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Falls after Hospital Discharge: A Randomized Clinical Trial of Individualized Multimodal Falls Prevention Education

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Title

Falls after hospital discharge: a randomized clinical trial of individualized multi-modal falls prevention education

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Key words

Accidental falls, Patient discharge, Patient education, Randomized controlled trial

Abstract

Background

Older people are at high risk of falls after hospital discharge. The study aimed to evaluate the effect of providing individualized falls prevention education in addition to usual care on falls rates in older people after hospital discharge compared to providing a social intervention in addition to usual care.

Methods

A randomized clinical trial at three hospitals in Western Australia: participants followed for six months after discharge. Baseline and outcomes measured by assessors masked to group allocation. Participants: aged 60 years and over, admitted for rehabilitation. Eligibility included: cognitively able to undertake education (Abbreviated mental test score >7/10). Intervention: tailored education comprising patient video and workbook, structured discussion and goal setting led by trained therapist. Main outcomes: falls in the six months after discharge; proportion of participants sustaining one or more falls.

Results

There were 382 (194 intervention; 188 control) participants [mean age 77.7 (SD 8.7) years]. There were 378 falls (fall rate/1000 patient days, 5.9 intervention; 5.9 control) reported by 164 (42.9%) participants in the six months following hospital discharge; 188 (49.7%) of these falls were injurious. There were no significant differences in falls rates between intervention and control groups: [adjusted IRR, 1.09; 95% CI (0.78 to 1.52)] or the proportion of participants who fell once or more [adjusted OR, 1.37; 95% CI (0.90 to 2.07)].

Conclusions

Providing individualized falls prevention education prior to discharge did not reduce falls at home after discharge. Further research is warranted to investigate how to reduce falls during this high risk transition period.

Introduction

Falls are a significant problem for older people recently discharged from acute medical, orthopedic, aged care or rehabilitation wards, with up to 40% falling in the six months after discharge (1-3). A prior history of falls also increases the risk of post hospital falls (1,2). Up to 50% of older people who fall sustain an injury after discharge and between 10% and 15% require readmission to hospital (1,3). Associated adverse events include functional decline, unplanned readmission, and hip fractures in the transition period from hospital to home (4-7). Interventions to improve the transition from hospital to home have yielded mixed outcomes, especially for older people with complex needs (8-10).

There is strong evidence that exercise as a single intervention significantly reduces injurious falls (11). However, post hospital discharge there is limited and comparatively low quality evidence about the efficacy of falls prevention interventions for older people (12). Older people are known to have low levels of knowledge and motivation to engage in falls prevention after hospital discharge (13,14). But behavioral change interventions which engage older people in falls prevention strategies have only been tested in a limited number of studies (15,16). A systematic review suggested that providing fall prevention education either as a single or as part of a multifactorial intervention could increase the uptake of relevant strategies, but there was significant heterogeneity regarding the education intensity and duration and underlying theory. Interventions intensity also ranged from providing a brochure to a structured program of materials and face to face discussion of approximately one hour (16). Two trials that evaluated an education intervention in a hospital setting found the intervention reduced falls rates and injurious falls rates in hospitals (17,18). These provided inpatient fall prevention education using multimedia formats and tailored follow up

by a therapist in approximately two to four 15 minute sessions. However there was no sustained protective effect in the immediate discharge period (1), most likely because those education interventions were designed specifically for the inpatient setting.

Given the lack of attention to falls prevention after hospital discharge, we designed a tailored multimedia education program for older people that focused on actively addressing post hospital functional decline and capability and motivation regarding falls prevention. Multimedia education has established efficacy for raising knowledge and awareness about falls prevention in older patients (19). A pilot trial also demonstrated that providing the tailored education increased engagement in falls prevention strategies for one month after discharge (20). The older people also responded positively to the education (20).

We aimed to evaluate the effect of providing a tailored multimedia falls prevention education program plus usual care on falls rates in the six months after hospital discharge.

