Getting the balance right: the role of exercise in falls prevention

Dr Frances Batchelor
Research Fellow
National Ageing Research Institute
The issue of falls: be alarmed

• Falls are the leading cause of hospitalisation due to injury (38% of all injury hospitalisations)

• Falls responsible for 87% of injury hospitalisations in 85+ year olds

AIHW 2012: Hospital separations due to injury and poisoning, Australia 2009-2010
Falls as a serious problem

**Transportation related hospitalisations:** 54,110

**Falls related hospitalisations:** 161,147

---

Table 2.1.2: Major external cause groups for community injury cases, by age, Australia, 2009–10

<table>
<thead>
<tr>
<th>External cause</th>
<th>0–4</th>
<th>5–14</th>
<th>15–24</th>
<th>25–44</th>
<th>45–64</th>
<th>65+</th>
<th>All ages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unintentional injuries</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td>843</td>
<td>6,193</td>
<td>13,271</td>
<td>17,314</td>
<td>10,979</td>
<td>5,710</td>
<td>54,110</td>
</tr>
<tr>
<td>Drowning &amp; near drowning</td>
<td>233</td>
<td>56</td>
<td>66</td>
<td>82</td>
<td>62</td>
<td>41</td>
<td>540</td>
</tr>
<tr>
<td>Poisoning, pharmaceuticals</td>
<td>1,322</td>
<td>197</td>
<td>1,041</td>
<td>1,817</td>
<td>1,144</td>
<td>1,083</td>
<td>6,604</td>
</tr>
<tr>
<td>Poisoning, other substances</td>
<td>391</td>
<td>117</td>
<td>404</td>
<td>714</td>
<td>403</td>
<td>318</td>
<td>2,407</td>
</tr>
<tr>
<td>Falls</td>
<td>8,626</td>
<td>17,748</td>
<td>10,057</td>
<td>16,023</td>
<td>24,925</td>
<td>83,768</td>
<td>181,147</td>
</tr>
<tr>
<td>Smoke, fire, heat &amp; hot substances</td>
<td>1,605</td>
<td>615</td>
<td>894</td>
<td>1,363</td>
<td>946</td>
<td>490</td>
<td>5,933</td>
</tr>
<tr>
<td>Other unintentional injuries</td>
<td>7,319</td>
<td>12,448</td>
<td>27,738</td>
<td>44,113</td>
<td>28,804</td>
<td>15,583</td>
<td>133,005</td>
</tr>
<tr>
<td><strong>Intentional injuries</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intentional self-harm</td>
<td>n.p.</td>
<td>n.p.</td>
<td>7,301</td>
<td>11,562</td>
<td>5,795</td>
<td>1,067</td>
<td>26,331</td>
</tr>
<tr>
<td>Assault</td>
<td>199</td>
<td>476</td>
<td>7,883</td>
<td>10,966</td>
<td>3,192</td>
<td>476</td>
<td>23,162</td>
</tr>
<tr>
<td>Undetermined intent</td>
<td>153</td>
<td>215</td>
<td>1,540</td>
<td>2,275</td>
<td>1,086</td>
<td>439</td>
<td>5,708</td>
</tr>
<tr>
<td>Other or missing</td>
<td>n.p.</td>
<td>n.p.</td>
<td>329</td>
<td>655</td>
<td>863</td>
<td>2,056</td>
<td></td>
</tr>
<tr>
<td><strong>Total community injury cases</strong></td>
<td>20,719</td>
<td>38,713</td>
<td>70,306</td>
<td>103,578</td>
<td>78,111</td>
<td>109,638</td>
<td>421,065</td>
</tr>
</tbody>
</table>

n.p. = Not published. Small cell counts have been suppressed to prevent patient identification.
Hospital length of stay

Falls: 7 days
Transport: 4.5 days

Figure 6.1: Mean length of stay (days ± SE) for fall injury case separations, men and women aged 65+, Australia 2009–10

AIHW 2013: Hospitalisations due to falls by older people, Australia
Mortality data

75 years +

• Deaths from falls in 2011 = 1,530
• Deaths from falls in 2002 = 365

All ages

• Deaths from car accidents in 2011 = 1292
The hidden costs of falls

• Fear of falling
• Activity restriction
• Anxiety/depression
• Post traumatic stress
• Loss of independence
• Social isolation
Falls in different groups

Lord et al, 1993; Forster & Young, 1995; Hill, 1998; Hill & Stinson, 2004
What works in falls and fall injury prevention?

- Multifactorial interventions
- Home safety assessment/ modification
- Psychotropic medication withdrawal
- Comprehensive medication review
- Cataract extraction
- Single vision lenses
- Vitamin D?
- EXERCISE

Cochrane review: Gillespie et al, 2012
Exercise

• 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
Exercise to reduce falls risk: effective interventions include

- Multi-component (balance and functional strength training) group exercise
- Multi-component home exercise (individually prescribed)
- Tai Chi reduces risk of falling

Gillespie et al, Cochrane Review 2012
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)
What type of exercise? The evidence.....

