



Update on Falls Prevention Research

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NSW Falls Prevention Network Rural Forum
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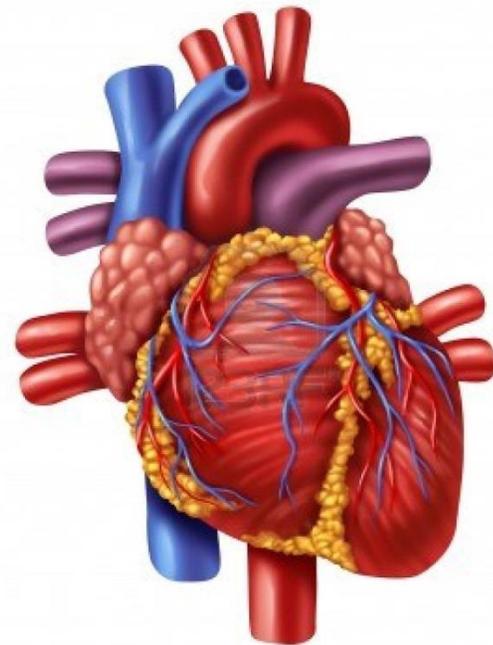
Acknowledgement: Prof Stephen Lord

www.NeuRA.edu.au

Recent falls risk factor studies

Vascular disease

- 38.6% of all deaths in 2000 (Australian Institute of Health and Welfare; 2005)
- Leading cause of morbidity (stroke, heart attack, heart failure...)
- Many fall risk factors: manifestation of systemic vascular disease or result of pharmacological interventions



Vascular disease: Arterial stiffness

Wong et al., JAGS, 2014

- 481 community-dwellers aged 70+
 - Carotid-femoral pulse wave velocity
 - 44.8% fallers - monthly calendars for 12 months

 - Increased arterial stiffness associated with
 - high systolic BP and HR, diabetes, low physical activity ($p < 0.05$)
 - 37% increased risk of falls (RR: 1.37, 95%CI: 1.06-1.78) (after adjusting for psychotropic & CV meds, age, sex, BMI, seated SBP, HR and diabetes)

 - Possible mediating factors: structural brain changes (through white matter lesions) and at the peripheral level (peripheral vascular disease).
 - **Vascular risk reduction to prevent falls: pharmacotherapy and exercise.**
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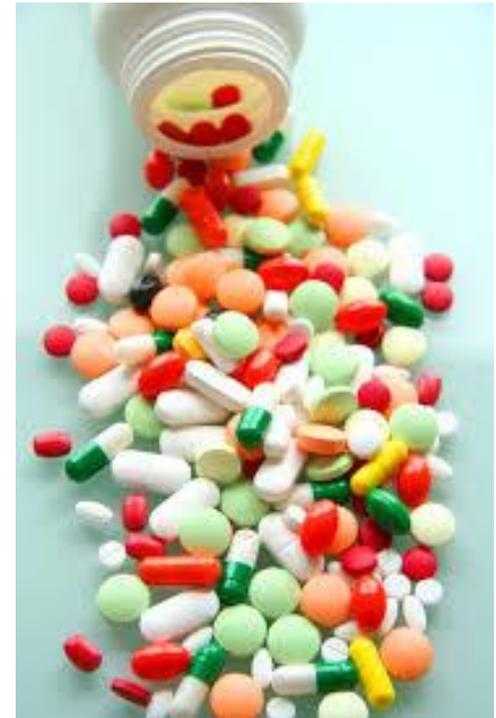
Medications

Milos et al., BMC Geriatr, 2014

- N= 369 from community and nursing home (87.4 (5.7) y)
 - Retrospective falls:
 - 29% (n=275) any falls (past 3 months)
 - 17% (n=369) severe falls (past 12 months)
 - **Fall risk increasing drugs:** antidepressants (29%), anxiolytics (24%), hypnotics and sedatives (23%)
 - 2.7 (0.7) severe falls vs. 2.0 (0.6) no severe falls; p<0.01
 - Orthostatic hypotension inducing drugs : not associated with falls
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Medications

- Mechanisms: impairing important sensori-motor systems that contribute to postural stability (Lord et al., 1995)
- Cognitive impairment, comorbidity and functional disability (27% chair bound) not accounted for
- Dosage of drug not examined
- **Focus on reducing the total number of drugs and withdrawing psychotropic medications**



Milos et al., 2014

Vitamin D

Hirani et al., J Am Geriatr Soc, 2014 – CHAMP study

- 1659 independent living older men aged 70-97 years
 - Low serum VitD (<50nmol/L) associated with (after adjustment)
 - 4+ diagnosed med cond; depression; diabetes ; poor self-rated health
 - Low grip strength; poor dynamic balance
 - All cause mortality – hazard ratio: 1.40 (95% CI: 1.04-1.89)
 - Serum VitD 50-75nmol/L: lowest physical disability, lowest incidence of falls
 - Serum VitD >75nmol/L: no further health-related benefits
 - Same serum VitD levels between those taking Vit D supplements or not
 - **Target range of serum VitD 50-75nmol/L for optimal health benefits**
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Recent interventions