Methods

Design

A single blinded randomized controlled trial was conducted in rehabilitation wards at three hospitals in Perth, Western Australia, using a two group parallel design and adhering to the CONSORT guidelines (21). Hospital and university ethics committees approved the study. All participants provided written informed consent. The trial's protocol and description of the education intervention were published previously (20,22). Patients were enrolled from August 2015 to September 2017 and followed up for six months after discharge. Trial registration: Australian New Zealand Clinical Trials Registry (ACTRN12615000784516).

Participants

Participants and setting have been detailed previously (22). Briefly, participants were older patients admitted to participating hospital rehabilitation wards. Patients on these wards receive rehabilitation for new onset stroke or other neurological conditions, orthopaedic diagnoses such as hip fracture, functional decline, general medical conditions or reconditioning after acute surgery. Eligible patients were those who were community dwelling (not admitted from nursing homes) and were 60 years of age older. Patients were included if they had sound cognitive function, classified as having an Abbreviated Mental Test Score >7/10 (23), and were able to receive telephone calls, as these two conditions were necessary to receive the education intervention. Patients were excluded if they had short stay admissions (<5 days), were receiving palliative care or had a medical plan for discharge to a nursing home.

Randomization

Participants were randomly allocated to either group in a 1:1 ratio. The computer-generated randomization sequence was prepared and sealed in consecutively numbered opaque envelopes by a researcher (located externally) who was not involved in recruitment, intervention delivery or assessments. The envelopes were held securely at an external university not accessible to the investigators. Each participant was assigned a trial identification number in the order of recruitment. After a participant's baseline assessment had been recorded, the trial manager telephoned a randomization gatekeeper at the external university who opened the next envelope to reveal group allocation.

Masking

Trained research officers masked to group allocation separately completed baseline and outcome measures. The participants were instructed not to reveal their group allocation to the assessors. Collected data were entered into a secure online database, with access provided only to these research officers.

Experimental group education intervention

Participants in the experimental group received the education intervention while in hospital in addition to usual care. Therapists commenced delivery of the allocated intervention within 48 hours. The education program has been described in detail previously (20,22). The program was piloted for use prior to the present trial to establish that the dosage and content raised knowledge and motivation and engendered a positive response among older patients(20). The program used a workbook and digital video to initially present information about falls and falls prevention specific to the post discharge period. Therapists then had face to face structured discussions with each participant to tailor the information to be personally relevant for their medical and social circumstances. They helped each participant to develop a

documented goal oriented action plan to be used once they arrived home. The same therapist made a monthly phone call for three months after discharge to reinforce the education and to modify the plan as appropriate.

The education design and delivery was based on the concepts of the COM-B model of behavioral change theory (24). It aimed to: i) raise capability (knowledge and awareness about falls risk and falls prevention); ii) raise motivation to undertake and sustain falls prevention strategies; iii) assist participants to identify opportunity (both social and environmental) to implement falls prevention strategies and address barriers during the post discharge period. The content was based on three key areas: i) seeking assistance with personal care and other daily activities that, after discharge, participants were not able to undertake independently; ii) engaging in exercise to regain functional mobility; iii) planning to gradually re-commence usual activities and making home modifications if required to safely re-engage in usual activities. Strategies were undertaken with the aim of ensuring treatment fidelity (22). This included providing the three therapists (experienced in geriatric treatment and rehabilitation) with structured training to deliver the intervention. This training was provided by therapists with experience in designing and delivering falls prevention education. Therapists were also provided with a purpose-designed intervention workbook which they completed for each patient, recording weekly summaries of patient interactions, including telephone calls. Additionally, each stage of intervention completion was recorded, including session time, whether participants received the video and workbook materials, which key areas were identified as requiring a strategy to be developed with the patient and if a written action plan accompanied the participant at discharge. This action plan was subsequently used by therapists to structure the telephone calls after discharge. The falls prevention education was designed to include two to four sessions in hospital (total

approximately 45 minutes) and three telephone calls (total 60 minute contact) after discharge. However, therapists were also instructed to modify the time according to each participant's ability to engage with the education and time taken to develop their action plan to ensure that the desired intervention was delivered in its entirety.

