dukeshire, & Gallagher, 2001; Scott, 2012) have provided several recommendations for fall prevention in community settings. Those that fit within public health's role include promoting (1) a review of medications annually with a physician or pharmacist; (2) an annual medical examination; (3) an annual vision examination; (4) the accumulation of at least 150 minutes of moderate- to vigorous-intensity aerobic physical activity per week including strength and balance activities at least two days per week according to Canada's Physical Activity Guidelines for Older Adults (CPAG-OA) (Canadian Society for Exercise Physiology, 2015); (4) proper nutrition including adequate vitamin D and calcium intake according to Canada's Food Guide for older adults (Health Canada, 2012); and (5) the identification and removal of home hazards and the installation and use of home safety devices.

Gaps in Local Fall Prevention Behaviour Data

There is a gap in local data on the six fall prevention recommendations for Ottawa's older adult community-dwelling population. Although existing Canadian data sources have measured aspects of fall prevention behaviours, they often assess the general population and are not specific to older adults. They also do not measure the six recommendations concurrently.

Statistics Canada's (2008) Canadian Community Health Survey on Healthy Aging (CCHS-HA) collected information on Canadian adults aged 45 and older living in private residences about the factors that contribute to healthy aging; however, those data are not reportable at the public health unit level. Statistics Canada's (2015) Canadian Community Health Survey (CCHS) collects information for the Canadian population aged 12 and older with estimates that are reportable for public health units in Ontario. Although the CCHS includes measures that describe the six behaviours, as a general population survey it would take several years of data collection to ensure sufficient sample size collection to report on these indicators for older adults at the local level, particularly for specific age groups within the older adult population. This is also true for the Rapid Risk Factor Surveillance System (RRFSS), which is an ongoing telephone health survey of adults aged 18 years and older conducted by a number of health units in Ontario that includes questions on fall prevention–related behaviours (Rapid Risk Factor Surveillance System, n.d.).

To address this gap at the local level and inform future programming, OPH designed a survey to measure awareness and uptake of the six fall prevention recommendations among community-dwelling older adults. This article outlines the design of the survey tool and presents key findings of the Ottawa Public Health Older Adults Fall Prevention Survey.

Methods

Questionnaire Development

The objective of the survey was to measure awareness and uptake of the six fall prevention recommendations. Several questions were replicated from established surveys, including the CCHS-HA (Statistics Canada, 2008) annual medical examination, the review of medications and vision testing questions, and the RRFSS (n.d.) fall prevention home hazards questions. To measure moderate- to vigorous-intensity physical activity and strength and balance activities, we considered existing physical activity questionnaires (DiPietro, Caspersen, Ostfeld, & Nadel, 1993a; DiPietro, Caspersen, Ostfeld, & Nadel, 1993b; The IPAQ group, n.d.; Mayer, Steinman, Williams, Topolski, & LoGerfo, 2008; Statistics Canada,

2011; Washburn, Smith, Jette, & Janney, 1993). The Community Healthy Activities Model Program for Seniors (CHAMPS) Physical Activity Questionnaire for Older Adults (University of California, San Francisco Insti-tute for Health & Aging, 2008) was selected because we could use it to measure the frequency and duration of specific activities, including those related to strength, balance, and flexibility. The questions were activity-specific, which we could score with a metabolic equiv-alent (MET) value to specifically measure moderate- to vigorous- activity. The questionnaire was also relatively simple to administer, and the tool has been recommended for use in self-report physical activity measurement among older adults (Falck, McDonald, Beets, Brazendale, & Liu-Ambrose, 2016; Stewart et al., 2001). We modified the CHAMPS questions for telephone use and for seasonal activities appropriate to older adults living in Ottawa. To assess the frequency of vitamin D and calcium supplementation and calcium-rich food intake, we modified questions from the CCHS-HA to measure the frequency of vitamin D and calcium vitamin and supplement intake over the past 30 days. Five new questions were developed to measure intake of common calcium-rich foods (milk, hard cheese, yogurt, fortified orange juice, and canned fish with bones). We also developed questions to measure awareness of each of the six prevention recommendations. See Table 1 for a list of the prevention behaviours, indicators, and existing questionnaires used to develop the questionnaire.

To minimize bias in the questionnaire design, we pilot-tested the questionnaire on a small group (n = 6) of community-dwelling older adult males and females to review the survey length and the clarity of the questions, as well as to identify questions that might be sensitive to answer. Results of the pilot suggested that respondents had a clear understanding of the survey objectives; the length of the survey was appropriate (approximately 20 minutes); answer choices were clear; respondents felt comfortable answering all questions except income; and no items produced irritation, embarrassment, or confusion. We made slight adjustments to more clearly differentiate some of the physical activities such as moderate to heavy house and yard work.

We used the *A pRoject Ethics Community Consensus Initiative* tool (Alberta Innovates Health Solutions, 2015) to determine the risk and appropriate ethics review. The results indicated that the project involved minimal risk to the population and reinforced that the purpose of the project was for quality improvement of our fall prevention program. We followed a verbal consent script and maintained respondent anonymity and confidentiality by collecting and reporting non-identifying aggregate measures.

Study Design

A stratified random sample of adults aged 65 years and older living in Ottawa was selected by randomly dialing telephone numbers of Ottawa residents and asking if anyone aged 65 years or older and speaking English or French lived there. To allow for analysis by age, three age group samples were collected: ages 65 to 74, 75 to 84, and 85 years and older. The survey was conducted via computer-assisted telephone interview by Nanos Research on behalf of OPH in December 2012. Older adults were excluded if they did not have a landline telephone number, if they did not speak English or French, or if they could not complete or understand the telephone based questionnaire.

Analysis

To account for the age-stratified design, we generated sampling weights and applied them using 2011 Census population data for Ottawa, representing 116,593 older adults. We followed this up by univariate analysis of the data by gender, age, mother tongue language, immigration, income, and education and calculated coefficients of variation (CV). Estimates were considered reliable for use if the CV was less than 16.6 per cent; estimates where the CV was between 16.6 per cent and 33.3 per cent were interpreted with caution due to the high sampling variability; and estimates with CVs greater than 33.3 per cent were deemed unreliable. All statistical analyses were conducted using Stata SE V.13 using Pearson's chi-squared tests with $\alpha = 0.05$ to assess for statistical significance – these p values are presented in Tables 3, 4, and 5. We made multiple comparisons between pairs if the overall chi-squared test indicated significance a nd adjusted them with a Bonferroni correction.

Results

Survey Completion

As Figure 1 shows, a total of 62,368 telephone numbers were called resulting in 8,330 responders and 28,720 non-responders. Of the responders, we disqualified 7,241 because of their age. A total of 1,050 interviews were completed: 400 for ages 65 to 74, 400 for ages 75 to 84, and 250 for ages 85 years and older. We calculated a response rate of 23 per cent using the empirical method approved by the Marketing Research and Intelligence Association (Marketing Research and Intelligence Association, n.d.), equal to the number of responders divided by the total number of people called.

Sample Characteristics (unweighted)

The majority of the respondents identified as female (64%). English was the most common mother tongue language (76%) and Canada was the most common country of birth (76%). Household income was evenly

Table 1: Survey objectives, measures, indicators, and question source

Objective: To measure awareness and uptake of falls-prevention behaviours among older Ottawa adults		
Risk Perception and Behaviour	**Indicator(s)**	**Questionnaire Source**
1. Perception of the susceptibility and preventability of falls	• The % of older adults who agree that falling is a concern for older adults. • The % of older adults who agree that falls in older adults can be prevented. • The % of older adults who say that taking 4 or more medications daily can increase the risk for falling. • The % of older adults who say that reviewing medications annually can decrease the risk of falling. • The % of older adults who say that having an annual eye examination can reduce the risk of falling. • The % of older adults who say that installing and using home safety devices can reduce the risk of falling. • The % of older adults who say that being active can reduce the risk of falling. • The % of older adults who say that regularly participating in strength or resistance exercise can reduce the risk of falling. • The % of older adults who say that taking a vitamin D supplement daily can reduce the risk of falling.	New questions using 5-point Likert item response for falls risk perception. A 4-point Likert item response was used for knowledge of preventability and modifiable behaviours.
2. Review medications annually with physician or pharmacist	• The % of older adults who are taking 4 or more medications on the same day. • The % of older adults who have an annual review of their medications by a health care professional. • The % of older adults who are taking 4 or more medications on the same day and have had an annual review of their medications by a health care professional.	RRFSS – Falls Prevention – Medication Use.
3. Have an annual medical examination	• The % of older adults who report having an annual medical examination (excluding check-ups during visits for specific health problems).	RRFSS – Access to Clinical Services.
4. Have an annual vision examination	• The % of older adults who report having an annual vision examination.	CCHS – Eye examinations.
5. Accumulate at least 150 minutes of moderate- to vigorous-intensity aerobic physical activity per week including strength and balance activities at least 2 days per week	• The % of older adults accumulating at least 150 minutes of moderate- to vigorous-intensity physical activity per week. • The % of older adults participating in strength and balance activities at least twice per week.	CHAMPS
6. Eat well and include adequate vitamin D and calcium intake	• The % of older adults who take a vitamin D supplement daily. • The % of older adults who take a vitamin D supplement daily and eat at least 3 servings of calcium-rich foods daily or eat at least 2 servings of calcium-rich foods and a vitamin D supplement daily.	CCHS-HA – Dietary supplement use – vitamins and minerals. New questions (frequency of consumption during a typical week).
7. Identify and remove home hazards and install home safety devices	• The % of older adults who have home hazards that can increase the risk of falling. • The % of older adults who use home modifications of hazards to reduce their risk of falling.	RRFSS – Restriction of activities module. RRFSS – Home modifications.

CHAMPS = Community Healthy Activities Model Program for Seniors
CCHS = Canadian Community Health Survey
CCHS-HA = Canadian Community Health Survey on Healthy Aging
RRFSS = Rapid Risk Factor Surveillance System

distributed across income categories, although 32 per cent of respondents refused to state their income. Fifty five percent of respondents reported that they lived with someone else (Table 2).

Perceived Susceptibility to Falling

When asked if they thought falling was a concern for people their age, 76 per cent agreed and 14 per cent somewhat agreed. When asked if they thought that falls among people in their age group could be prevented, 63 per cent agreed and 26 per cent somewhat agreed (Figure 2). Females, adults aged 85 years and older, and lower income respondents were more likely to agree that falling was a concern for people their age. Respondents with a mother tongue language other than English or French were more likely to agree that falls among their age group could be prevented (Table 3).

Annual Medication Review, Physical, and Vision Examination

Fewer than half (44%) of respondents were aware that taking four or more medications daily can increase fall

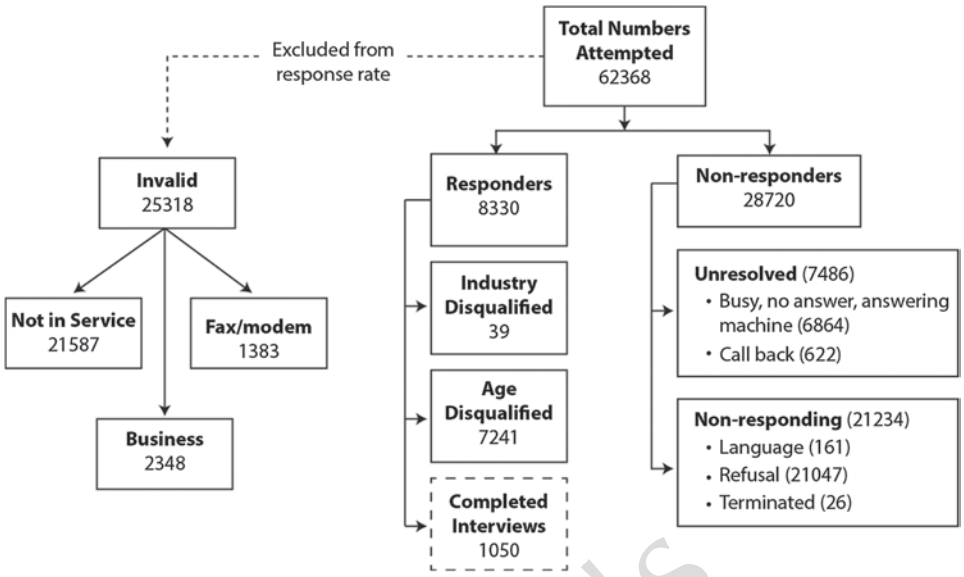

Figure 1: Flowchart of random telephone sampling responses to the survey

risk (Figure 3). This awareness decreased with age (65 to 74 years: 52%; ≥85 years: 25%) and lower income (≥$70,000: 55%; ≤$40,000: 37%) but increased with higher levels of education (no high school graduation: 26%; college or university graduation: 50%; Table 3). Although 43 per cent of respondents reported taking four or more medications daily, 79 per cent of them reviewed the side effects with their health care provider in the past year (Table 4). Seventy-one per cent of respondents had a general physical examination less than one year ago (Table 4).

Table 2: Demographic characteristics of the respondents

Characteristic	No.	%
Gender		
Male	377	35.9
Female	673	64.1
Age (years)		
65 to 74	400	38.1
75 to 84	400	38.1
85 and older	250	23.8
Mother tongue language		
English	800	76.3
French	122	11.6
Other	127	12.1
Income		
Less than $40,000	188	17.9
$40,000 to $69,999	216	20.6
$70,000 or more	224	21.3
Don't know	86	8.2
Refused to answer	336	32.0
Immigration		
Born in Canada	797	75.9
Immigrant	253	24.1
Length of time since immigration		
≤5 years	1	0.4
6 to 10 years	3	1.2
>10 years	249	98.4
Live with anyone		
Yes	579	55.7
No	461	44.3

Seventy-seven per cent of respondents were aware that having an annual eye examination reduces fall risk. This awareness was higher among females and adults 65 to 74 years old, and increased with higher levels of education (no high school graduation: 61%; college or university graduation: 82%; Table 3). Seventy-five per cent of respondents had a vision examination less than one year ago. Respondents 85 years and older were less likely to have had their vision checked less than one year ago compared to those aged 75 to 84 years (Table 4).

Physical Activity

Eighty-six per cent of respondents were aware that being active for 150 minutes (two and a half hours) a week reduces fall risk; 77 per cent were aware that regularly participating in strength or resistance exercises reduces fall risk (Figure 3). Awareness of these protective behaviours decreased with age (being active for two and a half hours/week reduces risk: at 65 to 74 years, 91% were aware and ≥85 years, 75% were aware; strength or balance exercise reduces risk: at 65 to 74 years, 83% were aware, and ≥85 years, 62% were aware) and increased with more education and income (Table 3). Fifty-one per cent of respondents met the aerobic component of CPAG-OA participating in at least 150 minutes of moderate- to vigorous-intensity physical activity. Thirty-eight per cent of respondents participated in strength activities at least twice a week, 40 per cent participated in stretching or flexibility exercises at least

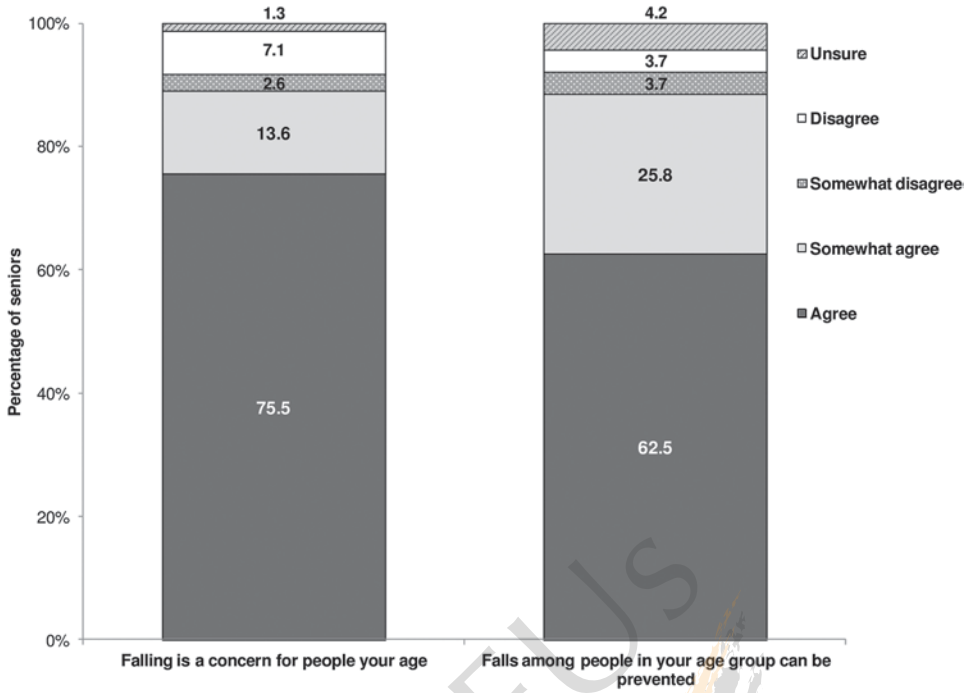

Figure 2: Perceived susceptibility and preventability of falls

once per week, and 36 per cent participated in balance and stability exercises at least once per week. Males, those 65 to 84 years of age, those with highest education status, and those with higher household incomes were most likely to meet the guidelines for aerobic as well as strength activity (Table 4).

Vitamin D and Calcium Intake

Half (55%) of respondents were aware that taking a vitamin D supplement daily can help prevent falls (Figure 3) – females were more likely than males to be aware of this (Table 3). Forty-six per cent of respondents took a supplement or multivitamin containing vitamin D daily – females and those aged 75 and older were more likely to report taking a vitamin D supplement daily (Table 4).

Nineteen per cent of respondents were taking a vitamin D supplement or multivitamin daily and consuming at least three servings of calcium-rich foods or two servings of calcium-rich food plus calcium supplementation daily as recommended in Canada's Food Guide – females were more likely to meet this recommendation (Table 4).

Home Safety Devices

Ninety per cent of respondents were aware that installing and using home safety devices reduces fall risk (Figure 3); this was lower among those aged 85 years and older and those who did not graduate high school (Table 3). Eighty-seven per cent of respondents with stairs at home had railings on one or both sides of the staircase; this was lower among those aged 65 to 74 years (Table 5). Half (52%) of respondents with mats or scatter rugs at home reported that all of them were secured to the floor (Table 5). Forty-four per cent of respondents regularly used extra night lighting to help them move about their homes at night (Table 5). Of respondents who used their home bath tub or shower, 71 per cent had a rubber bath mat or non-slip surface on the bath or shower floor – respondents aged 65 to 74 years and those with income of $70,000 or more were least likely to have one. Half (50%) of respondents who used their home bathtub or shower had grab bars or a rail installed; this was higher among females, those aged 75 years and older, those with income of less than $40,000, and those who did not graduate from high school. Nineteen per cent had a raised toilet or toilet seat – females and those aged 85 years and older were most likely to have one (Table 5).