Consensus statement on Vitamin D

American Geriatrics Society Workgroup on Vitamin D
Supplementation for Older Adults; J Am Geriatr Soc, 2014

- To reduce falls and fall-related injuries in older people:
 - Serum VitD concentration of **75 nmol/L** (30 ng/mL)
 - Vitamin D supplementation of at least 1,000 IU/d with calcium to community and institutions -dwellers
 - Total average input of 4,000 IU/d from all sources: diet, supplements, sun – adjust relative to sun exposure, skin pigmentation and body composition
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Consensus statement on Vitamin D

- To reduce falls and fall-related injuries in older people:
 - Routine laboratory testing for serum Vit D before supplementation begins is not necessary unless underlying conditions that increase the risk of hypercalcemia
 - Sun exposure: bathing suit or shorts and short sleeved shirt for 15 minutes in sun several days per week.
 - Specificity of vitD2 and vitD3 prescriptions
 - Full length doc: www.geriatricscareonline.org.

Perturbation training

- Trips and slips: primary causes of falls in older community-dwelling people - 60% of outdoor falls (Luukinen et al., 2000)
 - Current evidence for falls prevention: exercise that challenges balance – 2hrs /week and for at least 6 months (Sherrington et al., 2008)
 - Recent work on effect of low-dose perturbation training
 - Specificity of training allows recalibration of internal representation of the environment ; different from self-initiated, voluntary movements
 - Lacking in common interventions such as strength & balance programs
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Perturbation training: trips

Rosenblatt et al., JAGS, 2013

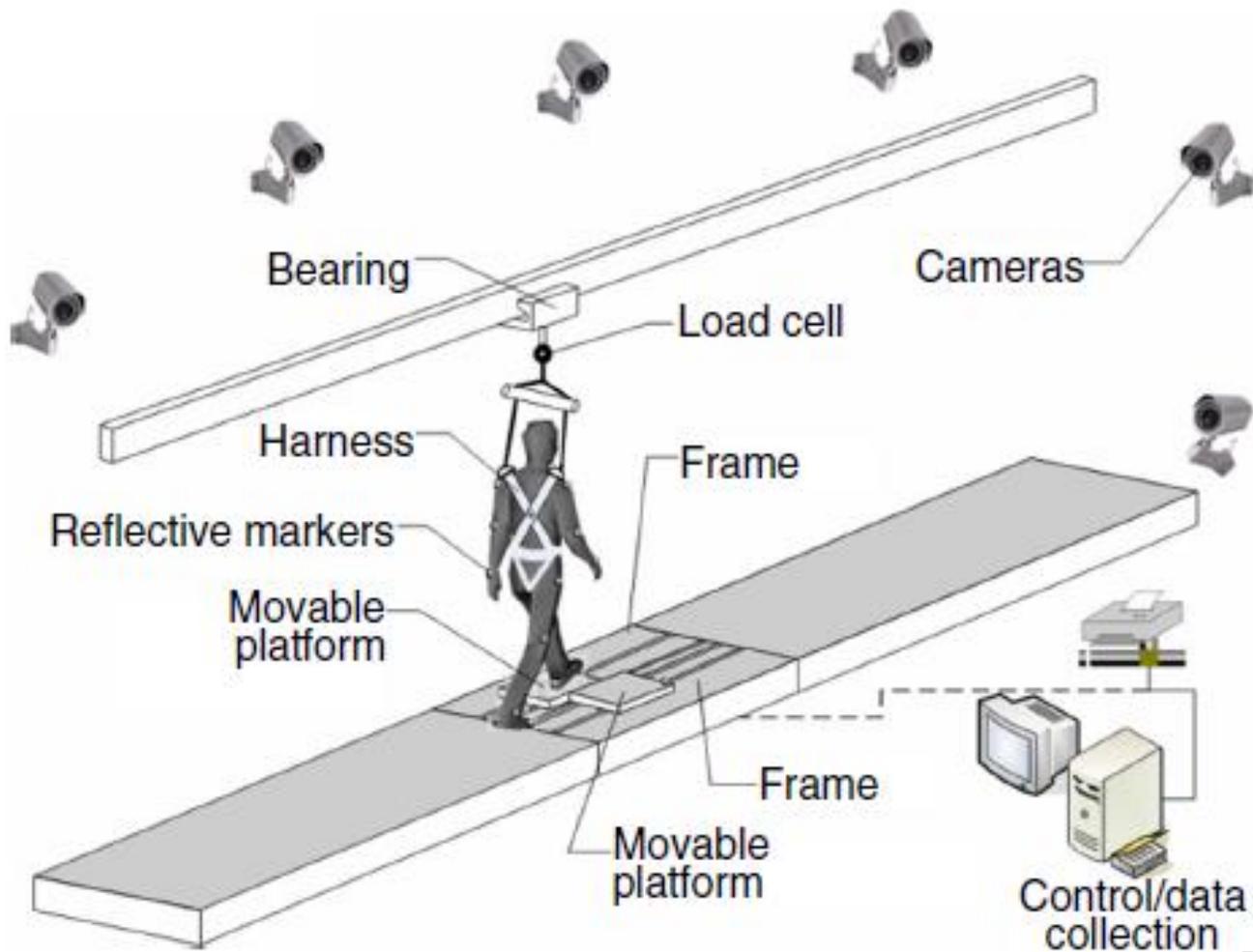
- 162 women community-dwellers aged >55 years split:
 - Control (n=80)
 - Intervention: 4 x 1hr trip training on treadmill (n=82)
- 1-year prospective falls follow-up with fortnightly contact