Control group intervention

Control group participants received usual care plus a scripted education program of 45 minutes with a trained health professional that discussed aspects of positive ageing. It did not include any falls prevention or medical health information. If control group participants enquired about medical or falls prevention topics, the health professional advised and subsequently reminded them to discuss the topic with their usual hospital multidisciplinary team.

Usual care conditions

Usual care was provided on the hospital wards and when the participants went home. The educator therapists were employed by the university for the purposes of the trial alone. Participants at all three hospitals received comprehensive geriatric care from a multidisciplinary team. This consisted of comprehensive medical and allied health services, 24 hour nursing care, home visiting services, outpatient rehabilitation and a discharge summary.

Outcomes

The primary outcome was: i) the rate of falls in the six months following hospital discharge. Secondary outcomes were: ii) the rate of injurious falls; iii) proportion of participants who sustained one or more falls in the six months following hospital discharge.

A fall was defined according to World Health Organization criteria as being "an event which results in a person coming to rest inadvertently on the ground or floor or other lower level (25)." An injurious fall was defined as any fall reported which also resulted in an injury (18). Falls and falls injuries post discharge were measured using the falls diary issued to participants at discharge by the baseline research officer and follow-up telephone calls monthly for six months to every participant (26).

Other secondary outcomes were initially measured at baseline in hospital. Follow up measures were undertaken during a telephone interview conducted at six months after discharge. These outcomes were: iv) participants' functional ability, classified as activities of daily living (ADL) measured using the Katz index (27) and instrumental activities of daily living (IADL) measured using the Lawton's index (28); v) participants' health related quality of life (HRQOL) measured using the Assessment of Quality of Life -6 dimensions scale (AQOL-6D) (29).

Process evaluation

The process evaluation is detailed in a separate, previously published protocol (30). The educators facilitated intervention group participants to set individualized strategies in all three key content areas, appropriate for their personal health and social circumstances. These strategies were receiving assistance with ADL (either personal or instrumental activities), undertaking exercise and modifying their environment. The strategies undertaken were measured in both groups by participant self-report, at baseline in hospital and six months after discharge through telephone interview.

Statistical analysis

Sample size

The sample size estimate was based upon 80% power to detect a 30% relative reduction in the rate of falls (negative binomial incidence rate ratio =0.70) from a control rate of 0.80 falls per person over the six month follow-up (two-tailed alpha =0.05) (1). We applied a 1:1 control to intervention allocation ratio and determined that a total sample size of n=372 was required (31). We enrolled 390 participants to allow for a drop-out rate of approximately 5%.

All analyses were performed using Stata 15 (Stata Statistical Software, College Station, TX: StataCorp LLC) and following intention-to-treat principles. Between group comparisons at baseline were performed using $\chi 2$ tests (categorical variables), unpaired t-tests (Gaussian, interval or ratio variables) or Mann-Whitney U (ordinal / non-Gaussian variables). Statistical significance was set at 0.05. Between group comparisons for the primary outcome of rates of falls and the secondary outcome of rate of injurious falls were analysed using negative binomial regression with adjustment for participant's length of observation in the study. The proportion of people who become fallers during the observation period was compared between groups using logistic regression. Comparisons of primary and secondary fall-related outcomes between groups were adjusted for whether each participant fell or not during hospital admission, whether they fell in the six months prior to hospital admission, whether they received assistance with ADL prior to hospital admission, presence of a depressed mood at baseline as measured by the Geriatric Depression Scale (32) and whether the participant used a walking aid or not at baseline. Functional ability and HRQOL were compared between groups using linear regression with adjustment for the baseline values of each individual outcome respectively. Hospital site was included as a random effect in each regression (for primary and secondary outcomes) to account for potential clustering within sites.

Results

The flow of participants (n=390) is presented in the CONSORT flow chart in Figure 1. Eight participants were lost to follow up in hospital and 30 participants were lost to follow up during the post discharge period, hence 382 participants were included in final primary analyses and of those, 352 patients provided falls data for the complete six months of observation. There were no trial related adverse events (other than falls) reported to the investigators during the trial.