Discussion

This survey is the first in Canada to examine the awareness and uptake of all of the six community-dwelling fall prevention recommendations and home environment modifications concurrently. To our knowledge, this is also the first Canadian study to report on the level of awareness among older adults that falls among people in their age group can be prevented – a message that public health organizations convey and use as the

Table 3: Perceived susceptibility of falling and awareness of falls-prevention behaviours by socio-demographic characteristics (%)

Characteristic	Falling is a Concern for People Your Age (Agree)	Falls among People in Your Age Group Can Be Prevented (Agreed)	Taking ≥4 Medications Daily Increases Risk of Falling	Annual Review of Medication with Health Professional Reduces Risk of Falling	Annual Eye Examination Reduces Risk of Falling	Being Active for at least Two and a Half Hours a Week Reduces Risk of Falling	Regularly Participating in Strength or Resistance Exercises Reduces Risk of Falling	Daily Vitamin D Supplementation Reduces Risk of Falling	Installing and Using Home Safety Devices Reduces Risk of Falling
Ottawa	75.5	62.5	44.0	56.4	77.0	86.4	76.8	53.1	90.0
Gender									
Male	67.7	63.0	42.5	52.8	72.9	86.7	75.3	43.6	89.3
Female	81.5	62.2	45.1	59.1	80.1	86.1	78.0	60.4	90.5
p value	0.00	0.55	0.73	0.28	0.00	0.51	0.20	0.00	0.85
Age (years)									
65 to 74	67.4	63.9	52.1	61.9	82.8	90.8	83.0	52.9	92.1
75 to 84	83.9	59.2	38.7	53.3	70.1	84.1	72.7	51.9	89.3
85 and older	87.1	65.1	24.8	42.2	70.4	74.5	62.3	56.9	83.6
p value	0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.44	0.00
Mother tongue language									
English	76.9	61.4	45.9	57.4	78.1	86.9	77.6	52.2	91.4
French	72.9	64.3	41.2	54.6	69.0	83.0	73.3	54.8	83.3
Other	68.6	67.9	33.8	51.6	77.8	86.8	75.8	57.2	87.5
p value	0.11	0.01	0.26	0.61	0.33	0.27	0.97	0.22	0.01
Immigration									
Born in Canada	76.8	62.2	46.2	55.7	76.1	86.3	76.3	52.5	90.2
Immigrant	71.3	63.6	37.0	58.6	79.8	86.5	78.6	55.2	89.3
p value	0.58	0.37	0.09	0.19	0.55	0.03	0.57	0.62	0.41
Income									
Less than $40,000	85.8	69.5	36.5	50.1	74.6	79.7	70.8	54.7	86.6
$40,000 to $69,999	70.9	61.3	41.5	55.5	73.1	85.0	76.9	51.9	86.8
$70,000 or more	72.8	61.8	54.6	65.5	80.6	92.5	87.3	52.2	94.0
Don't know	84.1	68.9	26.0	44.5	73.9	74.9	57.7	56.8	85.0
Refused	73.6	59.2	44.5	55.2	78.4	87.9	75.4	53.1	91.5
p value	0.02	0.43	0.00	0.00	0.51	0.00	0.00	0.79	0.04
Education									
Did not graduate high school	87.7	56.7	26.0	42.3	60.7	71.9	60.9	52.1	76.9
Graduated high school	75.7	63.6	35.3	42.2	70.7	83.0	69.3	60.5	90.4
Some post-secondary	78.2	65.8	41.7	59.1	79.3	88.8	74	51.8	88.3
College or university graduation	72.8	62.4	50.3	62.2	81.3	89.4	82.3	51.4	92.5
p value	0.29	0.15	0.00	0.00	0.00	0.00	0.00	0.18	0.00

***Note: p* value is from univariate sub-group comparison (Pearson's χ^2).**

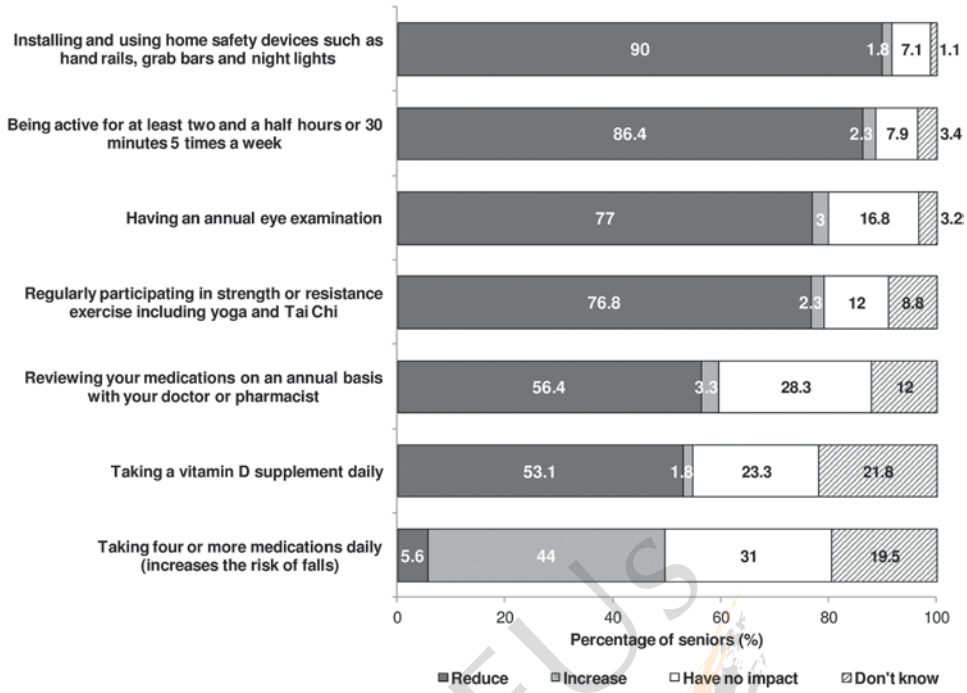

Figure 3: Perception of the impact of behaviours on the risk of falling

underpinning for fall prevention strategies (Public Health Agency of Canada [PHAC], 2014). Other studies have measured fear of falling but from an individual risk perspective (Scheffer, Schuurmans, van Dijk, van der Hooft, & de Rooij, 2008; Lee, Mackenzie, & James, 2008; Boyd & Stevens, 2009; Pearson, St-Arnaud, & Geran, 2014), including one national survey that found 34 per cent of Canadian adults aged 65 years and older were concerned about having a future fall (Pearson, St-Arnaud, & Geran, 2014). Our study found a higher perception of risk, with 76 per cent of respondents agreeing that falling is a concern for people their age. The difference suggests that older adults are generally aware of the risk of falls in their age group; however, they do not perceive the risk to the same extent individually.

Although perception of fall risk for older adults was high, results indicate that respondents were not aware of, and not taking, all steps to reduce the risk of falling. Only 44 per cent of respondents were aware that taking four or more medications increases risk of falling, and 56 per cent were aware that reviewing medications with their health care provider annually reduces risk. Encouragingly, a high proportion (79%) of the 43 per cent of respondents who took four or more medications daily had reviewed the side effects with a health care provider in the past year. One previous Canadian study of medication use among seniors living in private households found that 41 per cent of women and 29 per cent of men aged 65 years and older were taking four or more medications in the past month, but the study did not assess whether those taking multiple medications had reviewed them with a health care provider (Rotermann, 2006). Our findings indicate that adherence to this recommendation is high among one of the populations most at risk (multiple medication users). However, general awareness on the need to review medications with a health care provider to reduce fall risk is low, which suggests that universal health messaging may be warranted.

Our results found that 75 per cent of respondents had an eye examination less than one year ago, which was higher than the percentage found by a national study in 2003 (57%) (Rotermann, 2006). Although awareness that annual eye examination reduces fall risk was also high (77%), in Ontario routine eye examinations are covered by the Ontario Health Insurance Program once every 12 months for adults aged 65 years and older. Although we were unable to determine if the high proportion of those having an annual eye examination was influenced by high awareness or by universal coverage, both are plausible factors for the high level of adherence to this recommendation.

Physical activity plays an important role in preventing falls, but measurement is challenging because it is a multidimensional construct. Results from the 2012 and 2013 Canadian Health Measures Survey (CHMS) found that only 12 per cent of Canadian adults aged 60 to 79 years achieved the recommended aerobic component (at least 150 minutes of moderate- to vigorous-intensity activity per week) of the CPAG-OA when

Table 4: Falls-prevention behaviours by socio-demographic characteristics (%)

Characteristic	General Physical Check-up <1 Year Ago	Eye Examination <1 Year Ago	Took ≥4 Medications Daily	Took ≥4 Medications Daily and Reviewed Side Effects with Health Provider	Met Aerobic Component of CPAG	Met Strength Component of CPAG	Participated in Stretching or Flexibility Exercise ≥1 per Week	Participated in Balance and Stability Exercise ≥1 per Week	Took a Vitamin D Supplement Daily	Daily Vitamin D Supplement and Recommended Calcium Intake (diet or supplementation)
Ottawa	70.7	75.4	43.1	78.7	51.0	37.6	40.0	36.3	45.9	18.5
Gender										
Male	70.2	74.2	46.2	80.2	59.5	43.1	39.4	26.8	34.8	10.5
Female	71.0	76.4	40.6	77.4	44.5	33.3	40.4	43.6	54.3	24.7
p value	0.79	0.31	0.19	0.57	0.00	0.00	0.77	0.00	0.00	0.00
Age (years)										
65 to 74	70.4	74.8	36.6	76.6	59.4	42.1	44.0	36.5	41.4	16.5
75 to 84	72.7	79.9	47.5	85.3	46.4	36.0	40.9	37.5	50.9	22.0
85 and older	67.2	67.6	57.6	71.1	29.5	23.4	22.5	32.8	51.3	18.4
p value	0.62	0.00	0.00	0.09	0.00	0.00	0.00	0.56	0.00	0.09
Mother tongue language										
English	70.5	77.5	45.2	79.8	51.4	37.5	40.5	36.0	46.5	19.3
French	73.8	66.8	41.2	76.6	46.7	35.9	34.3	38.5	42.7	17.0[a]
Other	69.2	71.2	31.3	70.6	53.2	39.7	42.9	36.3	44.9	15.1[a]
p value	0.00	0.01	0.06	0.06	0.58	0.85	0.39	0.88	0.64	0.48
Immigration										
Born in Canada	72.7	74.8	46.0	79.2	49.6	36.6	38.2	36.3	46.9	19.7
Immigrant	64.4	77.5	33.7	76.4	55.4	40.5	45.6	36.1	42.6	15.0
p value	0.04	0.14	0.00	0.80	0.13	0.31	0.05	0.95	0.56	0.10
Income										
Less than $40,000	68.5	67.6	43.4	72.6	39.1	25.1	35.1	42.7	41.1	21.6
$40,000 to $69,999	68.2	78.1	49.1	74.0	55.1	39.3	39.8	39.1	49.4	17.2
$70,000 or more	72.5	71.2	41.6	79.3	58.3	44.0	44.8	27.6	45.4	16.8
Don't know	69.1	73.1	46.1	69.6	30.3	17.4	33.4	32.6	54.8	20.3[a]
Refused	72.2	81.3	39.6	73.5	52.7	41.6	40.1	38.9	44.5	18.9
p value	0.69	0.00	0.00	0.22	0.00	0.00	0.29	0.01	0.25	0.74
Education										
Did not graduate high school	70.9	64.9	47.5	75.3	32.0	26.3[a]	24.9	32.1	43.6	14.7
Graduated high school	72.1	76.7	45.3	73.3	43.6	21.2	31	30.2	48.5	18.3[a]
Some post-secondary	62.6	69.7	50.2	81.8	53.5	30.5	46.9	45.9	47.1	25.3
College or university graduation	71.8	77.8	40.7	80.0	56.4	45.7	43.9	37.2	45.3	17.9
p value	0.04	0.21	0.01	0.65	0.00		0.00	0.04	0.33	0.18

[a] Coefficient of variation 16.6% to <33.3%.

***p* value is from univariate sub-group comparison (Pearson's χ^2).**

CPAG = Canadian Physical Activity Guidelines for older adults

Table 5: Falls prevention home safety strategies by socio-demographic characteristics (%)

Characteristic	Stairs Have Railings on One Or Both Sides	All Mats or Scatter Rugs Are Secured to the Floor	Regularly Use Extra Night-Lighting	Have a Rubber Bath Mat or Non-slip Surface on Bath/Shower Floor	Grab Bars or a Rail Installed in Bath/Shower	Raised Toilet Seat Installed
Ottawa	87.1	51.5	44.0	71.3	49.8	19.0
Gender						
Male	85.5	47.4	41.5	68.3	41.1	14.3
Female	88.4	54.9	45.8	73.7	56.5	22.7
p value	0.06	0.25	0.38	0.06	0.00	0.00
Age (year)						
65 to 74	83.5	52.3	43.3	66.7	37.7	16.6
75 to 84	91.3	53.5	45.0	75.5	61.5	17.6
85 and older	93.8	41.2	43.9	79.6	69.6	31.7
p value	0.00	0.35	0.00	0.00	0.00	0.00
Mother tongue language						
English	86.9	51.1	43.5	72.7	50.5	20.3
French	92.3	55.9	47.3	68.5	49	12.8
Other	84.3	50.4	44.0	64.9	46.1	17.0
p value	0.30	0.29	0.72	0.17	0.17	0.31
Immigration						
Born in Canada	87.2	52.9	45.1	72.6	50.9	19.6
Immigrant	86.9	47.1	40.4	67.1	46.5	17.3
p value	0.35	0.06	0.52	0.16	0.18	0.71
Income						
Less than $40,000	83.7	41.7	50.1	79.9	61.3	19.2
$40,000 to $69,999	91.9	56.4	41.7	73.7	49.7	17.0
$70,000 or more	82.9	51.0	42.1	61.6	39.2	16.8
Don't know	88.4	52.5	45.8	75.5	71.6	27.3
Refused	88.8	52.6	43.4	72.4	48.2	20.4
p value	0.05	0.38	0.26	0.00	0.00	0.34
Education						
Did not graduate high school	86.5	49.1	49.8	80.3	67.1	25.1[a]
Graduated high school	90.3	42.7	45.1	72.6	57.8	20.1
Some post-secondary	92.0	47.0	51.9	68.5	54.8	21.2[a]
College or university graduation	85.5	54.5	41.4	69.7	43.9	17.4
p value	0.26	0.04	0.27	0.06	0.00	0.25

[a] Coefficient of variation 16.6 to < 33.3%.

***p* value is from univariate sub-group comparison (Pearson's χ^2).**

physical activity was directly measured (Statistics Canada, 2015). The CHMS is not directly comparable to our survey, but it suggests that our measurement of the proportion (51%) of older adults who met the aerobic activity component is likely an overestimate. It is widely known that self-reports are useful for gaining insight into a population's physical activity levels, but they are known to overestimate true energy expenditure and physical activity because of recall and response biases (e.g., inaccurate memory, providing a socially desirable response). Although self-reported measurements do not capture the same amounts of physical activity as more direct measures (accelerometers, pedometers, etc.) (Prince et al., 2008), measuring direct physical activity was not within the capacity of this study. We recommend further research to examine differences between self-reported population levels of activity using the CHAMPS Physical Activity Questionnaire for Older Adults and direct measures.

With respect to the proportion of older adults meeting the strength component of the CPAG-OA (38%) and the proportion participating in strength and balance activities (36%) or stretching or flexibility exercises (40%) at least once per week, to our knowledge these components have not been measured for community-dwelling Canadian older adults. The validity and reliability of these measures in comparison to direct measurements is uncertain and could be an area for future research.

In Canada, only a few population health studies have examined the use of vitamin D supplements among older adults. The CHMS found that 34 per cent of Canadians took a supplement containing vitamin D in the past month and intake was higher among 40- to 79-year-olds (Janz & Pearson, 2013). Another Canadian study found that 60 per cent of British Columbian adults aged 50 years and older had used a vitamin D supplement in the past month (Green, Barr, & Chapman, 2010). In comparison, our results indicate that 46 per cent of respondents took a vitamin D supplement daily.

To our knowledge, there are no Canadian estimates of the use of home safety strategies among community-dwelling older adults. One federal report examined home modifications, but it was limited to older adults with disabilities (Human Resources and Skills Development Canada, 2011). In the United States, 78 per cent of adults aged 52 years and older had assistive features in the home, with common features including (1) railings in stairways (89%), (2) railings at the home entrances with steps (44%), (3) grab bars in the bath/shower (30%), (4) a seat for the bath/shower (27%), and (5) a raised toilet seat (15%) (Freedman & Agree, 2008). While the United States' study population included both older and "near elderly" adults, our survey found similar proportions of the presence of stair railings (87%) and higher proportions of the installation of grab bars in the bath/shower (50%) and raised toilet seats (19%) – features whose installation in the home increases with respondent age.

Our findings indicate that, for the most part, there are inconsistencies between population level of awareness and adherence to fall prevention recommendations for community-dwelling older adults. High levels of awareness did not necessarily translate into high levels of behaviour, as demonstrated by the awareness and adherence to recommended physical activity guidelines and with recommended home safety modifications. On the contrary, low population levels of awareness did not always imply lower uptake as found with the recommendation regarding the taking of multiple medications and reviewing them with a health care provider. These results are not unexpected. Although it is generally thought that personal beliefs can influence behaviours, one behavioural change framework, the theory of planned behaviour, suggests that, in addition to beliefs and awareness, subjective norms and perceived behavioural control can shape intention along the pathway to behaviour change (Ajzen, 2002). External factors such as cost, access, and general health can also contribute to influencing behaviour, which may be the case with lower awareness but higher adherence to the recommendation related to medication review, as health care providers are expected to play a role in following the recommendation. However, we did not measure norms, perceived control, and other external factors or barriers for the lower levels in uptake. We suggest that future research might explore these reasons and examine whether perception of fall risk is associated with the apparent discrepancy.

The Public Health Agency of Canada (2014) has recommended a multifactorial and multisectoral approach to preventing falls, including public health interventions directed towards community-dwelling older adults and caregivers as well as collaboration between different sectors. Subpopulations that were found to have lower awareness of, and adherence to, the recommendations should be considered when planning equitable fall prevention interventions. Socio-demographic differences were found in some of the six fall prevention recommendations; however, further analysis is needed to control for relationships in these findings in order to inform tailored prevention approaches.

OPH's Fall Prevention Approach focuses on five priority areas (OPH, 2015e): (1) monitoring and reporting falls-related statistics; (2) engaging key stakeholders to improve fall prevention health care services such as work with primary care on falls assessments and pharmacists

and primary care to promote medication reviews; (3) expanding access to physical activity programming and products for older adults in the community with joint efforts with other sectors such as City of Ottawa recreation programs; (4) enhancing older adult environments to reduce falls by promoting environmental assessments and modifications to create safe environments and supporting a municipal Older Adult Plan that incorporates age-friendly initiatives (City of Ottawa, 2015); and (5) engaging older adults in fall prevention behaviours such as self-screening. OPH is an active member of the Champlain Regional Falls Prevention Program's working group, which brings together hospitals, primary care, public health and community support services, and care access to identify and reduce the risk of falls (Champlain Local Health Integration Network, 2014). The findings from this study informed the direction for each of these priority areas and were further used to advocate for expansion in physical activity programming and collaboration.

Challenges and Limitations

There were relevant challenges and limitations to the development of the survey. The primary challenge was to collect representative population-level data for older adults in Ottawa. A sampling frame of adults aged 65 years and older in Ottawa was not available; thus, substantial effort and cost was required to reach this target population through random-digit dialing, particularly among the oldest age group (85 years and older) who lived in private residences less frequently than 65- to 84-year-olds. As a result, the overall response rate seems low (23%); however, this includes a high number of non-responders who were likely not all age-eligible for inclusion. The generalizability of our results is limited to older adults in community dwellings who have and can use a landline telephone. With the trend towards the sole use of mobile phones, this limitation will become more apparent for studies of similar methodology. Another limitation is that the results may be biased towards those who chose to participate in the survey, and we were unable to collect any information about non-respondents.

