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Falls prevention for people with dementia

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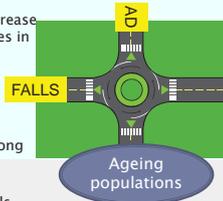
WA DTSC videoconference, May - August 2014

Overview

- Falls in **older people**
 - Magnitude of the problem
 - Risk factors
 - Evidence of effective interventions
- Falls in **people with dementia**
 - Magnitude of the problem
 - Risk factors
 - Evidence of effective interventions
 - Falls prevention and injury prevention
 - Exercise
 - Impact of falls on carers

The importance of Alzheimer's disease and falls

- Alzheimer's disease
 - Most common form of dementia
 - Progressive degenerative disorder
 - Currently leading cause of disability in Australia
 - Incidence of new cases in Australia projected to increase from 69000 new cases in 2009 to 385000 new cases in 2050 (Access Economics 2009)
- Falls
 - One in three older people fall each year
 - 10% of falls cause serious injury
 - Leading cause of injury related hospitalisations among older people in Australia (78600 fall related hospitalisations 2008-9) (AIHW 2012)
 - 10% of bed days for older people attributable to falls (AIHW 2012)
 - Direct costs to the health care system in Australia was \$648million in 2007-8



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Falls as a National Issue

Table 2.1.2: Major external cause groups for community injury cases by age, Australia, 2008

| External cause | Age group (years) | | | | | | All ages |
|-------------------------------------|-------------------|---------------|---------------|----------------|---------------|----------------|----------------|
| | 0-4 | 5-14 | 15-24 | 25-44 | 45-64 | 65+ | |
| Unintentional injuries | | | | | | | |
| Transportation | 941 | 6,441 | 14,405 | 17,823 | 10,845 | 5,102 | 55,457 |
| Drowning | 195 | 67 | 48 | 81 | 49 | 35 | 475 |
| Poisoning, pharmaceuticals | 1,411 | 190 | 1,032 | 1,820 | 1,096 | 1,033 | 6,591 |
| Poisoning, other substances | 447 | 117 | 407 | 745 | 522 | 281 | 2,519 |
| Falls | 6,025 | 17,433 | 9,907 | 15,397 | 23,802 | 78,606 | 153,170 |
| Fires, burns & scalds | 1,564 | 657 | 875 | 1,274 | 906 | 471 | 5,787 |
| Other unintentional injuries | 7,184 | 12,314 | 27,283 | 40,639 | 27,790 | 14,947 | 130,157 |
| Intentional injuries | | | | | | | |
| Intentional self-harm | n.p. | n.p. | 6,965 | 11,800 | 5,522 | 1,017 | |
| Assault | 231 | 457 | 8,211 | 11,652 | 3,314 | 444 | |
| Undetermined intent | 138 | 231 | 1,821 | 2,918 | 1,202 | 420 | 6,730 |
| Other or missing | n.p. | n.p. | 186 | 395 | 677 | 839 | 2,193 |
| Total community injury cases | 20,063 | 38,468 | 71,170 | 104,344 | 78,745 | 103,195 | 412,965 |

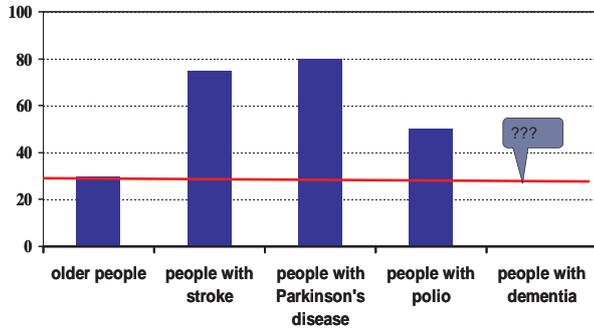
n.p. = not published. Small cell counts have been suppressed to prevent patient identification.