Demographic characteristics of participants are presented in Table 1. Participants were older adults [mean age intervention, 77.4 (±8.8); control, 78.1 (±8.5) years] and 70.9% had fallen in the 6 months prior to admission to hospital [intervention n=141 (72.7%); control n=130 (69.1%)].There were no significant differences between intervention and control groups, other than more control group participants were hospitalized in the 12 months prior to their current admission.

The investigators considered the intervention to have been delivered with a high level of fidelity. The median (IQR) number of sessions delivered was 3 (3-5) in hospital with 98% of intervention group participants receiving at least three sessions in a total time of 140 (110-185) minutes. There were 184 (94%) participants who additionally received three follow-up phone calls. Overall 188 (95.5%) control group participants received the healthy ageing education using a time of 45 (35-45) minutes. Intervention group participants developed a median (IQR) of 3 (3-5) goals to undertake strategies to reduce their risk of falling. The number of strategies undertaken by the intervention group was not significantly different to the control group (see Table 2).

There were no statistically significant differences between the intervention and control groups in the falls rate, injurious falls rate or proportion of participants who fell once or more (see Table 3). There were 378 falls reported by 164 (42.9%) participants in the six months following hospital discharge with 188 (49.7%) of the falls being injurious. Of the total falls 328 (86.8%) occurred at home and 50 (13.2%) (n=20 intervention, n=30 control) occurred when the participant was re-admitted to a hospital or admitted to a residential care setting after discharge. The overall falls rate was 5.9 per 1000 patient days and the injurious falls rate was 2.9 per 1000 patient days. Monthly falls rates demonstrated a reducing incidence over time. Of the 164 participants who fell, 79 fell once (n=43 intervention; n=36 control), 46 fell twice (n=26 intervention; n=20 control) and 39 fell more than twice (n=22 intervention; n=17 control).

Two hundred and ninety-two (82.9%) of the final 352 participants completed the final post discharge survey at six months, measuring functional ability (ADL and IADL) and HRQOL, which were compared with baseline measures (see Table 4). The most common reason for not completing the survey was admission to a nursing home during the six months after discharge (n=37) and hence no longer being able to engage in and report falls strategies relevant for community home dwellings. There were no significant differences between the groups in functional ability (ADL or IADL) or HRQOL at six months post discharge.

Discussion

This randomized trial found that providing a tailored education intervention, prior to hospital discharge plus telephone support after discharge did not reduce falls in the six months after hospital discharge. Therapists encouraged patients in a positive manner through the education to undertake necessary functional activities including exercise, in a graduated and safe manner. A previous RCT in a post discharge population found that exercise as a single intervention increased falls (2). However exercise programs are important to address rehabilitation including functional decline, which can be a significant problem after hospital discharge (6). We hypothesized that encouraging participants to exercise to regain function, while concurrently providing safety messages that encouraged participant engagement in strategies addressing increased risk of falls, would reduce falls. As part of these safety messages we also encouraged participants to initiate home modifications. Home visits by an occupational therapist who provide home modifications have been found to reduce the risk of falling in patients with a previous history of falls (33).

The education intervention was intensive with each participant receiving individualized support and feedback from a trained therapist and results demonstrated strong uptake of tailored evidence-based strategies. However use of these strategies was noted to be high in the control group as well, with no significant differences between the two groups. Our intervention provided approximately two hours of face to face contact with the therapist which was more intensive than the pilot study (20). This was higher than planned (22) but was found to be required to enable therapists to maintain the fidelity of the intervention and spend sufficient time with these older participants to develop their written action plan. Over 98% of participants received the hospital component of the intervention, which included