Questionnaires targeted at older populations should be kept simple and concise so as not to cognitively overload the respondent. To mitigate this, we used some previously developed questions from well-established surveys and pilot-tested the full questionnaire on the target population. Still, not all questions in this survey have been assessed for their validity and reliability in this population.

Other challenges specific to collecting data on this population included respondent trust to provide confidential data such as income – in our survey, although the survey was introduced as being from a credible munic-ipal organization with the offer of confidentiality, 32 per cent of respondents refused to provide their income. The survey was conducted in December, and the phys-ical activity questions may be subject to seasonal var-iations (Shephard, 2003; Uitenbroek, 1993). The survey was limited to older respondents who could speak English or French. Because data were collected on adults living in their home, findings should not be extrapolated to older adults living in long-term care homes, nursing homes, and hospitals.

Although taking multiple medications concurrently has been established as a risk factor for falling, certain medications (e.g., psychotropic drugs) increase the risk of falling (de Jong, Van der Elst, & Hartholt, 2013). Specific medications were not captured in the survey, and the proportion of older adults at risk for falling because of medications is likely underestimated by focussing on multiple medication use only.

The questionnaire did not address previous history of falls or other co-morbidities associated with an increased risk of falls. These factors would likely affect the extent of awareness and behaviours related to reducing a risk of falls.

Conclusion

Prevention approaches to reduce falls in community-dwelling adults aged 65 years and older are complex and multifaceted. However, essential to planning these approaches is an understanding of the levels of awareness and adherence to fall prevention recommendations. The Older Adults Fall Prevention Survey informed key priorities for planning fall prevention approaches. This survey tool can be used to assess fall prevention awareness and behaviours in other communities and the results may be applicable to similar Canadian settings.

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Attitudes of older people with mild dementia and mild cognitive impairment and their relatives about falls risk and prevention: A qualitative study

Abstract

Objective

To explore the perceptions of older people with mild dementia and mild cognitive impairment, and their family carers, about falling, falls risk and the acceptability of falls prevention interventions.

Design

Qualitative study involving thematic analysis of semi-structured interviews with patient and relative dyads.

Participants and setting

20 patient/ relative dyads recruited from Memory Assessment Services and Falls Prevention Services in the United Kingdom.

Results

The findings are presented under four key themes: attitudes to falls, attitudes to falls prevention interventions, barriers and facilitators, and the role of relatives. Participants' attitudes to falls interventions were varied and sometimes conflicting. Some worried about falls, but many resisted identifying themselves as potential 'fallers', even despite having fallen, and rejected the idea of needing the help that structured interventions signify. Participants preferred to focus on coping in the present rather than anticipating, and preparing for, an

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uncertain future. Falls prevention interventions were acknowledged to be valuable in principle and if required in the future but often felt to be not necessary or appropriate at present.

Conclusions

This study of how persons with cognitive impairment, and their relatives, view falls risk and prevention mirror findings relating to the wider population of older persons without dementia. Participants did not generally see falls prevention interventions as currently relevant to themselves. The challenge for clinicians is how to present interventions with understanding and respect for the older person's identity. They must identify and address goals that patients and relatives value. Simplistic or paternalistic approaches will likely fail. Individualised interventions which focus on maintaining independence and preserving quality of life are more likely to be acceptable by supporting a positive self-image for patients and their relatives.

Introduction

A fall is defined as unintentionally coming to rest on the ground or at a lower level through whatever cause [1]. Falls, and their consequences of injury, distress, pain, reduced independence, increased anxiety and negative impact on quality of life, are of great significance for older individuals [2], their carers [3–5] and national health care services [6, 7]. Thirty percent of those aged 65 and over, and 50% of those over 80, fall at least once a year [6]. Within the United Kingdom [UK], falls are estimated to cost the National Health Service [NHS] more than £2 billion annually [6, 7]. Dementia causes loss of memory and other cognitive abilities including 'executive function' [planning, judgement and decision-making] [8]. Dementia is progressive and irreversible, and interferes with daily activity. 'Mild cognitive impairment' [MCI] is a measurable loss of mental function, which does not interfere with daily activities, but often precedes future deterioration. Half of those with MCI subsequently develop dementia [9]. There is increasing evidence of the adverse effect of cognitive impairment on balance and increasing falls risk [10, 11] especially executive function [12] and visuospatial problems [13]. A two-fold increased falls risk is present in even mild impairment [14].

Dementia is an increasing public health problem for developed societies; prevalence is strongly associated with age and numbers will double over coming decades [15, 16] There is an urgent need to identify interventions that reduce or delay the dependency resulting from dementia; reducing the risk of falls provides one approach to doing this. Falls prevention interventions in general older populations are limited by low uptake [17, 18] poor knowledge, competing demands on time, perceived lack of benefits, and ill-health [19, 20]. Uptake also depends on health professionals' attitudes to falls interventions [21] and the older person's personality [22]. Health professionals commonly believe that falls prevention interventions are ineffective for those with cognitive impairment, although the evidence base is weak [23]. Much previous research has excluded older people with dementia [24, 25].

Older adults may cope with negative conceptions of aging by self-protective behaviour, preserving their identity as capable and 'still young at heart' [18, 26]. Falls prevention advice may be seen as threatening and unwelcome [18, 20]. Exercise programmes for people with cognitive impairment have, however, been found to improve strength, function and mood [27–29] and to reduce the risk of falls [30]. In addition, there is evidence in general populations to support

wider benefits such as cardio-vascular health and improving participation in social activities [31]. Helping older adults engage in any intervention whilst minimising damage to their positive perception of self is an important but difficult challenge. Family members and relatives play an essential role in supporting rehabilitation and falls prevention interventions in those with cognitive impairments, and their views should be heard when considering the acceptability of services [4, 32].

This paper presents findings from a UK study which explored the views and experiences of people with mild cognitive impairment [MCI] and mild dementia, and their relatives, about falls and what they might do to prevent them. We also explored participants' views about the facilitators and barriers to professional intervention, and their experiences and thoughts about receiving professional support. This was undertaken to inform the design of an exercise-based fall prevention programme for older people with cognitive impairment or mild dementia. The rationale was to target a group who were still relatively able, but who were at high risk of functional deterioration.

Method

This research was reviewed and approved by the NHS National Research Ethics Service Committee, East Midlands Ref 13/EM/1061. All participants provided written consent to take part in the study.

People aged 65 years or older with MCI or mild dementia [Mini Mental State Examination 21-26/30 [33], Montreal Cognitive Assessment 15-25/30 [34], depending on the clinical assessment used by recruiting services], and their relatives were recruited to a study of gait and neuro-cognitive risk factors for falls from Memory Clinics or Falls Prevention Services. A convenience sample of twenty patient/relative dyads was recruited to the qualitative study reported here. Dyads who indicated their agreement to take part in a research interview about their experience of falls and perspectives on strategies for prevention were subsequently contacted by a researcher [TP], a falls specialist occupational therapist who was not involved in the participants' clinical care. Interviews were held jointly with patients and relatives together to gather data on their experience and perspectives on falls and falls prevention, and on relatives' role in supporting patients to avoid falls.

All participants were deemed to have mental capacity to consent by the recruiting clinician following a structured assessment, and all provided written consent to take part. The study was approved by an NHS Research Ethics Committee.

Data collection

Participants. Twenty interviews were completed with 20 patients and 21 relatives. Sixteen patients were recruited from memory clinics and four from falls prevention services in the UK between 2013 and 2014. One patient forgot that a relative should be present so was interviewed alone, and two interviews were completed with two relatives present. At recruitment, eight patients had an established diagnosis of dementia. The remaining twelve had completed assessments at the memory clinic and were awaiting diagnosis. The relatives interviewed in this study fitted the definition of a carer as: 'anyone. . .. who looks after a family member, partner or friend who needs help because of their illness, frailty, disability a mental health problem or an addiction and cannot cope without their support. The care they give is unpaid.' [https://www.england.nhs.uk/commissioning/comm-carers/carer-facts/].

However, given the early stage of patients' cognitive impairment not all relatives needed to provide practical assistance, other than the help and support that exists in a caring relationship. To reflect this, the word 'relative' is used to refer to the spouses, children and friends of

patients participating in the study. For clarity, as both those with early dementia and their relatives were participants in the study, they will be referred to as 'patient' or 'person with cognitive impairment;' and 'relative', rather than 'participant', unless both relatives and patients are being referred to, when 'participant' will be used.

Semi-structured interviews were conducted in participants' homes using an interview guide. Interviews were audio recorded, and transcribed verbatim for thematic analysis. All interviews explored attitudes to specific falls prevention interventions [exercise, adaptations, mobility aids and group activities]. The interview also covered experience of falls, current activity limitation, concerns about the future and perceived barriers and facilitators to acceptance of falls prevention interventions. Interviews with cognitively impaired patients have challenges including attention and concentration lapses, problems with memory, abstract thinking and reasoning, word finding difficulties, fatigue, anxiety, and repetition [35]. These were managed with attention to communication strategies such as simplifying question structure and giving plenty of time for responses.

Data analysis. A thematic analysis was undertaken using the qualitative software analysis programme NVIVO 10 to manage the data [36]. All transcripts were coded by TP using a process of constant comparison. Eight transcripts were also independently read and analysed by KP as the coding frame was developed through a process of collaborative reflection and discussion and then applied to all transcripts [37, 38]. Coding extended beyond the topics underpinning the semi-structured interviews to incorporate data-driven themes around lifestyle and identity which emerged in addition. Coding of all transcripts was reviewed and the analysis developed by TP and KP following completion of the initial analysis and in the light of themes and patterns that emerged throughout the interviews.

Findings

Patients were aged between 70 and 93 years and included 13 men and seven women. All but one identified as white British. Most relatives were co-resident spouses [n = 10], or children [n = 9] of the person with cognitive impairment, who did not live with the patient. In addition, one friend and one grandchild took part.

Findings are presented under four key themes: attitudes to falls, attitudes to falls prevention interventions, barriers and facilitators, and the role of relatives. Pseudonyms have been used throughout.

Attitudes to falls

Thirteen patients reported that they had previously fallen at least once, and gave accounts of their falls, often describing injuries. It should be noted that these reports relate to *accounts* of falls which respondents remembered and were willing to acknowledge, rather than a record of 'facts' regarding these experiences. In addition, patients may have been operating with different assessments of what constituted a 'fall', especially when they were anxious to resist the attribution of 'someone who falls'. For example, interviews with three of the seven patients who stated that they had not fallen included descriptions of incidents [given by the patient or relative] which seemed likely to have constituted falls from a professional perspective. Participants' accounts referred to falls that had occurred, sometimes recurrently, between 30 years and six months previously. Some respondents could not recall exactly when they had fallen, but most of those who acknowledged having fallen described experience of falls within the last two years. The shock of falling was discussed, and its impact on confidence. In such cases, fear was expressed about the risk of hurting themselves, not being able to get up, or having to move into a residential care or nursing home. Relatives reported that they had to modify their own

activities and increase their supervision of the patient because of the risk of falls. One relative, who had fallen herself, said that falls were the 'worst thing that can happen'; a reminder that the patient is not the only vulnerable person in the dyad. Some relatives were more nervous of the patient falling than the individual was themselves.

It's getting a little bit scary for us as well to take her out.
Mrs Simmonds' son

I think we're getting to a stage where we're more worried about what if there was a fall whilst she was out.
Mrs Jones' daughter

When patients could not fully recall their falls, relatives supplied details to complete their account. In one case the relative supplied the full account as the patient was unable to remember any details. Reasons given for falling were environmental [for example tripping on uneven pavements, slipping on wet leaves], or linked to unfamiliarity with the environment. Some falls were attributed to personal limitations or carelessness ['my own stupid fault'], others to chance or arbitrary mishap. For all participants, both those with experience of a fall and those without, there was a low level of awareness of possible reasons for falls; only poor eyesight and uneven surfaces or 'catching your feet' were mentioned. The importance of muscle strength and good balance in reducing the risk of a falls was not widely acknowledged.

Several patients, all of whom had experience of falling, reported being wary or fearful of falling, describing this awareness as being 'always in my mind' or 'watching the entire time'. The others reported no specific fear of falling. Some acknowledged an awareness of the risk of falling but denied that this caused anxiety. Most patients considered that removing or avoiding the identified hazard, or increasing vigilance ['being careful'] was sufficient to reduce their risk.

It's always got to be something at the back of your mind that, you know, you must never forget.
Mr Brown

And I don't think he does worry about it, because to worry about it restricts him.
Mr Taylor's friend

No, not while I'm all right and walking about, no, it doesn't even occur to me that I might fall, never even thought about it.
Mrs Evans

Patients reported modifying their behaviour [doing activities with people rather than alone, reducing bending, 'allowing' for hazards], or exercising caution in specific situations [climbing stairs, crossing roads]. By attributing falls to arbitrary accidents [which could happen to anyone] or carelessness ['my own silly fault'] they felt that future falls were avoidable by 'being sensible'. Others who had fallen felt the cause or presumed explanation for their fall had been addressed, thus further intervention was not important. 'Personality' was sometimes considered to be a factor in anxiety around falling [being a 'born worrier' rather than someone who 'never worried'], rather than objective risk.

Attitudes to falls prevention interventions

Participants were asked about their attitudes to health service falls prevention interventions. Views varied from 'being prepared to try' or 'go along with it', to obvious reluctance. One dyad

had ‘never thought about it’. Recurring responses were: we ‘have it already’, ‘do not need it’, ‘do not want it’ or ‘do not need it at the moment’. Interventions were often seen as good for ‘later on in life’, and ‘out there if needed’, but not necessary at present. Many of the participants reported that they were satisfied with their present situation and therefore felt they did not need interventions. The view that ‘we’re all right, not lacking in anything’ was often expressed. Seeking help ‘would have to be something to do with ’having fallen’, and considered appropriately triggered by a crisis, ‘if needs must’. Even those who were worried about falling did not feel the need to take preventative action in advance of a crisis or initiate this pre-emptively when well.

Equipment, adaptations and mobility aids. Participants had access to a wide range of equipment or adaptations [e.g. toilet frame, delta walker, rambler trolley, walking sticks, perching stool, bath board, bed grab handle, grab rails or wet room]. Some had found these very helpful and felt they had ‘undoubtedly saved a lot of falls’, whereas others used them ‘as needed’, or had discontinued their use. Some participants reported contradictory stances. For example, two dyads who had equipment which they said they were using also reported that they did not need it at present. This may reflect a desire to maintain a stance of not needing help, while nevertheless accepting it. It is possible that respondents had normalised the use of these aids and no longer saw them as an active intervention. Equipment was acceptable ‘if needed’, when [in principle] there was thought to be ‘nothing wrong with it’, although there was concern that using such aids was a clear and unwelcome advertisement of vulnerability.

If it was enabling me to do something that I couldn’t, but wanted to do, I would go along with it.

Mr Davies

I mean, I’ve got no worries about what people might think or not think. I mean, if you need something, if it's going to make your life tolerable shall we say, well, by all means and it's on offer, get it.

Mr Brown

One object[ion] I would have to.. . . I suppose. . . if it was outside, not because of the look of it, but because it would make strangers aware. . .what sort of person lived in that property and therefore, they’d be more vulnerable.

Mr Banks’ wife

Many patients possessed a walking stick, which were reported to be used to variable extents: sticks gave confidence, reassurance or were something to rely on for those using them. However, some patients were openly ambivalent or evasive about the extent to which they used a stick. Others openly rejected the need or were not prepared to use them. Two patients used a delta walker for outdoors and a walking frame for indoors respectively. One relative said they would buy items privately rather than ask for professional help.

I think, well, if that time came, obviously, I would use it. Yeah, and not averse to using it. I just don’t, I don’t think I need it at the moment.

Mrs Smith

Mrs Evans’s Daughter: But she doesn’t use a walking stick, anything like that because, you know, she won’t, well, you see it all as a sign of weakness anyway, don’t you?

Mrs Evans: No, I don’t, no, not a sign of weakness but it hasn’t come to me [the need to use a stick yet].

Physical exercises. Participants said they were receptive to taking exercise specifically to prevent falls in principle 'if I thought it was doing me good', but felt they were not yet, or were no longer, in need. Previously practiced exercises were recognised to have been beneficial, but were discontinued once the need had passed, or only practised occasionally, as the habit had 'just drifted off somewhere' or exercise sheets were 'filed away'. Participants reported that they were currently 'doing enough' exercise through 'normal' activity such as gardening, walking, and even 'going to the loo'.

I do do some exercises and I've often said to P., 'Come on, let's do some', but you can't really. Even those later lots you were given from the doctor, when you said your back was bad, and that's only a few months ago, you didn't really get yourself going on them, did you?
Mr Davies' wife

Well, to be really honest, I feel as though I'm doing enough. I mean I don't sit all day.
Mrs Peters

When I've been in the garden, next door- my son lives next door—I was out there doing the lawn and gardening and digging. . .I come in and I've, oh, I've done enough exercise, I don't need to do them.
Mr Appleby

Participants referred to engaging in a wide range of leisure activities and hobbies which often involved activity and social engagement [including bowls, visiting friends and family, trips out, holidays, sewing, gardening, golf, walking, doing crosswords and puzzles, going into town, bus trips, reading, dancing, church-going]. Continued ability to carry out normal activities of daily living [e.g. cooking, making tea, cooking meals, ironing, housework/hoovering, washing pots] was an important indicator of functional independence ['we're alright']. Alongside assertions of ongoing independence and functional capacity, however, were many statements acknowledging attrition: a giving up or reduction of competencies and activities [no longer dancing, going on holiday, visiting friends and family, walking less far than formerly]. In this case, participants resorted to a strategy of absorbing and normalising loses to redefine themselves as maintaining [sufficient] independence and autonomy ['we're alright'].

Many practical challenges for completing prescribed exercises were reported. It was 'difficult to do the same thing every day', the exercises given by a physiotherapist were felt to be 'too difficult', 'too much', 'too fast' 'had not been demonstrated', or were not seen as relevant. Participants also reported that exercise may require family supervision, were difficult to fit into the day, or that it was difficult to motivate oneself to do. They were put off by not knowing where to access appropriate exercise in the community, or because they felt awkward and out of place in public places: e.g. feeling 'like an old lady' in the gym.

Some participants expressed an intention to start exercising again but did not report concrete plans for doing so. Several relatives described trying to prompt patients to exercise, but without success. Indeed, the need to remind patients, or monitor their exercise engagement, could constitute an unwelcome obligation. No relatives reported seeking to find or implement an exercise regime that they could do daily with the patient.

Group activity interventions. Three broad responses were expressed towards group activities: positive, negative, and those who were not averse in principle but were not likely to take part in practice. Several patients reported currently attending existing community social group and being happy with these. Others reported that they would join a group if invited, particularly if this involved their own age group and similar people 'right in my bracket'. They felt

they would feel more stretched and motivated to exercise, and would be happy to join in. They stated they would enjoy the social element and getting out of the house ['better to go somewhere'] and even if the group was 'boring' it was still 'something to do'. Community venues were considered acceptable provided they had the right skills to manage people, and were in an appropriate location. Relatives liked the idea of a group as this could give them respite from their caring role, although they respected the patients' preferences in this.

