



**UNSW**  
THE UNIVERSITY OF NEW SOUTH WALES



**Neuroscience  
Research Australia**  
*Discover. Conquer. Cure.*

# Research Update: Vitamin D and falls in older people Fall prevention in hospitals

Stephen Lord

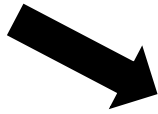
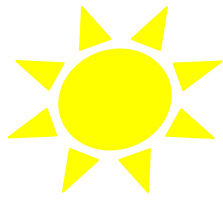
[www.NeuRA.edu.au](http://www.NeuRA.edu.au)

# Vitamin D insufficiency, physiological and cognitive functioning and falls in older people

Jasmine Menant, Jacqueline Close, Kim Delbaere,  
Daina Sturnieks and Stephen Lord

Osteoporosis International DOI 10.1007/s00198-011-  
1590-5.

[www.NeuRA.edu.au](http://www.NeuRA.edu.au)



Skin

**Vitamin D3 (cholecalciferol)**



Liver

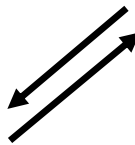


**25-hydroxy vitamin D<sub>3</sub> (calcidiol or serum 25OHD)**



Kidney

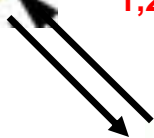
Parathyroid  
Glands



**1,25-dihydroxy vitamin D<sub>3</sub> (calcitriol)**



Bone



# Vitamin D insufficiency

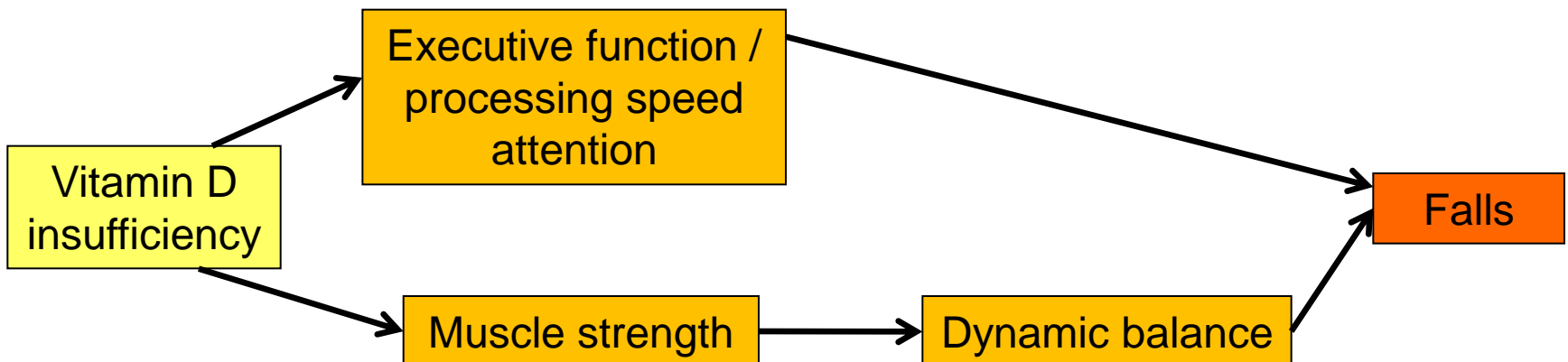
---

- Common in older people
- Associated with fall risk factors
  - muscle weakness, poor balance and physical function  
*(Houston et al., 2007, J Gerontol; Gerdhem et al., 2005, Osteoporos Int)*
  - Impaired executive function & slow processing speed  
*(Buell et al., 2009, J Gerontol; Lee et al., J neurol Neurosur Psychiatry, 2009)*
- Increased risk of falls and fractures *(Flicker et al., 2003, JAGS; Cauley et al., 2008, Ann Intern Med)*

