Update on Falls Prevention Research

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Acknowledgements: Prof Stephen Lord, Dr Daina Sturnieks

www.NeuRA.edu.au
Recent falls risk factor studies
**Research**

Risk factors for falls among older Aboriginal and Torres Strait Islander people in urban and regional communities

Lubaszy K, Radford, Delbaere et al; 2017

- Aboriginal & Torres Strait Islanders: “premature ageing” from 50 years on.
- Interviews with 336 aboriginal people aged 60+ years in 5 communities - Koori Growing Old Well Study
- 80 fallers (23%) (past year recall) including 34 multiple fallers
- Fall risk factors among 22 predictors examined:
  - Univariate analyses: female; used 3+ medications; had macular degeneration, depression, history of stroke;
  - Unable to do their own housework (relative risk: 1.9 (95%CI: 1.2 to 3.0))
  - Osteoarthritis / inflammatory arthritis (RR: 1.8 (95% CI: 1.0 – 3.2))

- Limitations: 1-year recall bias; cognitive screening not sensitive in this population;
- **Fall risk factors identified for older Aboriginal people appear to be similar to those identified in the general population**

→ current: Ironbark Project, falls prevention in older aboriginal people in NSW
Cardiovascular medications & falls

Fall-Risk-Increasing Drugs: A Systematic Review and Meta-Analysis: I. Cardiovascular Drugs

Max de Vries MB\textsuperscript{a,b}, Lotta J. Seppala MSc\textsuperscript{a,b}, Joost G. Daams MA, MD, PhD\textsuperscript{c}, Esther M.M. van de Glind MD, PhD\textsuperscript{a,b}, Tahir Masud MD, PhD\textsuperscript{d}, Nathalie van der Velde MD, PhD\textsuperscript{a,b,*}, on behalf of the EUGMS Task and Finish Group on Fall-Risk-Increasing Drugs

- CV medications commonly prescribed in ageing – which to review?
- Participants: 60+ years or mean age of 70+; all residential settings; mix of prospective and retrospective studies.
- Anatomical Therapeutic Classification (WHO) – 45 classes / drugs
- 131 studies – pooled Odds Ratios (95% Confidence Intervals) (adjusted to confounders)

<table>
<thead>
<tr>
<th>Medication Classes</th>
<th>No. of Articles</th>
<th>No. of Subjects Included</th>
<th>Pooled OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vasodilator</td>
<td>4</td>
<td>4750</td>
<td>1.14 (0.81, 1.63)</td>
</tr>
<tr>
<td>Antihypertensive</td>
<td>8</td>
<td>24,027</td>
<td>0.90 (0.72, 1.12)</td>
</tr>
<tr>
<td>Diuretics</td>
<td>11</td>
<td>10,496</td>
<td>1.00 (0.86, 1.16)</td>
</tr>
<tr>
<td>Loop diuretics</td>
<td>3</td>
<td>331,424</td>
<td>1.36 (1.17, 1.57)</td>
</tr>
<tr>
<td>Beta-blocking agents</td>
<td>8</td>
<td>391,947</td>
<td>0.88 (0.80, 0.97)</td>
</tr>
<tr>
<td>Calcium channel blocker</td>
<td>5</td>
<td>68,560</td>
<td>1.00 (0.80, 1.24)</td>
</tr>
<tr>
<td>ACE inhibitor</td>
<td>4</td>
<td>387,323</td>
<td>0.91 (0.78, 1.08)</td>
</tr>
<tr>
<td>Angiotensin II antagonist</td>
<td>4</td>
<td>387,323</td>
<td>0.87 (0.72, 1.06)</td>
</tr>
<tr>
<td>Alpha-adrenoceptor antagonist</td>
<td>3</td>
<td>4068</td>
<td>1.62 (0.76, 3.45)</td>
</tr>
</tbody>
</table>

- Loop diuretics significantly increase fall risk (n>330,000)
- Beta-blocking agents protective for fall risk (n>430,000)
- Unadjusted analyses: Antihypertensives increased fall risk, statins reduced risk
248 studies – pooled Odds ratios (95% CIs) (adjusted to confounders)

- Antipsychotics 1.54 (1.28 to 1.85)
- Antidepressants 1.57 (1.43 to 1.74)
- Tricyclic antidepressants 1.41 (1.07 to 1.86)
- Selective serotonin reuptake inhibitors 2.02 (1.85 to 2.20)
- Benzodiazepines 1.42 (1.22 to 1.65)
- Long-acting benzodiazepines 1.81 (1.05 to 3.16)
- Short-acting benzodiazepines 1.27 (1.04 to 1.56)
Psychoactive medications - mechanisms