> *I wouldn't mind attending a clinic if, if it was, you know, somewhere I could get to, taking part in activities with other old people.*
> *Mr Taylor*

> *I'd rather do it in a, you know, in a group. . .Yeah. With others in the same boat.*
> *Mrs Walker*

However, a third of patients said that they would not be interested in joining a group because they considered these would not be helpful, and anticipated that they would find them patronising, boring or a waste of time. Concern was expressed at groups not being geared for older people or not adapted to the participants' levels of need.

> *It doesn't appeal to me. Not because I'm sort of stand-offish or anything else, I think I'd be bored. . .That sounds rather pompous and I don't mean it to sound that. . .*
> *Mrs Thompson*

One patient felt that a group would show that she was 'not capable of being on my own and doing something on my own'. Some implied that they 'can't face Alzheimer's groups' as they feared these would underline the potential progression of the disease. Another view was that the respondent was in a 'different league' from those for whom group activities were appropriate, being 'top of the class' or 'not bad enough' compared to others attending. Some patients were concerned that they might not know anyone or felt that they were simply 'not group people' no matter what the group.

Barriers and facilitators to exercise

Several barriers to activity or exercise were mentioned in the interviews by both patients and relatives. The challenges for this group were public [services, location, environment, transport]; extrinsic [cost, time] and intrinsic [health, emotions, motivation]. Throughout the interviews it became clear that cognitive impairment presented challenges, such as route-finding, motivation and remembering appointments, although this was expressed in general conversation rather than overtly acknowledged as a barrier. It is simplistic to separate these factors due to the complex interrelationships existing between them. Facilitators to interventions were usually the inverse of the barrier [i.e., bad health is a barrier; good health a facilitator], but were not clearly articulated by participants. Support and supervision when completing exercises were considered important to successful intervention as was establishing the right level and relevance of interventions for people with cognitive impairment.

Relatives' role

Patients in this study were in the early stages of dementia and were reported to be independent in most activities of daily living [ADLs]. The relative who was interviewed did not necessarily define themselves as a 'carer', although some acknowledged this to be an increasing role.

Relatives expressed wanting to provide practical support whilst not undermining the patient's independence. Some relatives reported that they provided reassurance and guidance with daily activities, or undertook monitoring of activities of the patient to promote their safety. Relatives varied widely in their ability, resources and motivation to provide such support, which even when given willingly was reported to be exhausting and demanding. One relative described the fatigue resulting from her caring role. She reported that clinician expectations of her support for her husband were 'just one thing when you've got everything else'.

> *Not that, I'd not stop her but I'd make sure that I. . .. took her or, you know, and collected her. . .*
>
> *Mrs Walker's Daughter*

> *I don't know, you'd just have to see how things change, if they get worse and then you're struggling, and then there's help there, then obviously you would ask. But in between we try and look after mum best we can, and we do more and more slowly, you know, it builds up on you, you just do more and more for her than you used to. But as long as it's acceptable then you carry on.*
>
> *Mrs Simmond's son*

Family dynamics affected the nature of the support provided by the relatives—e.g. whether relationships involved a couple 'living for each other', or a son or daughter not wanting to 'push' their mother into challenging activities, or establishing a rota of family members to provide support. Relatives acknowledged their limits; e.g. feeling that they 'can't pick them up', or 'don't know how to handle it'. Some had experienced role reversals and a change in the domestic division of labour resulting from patient's cognitive decline. Other relatives acknowledged the symbiotic nature of the relationship: 'I need your strength, [while you need my memory]'. Availability and access to relatives were acknowledged as factors affecting the support that could be given. Patients did not want to rely on family as 'they have their own lives', and could feel guilty about the restrictions which their illness placed onto their relative on whom they strongly did not wish to impose a burden. Both patients and their relatives also had a range of competing obligations and commitments; to spouses, children, grandchildren or even dogs. However, it was notable that even in relation to those with early dementia or mild cognitive impairment, relatives tended to speak for the patient in the interviews. This was often encouraged by the patient: 'I'm looking at you [to answer]'; 'I think your thoughts are more appropriate'. This contribution came across as a loving support or simple reminder, rather than controlling or speaking over.

Discussion

This study expands our knowledge of patient and relatives' attitudes to falls risk in the early stages of cognitive impairment and moves towards an understanding of the challenges in engaging this group to maintain health and prevent future falls. Most patients were aware of the risk of falls. A minority were keen to intervene to reduce risk. A quarter of patients reported being engaged in some kind of community group exercise, but a third indicated no interest in this kind of activity now or in the future. Overall, however, patients expressed being open to falls prevention interventions in principle and in the future, but tended to present themselves as 'doing alright' and not in need of such measures at the present time. They held different preferences regarding falls interventions which might subsequently be appropriate, and varied in their receptiveness to information and falls prevention strategies; what was a

solution for one was not acceptable to another. Numerous barriers to exercise interventions were cited. Supervision was considered important, but relatives were mixed in their willingness and ability to provide this. Individual circumstances and relationships were very important in determining what might be possible and acceptable.

The semi-structured interview approach allowed an in-depth exploration of views, including topics not anticipated in advance. Interviewing twenty dyads enabled a wide range of views to be obtained. By interviewing dyads, the person with cognitive impairment was supported, and their relative was also encouraged to have a voice and make a valued contribution to the study. Accounts were retrospective, so details may have been forgotten, recalled selectively, or issues with insight or judgement may have influenced what was said, such as the tendency to discount or re-define non-injurious falls. It is likely that the incidence of falls, slips or trips was underreported. Relatives may have been selective in what they said in the presence of the person with cognitive impairment, and manifest a desire to articulate their own needs, or psychological defences to facing an uncertain future. The participants were volunteers, predominantly white and reasonably affluent. Different perspectives may have been articulated by a more diverse sample and the findings of this exploratory qualitative study may not be generalised to wider populations. However, their resonance with previous research findings reinforces their relevance and theoretical transferability to other settings [20, 39].

Few previous studies have explored the views of people with cognitive impairment and their relatives about exercise and falls prevention [32], but our findings are similar to those reported for populations without cognitive impairment [4, 18, 20, 22, 39, 40]. Dickenson et. al. [19] describe knowledge, availability, appropriate facilities and design, and experiencing benefits as key facilitators for engaging in falls prevention interventions. Other work with people with dementia [41] indicated that ensuring activities are pitched at the correct level is key to engagement. Health professionals and their response to reported falls played a major role in referral to, and uptake of, interventions [42] as did other forms of positive social reinforcement [23]. Issues such as lack of time and money, and accessibility of location, knowledge about and availability of appropriate services and motivation are barriers to exercise among the general population as well as those affected by cognitive impairment [43, 44]. In maintaining their lives at home, our participants demonstrated resilience and ability, and like frailer people more generally, 'balance[d] loss and capacity in their everyday lives' [45]. Participants expressed the hope that they would remain as they were, linking with De Witt et al's [46] concept of people with dementia 'holding back time'. The view that 'anyone can fall' or suffer an accident, minimises the link to personal vulnerability [18]. Participants resisted a sense of vulnerability and also acknowledged it; the same individual could do both in different parts of the interview, illustrating the tension between the 'real' and the 'ideal' or 'private' and 'public' accounts [47].

Studies have found that relatives are important in ensuring the success of interventions, for positive social reinforcement, as well as providing practical support in matters such as transport [32]. Relatives often act as activity enablers whilst also gate keeping to protect their loved one from potentially demanding or hazardous situations. Relatives have an important role in supporting patients and their input can be critical to the success of effective falls intervention [32]. However, they experience difficulties and ambivalence towards providing this, especially as the patient's conditions deteriorates [3–5, 48].

The idea that 'things are OK' might spring from the desire to maintain a positive sense of identity. This may involve redefining what 'OK' is for that person–'managing' or 'soldiering on' in preserving independence are seen as virtues [18, 22, 39]. Identifying with the current relevance of interventions is a critical point, as anticipation of the future, including the goal of preventing future decline, is not always a cause of present motivation [20]. Participants

described making changes to their lives in response to their deteriorating abilities. This contrasts with their expressed idea that interventions were not currently relevant. Indeed, the 'subjective perception of risk is often at odds with the objective benefits of the behaviour' [43]. Thus, participants balanced the risk of acknowledging themselves as weaker, and a potential faller, against the potential benefits of falls prevention interventions. Being in need of help is highly disvalued [49] and participants did not present themselves as in need of help during the interviews, preferring to retain a capable presentation of self: 'we're doing alright' [40].

Age-related conditions combined with deteriorating memory are additional challenges for those affected by cognitive impairment [50], particularly the very old: several of our patients were over 90. Co-morbidity and age impacted on patients' ability to manage physical and social environments, forcing them to adapt or avoid environments that were too challenging. Diminishing cognition was not an openly acknowledged barrier for engaging in interventions, although this would potentially present problems [e.g. finding a new location, remembering appointments, learning new skills], especially without carer support. However, while this is an understandable strategy, risk aversion and using 'being careful' as a primary coping mechanism can result in deskilling and the individual's loss of confidence in their capacity to undertake activities of daily living [20].

Participants who expressed increasing caution felt they reduced their hypothetical risk of falls because they were careful, and so did not perceive themselves at risk of falling. Even those who had fallen, because they were now careful in the situation they attributed as the cause of their fall, did not report themselves to be at risk of future falls [18, 51]. Indeed, the participants interviewed were largely independent and working to maintain function in their own ways. However, the introduction of effective exercise interventions at this point could be critical in enabling people with cognitive impairment [and their relatives] to develop and maintain key skills and prolong functional capacity and sustain their independence in the future.

Slowing or reversing decline through exercise and increased activity could help to preserve the independence and functional capacity which are important constituents of good quality of life [52]. Although perceived risk of falling did change behaviour among some participants, the importance of improving strength and balance to reduce the risk of falls in future was not generally appreciated. This reflects previous findings and demonstrates that this is still an area with great scope for awareness-changing within the general population [18, 20, 39].

It is also important to consider the role of relatives as potentially a barrier as well as a facilitator to successful interventions; they may lack the time or willingness to support the person with cognitive impairment with the intervention, or lack the energy or physical capability required to do this.

Implications

To engage patients with mild dementia or mild MCI in effective falls prevention we must reach agreement on goals that are important and meaningful to the individuals concerned. There is a delicate balance to be maintained between supporting patients' desire to maintain their ongoing integrity as independent agents who are managing to 'do alright', and generating awareness of their current and future risk. The goal is to engender acceptance of the value of falls interventions as effective measures to protect or even increase wellbeing and independence, rather than being viewed as a public and personal signifier of frailty and incapacity. Recruitment messages that emphasize the multiple benefits of interventions such as enjoyment, health maintenance, improving balance, retaining mobility and independence may have more relevance to older people's motivation to engage with interventions than directly emphasising the risk of falls [22, 32, 39, 50]. Falls prevention strategies of compensation,

rehabilitation and education need to be personalised to be effective [52]. Interventions should be framed in a way that positively appeals to the individual and move beyond the rhetoric of 'tailoring' [50]. Services need to focus on the scope for such interventions to contribute to both personal and family wellbeing, as well as relieving economic and demand burden on health care services.

Relatives or other caregivers are often critical to successful exercise engagement of patients with dementia. Understandably, however, they may not relish the role of being the person providing the intervention alongside balancing a range of other responsibilities and commitments. It should be noted, also, that relatives are often old and frail themselves. Becoming the 'personal trainer' for their loved one may not be their priority or within their capacity. This has an implication for practice as long-term continuation of exercise programmes may often have to rely on continuing professional or group support, rather than be delegated to informal care. An individually adapted approach for couples, which values the role of the carer and accounts for the progressive and changing nature of dementia, should be a guiding principle for intervention design. If an intervention is being promoted as good for the patient's health and wellbeing, it would seem wise to promote it to the relative too.

Participants expressed complex, inconsistent and contradictory positions on falls risk, their current abilities and need for interventions. Part of the challenge for clinicians is to find ways to bridge these gaps and work with people with cognitive impairments and their relatives to fit solutions into their existing lives and abilities. Further work is needed to explore practical ways of achieving this.

Conclusion

This study builds on the existing literature by finding that people with cognitive impairment and their relatives are similar to the wider population of older people in expressing themselves to be amenable, in principle, to falls prevention intervention, but not much interested in practice at the present time. They will need support to personally identify their current relevance and future gain. The introduction of therapeutic interventions, with their consequent implication of diminished capacity, needs to be balanced with preserving confidence and a positive sense of self. Clinicians need to focus on promoting present health, methods to preserve quality of life, independence and wellbeing, as opposed to talking about falls prevention and the negative prospect of risk in order to improve uptake. Pragmatic barriers that everyone faces must also be overcome to ensure accessibility of interventions. Health professionals need to take up the challenge of motivating a group of people with complex needs, who require input to remain independent and preserve quality of life as long as possible.

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Older adult fall prevention practices among primary care providers at accountable care organizations: A pilot study

Abstract

Background

Falls are a serious and common problem among older adults. Low-tech, inexpensive, community-based fall prevention programs have been shown to be both effective and cost effec-tive, however, these programs are not well-integrated into clinical practice.

Research design

We surveyed primary care providers at a convenience sample of two accountable care orga-nizations in Massachusetts to assess their beliefs, attitudes, knowledge, and practices rela-tive to fall risk assessment and intervention for their older patients.

Results

Response rate was 71%. Providers' beliefs about the efficacy of fall risk assessment and intervention were mixed. Eighty-seven percent believed that they could be effective in reducing fall risk among their older adult patients. Ninety-six percent believed that all older adults should be assessed for fall risk; and, 85% believed that this assessment would identify fall risk factors that could be modified. Nonetheless, only 52% believed that they had the expertise to conduct fall risk assessment and only 68% believed that assessing older adult patients for fall risk was the prevailing standard of practice among their peer providers. Although most providers believed it likely that an evidence-based program could reduce fall risk among their patients, only 14% were aware of the Centers for Disease Control and Prevention's fall risk assessment algorithm (STEADI Toolkit), and only 15% were familiar with Matter of Balance, the most widely disseminated community fall risk prevention program in Massachusetts.

Competing interests: The authors have declared that no competing interests exist.

Discussion

New strategies that more directly target providers are needed to accelerate integration of fall risk assessment and intervention into primary care practice.

Introduction

Falls among older adults are common. Each year, a quarter of those 65 years of age or older fall. These falls can result in debilitating, sometimes fatal, injuries and affect psychosocial status and quality of life. Among older adults, falls are the leading cause of fatal and non-fatal injuries [1]. In 2015, 2.5 million older adults in the U.S. were treated in emergency departments (EDs) for non-fatal fall-related injuries and more than 734,000 of these patients were hospitalized [2]. In that year, the direct medical costs for older adult falls exceeded $50 billion [3]. Even when falls do not require medical attention, the experience can result in fear of falling, which can be psychologically disabling [4] and lead to future falls through physical deconditioning [5,6].

Over recent decades, community-based fall prevention interventions have been developed and subjected to randomized trials [7]. These low cost, low-tech programs can result in 25–30% reductions in falls one-year post-program [7]. These programs, however, are not well-integrated into clinical practice and are most often offered by non-medical public and private organizations that serve older adults. Because these programs are typically marketed directly to the public, rather than through referrals from healthcare providers, they may not serve many older adults with the most to benefit from participation.

Recent studies have also shown community-based fall prevention programs to be cost-effective. The Centers for Medicare and Medicaid Services [8] conducted a retrospective cohort study evaluating Matter of Balance (MOB), a program developed to reduce fear of falling and increase mobility in older adults [9,10]. Compared to matched controls, older adults who had participated in the MOB program had significantly lower total health care costs during the post-participation year [8]. Another study estimated the net benefit and return on investment (ROI) of three evidence-based fall prevention programs [11]. Otago, a program targeting frail older adults that is delivered in the home by a physical therapist or other healthcare provider [12], had a one-year net benefit of $121.85 and a ROI of 36% for each dollar invested. Tai Chi: Moving for Better Balance, a group program for enhancing strength and balance [13], had a one-year net benefit of $529.86 and a ROI of 509% for each dollar invested. Stepping On, a program combining community-based group sessions with follow-up home visits by a healthcare provider [14], had a 14-month net benefit of $134.37 and a ROI of 64% for each dollar invested [11]. In a separate study, Howland et al. estimated a ROI of 144%, if all older adults presenting with a fall injury at Massachusetts EDs were referred to MOB and 50% complied and completed the program [15].

In addition to the development and evaluation of interventions to reduce fall risk, new risk assessment algorithms have been developed and promoted. Most notable among these is the STEADI (Stop Elderly Accidents, Deaths and Injuries) Toolkit [16], which was developed by the Centers for Disease Control and Prevention (CDC) for use in clinical settings. The STEADI algorithm outlines a standardized approach for healthcare providers to conduct fall risk screening, assessment, and intervention for older adults. Among the assessment tools recommended by STEADI are the Timed Up and Go Test [16], a test for mobility and recommended for all patients who screen positive to the fall risk screening questions, and the 4-Stage Balance Test, an optional test for assessment of balance.

There have been relatively few studies of provider practices for fall risk assessment and intervention. Wegner et al. queried a sample or community-dwelling older adults enrolled in two managed care organizations who had received care in 1998–1999 and found that most were not asked about their fall history [17]. Jones et al. surveyed a random sample of Colorado primary care physicians about older adult fall prevention practices [18]. Only 8% of respondents reported fall prevention practices based on guidelines from recognized organizations; lack of time, more pressing medical problems and lack of educational materials were the most frequently cited barriers to fall risk assessment [18]. Among 38 healthcare providers from 11 New York state practices, Smith et al. found that less than 40% asked most or all their older adult patients if they had fallen in the last year; less than 20% referred their older patients to community-based fall prevention programs; and, less than 16% conducted standardized functional assessment with their older patients at least once a year [19]. Burns et al. analyzed data on fall prevention recommendations to older adult patients among 1210 US primary care providers who participated in the 2014 DocStyles survey [20]. These investigators found significant practice differences by provider type, suggesting the absence of provider consensus on fall prevention guidelines [20].

For the present study, we surveyed a convenience sample of primary care providers to assess their beliefs, attitudes, knowledge, and practices relative to fall risk assessment and intervention for older adult patients. The purpose was to gauge the extent to which providers were assessing fall risk in older adult patients and referring these patients to evidence-based fall prevention interventions.

Materials and methods

Derivation of questionnaire

Survey questions were derived from several sources, including, replicated or modified questions from the National Council on Aging's Evaluation Guidelines for Falls Prevention Coalitions [21], the CDC's Clinician Baseline Questionnaire, which was developed for evaluating an on-line physician training program for the STEADI Toolkit [16], American Geriatric Society and British Geriatric Society's (AGE/BGS) best practice guidelines [22], and a study by Nyrop et al. [23]. Other questions were developed specifically for the present study.

Questions reflected four dimensions relative to older adult fall risk assessment and intervention: provider beliefs, knowledge, attitudes, and clinical practices. Questions about beliefs aimed to determine the extent to which providers endorsed that they could effectively mitigate their older adult patients' risk for falling. Knowledge questions asked about providers' expertise relative to fall risk assessment and intervention; their awareness of assessment tools; and, their awareness of several evidenced-based community programs for preventing falls and reducing fear of falling. Attitude questions focused on adequacy of time and reimbursement for assessing older adult fall risk. Practice questions asked about the frequency with which providers conducted various fall assessment and intervention practices. We also collected information on respondents' demographics and the characteristics of their patients. Table 1 shows all the questions included in the survey and their derivations.