setting written goals to engage in tailored strategies after discharge. It was provided in addition to existing discharge plans of the patients own multidisciplinary team and included multimedia materials consistent with those that had demonstrated success in our earlier inpatient trials (18,19). There were some early differences in falls rates between the groups and it could be that the intervention group participants initiated ehavior change immediately following hospital discharge, which was not maintained by telephone call contact alone from therapists. Behavior change is known to be mediated by the intervention components chosen (24) and our intervention aimed to raise capability and motivation. However, it may not have provided sufficient opportunity, including enablement, for participants to initiate and maintain desired strategies after discharge. It is also possible that the educational intervention provided patients with a safety advantage relative to the usual care control group in the first month after hospitalisation, but usual care interventions combined with natural recovery contributed to this advantage eroding over time until convergence of falls rates occurred at approximately 6 months. Another possible explanation for each group having similar fall-rates at 6 months was that hospitals in Australia may have incorporated formerly novel fall-prevention intervention strategies that were effective during the pilot for this study (1,20) into what is now considered to be usual care interventions. A large systematic review demonstrated that interventions tested more recently were less efficacious when compared with controls, and suggested this could reflect general improvement over time in the standard of care delivered in this transition period (9).

Falls rates in both groups were higher than a similar randomized trial in this population (2), possibly because our population was more functionally declined (having a longer hospital length of stay), although the increased rate of falls in the first month after discharge accords with trials in this population (2,3). Over 50% of the falls that occurred were injurious with a

rate of one injurious fall per person year, with a sharp increase immediately after discharge, confirming the vulnerability to adverse events described in this population (4,34,35). These injuries accord with a US national study which demonstrated a sharp increase in hip fractures in the 30 days after discharge[4] and is twice the rate of injurious falls in trials conducted in general community-dwelling populations (36). Further research is warranted to determine if combined strategies promoted as part of our education are actually effective in reducing falls after discharge. The sample in this trial were at high risk as they were functionally declined and over 70% had fallen in the previous year. We observed that more participants from the intervention group fell once or more. A recent network meta-analysis found that combined interventions that included patient-level quality improvement strategies, environmental modifications and exercise, increased the risk of injurious falls among patients at high risk of falls (11).

Limitations of the program were that therapists only provided telephone support after discharge and could not directly address problems that arose for participants. Falls data were collected monthly, which accords with good practice for falls research (26), although we are uncertain if the three monthly phone calls by therapists to the intervention group participants may have raised their awareness of reporting falls relative to the control group. This could have reduced early post discharge differences in falls rates between the groups. Another important consideration was the extent to which the study was at was risk of Type II error on account of our sample size target. Our a priori sample size estimate was based on our previous trial that achieved a relatively large effect within the first month after hospital discharge (1). We envisaged that this worthwhile effect could be maintained, but no such effect was evident at the 6-month primary end-point in the present study. We concluded that the negative finding was likely to be genuine in this case, and not the product of an

insufficient sample size, due to the close similarity in each group's falls rate at the 6-month primary end-point. There were also low levels of attrition, with falls data collected for six months of observation for more than 90% of participants.

Participants' levels of engagement in falls prevention strategies were measured at six months after discharge so as not to influence engagement during the observation period. Engagement may have been mediated by medical and social barriers after discharge which have been described previously (37) and a detailed process evaluation will identify barriers and intensity of engagement in tailored strategies (30). Furthermore, the intervention might not have addressed other post discharge problems sufficiently. Medical and social follow-up care in the community is an important consideration after discharge, as ongoing social and medical challenges are known to cause adverse events and contribute to readmission, both early and late after discharge (9,37). Further analyses of the participants' hospital readmissions, medical care and costs of care will be completed using patients' health records and healthcare costings data (22).

Conclusions

Providing tailored education for older people to assist them to safely transition from hospital to home did not reduce falls or injurious falls post discharge. Further research should investigate how falls and injury can be reduced among older people recently discharged from hospital.

