Interventions that work to prevent falls

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Increased knowledge = better outcomes for your clients

What is a fall?

How big a problem

What causes a fall?

What works to prevent falls?
What works in falls and fall injury prevention?
What can you do to reduce your risk of falls:
1. See your doctor / HP

- If you have a fall – have a check up
  - Even if you think it was just an accident
- If you are feeling unsteady when walking / turning
- If you are reducing your activities

No RCT’s, but best practice guidelines (JAGS 2011)
2. Exercise / physical activity

- Most researched single intervention in falls prevention
- Majority of research in the community setting

NOTE: Exercise programs usually have a range of other benefits as well as falls prevention
Effective Exercise for the Prevention of Falls: A Systematic Review and Meta-Analysis

Catherine Sherrington, PhD,*†‡ Julie C. Whitney, MSc,§ Stephen R. Lord, DSc,†
Robert D. Herbert, PhD,* Robert G. Cumming, PhD,‡ and Jacqueline C. T. Close, MD†‖

• 44 RCTs reviewed on exercise and falls prevention
• Combined result: exercise is effective
• Greater effect on falls rate if balance is included (17% reduction vs 10%)
• Greater effect with 50 hours exercise
• Need balance/functional strength, moderate intensity

Sherrington et al 2008 JAGS. 56: 2234-2243
Overall effect of exercise: RR 0.83 (95%CI 0.75 – 0.91)
Overall effect of exercise: IRR 0.84 (95% CI 0.77 – 0.91)

Sherrington et al 2011
A selection of effective exercise programs:

- Stay Safe, Stay Active (Barnett et al, 2003)
- The Otago Exercise Programme (Campbell, Gardner)
- Erlangen Fitness intervention (Freiberger et al, 2007)
- Tai Chi and modified Tai Chi (Li et al, 2005; Voukelatos et al, 2007; Wolf et al 1996)
- Falls Management Exercise (FaME) (Skelton et al, 2005)
What doesn’t work?

– Low intensity exercise
– Only one type of exercise
– Walking
– At risk populations e.g. stroke, cognitive impairment – high risk of falls but limited evidence on effective interventions
OTAGO EXERCISE PROGRAMME

• Designed specifically to prevent falls in community dwelling older adults
• Includes strength, balance components + walking program
• Progressive, individually tailored home exercise
OEP

- 30 minutes exercise
- 3 x per week
- Walking 2 x per week
- Ankle cuff weights for resistance
- 4-5 home visits
- Record exercise in diary
- Phone calls each month between visits
OTAGO – Balance exercises
Evidence

Meta-analyses

  - 7 studies, overall the OEP significantly reduced falls rates by 32%

  - 4 studies, overall the OEP significantly reduced falls rates by 35%; equally effective in men and women; most effective in reducing injurious falls in those 80+
Where to get it....


Another version:

- [http://www.laterlifetraining.co.uk/home-exercise-booklets-free-to-download/](http://www.laterlifetraining.co.uk/home-exercise-booklets-free-to-download/)
Another type of approach

- Nijmegen Falls Prevention Program

- Gait, co-ordination, obstacle crossing, uneven surfaces, dual tasks, visual constraint, falling practice, simulated crowded environment, walking to music

- Education: simulation of dangerous fall situations; physical activity

Weerdesteyn et al Gerontology 2006
NFPP

Weerdesteyn et al, Gerontology 2006
• N = 113
• Community dwelling
• 2 x 1.5 hr sessions weekly, 5 weeks
• Pre-post design with control group
• Falls 46% reduction in intervention group, no difference in controls

Smulders et al, Arch Phys Med Rehab 2010
• N = 96
• History of falls/osteoporosis
• 11 sessions, 5.5 weeks
• RCT
• Falling techniques modified
• Fall rate 39% lower in the intervention group after 1 year.
Another approach

- Lifestyle Integrated Functional Exercise (LiFE)
- Strength & balance embedded into everyday activities
- 3 arm study
  - LiFE
  - Structured ex
  - Gentle ex (control)
- 31% reduction in the rate of falls for LiFE