Sites and survey administration

Accountable care organizations (ACOs) are integrated healthcare provider organizations that include physicians, hospitals, and other providers to offer coordinated patient care to enhance quality of care and contain healthcare costs. ACOs contract with payers using "alternative payment methods" under which the ACO is responsible for the health care and health outcomes of attributed patients. If budget and quality goals are met, the ACO shares in the cost saving; if

Table 1. Survey questions and sources.

Beliefs	
I can do things for my independently-living older adult patients to reduce their risk of falling.	NCOA Evaluation Guidelines for Fall Prevention Coalitions
All patients ages 65 and older should be assessed for falls risk.	Nyrop Physician Perspective on Fall Prevention in Assisted Living (modified)
A falls risk assessment will uncover risks that can be modified	Nyrop Physician Perspective on Fall Prevention in Assisted Living (modified)
An evidence-based community falls prevention program can reduce the risk for falls among older adult patients identified as high risk.	Unique to project
I (or my office staff) have the expertise to do fall risk assessments of my patients ages 65 and older.	Unique to project
It is the prevailing community standard among my professional peers to assess the risk for falls in older adult patients.	Unique to project
Knowledge	
Are you aware of the falls risk assessment toolkit developed by the Centers for Disease Control and Prevention called STEADI?	Unique to project
Are you familiar with any of the following evidence-based community fall prevention programs?	
Matter of Balance	Unique to project
Tai Chi: Moving for Better Balance	
The Otago Exercise Program	
Attitudes	
I (or my office staff) have the time to do fall risk assessments of my patients ages 65 and older.	CDC STEADI Toolkit: Clinician Baseline Questionnaire (modified)
I am adequately reimbursed for doing fall risk assessments of my patients ages 65 and older.	Unique to project
Practices	
Do you (or your office staff) routinely use the STEADI Toolkit to assess your older adult patients for fall risk?	Unique to project
Over the past 12 months, for approximately what percent of your independently-living patients ages 65 and older did you (or your office staff) . . .	
Conduct a falls history?	AGS/BGS Clinical Guideline (2010) (modified)
Review medications for falls risk?	
Assess visual acuity?	
Conduct the Timed Up and Go (TUG) test?	
Conduct the 4-Stage Balance test?	
Educate about specific fall risk factors?	
Screen for Vitamin D deficiency?	
Refer to evidence-based community fall prevention programs?	CDC STEADI Toolkit: Clinician Baseline Questionnaire (modified)
Respondent Characteristics	
What type of medical degree do you have?	
What is your gender?	
How many years ago did you complete your medical degree	
Site Characteristics	
Approximately what percent of your office visits are patients ages 65 and older?	
Approximately what percent of your patients ages 65 and older would be considered low income ($30,000/year or less)?	
Approximately what percent of your older adult patients fall into the following race/ethnicity categories: White (non-Hispanic); Black (non-Hispanic); Hispanic/Latino; Asian/pacific Islander; and, Other?	
Approximately what percent of your older adult patients use a primary language other than English?	

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these goals are not met, the ACO bears a portion of the losses. In 2017, Massachusetts established the nation's first standards for (ACOs) and 17 ACOs were certified in the state that year.

A convenience sample of five of the 17 ACOs was selected based on proximity to investigators (to facilitate in-person meetings) and the large size of their patient populations. The executive director of each organization was sent an information package, including a copy of the questionnaire with a cover letter, signed by the Commissioner of the Massachusetts Department of Public Health and by the state's Secretary of the Executive Office of Elder Affairs. The cover letter introduced the study, requested a response about willingness to consider participation, and requested designation of a contact person within the organization with whom the study staff could discuss survey aims, content, and implementation. Three organizations responded, of which two agreed to participate (P1 and P2).

P1 is a vertically integrated ACO that serves urban communities in Eastern Massachusetts and offers inpatient services, primary care, specialty care, mental health, and substance abuse treatment. P2 is an ACO that provides primary and specialty care services to urban and suburban communities in Central Massachusetts and Boston MetroWest.

The investigators worked with the designated contact person to distribute the survey. The organizations identified eligible clinicians to whom the survey was administered. Physicians engaged in adult primary care and who care for older adult patients were the target of the survey, however, in some cases, nurse practitioners and physician assistants were included in the distribution. At P1, the survey was completed on-line and anonymously using the survey tool Qualtrics. Three reminder follow-ups were subsequently sent to non-respondents. At P2, the contact person distributed hard copies of the survey, which were returned anonymously by mail to the study staff.

The survey was administered in May, 2016 and data collection was continued through August 2016.

Data analyses

For questions that had a response consisting of a six-point agreement/disagreement scale, we dichotomized responses 1–3 as disagreement and 4–6 as agreement. Chi-square and Student's t-test were used to compare categorical and continuous P1 and P2 responses; significance was set at alpha = .05. Data were analyzed using Microsoft Excel and SAS v9.4.

Human subjects

This study was reviewed by the Institutional Review Board at Boston Medical Center.

Results

Response rates

In total, 136 surveys were distributed (90 P1 providers; 46 P2 providers). Overall, 97 of 136 (71%) of targeted providers responded to the survey (73% of P1; 67% of P2; p = .47).

Respondent characteristics

Ninety-three percent (89% of P1; 94% of P2; p = .76) of respondents were MDs. All those who responded "Other" were physician assistants, nurse practitioners, or did not specify.

Respondents at P1 and P2 did not differ significantly with respect to gender but did differ significantly with respect to years since graduation from medical school and specialty (Table 2).

Table 2. Respondent characteristics.

Characteristics	P1	P2	P Value
% Male	33.90%	51.60%	0.11
Years since Graduation	Mean = 15.2	Mean = 23.1	0.01
	SD = 12.7	SD = 12.3	
% MD	89%	94%	0.76
Geriatrics	4.8% (3)	12.1% (4)	0.045
Internal Medicine	51.60%	69.70%	
Family Practice	33.80%	18.20%	
Other	9.70%	0.00%	

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Site characteristics

P1 and P2 differed with respect to patient characteristics: percent of office visits by patients who were ≥65 years of age (25.6% vs. 43.2%; $p<0.01$); at least 50% of older adult patients were low income (80% vs. 44%; $p<0.01$); proportion of older adult patients who were minority (59% vs. 35%; $p<0.01$); and, percent of patients whose primary language was non-English (47% vs. 23%; $p<0.01$).

Respondent beliefs

Eighty-seven percent (83% of P1; 94% of P2; p = 0.16) agreed that they could do things to prevent their independently-living patients from falling. Ninety-six percent (98% of P1; 90% of P2; p = 0.08) agreed that all patients ages 65 and older should be assessed for falls risk. Eighty-five percent (83% of P1; 90% of P2; p = 0.34) agreed that a fall risk assessment will uncover factors that can be modified. Ninety-four percent (93% of P1; 94% of P2; p = 0.94) endorsed as likely that evidence-based community fall prevention programs can reduce fall risk among high risk older adult patients. Fifty-two percent (53% of P1; 50% of P2; p = 0.76) agreed that they had the expertise to perform fall risk assessments. Sixty-eight percent (73% of P1; 57% of P2; p = 0.12) agreed that it is the prevailing standard among professional peers to assess fall risk for of their older adult patients.

Respondent knowledge

Fourteen percent of respondents (14% of P1; 14% of P2; p = 0.95) were aware of the STEADI falls risk assessment toolkit [16]. Fifteen percent (19% of P1; 7% of P2; p = 0.20) were familiar with MOB [9,10]; 43% (40% of P1; 50% of P2; p = 0.49) were familiar with Tai Chi: Moving for Better Balance [13]; and, less than 1% of respondents (2% of P1; 0% of P2) were familiar with Otago [12].

Respondent attitudes

Fifty percent of respondents (53% of P1; 43% of P2; p = 0.36) agreed that they had the time to perform fall risk assessment of older adult patients. Twenty-four percent of respondents (27% of P1; 18% of P2; p = 0.33) agreed that they were adequately reimbursed for performing fall risk assessments for their independently-living older adult patients.

Respondent practices

Of those who reported awareness of the STEADI Toolkit [16] (N = 8), 50% (63% of P1; 25% of P2 respondents; p = 0.30) indicated that they (or their office staff) routinely used the STEADI Toolkit to assess their independently-living older adult patients for fall risk.

Table 3. Fall assessment & intervention practices.

Questions	P1		P2		p-value	Mean %
	Mean % (SD)	n	Mean % (SD)	n		
Conduct falls history	57.8 (26.6)	58	63.8 (33.3)	28	0.38	59.8
Review medications	57.8 (29.3)	58	68.1 (35.5)	28	0.12	61.5
Assess vision	35.6 (26.0)	57	45.1 (30.0)	28	0.14	38.8
Conduct TUG	19.1 (26.9)	57	23.8 (31.2)	28	0.48	20.6
Conduct 4-Stage balance test	2.6 (13.6)	57	5.7 (14.7)	27	0.34	3.6
Educate on fall risk	46.3 (29.7)	58	48.6 (28.6)	28	0.70	47.0
Screen for Vitamin D deficiency	50.3 (29.2)	58	52.3 (30.1)	28	0.78	50.9
Refer to evidence-based programs	7.1 (13.0)	57	13.4 (23.3)	26	0.20	9.1

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With respect to conducting assessments recommended by the AGS/BGS Guidelines [22], P1 and P2 did not differ significantly on any of the component parts. On average, they reported assessing at least 50% of their older adult patients during the past year for falls history (59.8%), medication regimen (61.5%), and vitamin D deficiency (50.9%). Other assessments were conducted for less than 50% of older adult patients during the past year: vision (38.8%); Timed Up and Go Test (TUG) (20.6%); 4-Stage Balance Test (3.6%). With respect to interventions recommended by the AGS/BGS providers counseled an average of 47% of older adult patients during the past year and made referrals to fall prevention programs for 9.1%. See Table 3.

Discussion

Our findings suggest that despite their efficacy and potential for cost saving, fall-risk assessment tools and community-based fall prevention programs are not well-integrated into clinical practice. Because fall prevention programs are often offered by public and private organizations that serve older adults, most are marketed directly to the public and participants are self-selected. This model presents several problems. First, people who elect to go directly to community-based programs, without seeing a clinician about their risk for falls, may have underlying health conditions that increase fall risk and need medical management. As a result, some older adults may not get, or may delay, the medical attention they need to address fall-related medical problems.

Second, low self-efficacy with respect to fall prevention is likely a risk for falling, to the degree that it limits individuals' fall prevention mindfulness and associated activities. Those who elect to participate in a community fall prevention program already demonstrate some level of control over their risk for falling. In other words, the act of participating in fall prevention activities indicates some measure of fall self-efficacy prior to program enrollment. But patients who do not elect to participate, because they do not believe that fall risk can be modified, may be those with the most to benefit from fall prevention programs. Thus, many older adults with the greatest needs are not accessing the programs but might be persuaded to do so by their healthcare provider.

Third, for community-based fall prevention programs to have population-level impact, they must be broadly disseminated and engage a substantial portion of the older adult population. Large scale participation by older adults in community-based fall prevention programs will likely not occur unless individuals are referred to these programs by their physicians within the context of clinical care.

Although Massachusetts has been a leader in fall prevention initiatives, our findings indicate that further effort is required to increase integration of evidence-based fall prevention assessment algorithms and community fall prevention programs into primary care. In a recent study of fall prevention activities undertaken by older adults (n = 87) 60 days post-discharge from an urban Massachusetts emergency department, only 37% had spoken to their healthcare provider about fall prevention, 22% had spoken to their provider about medication risk for falls, 15% had spoken to their provider about their vision, 2% had attempted to contact a community-based falls prevention program, and none had participated in a falls prevention program [24].

New strategies that more directly target providers are needed to accelerate integration of fall risk assessment and intervention into primary care practice. For example, initiatives could be implemented to enhance education and training about older adult falls for medical students, and other relevant providers, at health provider educational institutions throughout the state. Similarly, continuing medical education on fall prevention could be made a requirement for initial licensure and renewal for relevant Massachusetts healthcare providers. A state or private agency could create and maintain a website that listed the time, place, and sponsor of community-based fall prevention programs, so that older adults and their healthcare providers could locate these programs for referral. Insurance coverage for community-based fall prevention programs by private and public third-party payers could do much to stimulate provider referrals. In the absence of reimbursement, however, ACOs might consider offering or sponsoring fall prevention, and other chronic disease self-management programs, to reduce health care costs among their attributed patients.

The investigators acknowledge several limitations of this study. First, the study used a convenience sample that included only two of 17 Massachusetts ACOs, and therefore generalizability (external validity) of findings to all Massachusetts ACOs or primary care providers cannot be made. Moreover, because ACOs have financial incentives relative to quality of care and cost containment, it is possible that primary care providers at ACOs are more apt that those at other provider organizations to practice preventive medicine. We invited five group practices to participate in this study. One never responded, two responded, but subsequently ceased communicating about the study, and two participated. It is possible that the self-selection of the two out of five organizations we approached could have biased findings if, for example, willingness to participate was associated with better fall risk assessment practices. We could have opted for drawing a sample from the Massachusetts physician licensure registry, but this approach has yielded poor response rates in the past. Thus, the methodological dilemma was a choice between a valid sampling procedure that risked a small response rate versus a convenience sample, of limited generalizability, that yielded acceptable response rates and thus valid data for participants. We chose the second option.

Despite the limitation on generalizability, it is noteworthy that in most respects, the two practices surveyed were very similar with respect to knowledge, beliefs, attitudes, and practices, with few statistically significant differences. This suggests that findings may apply to other primary care providers in the state because most findings were consistent across the participating practices.

Nonetheless, even if there were reason to believe that our findings might be generalizable to most Massachusetts primary care providers, our sample included no other state. In areas of overlap, however, our results were not dissimilar from those of other recent studies of provider practices relative to older adult fall prevention [17–20].

Second, as with any survey, responses can be biased by social desirability, the tendency of respondents to distort answers towards what they perceive to be normative. Many of our findings, however, remain important, even if they are inflated towards socially desirable answers.

For example, even if some respondents indicated that they were aware of the STEADI Toolkit, when they were not aware, the finding that only 14% said they were aware remains a small proportion.

Third, our analyses of provider practices did not account for differences in patient case mix across providers or organizations.

Forth, while we asked providers if they referred their older adult patients to community-based fall prevention programs, we did not ask about fall prevention referrals to other providers, such as physical or occupational therapists, or general exercise programs such as those offered by YMCAs or Councils on Aging. This omission may have resulted in a failure to develop a complete picture of providers' fall prevention practices for their older adult patients.

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Experiences of general practitioners, home care nurses, physiotherapists and seniors involved in a multidisciplinary home-based fall prevention programme: a mixed method study

Abstract

Background: The feasibility of effective fall prevention programmes (FPPs) for use in daily clinical practice needs to be assessed in the specific healthcare settings. The aim of this study was to explore the perceived benefits and barriers of an evidence-based, home-based pilot FPP among the involved seniors, general practitioners (GPs), home care nurses (HCNs) and physiotherapists (PTs), in order to develop tailored implementation strategies.

Methods: The study was a mixed method study using an 'exploratory sequential design'. In the initial qualitative sequence, semi-structured interviews were performed with four participants from each group and analysed using a deductive content analysis. In the successive quantitative sequence, target group specific postal surveys were conducted with all participants. The triangulation of both steps allowed merging the in-depth experiences from the interviews with the general findings from the survey.

Results: In this evaluation study participated 17 seniors (mean age 79.7 (SD +/-6.2) years). 40 GPs, 12 HCNs and four PTs. All were satisfied with the organization and processes of the FPP. The main benefit, perceived by each target group, was the usefulness of the FPP in detecting risk of falling at the senior's home. A low number of recruiting GPs and HCNs, divergent opinions of the health professionals towards the aim of the FPP as well as no perceived need for changes by the seniors were the most important barriers to the participation of (more) seniors.

Conclusions: Multidisciplinary home-based fall prevention is a useful approach to detect the risk of falling in seniors. The barriers identified need to be resolved through tailored strategies to facilitate the successful nationwide implementation of this pilot FPP.

Keywords: Fall prevention, Elderly, Multidisciplinary care, Physiotherapy, Implementation

Abbreviations: FPP(s), Fall prevention programme(s); GP(s), General practitioner(s); HCN(s), Home care nurse(s); MPA(s), Medical practice assistant(s); PT(s), Physiotherapist(s); SD, Standard deviation; SLAR, Swiss League against rheumatism; SOYF, Stay on your feet

Background

Falls by the elderly frequently result in injury and repre-sent one of the most common and serious public health problems in Switzerland [1]. Around 30 % of community-dwelling persons over 65 years fall each year. This inci-dence rate rises by 10 % with each decade of increasing age [2]. The risk of recurrent falls is 50 % [3]. In 2013, 38.5 % of the people over 65 years were aged 80 years or older [4]. This demographic development, in combination with the age-related rise in the fall incidence rate, results not only in greater health problems and an increased re-quirement for care and fall prevention programmes (FPPs) but also in higher socio-economic costs [5, 6].

Research consistently showed encouraging results for multifactorial and multidisciplinary FPPs [6–11]. Other studies concluded, through cost-benefit analysis of community-based FPPs targeted at older people at all risk levels, that well-designed programmes for the elderly were highly cost effective [7, 12]. However, a trial by Hendriks et al. [13] showed substantial discrepancy between the FPP under study conditions and the same FPP implemented in daily practice. The authors recommended the assessment of the feasibility of such programmes for clinical practice and underlined the importance of implementation research in the specific healthcare setting, with special attention to barriers, e.g. the reasons for insufficient adherence of participants to fall prevention recommendations.

The Swiss League Against Rheumatism (SLAR) therefore conducted a multifactorial and multidisciplinary pilot FPP in Central Switzerland. It was based on the Australian 'Stay on Your Feet SOYF' FPP (1992–1996), where general practitioners screened their seniors > 60 years for fall risk and enrolled them to the SOYF. The SOYF addressed footwear, vision, physical activity, balance and gait, medication use, chronic conditions, plus home and public environmental hazards. This programme was evaluated extensively and achieved a significant reduction in fall-related hospital admissions [11, 12, 14]. The Swiss pilot FPP addressed older seniors living independently with or without previous falls. It was supported by a large body of stakeholders in this region: the association of general practitioners (GPs); the organization of home care nurses (HCNs), i.e. nurses and home helpers; the central hospital; the age organization "Pro Senectute"; the platform 'Osteoporosis' of the Swiss Society for Rheumatology and the section "health in age" of the public health department.

All HCNs (particularly the home helpers) were asked to assess the risk of falling among their clients (older seniors living at home, at risk of falling or with previous falls). In the case of a positive risk assessment, they were required to send a notification to the senior's GP and the SLAR. In case the GP included a senior in the FPP (either referred by the HCN or assessed by him/her), the GP was also to inform the SLAR. The SLAR then made contact with one of four physiotherapists (PTs) who were specially trained for this FPP. The PT visited the senior at home and performed a detailed assessment of her/his risk of falling, eliminated the identified environmental risk factors and provided tailored exercises [15]. The PTs informed the GPs about the assessment results and the measures taken and provided recommendations for further action in a report.