Transportation related hospitalisations – 55,457
Falls related hospitalisations – 153,170

Australian Institute of Health and Welfare, 2012

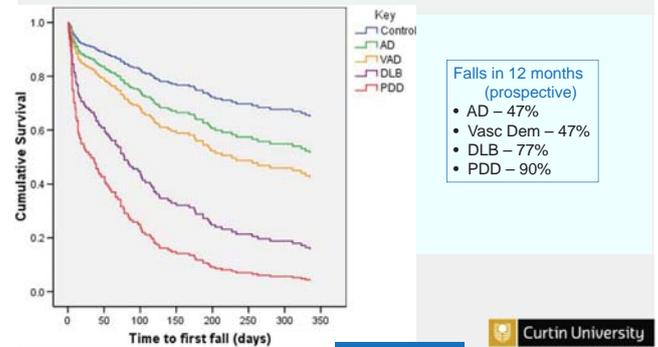
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Hospital separations due to injury and poisoning, Australia 2008-9

Falls in clinical groups



Lord et al, 1993; Forster & Young, 1995; Hill, 1998; Hill & Stinson, 2004

Survival curve (time to first fall) – community sample – OP clinic



Allan et al, 2009

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Why the increased falls risk?

- ▶ the neurological / chronic condition
 - modifiable / non-modifiable
- ▶ unrecognised falls risk factors
- ▶ inadequate preparation for transitions
- ▶ other

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Community setting

42% of a community sample with mild-moderate dementia fall at least once each year (9% fallers suffered leg #)

Most common falls related hazards in homes included:

- low chairs (57%),
- absence of grab rails (toilet - 48%),
- loose rugs (48%),
- missing 2nd bannister on steps (38%) and
- absent night lights (28%)

Horikawa et al 2005 (124 out-patients with diagnosis of probable AD); Lowery et al, 2000

Residential care setting

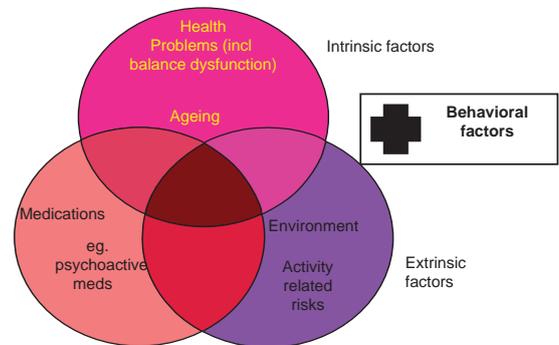
>60% of people with dementia in residential care fall at least once each year

Circumstances of falls

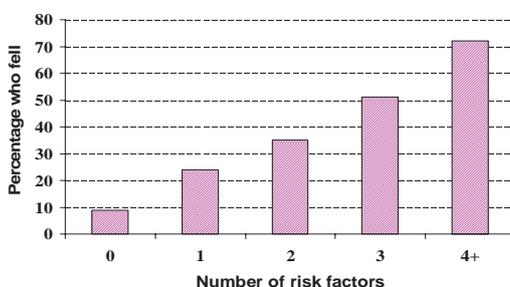
| | Sen citizens apartments (n=89) | Residential care (n=156) | Dementia specific RC (n=69) | Overall (n=314) |
|-----------------------|--------------------------------|--------------------------|-----------------------------|-----------------|
| Walking +/- aids | 35% | 56% | 31% | 45% |
| Standing | 24% | 7% | 19% | 14% |
| Rising / sitting down | 26% | 30% | 46% | 32% |
| Sitting / lying | 15% | 7% | 4% | 9% |

Jensen et al 2003; Eriksson et al, 2007

Falls are multi factorial



Number of risk factors



NB: Modifiable vs non-modifiable risk factors

Tinetti et al, 1988

Identifying who is at risk of falls...

Factors commonly associated with fallers:

- previous falls
- lower extremity weakness
- arthritis (hips / knees)
- gait / balance disorders
- cognitive disorders (depression / dementia / poor judgement...)
- visual disorders
- postural hypotension
- bladder dysfunction (frequency / urgency / nocturia / incontinence...)
- medications (psychotropics / sedatives / hypnotics / antihypertensives...)
- Others (stroke, PD)

➤ Falls risk assessment tools to classify risk

Tideiksaar, 1995

Risk factors for falls prevention for people with dementia

| Risk factors shared with cognitively intact older people, with particular relevance in older people with dementia | Risk factors specific to older people with cognitive impairment and dementia |
|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| Postural instability (impairment of gait and balance) | Wandering |
| Medication—particularly psychotropics | Agitation |
| Neurocardiovascular instability (orthostatic hypotension) | Perceptual difficulties |
| Environmental fall hazards | |
| Visual impairment | |