Clemson et al, BMJ 2012
Another effective approach

- Multi-task exercise program performed to the rhythm of piano music
- Walking in time to music, then more complex movements including footwork
- 6 month program
- 1 hour / week class
- Avoid additional ex at home

Trombetti et al 2011
Trombetti et al, 2011

- N = 134
- Intervention group had fewer falls
- 54% reduction in falls rates in intervention group (IRR 0.46, 95%CI 0.27 to 0.79)
- 39% reduction in proportion of fallers in intervention group (RR 0.61, 95% CI 0.39 to 0.96)
Principles for exercise prescription

- **Strength training** – 8-10 reps before fatigue
- **Balance training** – less clear
  - time limit for “static tasks”?
  - Number of “saves”
- **Walking dosage for falls prevention unclear**
Top tip

People can do more than first impressions indicate
What can you do to reduce your risk of falls:
3. Medication review

COCHRANE 2012: “Gradual withdrawal of psychotropic medications reduced rate of falls. A prescribing modification programme for primary care physicians significantly reduced risk of falling.”.

- Keep medications to the minimum
- Have medications reviewed by your doctor
- Try to avoid / minimise use of sleeping tablets, anti anxiety tablets etc

Largest effect of any falls prevention study involved weaning people off psychotropic medications: Campbell et al 1999
What can you do to reduce your risk of falls:
4. Vision check

- Regular vision review
- Cataract surgery
  - First eye effective
- Bifocals – can be problematic but single vision lenses for active people only

COCHRANE 2012: “First eye cataract surgery reduced the rate of falls in women but second eye cataract surgery did not.”
Effect on falls of providing single lens distance vision glasses to multifocal glasses wearers: VISIBLE randomised controlled trial

Mark J Haran, rehabilitation medicine physician,1 Ian D Cameron, professor of rehabilitation medicine,2 Rebecca Q Ivers, associate professor of injury prevention,3,4 Judy M Simpson, professor of biostatistics,4 Bonsan B Lee, rehabilitation medicine physician,5,6,7 Michael Tanzer, optometrist,7 Mamta Porwal, research assistant,7 Marcella M S Kwan, research assistant,7 Connie Severino, research assistant,7 Stephen R Lord, senior principal research fellow 6,7
What can you do to reduce your risk of falls:

5. Home safety

COCHRANE 2012: “Home safety interventions reduced rate of falls and risk of falling…particularly in reducing falls rates in participants at higher risk of falling…these interventions appear to be more effective when delivered by an occupational therapist. An anti-slip shoe device worn in icy conditions can reduce falls.”

- Removing environmental hazards will reduce risk of falls
- If having falls should have an occupational therapy home assessment
Environmental safety: Home falls risk assessment & modification

• commonly used
• Cumming et al 1999, JAGS: RCT identifying significant reduction in falls rates for OT home visit / environmental assessment / behaviour risk modification
• IN AT RISK GROUP ONLY
• NB: falls reduced at home and away from home
Cumming et al 1999

<table>
<thead>
<tr>
<th>Modification</th>
<th>% of homes recommended</th>
<th>Adherence at 12 months</th>
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<tbody>
<tr>
<td>Mats/rugs</td>
<td>48%</td>
<td>49%</td>
</tr>
<tr>
<td>Change footwear</td>
<td>24%</td>
<td>54%</td>
</tr>
<tr>
<td>Use non-slip bathmat</td>
<td>21%</td>
<td>75%</td>
</tr>
<tr>
<td>Change behaviour, improve safety</td>
<td>15%</td>
<td>60%</td>
</tr>
<tr>
<td>Use light at night</td>
<td>13%</td>
<td>58%</td>
</tr>
<tr>
<td>Add rail to stairs</td>
<td>12%</td>
<td>19%</td>
</tr>
<tr>
<td>Move electrical cords</td>
<td>12%</td>
<td>67%</td>
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</tbody>
</table>
What can you do to reduce your risk of falls and fall injuries: Vitamin D and calcium

- Many older people have low levels of vitamin D
- Main sources of vitamin D are:
  - Sunlight (approx 20 min/day)
  - Some foods (eg sardines)
  - Supplements
- Vitamin D and calcium together have been shown to reduce fractures and falls (in high risk samples (residential care))
Effect of vitamin D on falls

COCHRANE 2012: “Taking vitamin D supplements with or without calcium probably does not reduce falls, except in people who have lower levels of vitamin D in the blood at enrolment.”