Lord SR et al, Br J Pharmacol, 1995

- 414 women community-dwelling; 65-99 years

- 76 participants taking psychoactive medications (hypnosedatives; antidepressants; and/or antipsychotics)
  - 35.4% of them suffered multiple falls (vs 17.4% of those not on psychoactive medications)
  - Poorer sensorimotor & balance function than controls
Other medications & falls

Fall-Risk-Increasing Drugs: A Systematic Review and Meta-analysis: III. Others

Lotta J. Seppala MSc a,b, Esther M.M. van de Glind MD, PhD a,b, Joost G. Daams MA c, Kimberley J. Ploegmakers MD a,b, Max de Vries BM a,b, Anne M.A.T. Wermelink BM a,b, Nathalie van der Velde MD, PhD a,b,c, on behalf of the EUGMS Task and Finish Group on Fall-Risk-Increasing Drugs

- 281 studies – pooled Odds Ratios (adjusted)
  - **Opioids**, 1.60 (1.35 to 1.91)
  - **Anti-epileptics**, 1.55 (1.25 to 1.92)
  - **Polypharmacy (4+ meds most common definition)**, 1.75 (1.27 to 2.41)
  - Anti-Parkinson drugs, 1.54 (0.99 to 2.39)
  - NSAID, 1.09 (0.96 to 1.23)

- **Potential limitations of the 3 systematic reviews**
  - Confounding by medication: depression vs. antidepressants; antipsychotics vs. dementia
  - Medication collected at baseline only in most studies
  - Validity of fall ascertainment
Recent interventions
62 trials – 19,935 participants
44 trials with multifactorial interventions (tailored)
18 trials multiple components interventions

- Most trials at unclear or high risk of bias in 1+ domains

- Multifactorial interventions vs. control: reduced rate of falls compared with control: rate ratio (RaR) 0.77, 95%CI 0.67 to 0.87; 19 trials; 5853 participants; low-quality evidence.

- little or no effect on other fall-related outcomes

- Multiple interventions probably reduce the rate of falls (RaR 0.74, 95% CI 0.60 to 0.91; 6 trials; 1085 participants; I² = 45%) and risk of falls (RR 0.82, 95% CI 0.74 to 0.90; 11 trials; 1980 participants); moderate-quality evidence.
Does providing physical therapy (PT) services in the emergency department (ED) improve outcomes for older adults who fall?

Medicare claims data used to identify outpatients who had suffered ground level falls and were aged 65+ years: n= 560, 277
- Received PT services in the ED: information,, diagnosis, referral for FU PT after discharge; n=17, 975
- Control; n = 542, 302

Proportion of 30-day and 60-day fall-related ED revisits (accounting for survival to end of FU)

Receiving PT services in the ED during ground-level fall related visit was associated with significantly lower odds of a fall-related revisit at:
- **30 days** - Odds Ratio =0.655, p<0.001
- **60 days** - Odds Ratio = 0.684, p<0.001

Regression model controlled for age, sex, Medicaid eligibility (proxy for economic status), acute injury, some chronic comorbidities
Can peer education improve beliefs, knowledge, motivation and intention to engage in falls prevention amongst community-dwelling older adults?  

Linda A. M. Khong1 · Richard G. Berlach2 · Keith D. Hill3 · Anne-Marie Hill3

- 2 groups pre-test post-test study design
- Community-dwellers attending a peer-led presentation to raise awareness about falls prevention
  - Control (n=99)- 1-h presentation on falls (risk factors and strategies) by trained peer educators
  - Intervention (n=133): 1-h new falls prevention package presentation by educators trained in behaviour change and learning principles.
- 3 time-points: pre-presentation, post- and 1month-post.
- Peer educators: 65- 85 years, retired; various professional backgrounds
- Intervention presentation:
  - self-belief that falls prevention strategies are useful;
  - knowledge about falls;
  - motivation and intention to engage in falls prevention strategies.
1. For me, taking measures to reduce my risk of falling would be useful
2. Most people whose opinion I value approve of me taking measures to reduce my risk of falling
3. I am aware of the measures needed to reduce my risk of falling
4. I feel positive about reducing my overall risk of falling
5. I am confident that if I wanted to, I could reduce my risk of falling
6. In the next month, I intend to take measures to reduce falls or my risk of falling
7. I have a clear plan of how I will take measures to reduce falls or my risk of falling

Qu. 8. “List up to 3 ways (measures) that you could take in the next month, which will help you avoid falling or the risk of falling“
Peer education (Khong et al) – results

- **Both groups**: increased levels of beliefs and knowledge about falls prevention, and intention to engage in falls prevention strategies over time compared to baseline.