Shaw et al 2003 (Geriatrics & Ageing)

Identifying falls risk

Falls risk assessment tools – examples:

- Physiological Profile Assessment – PPA (FallScreen)
 - <http://www.neura.edu.au/fbrg>
- Quickscreen
 - <http://www.neura.edu.au/research/facilities/falls-and-balance-research-group/quickscreen>
- Falls risk for older People – Community version (FROP-Com)
 - National Ageing Research Institute



http://www.mednwh.unimelb.edu.au/nari_tools/nari_tools_falls.html

Gait and balance changes with dementia

| Gait impairments in older people with dementia* | Balance impairments in older people with dementia* |
|-------------------------------------------------|----------------------------------------------------|
| Slower walking speed | Increased double support time |
| Reduced step frequency | Increased sway path |
| Shorter step length | Increased unsteadiness |
| Increased postural flexion | Impaired one/two leg balance, eyes open/closed |

* Compared with age- and sex-matched controls/corrected for age and sex.

Balance impairments in mild to moderate AD



* $p < 0.008$

Suttanon et al, 2012

Identifying mild balance dysfunction

WHY

- mild balance dysfunction can be identified with simple clinical tests
- intervene at stage when active participation in exercise is more feasible
- May reduce longer term falls risk

HOW (examples)

- Step test
- Functional Reach test
- Timed Up and Go test (+/- dual task)
- (Timed sit to stand)

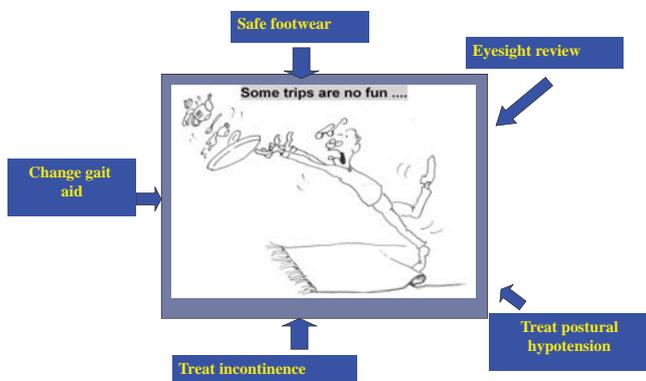
- Quick
- Minimal equipment
- Able to discriminate mild balance problems

What works in falls prevention for older people in the community setting

- There is good research (at least one randomised trial) evidence that a number of single interventions can reduce falls / injuries:
 - exercise (home exercise; tai chi; group exercise)
 - cataract extraction / change multiple glasses to 2 sets of glasses
 - psychotropic medication / medication review
 - home visits by Occupational Therapist
 - improved post hospital follow-up
 - approaches to support adherence to recommended interventions
 - vitamin D and calcium supplementation (in low vit D cases)
 - cardiac pacemaker for those with hypersensitivity
 - foot exercise, footwear and orthoses
- multiple interventions often based on a falls risk assessment have also been shown to be effective (including in high falls risk groups, eg older fallers presenting to ED)

Common exclusion criteria: cognitive impairment

Other interventions ???????



Post hospitalisation

15% of older people fall at least once within 1 month of discharge home from hospital, with 11% experiencing serious injuries (Mahoney et al, 2000)

Nikolaus and Bach 2003

- older people admitted to hospital with functional decline
- post discharge, usual care vs additional home intervention including follow-up visits, instructions on use of aids and home modifications, support for compliance
- significant reduction in falls at 12 months
- differential outcome based on compliance

Summary of what works: falls prevention interventions in the community setting for people with dementia (randomised controlled trials)



Unsuccessful RCT (Risk factors)