The SLAR as a national organisation will take care of the nationwide implementation of this FPP after its evaluation. Implementation is the planned and systematic approach with clear strategies for dissemination, implementation and/or maintenance of innovations or changes in (clinical) practice and encompasses a step-by-step procedure: After defining the targets for improvement or change, an 'analysis of current (clinical) performance, target group and setting is performed, including the exploration of facilitators and barriers for change among the target groups or stakeholders, followed by 'the development of tailored strategies and measures to change practice', subsequent 'execution of this implementation plan and finally its 'evaluation and adaptions if necessary' [16]. Related to this pilot FPP, the analysis of the current practice showed that there was no such home-based FPP available, and that thus this pilot FPP was innovative. The next step, which was the focus of this research, was to analyse the facilitators and barriers among the target groups of this FPP. Facilitators and barriers are generic, i.e. they may occur in any implementation process, or specific to the specific innovation being implemented. They are related to the context, i.e. to a) the individuals (health professionals); b) social setting (seniors, professional colleagues), c) organisational factors (management) or d) economic and system factors such as money or laws [17]. Facilitators may provide promising approaches and act as 'selling points', whilst barriers anticipate challenges and require tailored strategies.

Therefore this evaluation study was conducted simultaneously to the pilot FPP with the aim of investigating the experiences of the seniors, GPs, HCNs and PTs and identifying and analysing the facilitators and barriers of the FPP. As main facilitators we a priori assumed "satisfaction with the project" and "benefits of the project"; as main barriers we assumed reasons related to the inclusion and participation in the FPP. The results of this analysis will be linked to the factors a) to d), in order to develop tailored implementation strategies.

Methods

Study design

This study is a mixed method study with an 'exploratory sequential design' according to Creswell and Plano Clark

[18]. An initial qualitative sequence was followed by a quantitative sequence. The qualitative phenomenological sequence (sequence 1) used semi-structured interviews to obtain greater and more differentiated information than would have been possible through a questionnaire. The subsequent quantitative sequence (sequence 2) was based on these interview findings and utilized group-specific questionnaires in order to validate the qualitative results. The triangulation of both steps, i.e. the merging of the in-depth opinions obtained from the interviews with the larger scale findings from the survey, strengthens the validity of the results.

Participants

The four target groups consisted of the GPs, the HCNs, the PTs and the seniors involved in the FPP. In sequence 1, four persons from each target groups (total $n = 16$) were selected for interviews, to achieve a broad range of demographic characteristics, in terms of gender (in seniors and general practitioners (there was no choice in HCNs and PTs) and region (urban or rural in all target groups). In sequence 2, all GPs and HCNs in the region, as well as seniors, after providing written informed consent to participation, received group-specific questionnaires. The four physiotherapists were all interviewed and therefore not involved in step 2.

Procedure

Qualitative phase

The questions for the semi-structured interviews were developed based on literature [19] and expert opinions and tailored to each target group. They encompassed four a priori defined points of interest, representing both facilitators and barriers for future implementation of the FPP: 1. satisfaction with the organization and processes of the programme; 2.strength and benefits of the programme; 3. barriers to the inclusion of seniors and 4. barriers to the participation of seniors. The interview questions were pretested with one member of each target group.

The four selected GPs, HCNs and PTs were interviewed by telephone, the seniors face to face. The interviews were conducted in Swiss German, audiotaped and lasted 25 min on average. Transcription was conducted verbatim by using a predefined list of criteria adapted from Dresing and Pehl [20]. The language was changed from Swiss German to German after analysis of the data and from German to English during the writing of the manuscript.

Quantitative phase

The target group specific questionnaires were developed by two experts based on the deductive content analysis (see next paragraph) of the interviews [21]. They consisted of 8 categories/63 and 8 categories/61 questions for the GPs and the HCNs respectively; and 6 categories/40 questions for the seniors, all with dichotomous answer options (0 = no, 1 = yes).

The questionnaires were sent by post to the GPs, HCNs and seniors with the request to return the completed questionnaires within four weeks, using the enclosed postage-paid envelope. The chair persons of the GP association and the HCN organization reminded their members by e-mail after one and three weeks. Seniors were personally reminded by their PT.

In addition to the qualitative and quantitative data obtained in the two phases, characteristics of the participating persons were obtained from the SLAR.

Data analysis

A deductive content analysis was performed on the interview data [21, 22]. The transcripts were allocated line-by-line in a deductive manner to the corresponding a priori defined points of interest, resulting in 'meaning units'. These were condensed into 'condensed meaning units' and finally into 'subcategories' [23] (see Additional file 1). The target group specific questions for the questionnaire were developed from identified subcategories.

Descriptive statistics were performed using SPSS software, version 21 (SPSS, Chicago, IL).

Triangulation

The presentation of the following results is structured by five points of interest: Four of them were defined a priori, the fifth emerged from the data: 1. satisfaction with organization and processes of the FPP; 2. strength and benefits of the FPP; 3. barriers to the inclusion of seniors; 4. barriers to the participation of seniors; and 5. barriers in interdisciplinary cooperation. In each section, the interview results (sequence 1) are explicated and emphasized by the participants' statements. Additionally, they are validated, i.e. supported or not, by the survey results (sequence 2), thus performing the triangulation of both steps. Tables 3, 4, 5, 6, and 7 depict a selection of questions per point of interest and subcategory, derived from the condensed meaning units in the qualitative data, along with the quantitative survey's results. All questions derived from qualitative data and results of the quantitative survey are provided in the Additional files.

Results

Participants

The flow chart in Fig. 1 provides an overview on the FFP-study populations and the number of participants included in qualitative interviews and in the quantitative questionnaire survey.

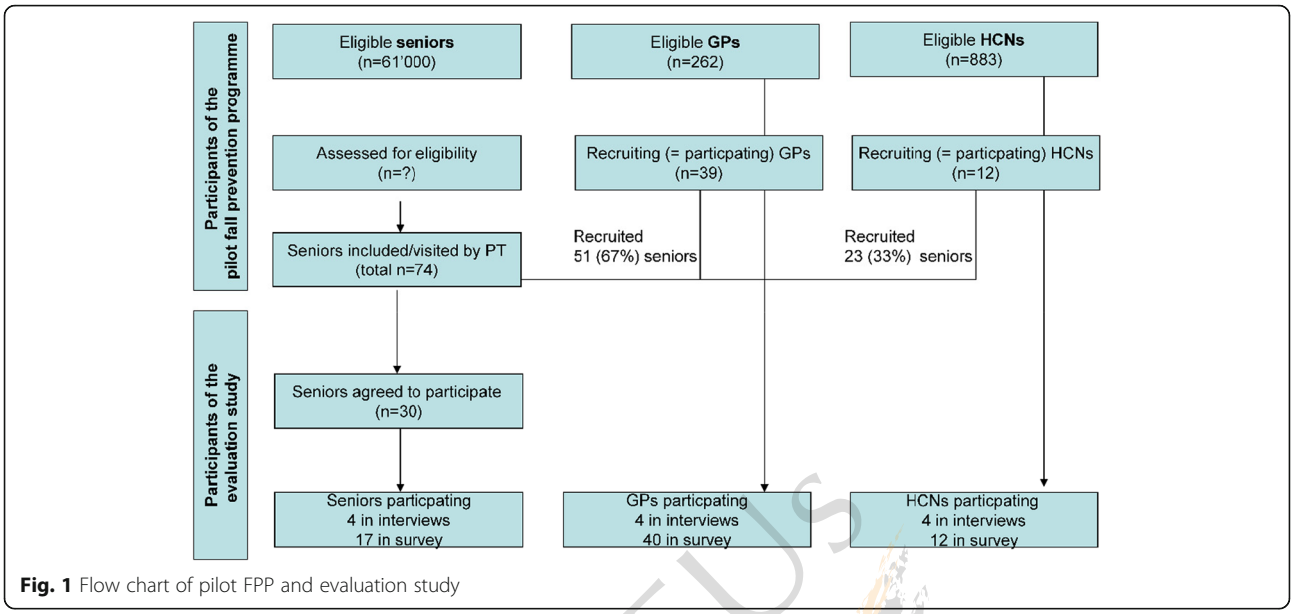

Fig. 1 Flow chart of pilot FPP and evaluation study

From more than 61'000 potential fallers over 65 years of age in this region [24], 74 seniors were recruited by GPs and HCNs to the FPP over one year; 51 (69 %) of them by 39 GPs (28 % of the 262 GPs in the area) and 23 by 12 HCNs (1.5 % of approximately 826 HCNs). Interviews were conducted with four participants of each target group. Participants' characteristics are shown in Table 1.

Of the 74 seniors recruited, 32 (53 %) agreed to answer the questionnaire survey, 17 (mean age 79.7 (SD +/−6.2) years) finally returned the questionnaire. Of all 262 GPs, 40 (15 %) participated in the survey; 25 of them stated being familiar with the FPP and could answer all questions. The 15 GPs who were not familiar with the FPP only answered the first three general questions: 1) familiarity with present fall prevention programme; 2) relevance of fall prevention in seniors over 65; 3) public attention of fall prevention. All 12 HCNs who had recruited seniors to the FPP returned the questionnaires. The characteristics of the questionnaire survey participants are shown in Table 2.

Table 1 Demographics of interview participants

	Seniors	PTs	GPs	HCNs
Age (in years): mean (range)	85 (65–88)	55 (49–59)	54 (49–60)	50 (48–54)
Gender (F/M)	2/2	4/0	1/3	4/0
Area (urban/rural)	2/2	NA	3/1	1/3
Practice (in years): mean (range)	NA	32 (29–40)	24 (14–36)	10 (3.5–20)

GP general practitioner, *HCN* home care nurse, *PT* physiotherapist, *NA* not applicable

Satisfaction with organization and processes of the FPP

For this a priori defined point of interest, no subcategories were revealed from the interview data. The HCNs, GPs and PTs underlined the good organisation of the project with adequate information, helpful documents and a well acceptable expenditure of time required for the project participation: *"I liked the good information: It was functional, and we received these lovely flyers (...). I considered this material to be easy to fill in and to register the seniors."* (HCN4). The seniors in the interviews however, although they did not express a lack of information, did not seem to have been informed sufficiently about the process: *"Eh, what kind of information? (...) She* (the physiotherapist) *just said that she would like to include me into her project and that she would like to do some assessments, to test my skills."* (senior 3). Similarly, the GPs did not reveal a need for more information, but they seemed not very well informed about the project either. One of their respondents explained how difficult it

Table 2 Demographics of survey participants

	Seniors ($n = 17$)	GPs ($n = 25$)	HCNs ($n = 12$)
Age (in years): mean (SD)	79.7 (6.2)	44.2 (9.1)	53.9 (9.8)
Gender n (%)			
Female	13 (76.5 %)	7 (17.5 %)	11 (91.7 %)
Male	4 (23.5 %)	33 (82.5 %)	1 (8.3 %)
Area			
Urban	4 (23.5 %)	12 (30 %)	4 (16 %)
Rural	13 (76.5 %)	28 (70 %)	8 (32 %)
Practice (in years): mean (SD)	NA	10.8 (8.2)	18.6 (11.1)

GP general practitioner, *HCN* home care nurse, *PT* physiotherapist, *NA* not available/applicable, *SD* standard deviation

is for the GPs to overview all projects running: *"We are inundated* (with prevention projects) *and sometimes, I think all the activities are somehow excessive."* (GP 2). Survey results (Table 3) supported the findings of the qualitative data on the satisfaction of the HCNs and the GPs; however, the majority of seniors and GPs did not express a lack of information in the survey.

Strength and benefits of the FPP

Qualitative data revealed the following subcategories of "strengths and benefits of the FPP": "General and specific benefits perceived by seniors", "Interests of seniors", "Further offers desired by seniors", "PTs instructions followed by the seniors" and "Project benefits perceived by GPs and HCNs".

One central benefit of the FPP in the eyes of the seniors was the recognition of their own risk of falling. Some respondents were able to follow the exercise instructions given by the PT on the basis of the risk assessment, and they experienced improvements: *"This* (performing the exercises) *has already helped nicely (…) I am now able again to rise from the floor without assistance."* (senior 2). But, some seniors didn't feel capable to perform the instructed exercises (*"I had a serious conversation with my doctor: My body tells me a story contradictory to the good advice I received* (by the physiotherapist)" (senior 1). And not all respondents consequently followed the advice to minimize environmental risk factors at home: *"I already said at the beginning that she* (the physiotherapist) *may come* (to my home), *but that I will not remove any carpets"* (senior 4). Veritable interests of seniors related to their participation were the recommendation of the GP or HCN, the recognition of risk for falling and their interest in the degree of the personal risk of falling. However, for most of the respondents, the FFP provided enough benefit; they did not require further visits or regular support. The programme ben-efits perceived by GPs and HCNs met the primary goals of the FPP, as the programme in their eyes was useful to prevent falls, draw attention to the risk of falling and to detect sources of risk of falling. Survey results (Table 4) supported these findings from quali-tative data.

Barriers to the inclusion of seniors

The interviews with GPs, HCNs and seniors revealed three subcategories of "barriers to the inclusion of seniors": 1) "Lack of clarity regarding the aim of the programme", 2) "Procedural approach of GPs and HCNs" and 3) "Reasons of GPs for not recruiting seniors". The GPs mostly stated that the FPP should primarily prevent *first* falls, whilst the HCNs rather thought that the focus ought to be prevention of *further* falls. The sub category, "procedural approach of GPs and HCNs", was presumably linked to this lack of clarity: The majority of them knew how to recruit, but they rather seldom did it. They recruited their clients on the basis of different idiosyncratic selection criteria, such as the seniors' known falls, their obvious risk of falling or their mobility problems: *"The criterion* (to recruit seniors) *is my own observation."* (GP2). *"It is obvious at the patients' gait. How, when I get her in the waiting room, how she is walking or sitting down. That she's obviously a candidate for falling."* (GP 3).

Some of the GPs prompted their patients to register themselves for the project. It has to be supposed, that this requirement to self-register was a barrier for some of these patients: *"It was disappointing to discover that several seniors to whom I had distributed the registration forms did not register…. I wanted them to do it by themselves at home." (GP 4).* For GPs, the main reason not to recruit more seniors was not, as it could be expected, the expenditure of time, but rather the anticipated reaction of "no need" or "refusal" by seniors. On the other hand, GPs and HCNs seemed to have a great influence on the seniors' decision to register for the project: *"And she said this project is supported by the HCNs community. So I said, then I will participate."* (senior 1). Therefore, if GPs and HCNs did not recognize the need for participation (e.g. for the reason, that they assume another target group), this was an important barrier. Other reasons for the restraint recruitment of GPs were that the project operations were not clear or that registration forms were not available. Survey results (Table 5) supported these findings.

Barriers to participation of seniors

Within the point of interest "Barriers to participation of seniors", two subcategories derived from the interviews:

Table 3 Selection of detailed questions on the topic "Satisfaction with the organization and processes of the FFP" and survey results

	Ratings from the survey		
	Seniors ($n = 17$)	GPs ($n = 25$)	HCNs ($n = 12$)
	"yes" *n* (%)	"yes" *n* (%)	"yes" *n* (%)
Were you satisfied with the organization of the project?	15 (88 %)	16 (64 %)	12 (100 %)
Were you well informed before the start of the project?	15 (88 %)	16 (64 %)	12 (100 %)
Was the expenditure of time for project participation adequate?	15 (88 %)	25 (100 %)	9 (75 %)

Table 4 Subcategories (bold) of and a selection of detailed questions on the topic "strengths and benefits of the FFP" with survey results

	Ratings from the survey		
	Seniors ($n = 17$) "yes" *n* (%)	GPs ($n = 25$) "yes" *n* (%)	HCNs ($n = 12$) "yes" *n* (%)
General and specific benefits perceived by seniors			
Was the personal visit of the PT at your home helpful?	13 (76 %)	NA	NA
Did you recognize your own risk of falling due to the consultation by the PT?	14 (82 %)	NA	NA
Interests of seniors			
Why did you participate?			
- GP or HCN recommended it to you.	10 (59 %)	NA	NA
- You recognized the risk of falling and have been motivated to do something against it actively.	8 (47 %)	NA	NA
- You have been interested in the degree of your own risk of falling.	8 (47 %)	NA	NA
- Because of your confidence in the HCN.	6 (35 %)	NA	NA
Further offers desired by seniors			
Would you participate again if you had the possibility to do so?	9 (53 %)	NA	NA
PTs instructions followed by seniors			
Did you investigate changes in your home after the consultation by the PT (i.e. fixating carpets or signalize door sills)?	10 (59 %)	NA	NA
Do you execute the instructed physical exercises received from the PT?	10 (59 %)	NA	NA
Do you carry out further measures such as group therapies or physiotherapy after the consultation by the PT?	6 (35 %)	NA	NA
Project benefits perceived by GPs and HCNs			
Was the project useful to:			
- Prevent falls?	NA	20 (80 %)	10 (83 %)
- Draw attention to the risk of falling?	NA	21 (84 %)	10 (83 %)
- Detect sources of risk of falling?	NA	18 (72 %)	8 (67 %)

"Personal reasons of seniors" and "Barriers for PTs to do assessments and give instructions." Physiotherapists, GPs and HCNs speculated in the interviews on personal reasons for seniors not to participate in the FPP. However, reasons such as "having difficulties with being consulted at home" or "feeling urged to participate" were hardly ever mentioned by the seniors as reasons for non-participation. Project costs on the other hand would be a barrier at least for some seniors. This concern was raised in the interviews by the health professionals, and

Table 5 Subcategories (bold) of and a selection of detailed questions on the topic "Barriers to the inclusion of seniors" with survey results

	Ratings from the survey		
	Seniors ($n = 17$) "yes" *n* (%)	GPs ($n = 25$) "yes" *n* (%)	HCNs ($n = 12$) "yes" *n* (%)
Lack of clarity regarding the aim of the project			
What is the primary aim of the project (one answer):			
- The prevention of first falls.	NA	20 (80 %)	4 (33 %)
- The prevention of further falls.		6 (24 %)	8 (67 %)
Procedural approach of GPs and HCNs			
Did you know how to recruit seniors?	NA	21 (84 %)	12 (100 %)
Did you use reminders (i.e. flyer, post-it…)?	NA	4 (16 %)	4 (33 %)
Reasons of GPs for not recruiting seniors			
Why did you not recruit any seniors? ($n = 13$)			
- No perceived need/refusal by senior.	NA	10 (77 %)	NA

Table 6 Subcategories (bold) of and a selection of detailed questions on the topic "Barriers to participation" with survey results

	Ratings from the survey		
	Seniors ($n = 17$) "yes" n (%)	GPs ($n = 25$) "yes" n (%)	HCNs ($n = 12$) "yes" n (%)
Personal barriers for seniors			
Had you participated in the project in case you had to pay for it?	6 (35 %)	NA	NA
Barriers for PTs to do asssessments and give instructions			
Was it possible to perform physical assessments to obtain your risk of falling?	10 (59 %)	NA	NA

it was confirmed by the seniors in the survey (Table 6): only one third of the seniors rated that they would have participated, even if they had to pay for it. "Barriers for PTs to do assessments and give instructions" accrued from the circumstance that some seniors were either not capable anymore to do the assessments and engage in exercises (this finding has also been supported by the survey results) or that their home had been checked before for sources of risk of falling by the HCN. *PT 3: "I had the feeling that if an HCN recommended a senior for the FPP, I could hardly do any preventive intervention, because much of it was already covered. If a GP recruited the senior it was different, because I could still do a lot."* The HCNs indeed stated that they always performed fall prevention at a senior's home, i.e. elimination of environmental risk factors, irrespective of this FPP.

