

Evidence-based clinical practice in falls prevention: a randomised controlled trial of a falls prevention service

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Abstract

Aims:

Evidence-based guidelines recommend a range of treatments for falls and injury prevention. We undertook a randomised trial of a falls prevention service to screen for falls risk factors and recommend to GPs an evidenced base prescription for falls prevention.

Methods:

All patients who presented with a fall to the Emergency Department at Flinders Medical Centre over a 22-week period were considered for the study. We excluded patients with dementia, resident in high care or those transferred to other hospitals and outside our catchment area. Of those who consented, we randomised patients between usual care or to an intervention consisting of a falls risk assessment and writing of an evidence-based prescription faxed to their GP for action. Patients were followed for six months and uptake of advice and fall rates were monitored.

Results:

Four hundred and fifty patients presented with a fall-related attendance and of these 261 patients were eligible for inclusion in the trial. Of these 261 patients, 140 consented and were enrolled in the trial. Over the six months patients in the intervention group were more likely to uptake preventative advice (OR=12.3; 95%CI=4.2-35.9). We were unable to show a reduction in falls (OR=1.7; 95%CI=0.7-4.4).

Conclusions:

A patient centered evidence-based approach is feasible and effective in increasing uptake of falls prevention advice. Long term compliance with advice needs further exploration.

Introduction

There is a growing evidence base around the prevention of falls and injury in older people. Exercise (Campbell et al. 1997, Day et al. 2002), home modification (Salkeld et al. 2000, Thompson 1996), psychotropic drug withdrawal (Campbell et al. 1999) and osteoporosis treatment (Dawson-Hughes et al. 1997, Karpf et al. 1997)

have all been shown to prevent falls and fractures, especially when used in combination (Close et al. 1999; Tinetti et al. 1994). This evidence has been gathered together in systematic reviews by the Cochrane Collaboration (Gillespie et al. 2002) and guidelines have been developed (American Geriatric Society et al. 2001, Feder et al. 2000). However, the challenge remains to see if this distilled knowledge can be successfully implemented in the clinical setting and reduce the burden of falls and injuries in older adults.

The establishment of a clinical service to implement evidenced based guidelines needs to consider several criteria. Firstly, such a service must target a high risk population. Each year, 30% of over 65 year olds will fall (Campbell et al. 1990) and available resources prevent treating this whole population. Patients who attend a hospital because of a fall are a high risk group and successful interventions in this group have been demonstrated (Close et al. 1999).

Secondly, the chosen patient population is unlikely to match the selected participants in a clinical trial. In particular patients from residential care and those with dementia have tended not to be included in trials and hence the applicability of our interventions to these patients is uncertain. In addition, the current practice for falls prevention in our target population may be different from the current practice for trial populations. It is important to understand the baseline uptake of evidence-based strategies amongst our patients, as this will guide how to apply the available evidence.

Finally, in the Australian health care context the general practitioner plays a pivotal role in the coordination of health care with appropriate specialist and allied health support. For those who fall and attend hospital, integration between the GP and hospital is critical for the implementation of any preventative strategy. However, it remains unclear if GPs implement evidence-based practice in the area of falls prevention. Furthermore, the ideal vehicle to encourage GP's to implement evidence-based practice is uncertain.

The National Demonstration Hospital Program Phase 3 was a Commonwealth funded program specifically aimed at the interface between public hospitals and general practice. As part of this program at Flinders Medical Centre we introduced an evidence-based falls prevention service and evaluated its effectiveness with a randomised controlled trial.

Methods

The study was conducted at Flinders Medical Centre (FMC), a 430-bed acute general hospital and the main public teaching hospital in the southern region of Adelaide, South Australia. In keeping with hospital policy, all acutely ill patients presenting to the hospital attend the Emergency Department (ED) for initial diagnosis, treatment and identification of those who require immediate hospitalisation. Some 50,000 patients are seen in the ED annually and some 80% of hospital admissions are first seen in the ED.

The ED compiles a database of all people attending and this allows people with specific medical problems to be tagged. For the purposes of this study, systems were modified to allow 'tagging' of all patient aged 65 years or over and whose ED attendance was related to a fall. After booking the patient in, the triage nurse answered a mandatory question related to whether the attendance was fall-related.