Table 3 Risk factors for falls. Values are numbers (percentages) of patients

| Risk factor for falls | Intervention group (n=130) | Control group (n=144) |
|-------------------------------------------------|----------------------------|-----------------------|
| Balance or gait: | 129 (99) | 142 (99) |
| Balance | 129 (99) | 142 (99) |
| Gait | 122 (94) | 137 (95) |
| Environmental fall hazards | 108 (83) | 118 (82) |
| Drugs: | 96 (74) | 99 (69) |
| Psychotropic drugs | 55 (42) | 53 (37) |
| Culprit drugs | 83 (64) | 88 (61) |
| Polypharmacy | 58 (45) | 52 (36) |
| Cardiovascular risk factor: | 76/122 (62) | 78/133 (59) |
| Orthostatic hypotension | 47/122 (38) | 55/133 (41) |
| Cardioinhibitory carotid sinus hypersensitivity | 18/89 (20) | 18/110 (16) |
| Vasodepressor carotid sinus hypersensitivity | 23/89 (26) | 29/110 (26) |
| Vasovagal syncope | 7/84 (7) | 4/108 (4) |
| Feet and footwear | 37 (28) | 45 (31) |
| Medical problem | 35/123 (28) | 36/134 (27) |
| Vision* | 23/93 (25) | 28/103 (27) |
| Depression | 9/93 (10) | 16/101 (16) |
| Cerebrovascular | 15/123 (12) | 9/134 (7) |

*Department of Health criteria for partial sight.
Incomplete data due to lack of patient cooperation with assessment.

Shaw et al, 2003 - RCT

Unsuccessful RCT – results (??some trends)

Table 4 Intention to treat analysis. Values are numbers (percentages) of patients unless stated otherwise

| Outcome | Intervention group (n=130) | Control group (n=144) | Relative risk ratio (95% CI) |
|-----------------------------------------------------------|----------------------------|-----------------------|------------------------------|
| Patients falling in 1 year | 96 (74) | 115 (80) | 0.92 (0.81 to 1.05) |
| Median No of falls (interquartile range)† | 3 (0, 7) | 3 (1, 8) | -0.02 (-0.32 to 0.09)‡ |
| Median time (weeks) to first fall (interquartile range) | 11 (2, 41) | 11 (2, 33) | P=0.459‡ |
| Major injury | 37 (28) | 31 (21) | 1.32 (0.87 to 2.00) |
| Fractured neck of femur | 6 (5) | 12 (8) | 0.55 (0.21 to 1.43) |
| Fall related accident and emergency department attendance | 52 (40) | 46 (32) | 1.25 (0.91 to 1.72) |
| Fall related hospital admission | 19 (15) | 19 (13) | 1.11 (0.61 to 2.00) |
| Mortality | 27 (21) | 29 (20) | 1.03 (0.65 to 1.64) |

*Corrected for diary returns.
†Estimated mean difference (95% confidence interval).
‡Log rank test.

Shaw et al, 2003 - RCT

Cochrane review – residential care

In care facilities, vitamin D supplementation is effective in reducing the rate of falls. Exercise in subacute hospital settings appears effective but its effectiveness in care facilities remains uncertain due to conflicting results, possibly associated with differences in interventions and levels of dependency. There is evidence that multifactorial interventions reduce falls in hospitals but the evidence for risk of falling was inconclusive. Evidence for multifactorial interventions in care facilities suggests possible benefits, but this was inconclusive.

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Cameron et al, 2012

Falls prevention in residential care

- Cluster randomised controlled trial
- 80% of intervention group and 70% of control group had MMSE<23
- Intervention – nurses from intervention facilities received falls prevention training (limited detail, but maximum reach, post fall analysis and management)
- Significant reduction in falls after adjusting for institution and baseline results

Several other RCTs using multifaceted or multifactorial interventions in residential care or hospitals have reduced falls in samples including cognitively impaired participants.

Bouwen et al, 2008

What works in falls prevention: hospital setting

- setting with least research base
- 17 studies (29,972 participants) in hospital settings, 8 in an acute hospital setting, 7 in subacute settings, and 2 were in both acute and subacute care settings:
 - supervised additional exercise
 - patient education by nurse (Ang et al 2011), or DVD + personalized education by AH (for cognitively intact patients – Haines et al, 2011)
 - multiple interventions based on:
 - falls risk assessment in the subacute setting (Haines et al, 2004);
 - Comprehensive geriatric assessment in an Orthopaedic ward after surgery for femoral neck fracture (Stenvall et al, 2007)
 - nursing care plan in the acute & sub-acute (Healey et al, 2004)
- nb- trend towards reduced falls using bed alarm system (Tideiksaar, 1993)

COCHRANE REVIEW (2012): Cameron et al

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Sub-acute setting RCT – Haines et al, 2004