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Tables

Table 1. Demographic characteristics of participants

Variable	Intervention n=194 (100%)	Control n=188 (100%)
Mean age, y, mean(SD)	77.4 (8.8)	78.1 (8.5)
Gender, female, n (%)	116 (59.8)	119 (63.3)
Length of stay in hospital, days, median (IQR)	27 (17-45)	25 (18-39.5)
Diagnosis, n (%)		
Stroke/other neurological	27 (13.9)	31 (16.5)
Musculoskeletal/arthritis	28 (14.4)	24 (12.8)
Orthopaedic	60 (30.9)	52 (27.7)
Cardiac/respiratory	18 (9.3)	26 (13.8)
Other geriatric management	61 (31.4)	55 (29.3)
Highest education level attained, n (%)		
Primary	24 (12.4)	30 (15.9)
Grade 10	87 (44.8)	89 (47.3)
Grade 12	20 (10.3)	24 (12.8)
College	36 (18.6)	26 (13.8)
University	27 (13.9)	19 (10.1)
Visual impairment,[a] n (%)	54 (27.8)	41 (21.8)
Hospital admission in year prior to current admission, n (%)	72 (37.1)	93 (49.5)

Fell in 6 months prior to hospital admission, n (%)	141 (72.7)	130 (69.1)
Fell during hospital admission, n (%)	18 (9.3)	17 (9.0)
≥4 medications prescribed at discharge, n (%)	175 (90.2)	167 (88.8)
Psychotropic medications prescribed at discharge n (%)	58 (29.9)	55 (29.3)
Discharge destination, n (%)		
Home alone	83 (42.8)	72 (38.3)
Home with partner	79 (40.7)	65 (34.6)
Home with other	16 (8.2)	35 (18.6)
Other[b]	16 (8.2)	16 (8.5)
Mobility, n (%)		
No aid	23 (11.9)	27 (14.4)
Walking stick	18 (9.3)	22 (11.7)
Walking frame	133 (68.6)	121 (64.4)
Wheelchair	20 (10.3)	18 (9.6)
Mood		
GDS,[c] mean(SD)	4.17 (2.8)	4.22 (2.8)
GDS≥5, n (%)	47 (24.2)	51 (27.1)
Functional ability prior to hospital admission, median (IQR)		
ADL[d]	6 (5-6)	6 (5-6)

IADL[e]	7 (5-8)	7 (5-8)
Functional ability at discharge, ADL,[e] median (IQR)	5 (3-6)	5 (3-6)

Note. ADL, activities of daily living; GDS, geriatric depression score; IADL instrumental activities of daily living; IQR, interquartile range; SD, standard deviation

a glaucoma, cataracts, macular degeneration

b transitional care facility or nursing home

c geriatric depression scale,[32] range from 0 to 15, score >4 indicates presence of depressive symptoms

d ADL measured using Katz index of independence in activities of daily living scale,[27] range from 0 to 6, higher score indicates more independence

e IADL measured using Lawton's instrumental activities of daily living scale,[28] range 0-8, higher score indicates more independence

Table 2. Falls prevention strategies reported by participants

Strategy reported	Intervention n=149 (100%)	Control n=143 (100%)	OR (95% CI), p-value[e,f]
Received formal[a] assistance with ADL/IADL through home care agency	97 (65.1)	92 (64.3)	1.28, (0.75 to 2.20), 0.36
Received informal[b] assistance with ADL/IADL	96 (64.4)	103 (72.0)	0.73, (0.43 to 1.24) 0.24
Engaged in exercise[c]	111 (74.5)	101 (70.6)	1.28, (0.76 to 2.17), 0.35
Home visit from hospital occupational therapist	95 (63.7)	89 (62.2)	1.02 (0.62 to 1.67), 0.93
Completed home modifications[d]	105 (70.5)	94 (65.7)	1.24, (0.76 to 2.04), 0.38