A fall was defined as: 'inadvertently coming to rest on the ground or other lower level with or without loss of consciousness and other than as a consequence of a major intrinsic or extrinsic event'. Thus people whose fall resulted from a stroke, seizure, cardiac or respiratory arrest, major infection, haemorrhage, motor vehicle accident, or being knocked to the ground by another person were not identified at triage as having a fall-related presentation.

To facilitate this, at the beginning of the study, the principal research officer (RW) conducted in-service training for all triage nursing staff. The staff were also provided with a written explanation of the study. The research officer attended the ED on each weekday to collect information on all patients identified as having a fall-related presentation.

We also established an informal network of the service providers who provided falls prevention programs. This included day therapy centres, local government organisations, the falls and balance service established at the regional rehabilitation hospital and the allied health staff of the acute hospital. This network allowed information sharing and increased knowledge of the available falls prevention services in the southern region of Adelaide.

Inclusion and Exclusion Criteria

All patients aged 65 years or over whose presentation to the ED was identified as related to a fall were reviewed by our research officer. They were included in the study provided they were living in the community or in low care residential care (ie. hostel accommodation) and satisfied our definition of a fall.

We also excluded those who lived in nursing home accommodation, those who had significant cognitive impairment (MMSE <25 out of 30; Folstein et al. 1975) without a resident carer, those who lived outside the FMC catchment area, those who could speak little English and those with severe or terminal illness.

Consent processes

At the time of presentation to the ED, treating staff provided relevant patients with written information about the study, together with the contact telephone number of the principal research officer from whom they could obtain additional information. The research officer subsequently sought to contact all patients who met the inclusion criteria to invite them to participate in the study and obtain written consent. This generally occurred within one normal working day of presentation to the ED. Patients who had been discharged home were first approached by ED staff and asked whether they wished to consider participating in the study prior to our research officer contacting them. The research officer approached those admitted to hospital in person, at a time when their treating team felt that the person's health status permitted such an approach.

The FMC Committee on Clinical Investigation granted ethical approval for the study.

Data collection

Data were collected from patients when they were visited at home following their discharge from hospital. We recorded basic demographic information, a detailed description of the fall that precipitated the ED attendance and a list of currently prescribed medications. In addition we measured self efficacy with the Falls Self Efficacy scale (FES; Tinetti et al. 1990) and functional status with Modified Barthel Index (MBI; Shah et al. 1989) and Adelaide Activities Profile (AAP; Clark and Bond 1995)

Randomisation and Intervention

Patients who had provided written consent were randomised to either the intervention or control group using a numbered and sealed opaque envelope containing allocation details. The randomisation and allocation schedules were created by a researcher external to the trial.

A strategy to reduce the risk of further falls was customised for each individual in the intervention group. This was based on each individual's 'fall risk profile' which in turn was determined by a questionnaire that screened for known risk factors for falls. A copy of this questionnaire is available from the authors on request. The GPs of all patients randomised to the intervention arm of the study received a letter informing them that their patient had fallen and invited them to review the patient. This letter also highlighted all identified risk factors for further falls in that individual patient. Finally, it suggested possible strategies for falls reduction relevant to that specific patient. This evidence-based prescription was also accompanied by a one page evidence summary designed by GPs and a specialist geriatrician.

Among the potential strategies recommended were:

- A review of medication in use, in particular psychotropic drugs. Medications known to contribute to falls in elderly people were identified by the research officer from a prepared check-list and these were flagged to the GP.

- A home assessment by an Occupational Therapist or trained health professional with advice on modification of the home environment to minimise the risk of falling.
- Participation in an exercise program provided by community-based or hospital-based services. These programs varied in frequency and duration from one to two per week and for one to two hours per session respectively. They continued for up to twelve weeks and most included facets of ways to prevent falls around the home as well as balance retraining and exercise.
- An interdisciplinary assessment at a hospital-based 'Falls & Balance' clinic which has input from medical, physiotherapy and occupational therapy staff as well as an exercise program, home assessments and medication reduction program.
- Assessment of osteoporosis risk for those patients who had a fracture.