- ▶ patients randomised
- ▶ multidisciplinary falls risk assessment on admission and as required
- ▶ targeted interventions (based on identified risk and clinical judgement of likely benefit) as well as usual care:
 - falls alert card
 - patient / carer education
 - group exercise
 - hip protectors
- ▶ significant reduction in falls
- ▶ 30% (non-significant) reduction in falls related injuries

Included patients with cognitive impairment

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Haines T, Bennell K, Osborne R, Hill K. 2004 Effectiveness of a targeted falls prevention program in a sub-acute hospital setting – a randomised controlled trial. *British Medical Journal* 328(7441):676-9.

Acute and sub-acute setting – Healey et al, 2004

- ▶ Matched ward randomised design
- ▶ care plan based on falls risk factor screen

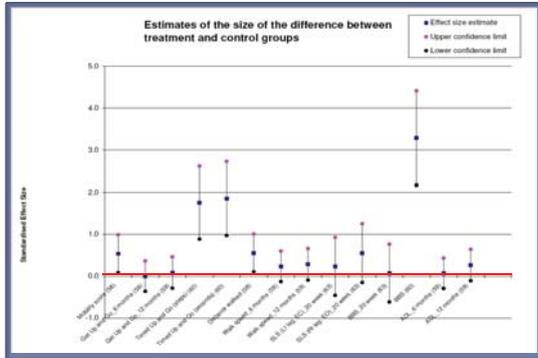
| | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • vision • medications • lying and standing blood pressure • urine ward test | <ul style="list-style-type: none"> • mobility • environment • risk / benefit analysis of use of bed-rails |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
- ▶ included guidelines for management of identified risk factors
- ▶ significant reduction in falls, no change in injuries
- ▶ issues– baseline differences between wards

Included patients with cognitive impairment

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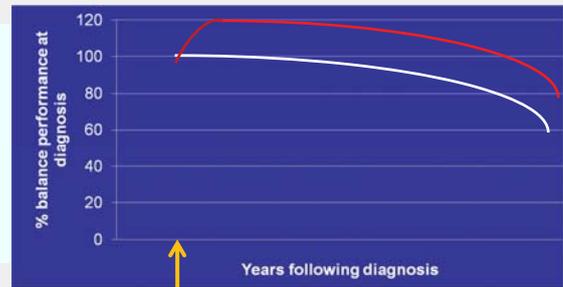
Healey F, Monro A, Cockram A, Adams V, Haseltine D. Age Ageing. 2004 Jul;33(4):390-5

Balance training RCTs and effect on balance related outcomes (dementia)



Effect Size (ES) and 95% CI of the physical outcomes in reviewed studies providing data for ES calculations (n=4) (Suttanon et al, 2010)

Potential effect of exercise on balance



Time of diagnosis

Pilot randomised trial

AIM: to evaluate the feasibility/safety of a home-based balance exercise program and to provide preliminary evidence of program effectiveness in people with mild to moderate AD



Dr Plaiwan Suttanon,
Thammasat University, Thailand

Methods

40 participants* with mild to moderate AD (with carer in most cases) **randomised** to 6 month home-based programs:

- i) balance exercise (physio), OR
- ii) education / support program (OT)

Inclusion criteria:

- community living
- AD diagnosis by GP or specialist
- mild to moderate severity (MMSE>10)
- able to walk outdoors with no more support than a single point stick
- no other major neurological or orthopaedic past history impacting on balance / mobility

Intervention and control activities

Home-based balance exercise program (6 home visits[#] and 5 phone calls in 6 months)

- based on "Otago programme"
- individualised balance, strengthening & walking exercises
- by a physiotherapist (monitor, motivate, modify)
- an exercise booklet
- exercise 5 days/week



Home-based education / support program (6 home visits and 5 phone calls)

- based on study by Graff et al., 2007
- included education/information sessions
- by an occupational therapist

[#]increased from original Otago program

Measures

- Balance/mobility performance
 - Clinical measures (Functional Reach, Step Test, Timed Up and Go – single and dual task)
 - Neurocom Balance Master (Limits of Stability, modified CTSIB, Sit to Stand, Step Quick Turn, Gait step width)
- Falls (questions at each home visit and telephone contact)
- Falls risk: FROP-com, PPA
- Zarit carer burden index