# Research aims

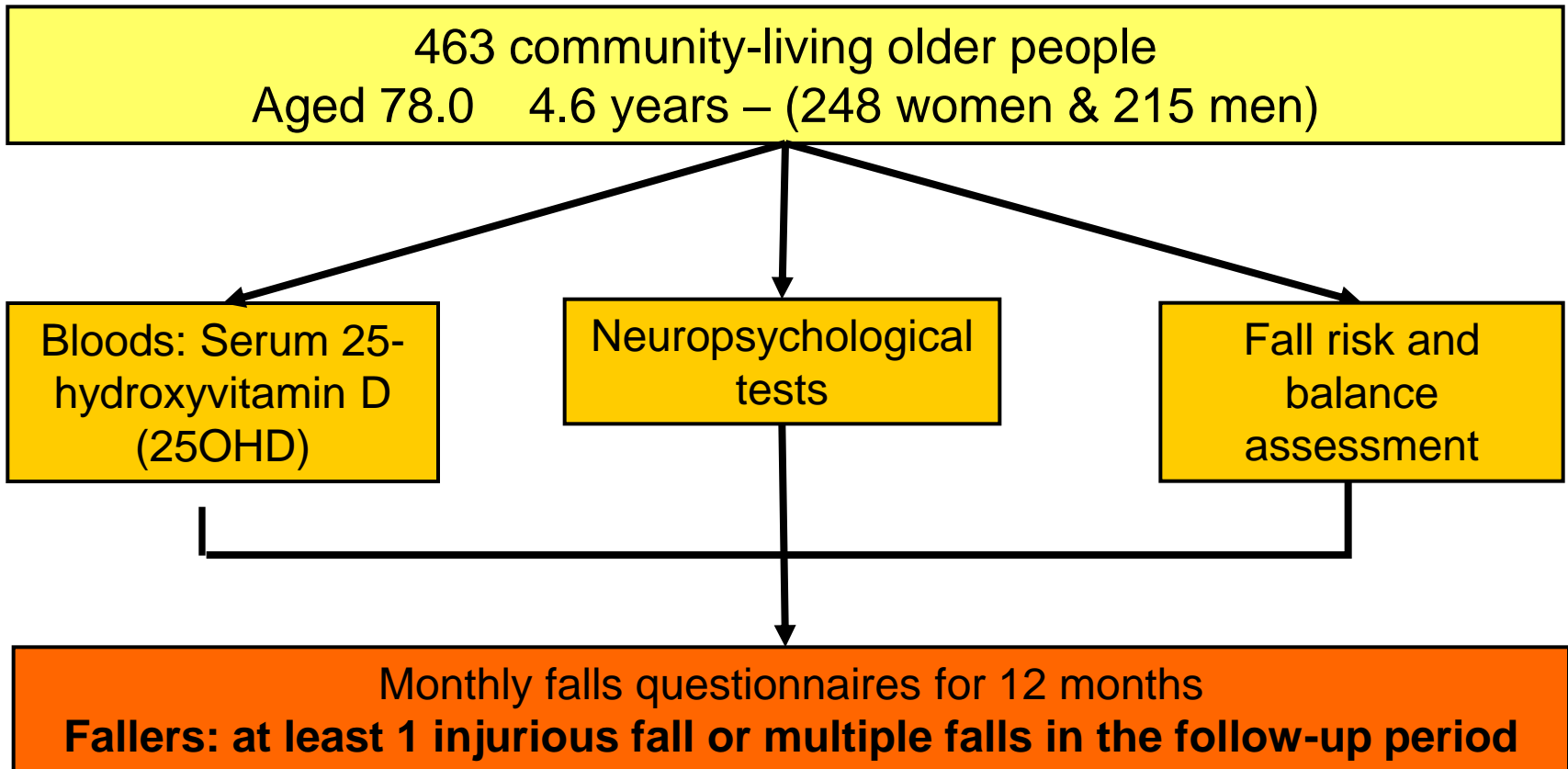
---

- Relationship between serum Vit D and:
  - Neuropsychological and neuromuscular function, balance and stepping performance in older people
  - Prospective falls