• 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)
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
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

Wyerdesteyn et al. Gerontology 2006
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
A novel 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
- 54% reduction in falls

Emile Jacques-Lacroze

Trombetti et al 2011
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

Effects of a Multifactorial Falls Prevention Program for People With Stroke Returning Home After Rehabilitation: A Randomized Controlled Trial

Frances A. Batchelor, PhD, Keith D. Hill, PhD, Shylie F. Mackintosh, PhD, Catherine M. Said, PhD, Craig H. Whitehead, MD

ABSTRACT

Objective: To determine whether a multifactorial falls prevention program reduces falls in people with stroke at risk of recurrent falls and whether this program leads to improvements in gait, balance, strength, and fall-related efficacy.

Design: A single blinded, multicenter, randomized controlled trial with 12-month follow-up.

Setting: Participants were recruited after discharge from rehabilitation and followed up in the community.

Participants: Participants (N=156) were people with stroke at risk of recurrent falls being discharged home from rehabilitation.

Interventions: Tailored multifactorial falls prevention program and usual care (n=74) or control (usual care, n=85).

Main Outcome Measures: Primary outcomes were rate of falls and proportion of fallers. Secondary outcomes included injuries from falls, falls risk, participation, activity, leg strength, gait, balance, and falls efficacy.

Results: There was no significant difference in fall rate (intervention: 1.89 falls/person-year, control: 1.76 falls/person-year, incidence rate ratio: 1.10, P=0.74) or the proportion of fallers between the groups (risk ratio: 0.83, 95% confidence interval: 0.56-1.21). There was no significant difference in injuries from fall rate (intervention: 34 injuries falls/person-year, control: 49 injuries falls/person-year, incidence rate ratio: 1.57, P=0.25), and there were no significant differences between groups on any other secondary outcomes.

Conclusions: This multifactorial falls prevention program was not effective in reducing falls in people with stroke who are at risk of falls for many other reasons than usual care in improving gait, balance, and falls efficacy. Further research is required to identify effective interventions for stroke survivors with falls.

Key Words: Falls; Exercise; Randomized controlled trial; Rehabilitation; Stroke

FALLS ARE COMMON after stroke, with fall rates in people with stroke higher than in other older populations. Studies have reported that between 46% and 75% of people with stroke fall during the first 6 months after discharge from hospital, compared with the 30% of community-dwelling older people who fall in a 1-year period. In particular, people with stroke who have impaired balance or have fallen in hospital are at risk of recurrent falls when they return home. In community-dwelling people with stroke, the causes of falls are multifactorial. However, the literature on the association between risk factors and falls and the predictors of falls is somewhat inconsistent. Falls risk factors identified in some studies include: balance problems, motor and sensory impairment, and fear of falling. However, other studies have found no difference between fallers and nonfallers on measures of gait and balance.

Despite the high rate of falls in people with stroke, there are few published studies in community-dwelling people with stroke evaluating interventions where falls are the primary outcome. Of the published studies, few have identified effective interventions. A systematic review investigating the effectiveness of falls prevention strategies after stroke in any setting identified only one effective falls prevention intervention (vitamin D supplementation for older women with chronic stroke residing in an institutional setting). The review highlighted the lack of evidence for any single or multifactorial approaches being effective in reducing falls in the high fall risk group of people with stroke. This is in contrast to the strong evidence that a range of simple and multifactorial interventions are effective in preventing falls in community-dwelling older people. Hence, there is a need for randomized controlled trials evaluating the impact of interventions on falls as a primary outcome in community-dwelling people with stroke. In particular, the evaluation of interventions incorporating strength and balance training as well as components that address general and stroke-specific risk factors is warranted, because people...
The challenge

• Fall rates have not changed substantially over the last decades.......  

• Perhaps a different approach is needed
Lifespan approach

Granacher et al 2011
The role of balance in falls
Lifespan approach

Granacher et al 2011
Age-related changes in balance

Antero-posterior sway, by age group and gender

Era et al 2006
Continuum of balance performance

Ideal range for early risk assessment

Range commonly seeking health professional assistance

Active older people
Balance concerns
Near miss
Single fall
Recurrent falls
Very frail/High falls risk

NARI National Ageing Research Institute Ltd
Bringing research to life
Balance screening and exercise

- NARI research focusing on identification and treatment of mild balance dysfunction
- Screening: those with concerns do have problems
- RCT: exercise program improves balance
- Translational study: similar results
Continuum of balance performance

Falls prevention should start here……

Ideal range for early risk assessment

Very frail/High falls risk

Active older people
Balance concerns
Near miss
Single fall
Recurrent falls

Range commonly seeking health professional assistance

NARI
National Ageing Research Institute Ltd
Bringing research to life
The future:

- Lifespan approach
- Prevention, broad reach
- Very early identification of balance problems
- Very early intervention
- Balance training should begin at an early age….
In conclusion....