Note. ADL, activities of daily living; IADL, instrumental activities of daily living; OR, odds ratio

a formal means assistance provided by employed carers from community home care organisations for activities including showering, shopping, cooking and other personal care as required

b informal means assistance provided by family, friend or other for showering, shopping, cooking and other personal care as required

c any type of exercise, including walking, exercise program provided by health care professional, swimming or gym attendance

d includes all modifications provided by occupational therapist and those completed by the participant, family or other (such as rails, equipment, environmental alterations)

e clustered by site (3 sites)

f adjusted for levels reported at baseline

Table 3. Falls outcomes in the 6 months after hospital discharge

	Intervention group	Control group	Unadjusted[a] IRR or OR, (Robust 95% CI),p-value	Adjusted[a,b] IRR or OR, (Robust 95% CI),p-value
Falls/injurious falls/fractures/number of participants who fell one or more times, days of observation, n	194/98/9/91/32521	184/90/12/73/31004		
Falls rate (95% CI) per 1000 patient days)	5.9 (4.7 to 7.2)	5.9 (3.9 to 8.8)	1.0, (0.73 to 1.46), 0.85	1.09, (0.78 to 1.52), 0.61
Injurious falls rate (95% CI) per 1000 patient days)	2.7 (2.1 to 3.5)	3.1 (2.4 to 4.0)	0.88, (0.60 to 1.28), 0.49	0.86, (0.60 to 1.24), 0.42
Proportion of participants who fell one or more times %, (95% CI)	46.9 (40.0 to 54.0)	38.8 (32.0 to 46.0)	1.42, (0.95 to 2.14), 0.09	1.37, (0.90 to 2.07), 0.14

Note. IRR, incident rate ratio; OR, odds ratio

a analyses clustered by site (3 sites)

b adjusted for history of falls, requiring assistance with activities of daily living in 6 months prior to admission; sustaining a fall while in hospital; depressed mood, use of a gait aid at baseline

Table 4. Functional ability and health-related quality of life outcomes at 6 months after hospital discharge.

	Intervention n=149 (100%)	Control n=143 (100%)	Co-efficient, (95% CI), p-value[d]
Functional ability at 6 months, median (IQR)			
ADL[a]	6 (4-6)	6 (4-6)	0.91, (0.65 to 1.28), 0.60
IADL[b]	5 (5-6)	6 (5-6)	0.84, (0.65 to 1.09), 0.19
Health related quality of life at 6 months, AQOL6[c] mean SD)			
Independent living	0.4 (0.3)	0.4 (0.3)	1.00, (0.94 to 1.07), 0.90
Relationships	0.5 (0.3)	0.5 (0.3)	0.99, (0.93 to 1.06), 0.82
Mental health	0.7 (0.3)	0.7 (0.3)	0.98, (0.92 to 1.04), 0.53
Coping	0.6 (0.3)	0.6 (0.3)	0.95, (0.89 to 1.01), 0.12
Pain	0.5 (0.3)	0.6 (0.3)	0.94, (0.87 to 1.01), 0.10
Senses	0.9 (0.2)	0.9 (0.2)	1.01, (0.97 to 1.04), 0.67

Note. ADL, activities of daily living; AQOL6, Australian quality of life 6 dimension version; IADL instrumental activities of daily living; IQR, interquartile range; SD, standard deviation