- **Intervention group**: more likely to report a clear action plan to which they intended to implement to reduce their risk of falling compared to control group. (OR= 1.69 , 95%CI: 1.03 to 2.78)

- Gender bias: women – stronger beliefs, increased knowledge & intention

- People who previously discussed fall prevention with doctor

- **Limitations**
  - Motivated individuals (eg. need access to transport to attend meeting)
  - Recruitment, training and retention of new peer educators

- **Peer-led falls prevention education is an effective approach for raising older adults' beliefs, knowledge and intention to engage in falls prevention strategies.**
A multidisciplinary intervention to prevent subsequent falls and health service use following fall-related paramedic care: a randomised controlled trial

A. Stefanie Mikolajak¹, Stephen R. Lord¹, Anne Tiedemann², Paul Simpson³, Gideon A. Caplan⁴, Jason Bendall⁵, Kirsten Howard⁶, Lyndell Webster¹, Narelle Payne¹, Sarah Hamilton¹, Joanne Lo¹, Elisabeth Ramsay², Sandra O’Rourke¹, Linda Roylance¹, J. C. Close⁷,⁸

- **RCT of** 221 non-transported older fallers (mean age: 83 ± 7 y, 65% women)
  - Intervention: based on identified risk factors and used existing services to implement PT, OT, geriatric assessment, optometry and medication management
  - Control: individualized written fall prevention advice
- **No difference between groups in subsequent falls (12 months FU), injurious falls and health service use.**
- intervention participants who adhered to the recommended interventions had significantly lower rates of falls compared to non-adherers (IRR: 0.53 (95% CI: 0.32-0.87)).
- **A multidisciplinary intervention did not prevent falls in older people who received paramedic care but were not transported to ED. However the intervention was effective in those who adhered to the recommendations.**
16 studies in community-dwelling older adults discharged from hospital - total N = 3,290

Range of interventions (home hazards modification, home exercise programme, Vitamin D therapy, falls risk minimisation strategies, various exercise interventions, education...) delivered in a limited number of small studies → high risk of bias

- **Home hazard modification interventions** in those with a previous falls history (1 study) → effective in reducing the number of falls (RR 0.63, 95%CI 0.43, 0.93).
- **Home exercise interventions** (3 studies):
  - significantly increased the proportion of fallers (OR 1.74, 95%CI 1.17, 2.60)
  - did not significantly reduce falls rate or falls injury rate.
- **Nutritional supplementation for malnourished older adults** (1 study) significantly reduced the proportion of fallers (HR 0.41, 95% CI 0.19, 0.86).

Falls prevention interventions effective in the general older population not always readily transferrable to older post-hospital discharge patients.

Recommendations for falls prevention for older adults recently discharged from hospital:
- to provide home hazard minimisation particularly if they have a recent previous falls history
- consider nutritional supplementation if they are malnourished
Pragmatic cohort RCT specifically targeting foot and footwear risk factors

1010 community-dwelling people who had attended podiatry services in past 6 months & were at high risk of falls

Multifaceted intervention (n=493) vs. usual care (routine podiatry + falls prevention leaflet) (n=517) - with 12 month falls follow-up

- Footwear
- Orthoses
- foot/ankle exercises (home-based, 30mins, 3/wk for 6 months)
- Falls prevention leaflet
- routine podiatry

12% fewer falls in the 12 months follow-up in intervention group
Fewer fallers and multiple fallers among intervention group
Cognitive-motor training – current work

Sturnieks et al., NeuRA, 2015-2019

Multidisciplinary assessment to uncover mechanisms of action
- Sensorimotor & balance function
- Executive function
- Brain structure (MRIs, n=105)
The slip and trip walkway

Yoshiro Okubo, Daina Sturnieks, Matthew Brodie, Jasmine Menant, Paulo Pelicioni, Stephen Lord - NeuRA

- To train reactive step training
  - Ageing
  - Clinical groups: Multiple Sclerosis, Parkinson’s disease...
- To assess effects of stepping interventions on laboratory falls and behavioural outcomes
Summary
Gold bar evidence scale

- One good quality RCT
- At least two good quality RCTs – little inconsistency
- Multiple RCTs and/or systematic reviews – little inconsistency
Falls prevention – what works - community

- High level balance exercise in group or home settings (functional balance exercises, Otago, Tai Chi)
- Occupational therapy interventions (home safety modifications in association with transfer training and education) in high risk populations
- Expedited first eye cataract surgery
- Restriction of multifocal glasses use in older people who take part in regular outdoor activity
- Pharmacist-led education and GP medication review
- Podiatry intervention in people with disabling foot pain
Falls prevention – what works - community

- Withdrawal of psychoactive medications
- Intensive multidisciplinary assessment of high risk populations
Falls prevention – what works - hospital

- Intensive interventions in hospitals
- OT home visit after ED
- Physio exercise after ED
Falls prevention – what works – residential care

- Comprehensive geriatric assessment in residential aged care
- Vitamin D supplementation in residential aged care
- Medication review in residential aged care
- Physio exercise in residential aged care
Thank you!

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