Each person in the intervention group was provided with a written care plan that itemised the elements of the intervention and provided details on how they would be addressed. Control patients received standard medical care from their General Practitioners.

Outcome measures

The principal outcome measure was the uptake of recommended evidence-based strategy at six months. We also assessed the self-reported fall rate over the ensuing six month period. This was done with a falls diary to log the occurrence of all falls. All patients were contacted by telephone by the principal research officer once every month to monitor any falls and to encourage relevant use of the diary.

At the end of the six month study period, a research assistant who was blind to participants' allocation undertook a telephone interview with all patients. At this interview, the AAR, FES and MBI scales were again administered. All falls prevention activities undertaken during the course of the study were recorded and patients were asked to return their falls diaries. When patients had difficulty in using the telephone, had significant hearing problems, or were hospitalised at the time, the research assistant visited the patient in their home or in the hospital for the six month follow-up.

Statistical Analysis

The intervention and control groups were initially compared using chi-square tests of association for categorical variables and t-tests for continuous variables. Because of significant differences between the intervention and control group at baseline, the data at follow-up were analysed using logistic regression to account for these baseline differences. Logistic regression was used to determine whether there was any significant difference in uptake of preventative strategies between the intervention and control groups, and whether patients fell subsequently or not. Age group, gender, and variables with a P-value of 0.2 or less in the univariate analyses were included in the initial logistic regression models (Hosmer and Lemeshow 2000). Backward elimination of non-significant variables was used to give the final model.

Results

Study Population

Patients were recruited over a 22-week period from August 1999 to January 2000. Over this time period, 450 presentations by people aged 65 years and over were recorded in the Emergency Department at FMC with a fall-related injury. Of these, 261 (58%) were eligible for inclusion in the study.

Of those deemed ineligible 22% were presentations from a group for whom there is clear a deficiency in the available evidence (Nursing Home residents (n = 57) and dementia (n = 44)). A further 13% were either admitted to another hospital, often private (n=32), or were outside the catchment area (n=30). A total of 5% did not meet our definition of a fall upon review (n = 23) and 0.6% had a communication difficulty (n=3) precluding assessment.

One hundred forty (54%) patients of the 261 eligible presentations enrolled in the study; 70 were randomised to the intervention group and 70 to the control group. ED staff neglected to invite 44 eligible patients to participate in the study and guidelines from the hospital's Committee on Clinical Investigation did not allow a later approach to such people. A further 34 declined to participate, 15 were already enrolled in another clinical trial and 12 could not be contacted. Seven patients were still in hospital at the end of the recruitment period and were not approached, and eight presentations represent four patients who re-presented to the ED during the recruitment period. Lastly, one patient was visited but was unsafe in their current living situation and required intervention and therefore, as specified by the Committee on Clinical Investigation, was not randomised. At study end, evaluable data were available for 140 patients

Baseline characteristics

Table 1 outlines the characteristics of those who were included in our study. There were more females than males, and the participants had a mean age of 77.8±7.0 years. The patients were largely independent in ADLs with Barthel scores around 18 out of 20. Just under half of the patients lived alone. Psychotropic medications were used in 25% of patients. A total of 67% of patients reported some form of home modification to prevent falls. Osteoporotic fractures occurred in 55% of patients (since age 65) and 17% of this group were on treatment for osteoporosis. Although one third of patients were afraid of falling, the mean falls self efficacy score was 79.3±22.6. A total of 54% of the patients presented with their first fall and 12% had a history of greater than four falls. There were more patients with a history of recurrent falls in the intervention group (53%) than the control group (32%).

Uptake of strategy following intervention

At six month follow-up, falls and uptake data were available for 123 participants (65 control and 58 intervention patients). A total of 86% of the intervention group had taken up any preventative strategy during the follow-up period, compared with 48% of the control group. After controlling for differences in baseline characteristics the patients in the intervention group were over 12 times more likely to uptake any preventative strategy (OR=12.3; 95%CI=4.2-35.9; P<0.001). The majority of these changes were GP initiated but our research nurse may also have referred patients to services if requested by the patient. It was not possible to separate out each individual type of strategy offered given the small patient numbers. However referrals to the regional falls clinic were initiated in 13 of the 16 patients for whom this was suggested to the GP.