Barriers in interdisciplinary cooperation

This category was added after a first round of analysis of the qualitative data, as barriers in interdisciplinary cooperation emerged on several areas: "Satisfaction with multidisciplinarity", "Consideration of other professionals' opinions", and "Information and processes". Although in the interviews, HCNs uttered only initial doubts about the multidisciplinary FPP, and although GPs and HCNs expressed in their majority satisfaction with their role allocated in the project, only a minority of them reported to be satisfied with the multidisciplinary setting in the survey. Reservations regarding multidisciplinarity may have risen from the fact that areas of competences were overlapping in this field: *"Consulting in general is very important to us HCNs. We always perform a medical diagnostic screening and look also for these things. (…) … and consulting* (regarding facility). (We say)*: "You have this carpet", then we solve this* (problem) *or search for solutions. Also the risk of falling in the shower."* (HCN 1). Furthermore, GPs and HCNs were not always satisfied with the reports they received from the physiotherapists (unfortunately, they did not mention this fact in the interviews), and they often did not implement PTs recommendations. Finally, the information of other stakeholder groups was sceptically evaluated: *"It was put about that GPs are informed, but however, our GPs did not really have a clue. (…) But the project flyer (previously mentioned) was helpful then."* (HCN 1). Altogether, the statements on the multidisciplinary cooperation were slightly more positive in the interviews than they were subsequently rated in the survey (Table 7).

The Additional files complete the information of the Tables S3-S7 and encompass: the interviews' content analysis (Additional file 1); all questions on the topics with survey results (Additional file 2); the SPSS databases (in excel

Table 7 Subcategories (bold) of and a selection of detailed questions on the topic "Barriers in interdisciplinary cooperation" with survey results

	Ratings from the survey		
	Seniors ($n = 17$) "yes" n (%)	GPs ($n = 25$) "yes" n (%)	HCNs ($n = 12$) "yes" n (%)
Satisfaction with multidisciplinarity			
Was it positive that the project was multidisciplinary?	NA	9 (36 %)	4 (33 %)
Were you satisfied with the role allocation in the project?	NA	15 (60 %)	8 (67 %)
Would you support the participation of e.g. rehabilitation centers or hospitals in the project?	NA	9 (36 %)	9 (75 %)
Consideration of other professions' opinions			
Were you satisfied with the report received from PTs?	NA	9 (36 %)	6 (50 %)
Did you partially or in general implement the recommendations by the PTs?	NA	11 (44 %)	7 (58 %)
Information and processes			
Do you think GPs were well informed?	NA	NA	6 (50 %)
Were your medical practice assistants informed?	NA	8 (32 %)	NA

format) of the survey results from the health professionals (Additional file 3) and seniors (Additional file 4).

Allocation of facilitators and barriers to context factors (individual/social/organizational/system)

Facilitators ("Satisfaction with organization and processes" and "Strength and benefits of the FPP") and barriers ("to the inclusion of seniors", "to participation of seniors" and "in interdisciplinary cooperation") were allocated to the context factors. They require different strategies to implement the FPP (displayed in Table 8).

Discussion

This study aimed to explore the individual, structural and process-related facilitators and barriers of a pilot FPP in Switzerland in order to support its nationwide implementation. The majority of all involved persons, the health care providers as well as the seniors, were satisfied with this project aiming at preventing falls through the detection and elimination of risks at the seniors' homes. These confirmed facilitators will certainly work as strong pros and selling arguments in the planned implementation process.

A low number of recruiting GPs and HCNs, divergent opinions of the health professionals towards the aim of the FPP, as well as no perceived need for changes by the seniors were the most important barriers to include (more) seniors.

The allocation of facilitators and barriers to the individual, social, organizational and system context factors provides the basis for developing tailored strategies when executing the implementation plan.

Table 8 Allocation of identified facilitators and barriers to the context factors (individual/social/organizational/system) and suggestions for implementation strategies

Context/Point of interest	Individual	Social	Organizational	System
Satisfaction with organization and processes of the FFP	F: Satisfaction of HCNs and seniors with information and organization F: Satisfaction of GP with expenditure of time for project participation F: High satisfaction of physiotherapists with time allocated for the home visit → *Highlight satisfaction of physiotherapists, HCNs and seniors*		B: Seniors and GPs not sufficiently informed → *Information strategy tailored to target group*	F: FFP is funded B: Concerns for the future → *Programme funding has to be granted for the future*
Strength and benefits of the FFP	F: Majority of seniors perceives general and specific benefits (such as insight into risk of falling); a concise majority executes instructed exercise and changes in their homes → *Strengthen motivation and self-efficacy in seniors*	F: Potential of the FPP to prevent falls and draw attention to the risk of falling accepted by GP and HCNs → *Highlight confidence of GPs and HCNs in potential effectiveness of the FFP*		
Barriers to the inclusion of seniors	B: Seniors don't need or/and refuse participation → *Highlight the importance that GP and HCNs invest efforts at convincibility, as they exert a great influence in their patients/clients.* → *Invest in information, awareness rising; self-efficacy, empowerment of seniors*		B: Lack of clarity regarding the aim and target group of the project; B: no systematic recruitment procedure → *Invest in clear messages about the aim of the project and in clear recruitment instructions*	
Barriers to participation			B: Recruited seniors are not capable to do exercise or their home has already been checked for extrinsic risk factors → *Invest in clear messages about the aim of the project and in clear recruitment instructions*	B: Taboo character B: Costs: Participation not for free → *Programme funding has to be granted for the future*
Barriers in interdisciplinary cooperation		B: Unsatisfactory information-flow → *Invest in clear information, who should be informed when and how about the project*	B: Procedure reports → *Invest in clear instructions how to proceed with reports*	

F facilitator, *B* barrier

One important indicator for success of such a FPP is the number of seniors who participate, which may also be determined by the number of recruiters who actively include seniors. The data showed that only 74 of more than 61'000 potential fallers in the area were recruited to the FPP over one year, by a minority of only 15 % and 1.5 % of the participating GPs and HCNs respectively. This pilot FPP was supported by a large body of stakeholders in the region and extensive written and oral information about the project was provided to the GPs and HCNs before the start which we judge as strong facilitators. However, not all GPs and HCNs were familiar with the FPP. This emphasises the strategy to carefully tailor the information to each target group.

The perceived strengths and benefits of the pilot FPP were limited by the divergent opinions as to which seniors would benefit the most from the FPP. The majority of the HCNs stated that the FPP should prevent further falls in recurrent fallers, whilst the PTs and the majority of the GPs indicated to prioritize first fall prevention. However, the GPs almost exclusively recruited seniors who were frail and in old age. They explained their strategy with the fact that younger and healthier seniors usually did not perceive a need for joining the FPP. This discrepancy is a specific barrier and a great challenge inherent in FPPs. For the successful implementation of this FPP, this issue needs to be resolved by a clear message of the aims and target groups and clear instructions about the recruitment procedures. Recent findings show that good physical and cognitive functional abilities may be strong predictors of adherence in multifactorial FPPs [25] and that FPPs for persons at high risk of falling are not cost-effective because of an increased need for further therapies, medication, healthcare devices, aids, adaptations and low adherence to the recommendations [26]. Most participants of the FPP reported an increase of awareness towards their risk of falling, but not all participants really wanted (or were able) to follow the instructions and only a part of them reported to be adherent to the advice and exercises after the visit. This leads again to the question if the target group was adequate. It is not an easy task, besides the usual time and routine constraints in daily clinical practice, to involve pre-frail seniors with low risk of falling. However, to overcome this barrier it is important that GP and HCNs become aware of the great influence they have on their patients and go to the time and efforts of convincing them. The central message in the recruitment of younger, pre-frail seniors would be that FPPs (or rather 'gait security and mobility programmes') lead to better health and longer independency [19]. For a FPP offering an intervention at the senior's home, this may be a strong and consistent message. Positive goals (what to reach) are more successful than negative ones ('what to avoid') [27] and may also help to overcome the taboo character of 'falls' and 'fall prevention' in our society and most of all in the seniors themselves.

Nearly a third of the GPs wanted their patients to register for the FPP themselves, which meant an unnecessary additional barrier for the seniors. Instead, the often revealed lack of insight concerning the need of fall prevention among seniors would have required a high degree of support in the registration procedures [19]. This role could be fulfilled by medical practice assistants (MPAs). During the pilot programme, they were involved only in a minority of the GP practices. The information flow between GP and MPA, as well as between GP and HCN turned out to be important barrier. The strategy for implementation could be to invest in clear information, and who should be informed when and how about the project. The MPAs for example may be very important to overcome recruiting problems and the constraints in time of the GPs. Well-informed and trained MPAs may substantially support the GPs and seniors alike and take care of a smooth recruitment process.

Programme costs to be covered by the participants themselves are usually a key barrier. This was not the case in this pilot FPP, as without costs for the participants. However costs may be a future barrier for seniors to participate in this FPP. Only a minority of the responding seniors would participate if they have to pay by themselves. Finding continuous financial resources for this FPP may therefore be of capital importance to its successful implementation. A FPP is not covered by the basic health insurance in Switzerland, although health insurances in fact ought to have an interest in supporting this evidence-based, low-threshold FPP. Therefore, mid-term changes of the payment for preventive care, such as FPPs, are mandatory, given the high socio-economic costs of falls.

Strengths of this study are that all stakeholders were involved in this evaluation and the use of an exploratory sequential design, including triangulation strengthened the validity of the results. However it is a limitation of this study that the barriers to participation in the FPP were only derived from statements of the involved persons. Therefore, information from seniors who declined to participate in the programme as well in this evaluation study is not available. This target group would have been difficult to reach but could have provided valuable information. The same would be true for information gained from GPs or HCNs who did not participate. Interestingly all twelve HCNs, participating in the programme, also answered the survey. However they only represented a small minority of all HCN branches and staff. The lack of HCN-branches which didn't recruit any seniors could have biased the results. Knowing

about the reasons for non-participation of the other 98.5 % may be very relevant for the future of this FPP.

Further research should include investigating other re-cruitment strategies, involving other health professionals, e.g. MPAs, and evaluating the effect of the PT interven-tion, including their reports to the GPs, as well as the cost effectiveness of the FPP.

Conclusion

The allocation of the facilitators and barriers to the individual, social, organizational and system context factors provides the basis for tailoring the strategies when executing the implementation plan. Mainly the barriers require specific strategies: The low number of recruiting GPs and HCNs should be addressed by improving the information flow between the involved health professionals and by thinking about alternative recruitment channels. The divergent opinions of the health professionals towards the aim of the FPP need to be resolved by a clear message of the aims and target groups and clear instructions about the recruitment procedures. A careful but convincing communication, emphasizing long-term gait security and independence, by the health professionals and especially the GPs may be a key to overcome the not perceived need for changes by the seniors.

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Making fall prevention routine in primary care practice: perspectives of allied health professionals

Abstract

Background: While there is strong evidence that fall prevention interventions can prevent falls in people aged 65 and over, translating evidence into routine practice is challenging. Research regarding how allied health professionals (AHPs) respond to this challenge is limited. As part of the Integrated Solutions for Sustainable Fall Prevention (iSOLVE) project, this study aimed to explore how AHPs were making fall prevention practice routine in primary care and the factors that influenced their fall prevention practice.

Methods: In-depth qualitative interviews were conducted with fifteen AHPs who had attended evidence-based workshops associated with the iSOLVE project. AHPs had backgrounds in physiotherapy, occupational therapy, exercise physiology and podiatry. Interviews explored how fall prevention was being incorporated into routine practice and the factors that influenced routinisation, including the project workshops. Thematic analysis was used to analyse the data.

Results: We found fall prevention was valued in practice and recognised as complex. AHPs worked through challenges relating to clients (multi-morbidity, complex living situations, client motivation), challenges working alongside other health professionals (understanding respective roles/overlapping roles, sense of competition, communication) and challenges associated with funding systems perceived as complicated and constantly changing. Despite these challenges, AHPs were adopting strategies for integrating fall prevention routinely. The iSOLVE workshops were perceived as important in supporting existing practice and in providing strategies to enhance practice.

Conclusions: Policy makers, program managers, educators and AHPs can adopt strategies identified in this research for routinising fall prevention such as being alert that falls are common, asking every client about falls, having processes for assessing clients for fall risk, and having structured and evidence-based programs to work with clients on fall prevention. Adapting and streamlining funding systems are also important for facilitating fall prevention work.

Keywords: Allied health, Implementation, Inter-professional collaboration, Qualitative methods

Background

Falls are a major health issue experienced by 1 in 3 people aged 65 and over every year. They are the major cause of injury in this age group [1], with an estimated 30% of falls requiring medical care and up to 1 in 5 falls leading to serious injury such as hip fracture [2]. Annual direct medical costs for fall-related injuries in the United States have been estimated at more than US$30 billion [3]. In Australia, more than half of injury-related hospital admissions among older people are due to falls [4] and total health care costs of fall-related injuries in New South Wales (population over 7 million) have been estimated at AUS$558.5 million per year [5]. Even non-injurious falls adversely affect people's everyday function, social participation and independence [6]. Given the significant impact falls have on older people's lives and on health care systems, preventing falls is crucial.

Multi-component fall prevention programs that treat underlying conditions that contribute to falls, and incorporate strength and balance exercises and home environment modification, have been found to lessen the

risk of falling [7]. However, routinely applying effective fall prevention interventions in practice is challenging [8–10]. Multiple barriers to implementation have been cited, for example, insufficient time for health professionals to address fall prevention in the context of competing demands and a focus on diagnosis and treatment of specific diseases [11, 12]; fragmentation of services across settings and service providers with limited or differing understandings of respective roles [13, 14]; inadequate reimbursement for fall prevention work which is multifactorial and complex [11, 12, 15] as well as perceived lack of interest and/or fatalistic attitudes towards falling by clients [13, 16, 17].

Allied health professionals (AHPs) have an important role in identifying and managing fall risk through, for example, exercise and physical therapy [18] and home assessment and modification [19]. Yet, empirical research to guide AHPs on how best to take up and sustain evidence based fall prevention interventions in routine practice is limited [20]. Research to date has focused on implementation challenges faced by health professionals in hospital, emergency department or clinic settings, or by general practitioners (GPs) or nurses in primary care settings [15, 21], rather than the specific challenges faced by AHPs such as occupational therapists or physiotherapists, especially those in private practice [13, 22]. In Australia, private practitioners are those either self-employed or employed in a small business and who receive direct payment for services from clients [23]. Other sources of income include reimbursement through private health insurers and Federal government rebates through the Department of Veterans Affairs and Medicare [24]. In contrast, public sector AHPs are employed directly in government (usually State) funded and operated services. Research in Australia involving private practice AHPs has examined the use of Enhanced Primary Care funding (a government funded program) as a mechanism for greater involvement of AHPs in chronic disease management where fall prevention interventions can be included [21, 25]. This research echoes the need for better care models and reimbursement systems for health professionals noted in other contexts. What is not known is how else to facilitate AHPs making fall prevention routine. Guidance for AHPs in primary care settings is needed to enable better integration of evidence-based fall prevention strategies with the realities of day-to-day practice.

Theory can provide insights into how health professionals implement and sustain changes in practice including making fall prevention routine. For example, the current study drew on the Normalization Process Theory (NPT) which proposes that new practices become the norm as a consequence of people working individually and collectively and is dependent on how people make sense of a new practice, develop skills in, engage with, enact and appraise the new practice [26]. NPT introduces four key concepts – *coherence*, where the new way of working makes sense to people who would be normalising the practice; *cognitive participation*, where people cognitively engage with the new way of working, thinking through how the work will happen; *collective action*, where people enact the new work in practice; and *reflexive monitoring*, where people appraise whether the new way of working has been worthwhile [26]. Further, in order for a practice to become normalised there must be institutional or policy support to do so, for example, support from key stakeholders in the organisation or appropriate reimbursement.

The current study was undertaken as part of the Integrated Solutions for Sustainable Fall Prevention (iSOLVE) project [27]. The project takes a whole of primary care approach supporting AHPs and GPs to routinise fall prevention in practice. As part of the project 238 AHPs attended interactive fall prevention training workshops staggered over 2015 and 2016. The workshops included the latest research evidence for fall prevention, discussion on how to implement evidence into practice and opportunity to be included in local referral lists used by GPs in the project. Separate workshops were held on exercise interventions, home safety, the LiFE program [28] and foot and ankle interventions [29]. Following workshop participation, we aimed to explore in this study, how AHPs were making fall prevention practice routine in primary care and the factors that influenced their fall prevention practice, including the project workshops.

Methods

Design

A qualitative approach using interviews was designed to explore the experiences of AHPs working in fall prevention. Interview studies elicit practitioners' perceptions and experiences, and importantly enable incorporation of the context in which they work, as this is fundamental to understanding how practices are normalised. We undertook in-depth interviews and analysed the data thematically [30].

Study participants and recruitment

We purposively invited AHPs working in primary care settings who had attended more than one workshop ($n = 42$). We sought to recruit AHPs from occupational therapy, physiotherapy, exercise physiology and podiatry and from public and private practice. Potential study participants were invited by email to a 30–60 min face-to-face or telephone interview.

Data collection and analysis

Interviews took place during 2016 and 2017. Time from first workshop attendance to time of interview varied from 3 to 18 months. Most interviews were conducted by the first author (JL), who is an experienced qualitative researcher and

interviewer. Two interviews were conducted by an allied health Honours Student supported by the research team. Depending on AHP's preference, interviews were conducted face-to-face at the AHP's workplace (6 AHPs) or by telephone (9 AHPs). An interview guide was used to explore participants' current practice context and experience, how fall prevention fitted into their everyday work and the extent to which, and how, workshop information had been integrated into practice (see Table 1 for sample interview questions). Unscripted follow up questions allowed participants opportunity to clarify and elaborate on responses. The main points of the interview were summarised by the interviewer and fed back to the participant at the end of the interview, to allow final opportunity to comment before interview closure. Interviews were audio-recorded and transcribed verbatim by the interviewer. The interviewer (JL) took comprehensive notes during and immediately after one interview where the participant declined audio-recording due to privacy concerns.

Interview recordings were listened to several times as part of the transcription process and transcripts and interview notes were read multiple times. Two transcripts were independently coded by four members of the research team. Similarities and differences in coding were discussed, leading to an agreed code listing, which was applied to the remaining transcripts and interview notes. No new codes were identified from the final three transcripts, indicative of data saturation [31]. Analysis proceeded iteratively with constant comparison between the data and emerging themes by the use of memos, reflexive notes, concept mapping and discussion among research team members until major conceptual themes were agreed [32]. N-Vivo 11 was used to manage interview data and document the analysis [33].

Results

Study participants

Fifteen workshop participants (13 women, 2 men) were interviewed. Participants had backgrounds in physiotherapy (6), occupational therapy (OT) (4), exercise physiology (EP) (2) and podiatry (3). Ten participants had been in practice for more than 10 years. Twelve participants were working in the private sector, of whom five ran their own business, three were employees in a small business, and four were employees in larger private sector organisations, for example, a not-for-profit aged-care organisation and a private rehabilitation hospital. Three AHPs were employed in either clinical, education and/or management roles in public sector organisations, coordinating and/or providing fall prevention programs and services in the community.

Table 1 Sample interview questions

Example questions
- Can you describe to me the current practice settings you work in?
- How well does fall prevention fit into your everyday practice?
- How do clients respond to the fall prevention work you do with them?
- Having gone to the workshops, what, if anything, are you doing differently?
- How have you worked with colleagues to implement changes in practice?
- Can you tell me about anything you would have liked to have implemented from the workshops but you haven't been able to?
- Is there anything else you'd like to say about fall prevention, the workshops or the iSOLVE project before we finish the interview?