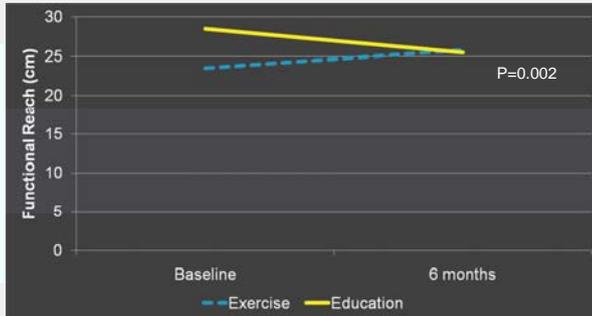
Sample

| Characteristic | Exercise Group (n = 19) | Control Group (n = 21) |
|------------------------------------------------------------|-------------------------|------------------------|
| Age, mean ± SD | 83.42 ± 5.10 | 80.52 ± 6.01 |
| Gender (M:F), n | 6:13 | 9:12 |
| Mini Mental State Examination score, mean ± SD | 20.89 ± 4.74 | 21.67 ± 4.43 |
| Number of medical conditions [†] , median (range) | 3 (6) | 3 (5) |
| Fallers: non-fallers, n (% fallers) | 9:10 (52.6%) | 4:17 (19%)* |
| FROP-Com [‡] Falls Risk score, mean ± SD | 15.42 ± 4.99 | 12.57 ± 5.56 |
| PPA [§] Falls Risk score, mean ± SD | 1.84 ± 1.18 | 1.39 ± 1.21 |
| Functional Reach (distance_cm), mean ± SD | 23.51 ± 5.74 | 28.48 ± 4.70* |
| Step Test (number of steps_worse side), mean ± SD | 12.33 ± 2.38 | 13.00 ± 3.23 |

Results: Completion of 6 month interventions

- Program completion: exercise program (11 of 19, 58%)
control program (18 of 21, 86%)
- No adverse events during exercise program
- 83% adherence for those completing the program

Change in Functional Reach



Generalized linear models, with baseline performance on the outcome measure as a covariate.

Changes in other measures

Compared to education group, exercise group achieved significantly better:

- Change in falls risk (FROP-Com), $p=0.008$
- Limits of stability (movement velocity), $p=0.016$

Compared to education group, exercise group achieved trends for better:

- Step Test, $p=0.082$
- Modified CTSIB, $p=0.086$
- Timed Up and Go (dual task-manual), $p=0.088$

Most measures indicated similar direction of change

No significant change in falls / fallers (underpowered)

No significant change between groups for carer burden (Zarit)

Best practice falls prevention with dementia

Evidence from community setting

- falls risk assessment
- Exercise (balance focus)
- cataract surgery
- environmental modification
- behaviour change
- medication review
- vitamin D
- hip protectors

Other best practice options

- appropriate footwear / glasses
- correct use of walking aid
- Manage orthostatic hypotension
- Manage incontinence



Dementia specific management

- Dementia friendly environments

Injury minimisation

- Hip protectors
- Vitamin D / calcium
- Anti-resorptive medication

Don't just consider falls are due to dementia – look for risk factors that can be managed

Caution – falls risk can be increased!

- Acute and sub-acute hospital setting
- Education (DVD) with health professional support
- Reduced falls in cognitively intact older patients
- Increased falls in cognitively impaired patients



Haines T et al, *Archives of Internal Medicine*, 2010

Adherence in falls prevention interventions

(Nyman and Victor, Age and Ageing, 2012)

- ▶ Reviewed 99 randomised trial in 2009 Cochrane review (falls prevention in the community)
- ▶ Adherence rates (n = 69) were:
 - ≥80% for vitamin D/calcium supplementation;
 - ≥70% for walking and class-based exercise;
 - 52% for individually targeted exercise;
 - approximately 60–70% for fluid/nutrition therapy and interventions to increase knowledge;
 - 58–59% for home modifications;
 - Adherence to multifactorial interventions was generally ≥75% but ranged 28–95% for individual components. Home-exercises on average 11 times per month

CONCLUSIONS:

Using median rates for recruitment (70%), attrition (10%) and adherence (80%), we estimate that, at 12 months, on average half of community-dwelling older people are likely to be adhering to falls prevention interventions in clinical trials.