Reduction in trip-related falls rate:

- Intervention: 0.21 pp/year vs. Controls: 0.39 pp/year (IRR=0.54, 95%CI=0.30-0.97, p=0.04)
- But no significant difference in trip-related stumbles or non-trip-related avoidable falls
- Motor skill of trip-related falls avoidance improved with specific short-term training
- **Potential of such low dose intervention to be as effective as multifactorial long-term interventions.**

Perturbation training: slips

- Repeated slip exposure in lab (moveable platform)



Perturbation training: slips

Repeated slip exposure in lab (moveable platform) (Pai et al., 2009-14)

- Transfers to real-life: vinyl floor
- Improves reactive control of stability when exposed to trips
- Long-term motor retention (up to 12 months) in older people
- Can improvement of the protective stepping be generalized to untrained activities?

Perturbation training: slips

Pai et al., J Gerontol A Biol Sci Med Sci, 2014

- 212 community-dwellers aged 65 +
 - Control (n=103): 10 walking trials + 1 slip
 - Training (n=109): 10 walking trials + 24 repeated slips in 3 blocks
- 12 months prospective falls follow-up with contact every 6 weeks
- Less fallers in intervention vs. control (15% vs. 32%, $p=0.0173$; and for intention-to-treat: 13% vs. 25%, $p=0.0193$)
- Sign reduction in falls from retrospective to prospective for intervention
- Training more effective in those with falls history (frailer)

Perturbation training: slips

- Largest number of falls in the control group was from unknown causes
- 70 participants lost to follow-up (intervention: n=42)
- Final intervention group: more men, younger, better mobility compared with control group
- Learning and generalization of repeated slip exposure
- Fear-conditioning
- Dose-response : how many slips needed for optimum protection?
- What about in frailer groups ? Affects perturbation-related falls?
- **Potential efficacy & cost-effectiveness of slip-training to prevent falls**

Post-hospital home exercise program

Sherrington et al., PLOS One, 2014

- 340 people dwellers aged 60 + years recruited as inpatients
 - Control (n=169): falls prevention education booklet
 - Training (n=171): tailored home exercise program prescribed by physio (10 visits- 5 phone calls)- 15-20min 3-6/week ; booklet
- Intervention group:
 - Improved performance-based mobility
 - Increased falls (177 vs. 123 falls in controls, IRR=1.43, 95%CI= 1.07-1.93, p=0.017)
- Increase in falls in those who walked faster at baseline

Post-hospital home exercise program

- Hypotheses re increase in falls
 - Sub-optimal adherence (29% of interventions not exercising anymore at 12 months)
 - Harmful effect of exercise
 - Increased exposure / confidence
 - Different time course of improvement in mobility vs falls (more in first 6 months)
- **Single home exercise training not appropriate to prevent falls in frail population**
- **Multifactorial approaches incl. safety modifications and supervised exercise training might be more effective in preventing falls in high-risk frail populations**

Falls prevention . what works

- Highest level of evidence given by meta-analyses of RCTs
 - Gillespie LD et al. Interventions for preventing falls in older people living in **the community**. Cochrane Database Syst Rev. 2012 Sep 12;9
 - Cameron ID et al. Interventions for preventing falls in older people in **care facilities and hospitals**. Cochrane Database Syst Rev. 2012 Dec 12;12:
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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

- 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

- Withdrawal of psychoactive medications
- Intensive multidisciplinary assessment of high risk populations
- Intensive interventions in hospitals
- Comprehensive geriatric assessment in residential aged care
- Vitamin D supplementation in residential aged care
- Medication review in residential aged care



Any questions?