Overview of major themes

In normalising fall prevention work, four major themes were evident. Figure 1 represents these themes as stages in a process. In the first stage (Theme 1), AHPs valued fall prevention in practice recognising benefits for themselves and their clients. In the second stage (Theme 2), AHPs recognised the complexity of fall prevention work including working with clients who had multi-morbidity, complicated living situations and varying motivation. Complexity was also evident in working with other health professionals, where roles were unclear or overlapping; where there was a sense of competition; or where communication between health professionals was limited. A constantly changing funding environment was an added complexity. In the third stage (Theme 3), AHPs worked through these various tensions, mindful of their client demographics and the realities of running a business or meeting organisational requirements. In the fourth stage (Theme 4), strategies were adopted for integrating fall prevention into routine practice. We conclude the findings with a brief overview of participants' perceptions on the influence of the iSOLVE workshops on fall prevention practice (Theme 5). In reporting findings, individual disciplines for private sector participants are identified. Due to the small number of public sector AHPs, individual disciplines are not identified when reporting findings specific for these participants.

Theme 1: AHPs valued fall prevention in practice

Fundamental to the routinisation of fall prevention in practice was AHPs believing in the value of fall prevention. Regardless of private or public practice setting or disciplinary background, participants valuing of fall prevention came about through seeing evidence of benefit to clients:

> "... he hasn't fallen since. He walks two hours a day, goes down to the shops … he does everything. He gets out all the time." (Public AHP, ID1).

> "... you give them a lot of skills to increase their functional independence, increase their confidence,

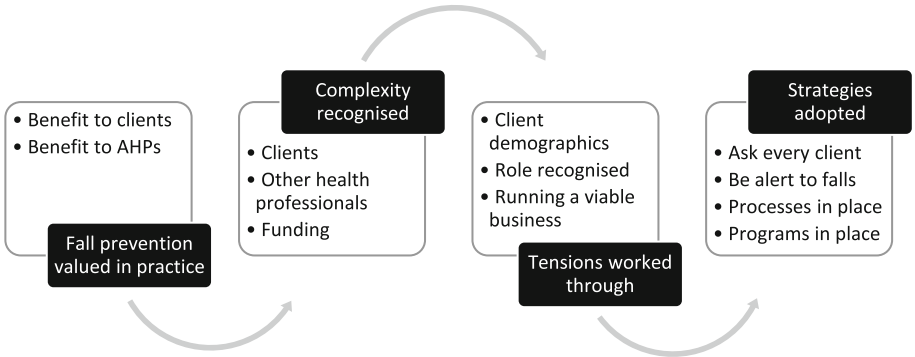

Fig. 1 Major themes – Process of AHPs integrating fall prevention into routine practice

reduce their anxiety and independently manage their falls risk factors." (Private OT, ID9).

For Private OT, ID9, the sense of making a difference to clients contributed to professional interest and satisfaction - "The kind of work that I was doing within the falls team ... I really like. I find it really empowering." Seeing the benefits for clients as well as to themselves reinforced the importance of fall prevention as part of everyday practice.

Theme 2: AHPs recognised the complexity of fall prevention work

While clients were at the centre of AHPs practice, clients also posed challenges to fall prevention work. AHPs could see the interconnected nature of falls and recognised the "complexity of what falling does … and that involves physical, mental, their support systems, confidence. It's everything" (Private podiatrist, ID15). Clients at particular risk of falls had multiple morbidities that meant AHPs treating one problem could instead create another problem. ID15 described a client with diabetic neuropathy, foot drop and shuffling, "so now I've chucked these whopping big Otoform®s under her toes, so that's obviously going to cause a little bit of an imbalance issue..." AHPs had to gain the trust of clients and work with them to adapt clients' living spaces. In going to a client's home, AHPs could see potential fall hazards first hand. However, engaging with clients to make changes and ameliorate fall risk, added further complexity to fall prevention work. Clients did not necessarily see they had a particular risk of falls, or that hazards needed to be addressed, or that exercise would be beneficial. Several AHPs expressed the view that persuading clients to act was the most difficult part of their fall prevention work:

> "I did a home visit with a gentleman who was 94 and he had never had a fall ... I had a lot of trouble even convincing him that a home visit might be a good idea." (Private OT, ID12).

> "So the tricky bit in physio is getting people to do it...if you're talking to someone who's never exercised in their life and trying to persuade them why to follow something - that is the hardest bit I think." (Private physiotherapist, ID7).

The multifactorial nature of falls meant that different health professionals could contribute to different aspects of fall prevention with individual clients. However, working alongside other health professionals in delivering services added further complexity. Part of this challenge was around role clarity – AHPs knowing their own role and the role of others, a challenge compounded when there was overlap in skills and experience across disciplines, for example, physiotherapists, EPs and OTs all had expertise in running exercise programs. This could contribute to a sense of competition and interprofessional rivalry between practitioners, especially where AHPs saw other health professionals as competing for business:

> "Physios go in and take over everything because they're dedicated to that sort of stuff and the patients trust them more with the exercises, so we don't really get that." (Private podiatrist, ID15).

Skepticism about the value of what other health professionals did in relation to fall prevention was expressed by AHPs in both private and public sector settings, however, recognition of how AHPs could complement each other's services was also evident:

> "...it's mostly physios who send people through because they know that these people need to be motivated in another way and just giving them exercises is not enough. They need to get them to think through the issues ... so they send them to me, and then they get to ... consolidate what the physios been doing." (Public AHP, ID1).

Furthermore, as noted by both private and public sector AHPs, communication between health professionals was limited, where AHPs could receive little or no information about clients referred to them and receive little or no feed-back regarding clients they referred to other health profes-sionals, compounding misunderstandings of how AHPs could work together.

The last element of complexity concerned a funding system which was perceived as complicated, constantly changing, had the potential to compromise continuity of care and was inadequate to meet demand. Private sector AHPs could be reimbursed for their fall prevention work through multiple publicly funded sources, private health insurers, or directly from clients. AHPs needed to know what funding options were available, how to access, and keep up to date with changing policies and funding opportunities:

> "I still haven't quite got my head around how it all works, the intricacies of all these new systems they have in place." (Private physiotherapist, ID7).

Private practitioners expressed concern that a change in approach from government or private health insurers could mean their businesses getting "caught out" (Private physiotherapist, ID3). Two AHPs spoke of how they were funded for discrete services only, for example, assessment only or for a time limited period, and were then required to refer clients onto others for ongoing management, which could compromise continuity of care.

Theme 3: Working through the tensions of integrating fall prevention into routine practice

Having recognised the multiple complexities involved, AHPs worked through the various tensions of routinising fall prevention in practice. Having a high proportion of clients aged 65 years and over with a greater risk of falls was a compelling reason for AHPs integrating fall prevention into routine practice regardless of private or public setting:

> "... really anyone over a certain age if you've been unwell is actually falls prevention ... no matter what the original issue was." (Private physiotherapist, ID7).

> "... so you're talking about that elderly population...it's quite an everyday occurrence – falls prevention." (Public AHP, ID8).

For public sector AHPs interviewed, fall prevention was recognised by their employing organisations as part of their role. For private sector AHPs, the proportion of time spent on fall prevention work varied. For those employed in larger private organisations, fall prevention represented "a very high percentage of my work" (Private OT, ID12), with increasing client demand for fall prevention services being a catalyst, in some cases, for their employment:

> "... I was actually brought on ... because before that we only had two people in the team and they were finding it a bit hard to cope with the increasing volume of people wanting balance interventions." (Private physiotherapist, ID10).

While most AHPs in private practice did not specifically tie their business to fall prevention and retained a generalist orientation, one private AHP had decided to specialise in fall prevention and balance, and market their services accordingly, believing in the value of a specialised practice. For some, a tension existed between providing more fall prevention services as part of their model of care and running a viable business:

> "... the problem is that it's crap for business ... so, although we come from the right place of caring, well I do – I come from the right place of caring, but you have to remember that you're supposed to be making money for your time." (Private podiatrist, ID15).

For other private sector AHPs, seeing the success of fall prevention strategies for improving clients' lives had motivated them to incorporate balance improvement into every client's program and use client word of mouth about their programs to grow the business and generate ongoing revenue:

> "That's what we focus on, client success, and the business grows from there … we've got to generate business through getting great results with our clients and getting them to refer." (Private EP, ID4).

Theme 4: Adopting strategies for integrating fall prevention into routine practice

AHPs adopted various strategies to make fall prevention routine including: asking every client about falls, being alert to falls as a common issue for their clients, having processes in place for assessing clients for falls risk and having structured programs in place to work with clients on fall prevention whether individually or in a group (see Table 2 for further details). Which strategies were used depended in part on the nature of each AHP's practice, for example, Public AHP, ID1's work focused on delivery of group-based programs, however, clients were still asked if they had experienced falls when they registered for the program. AHPs with a high proportion of older clients tended to ask every client about falls. Others with a wider age range of clients were alert to falls as a potential issue for their older clients. Some used standardised assessment

Table 2 Strategies for integrating fall prevention into routine practice

Strategies	Example quotes
Ask every client about falls	"Every patient we consider it ... it's a standard question we ask everyone whether they come in for neck pain, shoulder pain or if they've had a hip replacement, we ask everyone their falls history." (Private physiotherapist, ID11)
Be alert to falls as a common issue relevant to many clients	"I'd say about half of them have been admitted because of a fall ... usually they've had an injury ... they've had a long hospital stay and they're deconditioned and their mobility is reduced and they don't have the confidence now ... so everyday I'm probably addressing falls in some kind of way in the community." (Public AHP, ID8)
Have processes in place for assessing clients for risk of falls	"Some of them specifically come in for the [fall prevention] program, but others will come in with ... say a musculoskeletal impairment and then during assessment I will identify that there is also a balance component in it or a risk of falls because of other components that they've got." (Private physiotherapist, ID10)
Have structured programs in place for working with clients on fall prevention	"… this is a simple exercise program ... we might not use every exercise with every patient but we're aiming for them to do the whole program." (Private podiatrist, ID5)

forms to capture key information, however, Private physiotherapist, ID3 felt standardised forms "makes you close your eyes". Rather, as an experienced clinician, it was important for ID3 to be open to observing what was happening with individual clients in their own environments and pick up issues not captured on the form.

Many AHPs interviewed were using the strategies described as part of their own practice rather than influencing what other health professionals were doing. However, some self-employed business owners were in positions to make changes across a practice which affected what other health professionals did in regard to fall prevention, including making decisions on offering group and/or individualised services and programs and providing fall prevention services in clients' homes:

> "I think it's up to us as a business and individual podiatrists that we employ, to say 'I need to see you for a falls prevention assessment. Come back'." (Private podiatrist, ID5).

In addition, some self-employed AHPs as well as public sector AHPs acted as fall prevention educators within their local networks.

Theme 5: Perceptions of the influence of the iSOLVE workshops on practice

From the perspective of both private and public sector AHPs, and across the disciplines interviewed, fall prevention workshops were important in supporting existing practice and/or in providing strategies to enhance practice (see Table 3 for further details). Many were reassured that their practice was in line with "the right stuff" (Private physiotherapist, ID7) and were encouraged to use ideas and techniques from the workshops in their practice, for example, Private physiotherapist, ID3 reported more testing of balance with clients' eyes closed and on unstable surfaces. Private OT, ID12 was "much more aware of asking about details". Private OT, ID9 used the assessment tools discussed at the workshops when the organisation was updating its own client assessment processes. Others described refocusing their practice in line with research evidence.

The workshop on foot and ankle interventions detailed a comprehensive program which was new to many workshop participants. Consequently, AHPs described being more aware of foot issues in relation to fall prevention; were contemplating how to reinforce that in their practice and made sure clients took their shoes off. Private podiatrist, ID5 was incorporating that whole program into routine practice and actively engaging with other AHPs and GPs about the service, noting "they refer me a lot of work for falls prevention, but only since they've known I've been to the seminar and that I've started to talk about it." Despite the positive feedback indicated above, some AHPs felt the workshops had not addressed the critical issue of motivating clients and saw that as a continuing gap in their training.

Discussion

AHPs were alert to falls as a common issue with their clients. While acknowledging the challenges associated with the complexity of fall prevention work, they described taking steps to routinely incorporate fall prevention into everyday practice. Some asked every client about falls. Many had processes in place for assessing clients for falls risk and some were using specific fall prevention programs. Having an underlying belief in the importance of fall prevention to their practice was an important motivating factor for doing fall prevention work routinely. AHPs noted the difficulty of motivating some clients to make changes that would lessen fall risk and suggested behavioural change strategies as an area for future professional development. Other studies have observed that while older people acknowledge fall prevention as important, many do not consider fall prevention as personally relevant, linking falls to physical incapacity, advanced age and dependency [34, 35]. Given the multifactorial nature of falls and the complexity of preventing falls

Table 3 Perceptions of the influence of the iSOLVE workshops on practice

Example quotes
"… having been to the workshops I'm much more likely now to say, right we're going to really look at the circumstances of this fall and look at what really caused it and look at how we can prevent it." (Private OT, ID12)
"... [I'm] making sure there's as much dynamic balance exercises as possible and incorporating it more into everyday life, using little strategies that we went through, like turning when the kettle's boiling, standing on one leg, or doing some side stepping exercises, little things like that, trying to get people to change habits." (Public AHP, ID8)
"What I found really helpful was some of that research about how it's balance exercise and lower limb strengthening exercises that shows an improvement in balance and reduction in falls ... that's made me focus more on that, because that's where the research is, so that's where my practice needs to be as well." (Private EP, ID2)
"It's just a matter of getting the program up and running and ... slot it in as an appointment type ... and that's when we can integrate the falls prevention program ... we don't have the foot exerciser, but we are using the marbles, foot movements and the Thera-Band®... and I'm printing out a list of things for the patient to do, giving them the link to [the] video. We've now got two CDs that we can lend to people, so we are actually doing it, which is good." (Private podiatrist, ID5)

in the context of clients' individual lives, fall prevention work needs to draw on knowledge and skills from multiple health disciplines [36]. AHPs found working with other health professionals complex especially when roles overlapped or were unclear. The workshops had value in improving inter-professional understanding and collaboration and supporting practice by providing opportunities for networking across disciplines; by reassuring AHPs they were taking an evidence based approach; by providing resources that AHPs were now using; and by stimulating AHPs to think about and implement additional strategies for implementation.

Governments increasingly recognise that existing disciplinary silos in health care systems need new care models that involve greater inter-professional collaboration [37]. However, and consistent with previous studies, our study still noted limited communication between service providers as a barrier to both inter-professional working and continuity of care [11, 13] as well as issues around funding [11, 12, 15]. Importantly, in our study, AHPs emphasised complexity and changing funding models for fall prevention as issues, in addition to inadequate funding. While a tension existed for some private practice AHPs between doing fall prevention as part of their model of care and running a viable business, others had seen opportunities to develop their business based on positive client word-of-mouth and by promoting their fall prevention expertise and services within their local networks. Other researchers have noted the ethical dilemma faced by health professionals in private practice to balance their desire to provide high quality services with the realities of running a successful business [38, 39]. More in-depth research could better identify which factors allow AHPs to successfully build viable businesses around routine falls prevention with the potential to translate those success factors to other businesses.

The workshops presented evidence supporting fall prevention practice around exercise, home safety and foot and ankle interventions. From a theoretical perspective, our major themes indicated normalisation of some of these practices was occurring, consistent with that espoused in Normalization Process Theory [26]. Consistent with the NPT concept of *coherence,* AHPs understood what fall prevention encompassed, why preventing falls was important and what the potential benefits were to both themselves and their clients. Benefits of an evidence based approach made sense and was consistent with practice goals and professional desire to help clients. Having attended workshops, AHPs thought about how they might adapt current practices to incorporate workshop learnings. Some AHPs were reassured their current practices were consistent with workshop content. However, fully integrating fall prevention in practice was complex. Some were grappling with multiple stakeholders and funding mechanisms and expressed doubt in their own ability to motivate clients or the wisdom of building their business model on prevention. Other AHPs felt confident in their ability to work through the complexity and were willing to further invest their resources in setting up additional programs at their practices and were in the process of thinking through how that would happen. This process of thinking through how normalisation could occur and in some cases, committing to moving forward with the new way of working was consistent with the NPT concept of *cognitive participation* [40]. *Collective action* was evident where AHPs were taking charge on fall prevention within their practice and sphere of influence. Some were already enacting elements of the iSOLVE approach that they found easy to adapt to current work practice, for example, using additional assessment tools or purchasing and using additional equipment. Some AHPs who were business owners or were in positions of influence, were engaging with their work teams (through team meetings, educational sessions) and enacting new programs at the practice. Some AHPs were actively engaging with health professionals outside the practice to promote their services and expertise in fall prevention. However, in the reality of everyday practice, some areas of evidence based practice were seen as needing a longer time to organise or would not be put in place as the barriers to make routine outweighed the benefits. The interview process itself represented an opportunity for AHPs to reflect on the impact of the workshops on routine practice as they identified ways to evaluate whether changes in practice had been worthwhile (*reflexive monitoring*), for example, through feedback from clients, direct observation

and measurement of client progress and feedback from other health professionals.

The study had several limitations. A small number of workshop participants volunteered to be interviewed, and these may have had a particular interest in fall prevention. As participants in the current study were also participating in longitudinal surveys as part of the larger iSOLVE project, we decided that formal member checking here was not necessary and would overburden participants [41]. However, we did at the time of interview summarise the main points, allowing participants opportunity to comment before interview closure. The study was based in metropolitan Sydney and did not focus on issues specific to rural or disadvantaged communities. The time frame between attending workshops and being interviewed was short so sustainabil-ity of change beyond 18 months was not assessed. How-ever, lessons can still be learnt from early adopters to translate routine falls prevention into practice. Our study included a range of AHP disciplines from a mix of small and large organisations and included twelve AHPs in the private sector who provided particular insight into the pri-vate sector context.

Conclusion

Our study explored how AHPs were making fall preven-tion practice routine in primary care and the factors that influenced their fall prevention practice. Consistent with Normalization Process Theory, AHPs believed in the value of fall prevention work. Individually, and in some cases collectively, AHPs were appraising their current practice in line with what was recommended in the workshops, thinking through what more could be done or had begun to normalise some practices. In making fall prevention routine, AHPs were faced with many challenges such as motivating complex clients with multiple problems, work-ing collaboratively across inter-professional boundaries, meeting organisational and professional goals, while at the same time, trying to make a living. Our examples, showing how some AHPs in real world practice have worked through these complexities, can assist other AHPs looking to incorporate fall prevention in their own context. Local, inter-professional workshops in specific fall prevention interventions was one area of support for AHPs, however, additional supports are needed for sustained implementation. Examples include AHPs being able to measure the benefits of fall prevention interventions and enhanced communication and collaboration among health professionals through local networks. Policy makers, program managers, educators and AHPs could use and promote strategies described by AHPs here. Additionally, adapting and streamlining funding systems in the Australian context would further assist routinising fall prevention in primary care practice beyond the iSOLVE project.

Abbreviations

AHPs: Allied health professionals; EP: Exercise physiologist; GPs: General practitioners; ID: Participant identification number; iSOLVE: Integrated Solutions for Sustainable Fall Prevention; LiFE: Lifestyle Integrated Functional Exercise; NSW: New South Wales; OT: Occupational therapiste.

Competing interests

The authors declare that they have no competing interests. Authors Tiedemann an Sherrington are supported by fellowships from the NHMRC.

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