Impact of falls on carers and capacity to maintain caring arrangements for frail older people living at home

Facts and figures on caregivers

- ▶ Informal caregivers provide up to 80% of support to older people in Australia, enabling them to stay at home rather than enter residential care (Productivity Commission 2011)
- ▶ Often under moderate to high levels of stress / burden
- ▶ Often focus energies on caregiving, rather than own health
- ▶ Increasing proportion of older people with dementia living in the community with carers and support services

Impact of falls on care recipients and caregivers

- 96 dyads recruited

| | Caregiver | Care recipient |
|----------------------------------|-----------|----------------|
| Age | 71.8 | 78.0 |
| Female - n (%) | 66 (69%) | 36 (38%) |
| Time in caring role (mean) | 6.1 years | |
| Relationship to care recipient | | |
| -Spouse | 82 (85%) | |
| -Child | 11 (12%) | |
| -Other | 3 (3%) | |
| Number of health problems - mean | 2.7 | 4.6 |
| Proportion with dementia | | 28% |
| Falls risk (FROP-Com) | | |
| -Low risk | | 7.4% |
| -Moderate risk | | 31.6% |
| -High risk | | 61.0% |



Falls by care-recipients

- ▶ 12 month prospective follow-up
 - 198 falls by 54/96 care recipients (56%)
 - 33/56 were multiple fallers (59%)

Change by care recipient from baseline to first fall

Table 2. Comparison of measures (independent group *t*-test) from baseline to first fall
Sample includes all care recipients who fell (*n* = 56) and their caregivers. CG, caregiver; CR, care recipient; IADL, Instrumental Activities of Daily Living. **P* < 0.05; ***P* < 0.01

| Measure | Baseline | | After first fall | | <i>P</i> -value |
|-------------------------------------|----------|------|------------------|------|-----------------|
| | Mean | s.d. | Mean | s.d. | |
| Modified Barthel Index (CR) | 17.4 | 3.0 | 16.7 | 4.2 | 0.041* |
| Modified Barthel Index (CG) | 19.7 | 0.6 | 19.7 | 0.7 | 1.000 |
| SF-36 Total Physical Score (CR) | 46.4 | 10.9 | 46.6 | 10.0 | 0.994 |
| SF-36 Total Mental Score (CR) | 48.3 | 8.9 | 48.8 | 9.9 | 0.648 |
| Lawton-Brody IADL (CR) [^] | 3.6 | 2.2 | 3.5 | 2.4 | 0.473 |
| Zarit Burden Interview (CG) | 24.2 | 14.2 | 27.6 | 14.5 | <0.001** |
| Geriatric Depression Scale (CG) | 3.3 | 2.3 | 3.0 | 2.2 | 0.193 |
| Assessment of Quality of Life (CG) | 9.8 | 4.6 | 10.4 | 4.8 | 0.148 |

[^]CG assessment on behalf of the CR.

Health services utilised by care recipients

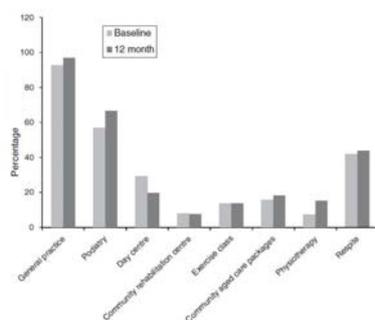


Fig. 1. Most commonly used health services at baseline and 12-month assessments for the entire sample.

Summary

- ▶ Dementia is an independent risk factor for falls
- ▶ Good research evidence that falls can be reduced in people without cognitive impairment
- ▶ Limited but growing evidence that falls risk factors can be improved, and falls can be reduced in people with cognitive impairment
- ▶ Balance training exercise is feasible and appears to improve balance and mobility related outcomes
- ▶ Best practice management to reduce falls includes
 - Identify falls risk factors and address these where possible, in addition to optimal management of the cognitive impairment
 - Utilise injury minimisation and environmental modification strategies
 - In hospitals and residential care – optimise surveillance / observation
 - Staff training in falls prevention
- ▶ Minimising falls for high risk older people (eg with dementia) living at home may increase sustainability of the care giving dyad
- ▶ Need for further research