Complex series of studies to interpret because of:
- different types of vitamin D (D2 and D3)
- different dosages
- different samples in terms of vit D deficiency
- supplementation of vitamin D with/without calcium
- outcomes of fractures as well as falls
- a more recent study showed increase in falls & fractures with yearly dose of 500,000 IU (Sanders et al 2010, JAMA)
COCHRANE 2012: “Multifactorial interventions consist of more than one main category of intervention and participants receive different combinations of the interventions based on an individual assessment to identify potential risk factors for falling. …Multifactorial interventions reduce the rate of falls but not the risk of falling.”
Luck et al 2013, Clin Int Aging

• RCT with falls follow-up for 12 months (retrospective)

• N = 230, 80+ years

• Intervention:
  – Multidimensional geriatric assessment
  – Multidisciplinary case conference, identify risk factors, recommend interventions
  – 3 home visits focusing on falls prevention strategies including education

• Results: IRR 0.32 (95% CI 0.22-0.49)
Other interventions

• Foot exercises and orthotics for those with foot pain (Spink et al, 2011): significant decrease in falls

• Falls after stroke: no RCTs showing effect apart from vit D in residential care for women (Batchelor et al, 2010)
Falls prevention in the community setting

- SINGLE INTERVENTIONS (RCT evidence)
  - Exercise
    - Multi-component group
    - Multi-component home exercise
    - Tai chi for risk of falling
  - vitamin D – ?for people with lower levels
  - Change to single vision lenses for those active outdoors (worse for those undertaking little activity)
  - Cataract extraction

COCHRANE REVIEW: Gillespie et al, 2012
What can you do to reduce your risk of falls:

2. Exercise

COCHRANE 2012: “Multi-component (combination of two or more categories of exercise) exercise classes significantly reduced rate of falls and risk of falling, as did multiple-component home-based exercise…. Tai chi significantly reduced the risk of falling….and appears to be more effective in people who are not at high risk of falling”.
Falls prevention in the community setting

- SINGLE INTERVENTIONS (RCT evidence)
  - Comprehensive prescriber modification program/psychotropic medication withdrawal
  - Home safety assessment/modification
  - Pacemakers for carotid sinus hypersensitivity
  - Anti-slip shoe device!

COCHRANE REVIEW: Gillespie et al, 2012
Falls prevention in the community setting

- **MULTIPLE INTERVENTIONS**
  - Foot exercises and podiatry for people with foot pain (rate of falls)

- **MULTIFACTORIAL INTERVENTIONS** based on individualised falls risk assessment reduce the rate of falls, but not risk
Other interventions?

- Safe footwear
- Education
- Nutrition
- Treat postural hypotension
- Change gait aid
- Treat incontinence
- Some trips are no fun ....
What works in to prevent falls in residential care?

- Systematic review and meta-analyses
  - Cochrane Review: Interventions for preventing falls in older people in nursing care facilities and hospitals (Cameron et al 2010, updated 2012)
  - Strategies to prevent falls and fractures in hospitals and care homes and effect of cognitive impairment: systematic review and meta-analyses (Oliver et al 2007)

- Randomised trials
  - Covering a range of intervention types
1. Education

- targeting staff, residents, family
  - commonly used
  - most commonly target staff (cf community)
  - Few RCT’s with falls/injuries as outcome
Falls prevention in residential care: Staff education

- Bouwen et al, 2009:
  - 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
Falls prevention in residential care: Staff education

• Cox et al 2008: Care homes in UK – randomised to receive intervention at start or 12 months later
• Primary aim # prevention, falls as secondary outcome
• ½ day Education, STRATIFY falls risk assessment to managers, nurses, health care assistants.
• NO difference in fall rate or fracture rate
Education kits

