Update on Falls Prevention Research

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NSW Falls Prevention Network Rural Forum
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Acknowledgments: 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 ≥70 years
- 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.
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
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
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
- Routine laboratory testing for serum VitD before supplementation begins is not necessary unless underlying conditions that increase the risk of hypercalcemia
- Sun exposure: 15 minutes in sun several days per week.
- Full length doc: www.geriatriescareonline.org.
Perturbation training- an adjunct intervention?

- 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) but :
  - Moderate overall effect (averaging 15% -Cochrane review)
  - Poor uptake and adherence

- Alternative is low-dose perturbation training
  - simulates “real-world” balance challenges such as slips and trips
  - Practice of the motor skills required to avoid a fall after a loss of balance
  - Specificity of training allows recalibration of internal representation of the environment ; different from self-initiated, voluntary movements
Perturbation training: trips

Rosenblatt et al., JAGS, 2013

- 162 women community-dwellers >55 years - 12-months falls follow-up
  - Control (n=80)
  - Intervention (n=82): 4 x 1hr trip training on treadmill

- **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)

- No 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) (2009-14)
  - Transfers to real-life: vinyl floor
  - Transfers to other types of perturbations (trips)
  - Long-term motor retention (up to 12 months) in older people

Pai et al., 2014
Perturbation training: slips


- 212 community-dwellers ≥ 65 years - 12-months falls follow-up
  - Control (n=103): 10 walking trials + 1 slip
  - Intervention (n=109): 10 walking trials + 24 repeated slips in 3 blocks

Reduction in fall risk: Intervention: 13% fallers vs. control: 25% fallers (p=0.0193)

Limitations
- 70 participants lost to follow-up (intervention: n=42)
- Final intervention group: more men, younger, better mobility vs. control group

Mechanisms
- Practice reactive skills, which are independent of self-motivation
- Fear-conditionning
- Dose-response? 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 community-dwellers ≥ 60 + years recruited as inpatients – 12 months falls follow-up
  - Control (n=169): falls prevention education booklet
  - Intervention (n=171): tailored home exercise program prescribed by physio (10 visits- 5 phone calls)- 15-20min 3-6/week ; booklet

- Improved performance-based mobility in intervention group
- Increased falls in intervention (n=177) vs. control (n=123) (p=0.017)
- Increased 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

Sherrington et al., 2014
Cognitive-motor training – pilot RCT

Schoene et al., Plos One, 2013

- 37 community-dwellers ≥70 years – cognitively intact
- 8 weeks of home-based step training – 15/20min x3/wk
- Adding a cognitive load to step test improves the discriminative ability (fallers/non-fallers)
- Intervention group:
  - Faster choice-stepping reaction time
  - Reduced falls risk score
  - Improved dual-task ability
- RCT in 90 people ≥70 years: 16 weeks of cognitive-motor training: significant improvements in processing speed and visuo-spatial abilities (Schoene et al., submitted)
- Cognitive-step training with low-cost computer: safe home-based training to improve physical and cognitive fall risk factors
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:
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
Thank you!