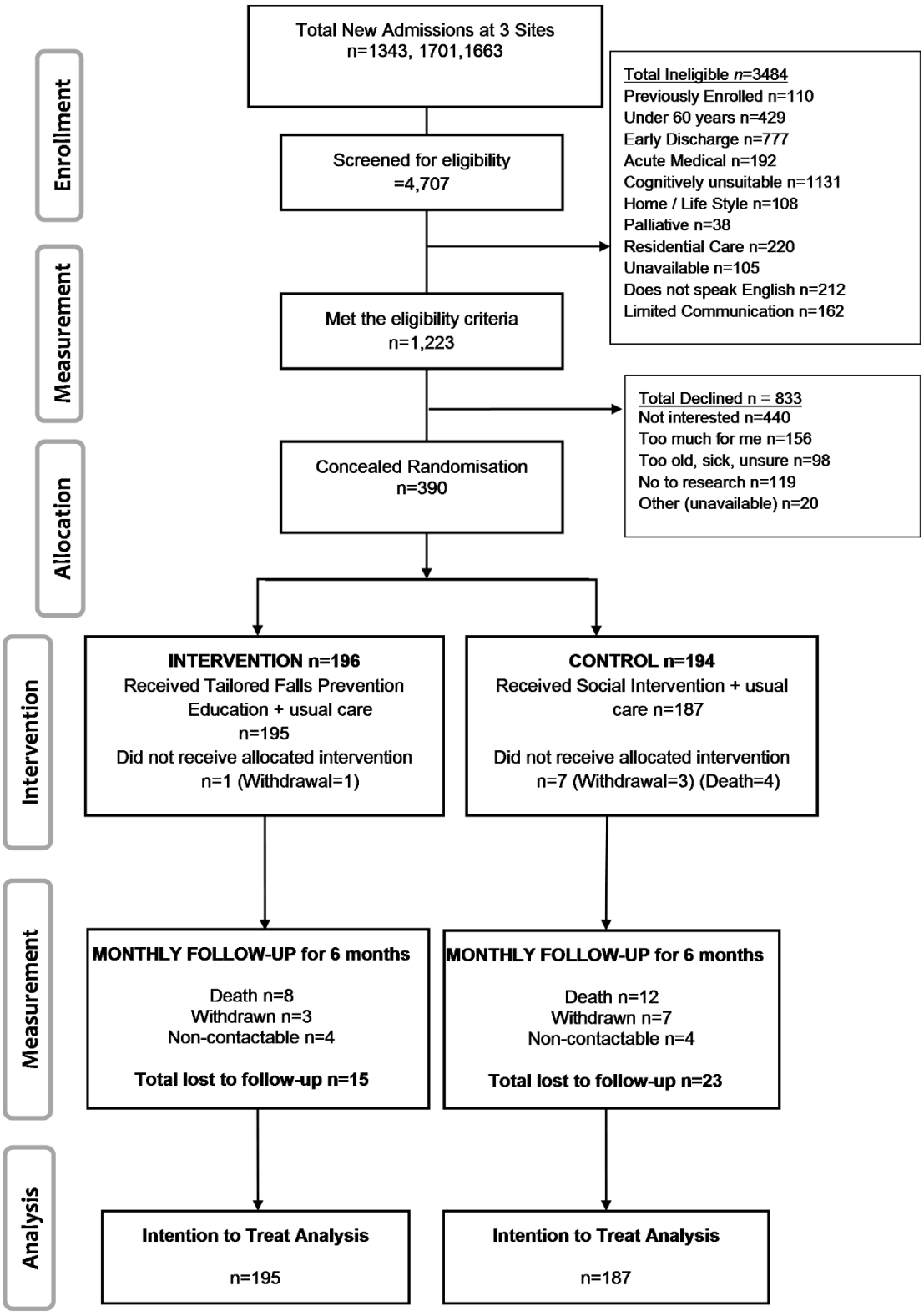
a ADL measured using Katz index of independence in activities of daily living scale,[27] range from 0 to 6, higher score indicates more independence

b IADL measured using Lawton's instrumental activities of daily living scale,[28] range 0-8, higher score indicates more independence.

c measured using AQOL 6,[29] range from 0 to1, higher scores indicate better self-perceived health-related quality of life

d adjusted for levels reported at baseline and clustered by site (3 sites)

Figure 1. Participant flow through the study



Conflict of Interest

Professor R. Shorr declares he serves as an expert witness regarding falls in hospital. The other authors have no conflicts to declare.

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Author Contributions

AMH, TH, CEB, SMM led the study conception and design and MM, LF, NW, RS, MB contributed to study conception and design. AMH, SMM TH led overall trial procedures including intervention delivery protocols and data management. AMH and SMM led the statistical analyses with input from TH. LF, AB, CEB and NW contributed to overall trial management, including data collection and procedure and led trial management at the sites and JFC, DCL, MM contributed to intervention design, delivery, and evaluation. AMH was responsible for original manuscript drafting with support from SMM. All authors appraised the manuscript critically for intellectual content and read and approved the final manuscript.

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