- VQC online education:

- Preventing falls in the care home:
  http://www.medicaleducation.co.uk/free.html
2. Exercise

- commonly utilised (USA - 96% of settings offer some form of exercise)
- wide variation in type:
  - group exercise classes, seated ex, Tai Chi
  - individual sessions with a physiotherapist
  - supervised walking
  - activity / leisure pursuits
  - flexibility
  - single leg standing!
Cochrane review:

“There is no evidence that […] interventions targeting single risk factors reduce falls and this includes exercise interventions …”
Exercise

- **Functional Incidental Training (FIT):** Schnelle et al 2002, 2003; Ouslander
  - N = 190
  - Exercise linked to continence care
  - Walking/repeat sit-to-stands
  - Upper body resistance training when in bed
  - 5 days/wk, every 2 hrs; 32 weeks
  - Significant reduction in fallers, not in fall rate
Exercise

- Balance training on a force platform:
  Sihvoven et al, 2004
  - Gait, balance and coordination exercises
  - 3 sessions per week 20-30 mins, 4 weeks
  - Small sample, n = 28
  - Significant reduction in falls risk, not in rate
Exercise

- Shimada, 2004
  - Perturbed gait exercises on treadmill – gait, balance, co-ordination, endurance
  - Small sample size, n = 32
  - 6 months, 600 minutes in total
  - Non significant reduction in falls
  - ? Results from pilot study inconsistent
Exercise

- RCT of multifactorial intervention: Dyer et al, 2004
- Group (multi-component) exercises
  - 3x weekly run by physio
  - Balance, gait & strength, weights, theraband
  - Flexibility & endurance
  - Linked to function

Results:
- 45% (non significant) reduction in falls; Compliance an issue (59%)
Exercise

- Faber 2006 N = 238
- RCT of 15 facilities – 2 intervention types, + usual care
- Functional Walking exs, 1 session/wk for 4 weeks then 2 sessions for 16 weeks
- OR
- 3D balance based on Tai Chi as above
- Results: falls higher in FW than IB/control – not sig.
3. Environmental safety

- commonly used
- range of strategies utilised
- no published RCT’s evaluating effect on falls in isolation
- tredaded slippers introduced resulting in marked reduction in falls due to slips in urine (Meddaugh et al, 1996)
Use of environmental audits

• Have been used as part of successful multi-factorial interventions in residential care

• Need to consider:
  – Individual environment
  – General environment
Audit tools

- Audit tools:
4. Clinical assessment

a) Medical screen

- no single intervention RCT’s published evaluating medical screen with falls rate as an outcome

- As part of multifactorial interventions:
  - Two studies resulting in significant reduction in falls / fallers (Dyer et al, 2004; Jensen et al, 2002)
4. Clinical assessment

b) Medication review

- Clinical medication review by pharmacist and recommendations to GP
  - Significantly reduced falls (Zermansky et al, 2006)
  - No significant effect in the study by Crotty.

- NB Community setting
  - High rate of use of psychotropic medications
  - Largest effect in reducing falls related to weaning patients off psychotropic medications (Campbell et al, 1999)
5. Multiple strategy (targeted and untargeted)

- Successful interventions based on well designed studies (randomised trials):
    - Staff education, environmental modification, strength balance & mobility exercises, supply and repair of walking aids & wheelchairs, changes in medication, hip protectors, post fall problem solving conference
  - multi-factorial interventions without falls risk assessment (Becker et al, 2003)
    - Staff training, monthly feedback of falls data, resident information sessions, environmental assessments, group exercise programs, hip protectors
    - Staff training, group exercise program, medical reviews, environmental modification, optician and podiatry review if required

*NOTE: each of these studies included residents with cognitive impairment*
6. Vitamin D supplementation

- RCTs examine effects of vit D with/without calcium in comparison to placebo/calcium only
- Vit D2/3 oral
- Possible differences depending on serum vitamin D levels
Effective interventions – to reduce fractures
Electronic monitoring and alarms

- Limited RCT evidence - none in residential care
- Shorr et al (2012) – education and training to increase use of bed/chair alarms in hospital
- Found increase in use of alarms but NO change in falls

NB Bressler et al (2011) : found a reduction in falls after eliminating alarms in dementia care facility!!
Other interventions....