Risk of falling following intervention

The risk of falling was also analysed over the six month period following the fall that led to a presentation at ED. During the six month follow-up period, 48% of the intervention group reported at least one fall, compared with 23% of the control group. After controlling for baseline characteristics, there was no significant difference between the intervention and control groups in the risk of a subsequent fall (OR=1.7; 95%CI=0.7-4.4; P=0.244).

Discussion

In our study, nearly three patients presented per day with a fall related problem, supporting the decision by government to make falls and fall related injury a major funding and health policy issue. These frequent attendances represent a prime opportunity for future falls prevention, and the hospital sector and its associated medical and allied health resources need to grasp this opportunity to provide optimal care. Our study provides one evidence-based model for delivering that care.

Recurrent fallers come under the responsibility of a disparate group of clinicians, and prior to our study were difficult to track through the hospital system because they are classified under many different Diagnosis Related Groups (DRGs). The changes we made to the information system of the ED will allow this problem to be tracked in the future. One of the successes of our study was to allow a heterogeneous group of patients access to a uniform process of preventative care. Furthermore the intervention in this study was a relatively simple

screening and referral process. The process has been sustained in our hospital through other staff assuming the role of the research nurse.

In the Australian health care setting it is difficult to bring together allied health and general practice as they are funded by different parts of the health system. This limits the development of multidisciplinary assessment in the primary care setting. The majority of interventions in our study were GP initiated following review by a hospital service. Our service is one way to enable interactions between state funded allied health and nursing and Commonwealth funded general practice. Our service has facilitated information transfer from a hospital assessment into general practice. However, these interactions were fairly limited and not face-to-face as would occur in most multidisciplinary practice settings.

This study is one of the few attempts to develop evidence-based clinical practice in older populations. We have been able to show that a population of fallers presenting to hospitals can take up advice based on the best available evidence. This is an important step to demonstrate that an unselected population will accept interventions that have been developed in the highly controlled environment of a clinical trial.

However we were not able to achieve the “holy grail” of evidence-based clinical practice – that is, to demonstrate that evidence-based clinical practice has led to improved patient outcome. Our study did not have sufficient statistical power to achieve this result. Another limitation is that there were baseline differences between the intervention and control groups in terms of recurrent falls. Patients in this study did not immediately undertake the recommended preventative strategy whereas in a conventional trial this would have occurred as soon as the patient had been seen. This delay would have reduced our ability in the present study to demonstrate an effect on falls.

Importantly, this study demonstrates some of the challenges of applying evidence in the clinical setting. The services to which we referred were not all supported by the highest level of evidence. One of the aims of setting up the falls network was to explore to what extent the service provision was based in evidence. Most day therapy settings provided strengthening and balance training which alone is of uncertain effectiveness (Gillespie et al. 2002), although recent studies support this as an isolated strategy (Day et al. 2002). In comparison, multidisciplinary assessments are carried out in the regional falls and balance clinic (Tinetti et al. 1994). Duration of therapy varied between the different groups but many providers were shorter than the 12 weeks recommended in some studies (Day et al. 2002, Rubenstein et al. 2000). No provider delivered the home based therapy (Robertson et al. 2002) which has been successful as a strategy for falls and fracture prevention. The Home safety assessment most commonly utilized (the Home safe program) was not supported by a randomized controlled trial (Thompson 1996) and Occupational Therapy (OT) home visits were a limited resource. On balance we believe that there was a reasonable match between the available services and the evidence base.

The baseline uptake of evidence by the study group will also affect the impact and nature of our implementation trial. The trial of Close et al. (1999) which involved OT medical assessments after attendance at an ED, had a highly significant effect on falls rates. The applicability of this important UK study in our Australian context is debatable given the 67% baseline uptake of home safety modifications. Although we had significant numbers of patients on psychotropic drugs at baseline, this is a difficult risk factor to change (Campbell et al. 1999). While we could not measure the uptake of evidence-based exercise strategies for fall prevention at baseline, this would appear to be an important target for future implementation studies.

Our study has also shown an incomplete match between the available evidence and those who present to a hospital with falls. Patients with dementia are typically excluded from most trials of fall prevention because of the difficulty of measuring fall rates in this population. There is also little evidence surrounding falls prevention for those living in residential care (National Ageing Research Institute 2000), although there is evidence for the prevention of hip fracture with external hip protectors (Parker et al. 2002). There is some evidence for a nursing home wide falls prevention programme (Ray et al. 1997, Jensen et al. 2002) rather than programmes targeted to an individual. In our study, 22% of potential participants were excluded from the study because of the limitations of available evidence. We believe that this should be an opportunity for “medicine based evidence”. That is, in order to reduce the burden of fall and fall related injury in the whole population, further research into how to prevent falls in patients with dementia and patients living in residential care is necessary.

One of the questions unanswered by this study was whether the referral process and evidence-based prescription was of educational value for the participating GPs. Clinical practice improvement often uses structured educational visits or “academic detailing”. This has been used to successfully improve medication prescription (May et al. 1999). However, it remains unclear if the regular provision of evidence-based prescriptions to GPs alter their habits when dealing with patients who have sustained falls. Unfortunately this question was beyond the scope of the present study, but our patient based strategy should be assessed for its ability to modify clinical behaviour amongst GPs who receive the information about specific patients.

Our small study, with its recognised limitations, has shown that evidence-based clinical practice in falls prevention is possible to achieve. However future attention needs to be given to develop additional pragmatic trials in the areas of falls prevention. Such trials should be designed to easily implemented within the current service delivery framework of Australia. Finally, we also urgently need evidence-based strategies for patients who have significant cognitive impairment and those in residential care.

Table 1: Characteristics of people in control and intervention groups at baseline

Characteristics	Control Group (n = 70)	Intervention Group (n = 70)	Total Group (n = 140)	P-value
Gender (%)				
Men	25.7	31.4	28.6	0.454
Women	74.3	68.6	71.4	
Mean age (\pm SD) (years)	76.1 (\pm 6.9)	79.5 (\pm 6.8)	77.8 (\pm 7.0)	0.004
Mean Modified Barthel's Index ¹ (\pm SD)	18.9 (\pm 2.1)	18.2 (\pm 2.7)	18.6 (\pm 2.4)	0.106
Mean Adelaide Activities Profile score ² (\pm SD)				
Domestic duties	14.4 (\pm 6.2)	13.0 (\pm 6.6)	13.7 (\pm 6.4)	0.199
Maintenance	11.2 (\pm 5.8)	8.6 (\pm 4.5)	10.0 (\pm 5.3)	0.004
Service to others	3.3 (\pm 2.6)	3.1 (\pm 2.3)	3.2 (\pm 2.4)	0.533
Social	4.2 (\pm 1.9)	3.9 (\pm 2.1)	4.0 (\pm 2.0)	0.385
Self-rated health (%)				
Excellent/very good	25.8	27.0	26.4	0.004
Good	42.4	17.5	30.2	
Fair/poor	31.8	55.6	43.4	
Accommodation (%)				
House	64.3	63.2	63.8	0.576
Flat/Unit	31.4	35.3	33.3	
Lodge/Hostel	4.3	1.5	2.9	
Social situation (%)				
Lives alone	41.4	47.1	44.2	0.575
Live with family	8.6	11.8	10.1	
Lives with spouse/partner	48.6	41.2	44.9	
Other	1.4	0	0.7	
Home modification to prevent falls (%)	55.2	79.4	66.9	0.003
Osteoporotic fractures after age 65 (%)	61.5	49.2	55.5	0.160
Mean total number of medications (\pm SD)	3.5 (\pm 2.6)	3.7 (\pm 2.6)	3.6 (\pm 2.6)	0.562
Prescribed any psychotropic medications (%)	20.0	32.4	26.1	0.098
Mean Falls Efficacy Scale score ³ (\pm SD)	82.4 (\pm 20.6)	75.9 (\pm 24.3)	79.3 (\pm 22.6)	0.109
Fear of falling (%)	33.3	29.0	31.3	0.600
Recurrent faller (ie previous fall in last six months) (%)	32.4	53.1	42.4	0.016
Mean number of falls in prior six months	1.69 \pm 1.70	2.34 \pm 1.91	2.01 \pm 1.83	0.041

¹ higher score indicates more ability² higher score indicates more active³ higher score indicates more confidence

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