• Consider interventions effective in community-dwelling older people
• Podiatry
• Nutrition
• Electronic monitoring/alarms
• Exergaming?
• Aromatherapy
Fall Prevention Using Olfactory Stimulation with Lavender Odor in Elderly Nursing Home Residents: A Randomized Controlled Trial

Yuko Sakamoto, MSc, a,† Satoru Ebihara, MD, PhD, a Takae Ebihara, MD, PhD, a Naoki Tomita, MD, PhD, MPH, b Kenji Toba, MD, PhD, c Shannon Freeman, MSc, d Hiroyuki Arai, MD, PhD, e and Masahiro Kobzuki, MD, PhD a

OBJECTIVES: To investigate the effects of lavender olfactory stimulation intervention on fall incidence in elderly nursing home residents.

DESIGN: Randomized placebo-controlled trial.

SETTING: Three randomly selected nursing homes in northern Japan.

PARTICIPANTS: One hundred and forty-five nursing home residents aged 65 and older.

INTERVENTION: Participants were randomly assigned to the lavender (n = 73) or placebo group (n = 72) for a

The lavender group also had a significant decrease in CMAI score (P = .04) from baseline to follow-up in a per protocol analysis.

CONCLUSION: Lavender olfactory stimulation may reduce falls and agitation in elderly nursing home residents; further research is necessary to confirm these findings. J Am Geriatr Soc 60:1005–1011, 2012.

Key words: fall prevention; lavender; nursing home residents
Falls and injury prevention: what works in hospitals?

• Acute setting - orthopaedic ward post femoral neck fracture surgery: **comprehensive geriatric assessment and management**\(^1\), including medication review (RCT): **significant reduction in fall rate**, proportion of fallers, proportion of fallers with injuries; NB whole-ward approach

\(^1\)Stenvall 2007;
Falls and injury prevention: what works?

- Mixed settings (acute and sub-acute):
  - Nursing care plan\(^1\) based on falls risk factor screen, including guidelines for managing identified risk factors: decrease in falls, no change in injuries (NB matched ward design)

  \(^1\)Healey 2004;
Falls and injury prevention: what works?

• Mixed settings (acute and sub-acute):
  – Falls prevention education\(^1\) using DVD/written education ± health professional follow-up: reduced falls in cognitively intact older patients but increased injurious falls in cognitively impaired patients;

• Sub-acute
  – Multi-factorial\(^2\) with targeted intervention: significant decrease in falls, 30% reduction in falls

- Multidisciplinary falls risk assessment
- Falls risk alert card
- Brochure
- Exercise
- Education
- Hip protectors

\(^1\)Haines 2010; \(^2\)Haines 2004
Mixed/unclear/no evidence

• Low-low beds – no effect\(^1\) vs dose response\(^2\)
• Exercise – effective as part of multi-factorial intervention vs no effect as single intervention
• Multifactorial approaches - no effect\(^3\) vs effect\(^4,5\)
• Alarm systems
• Wrist bands – no effect\(^6\)

\(^1\)Haines 2010; \(^2\)Barker 2012; \(^3\)Cumming 2007; \(^4\)Haines 2004; \(^5\)Stenvall 2007; \(^6\)Mayo 1994
Other considerations

• Interventions in residential care need to be different to acute/sub-acute\(^1\)
  – Vitamin D
  – Comprehensive geriatric assessment
  – Multi-factorial with exercise
• Consider interventions effective in community-dwelling older people for community-based services e.g. exercise, multi-factorial approaches, environmental modification\(^2\)
• What happens after discharge?
  – 15-30% at risk falling within 1 month of discharge from hospital\(^3,4\)

\(^1\)Cameron 2010; \(^2\)Gillespie 2009; \(^3\)Mahoney 2000; \(^4\)Batchelor 2012
Take home messages

• Falls and fall-related injury can be prevented
• This requires a multidisciplinary effort
• Each patient needs an individualised plan