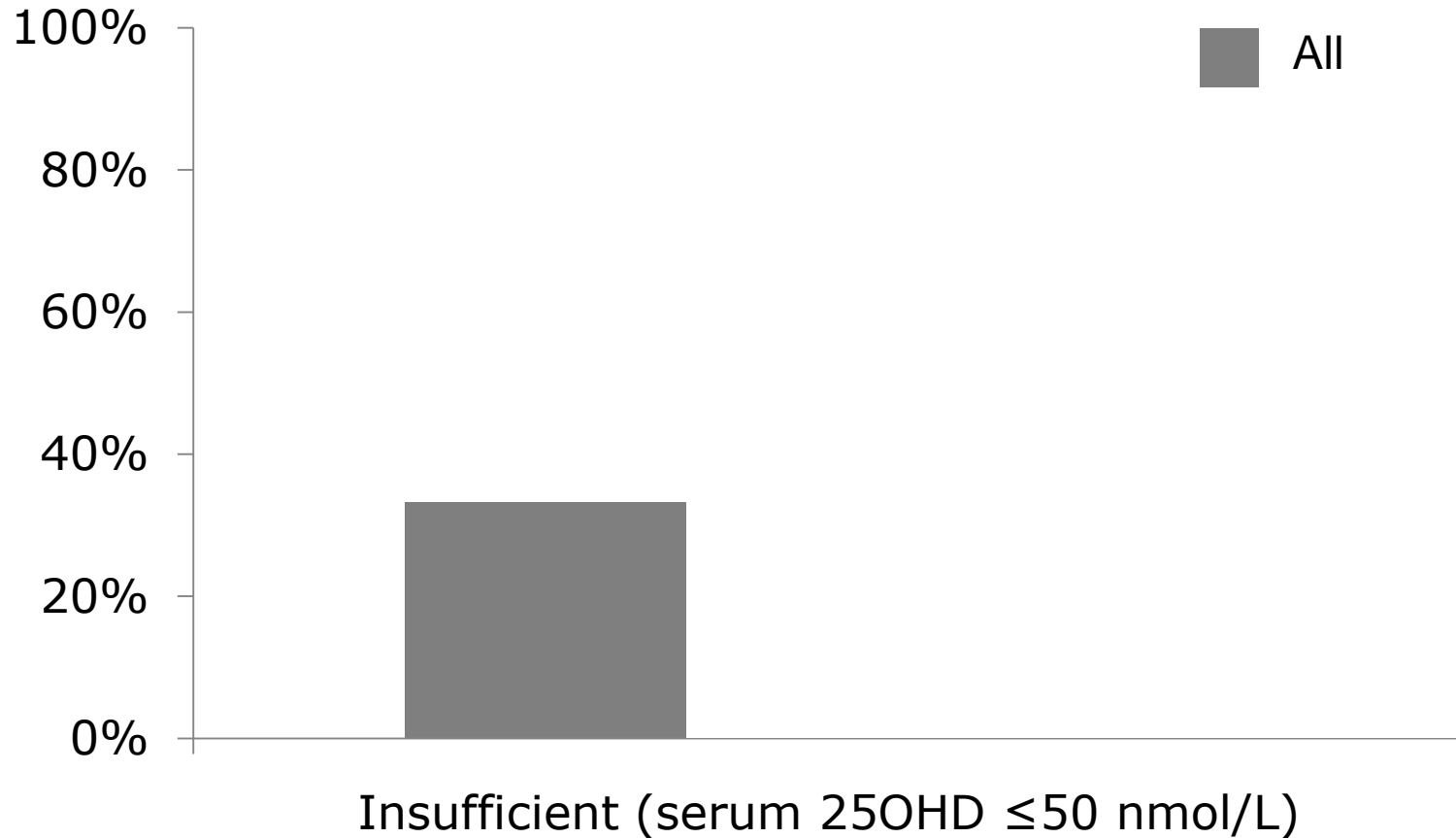
# Protocol

---



# Prevalence of Vit D insufficiency

---



Gender effect :  $p < 0.001$

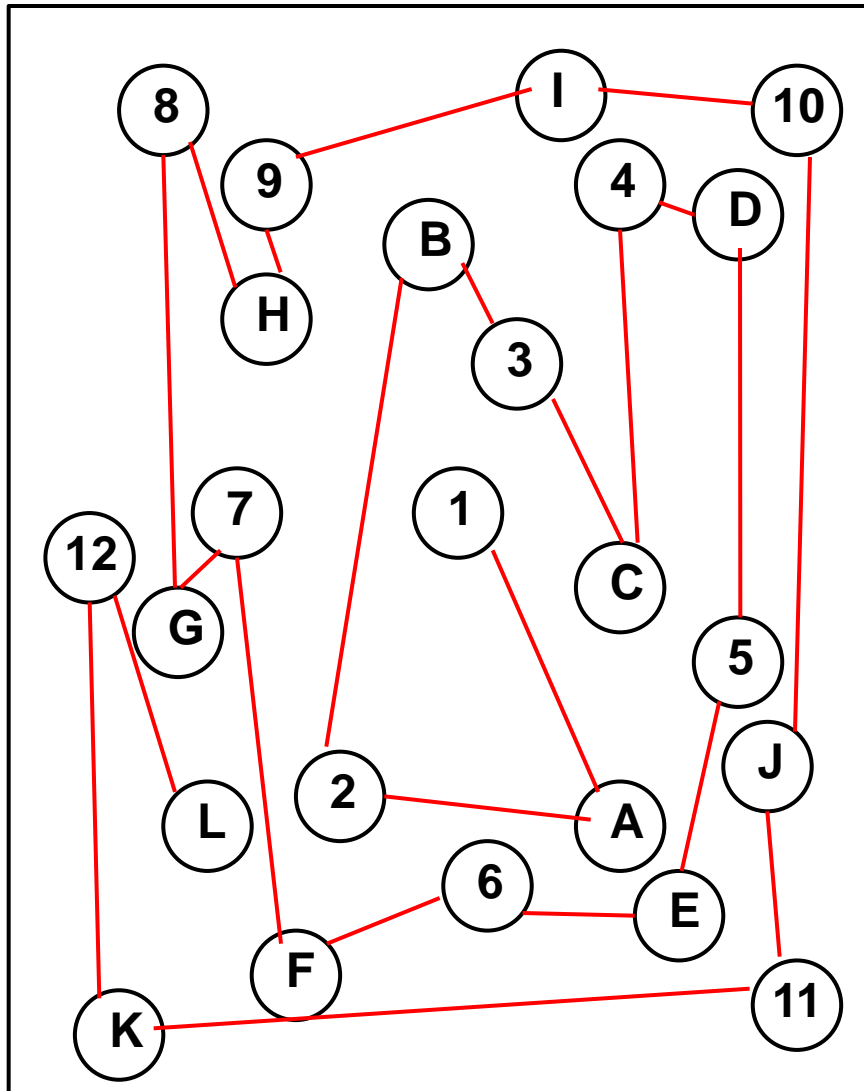
# Demographics

---

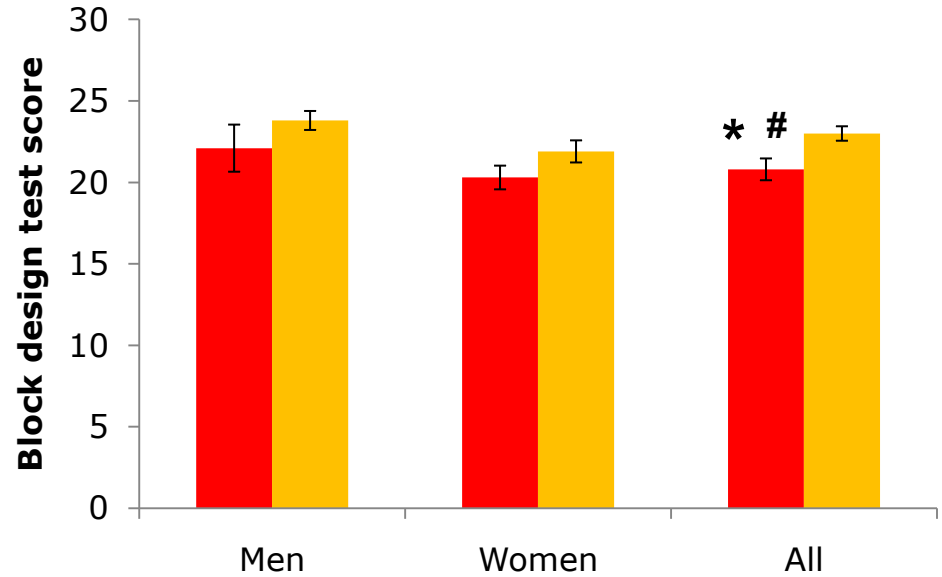
<b>Variable</b>	<b>Vit D Sufficient N=309</b>	<b>Vit D Insufficient N=154</b>
<b>Age (y)</b>	<b>77.7 ± 4.5</b>	<b>78.6 ± 4.8 *</b>
Comorbidity score (out of 9 system-related conditions)	2.81 ± 1.34	2.96 ± 1.49
<b>BMI</b>	<b>27.0 ± 4.4</b>	<b>28.3 ± 5.2 *</b>
<b>Diabetes</b>	<b>31 (10%)</b>	<b>27 (17.5%) *</b>
<b>Osteoporosis</b>	<b>53 (17.7%)</b>	<b>39 (27.7%) *</b>
<b>Planned exercise (hrs/wk)</b>	<b>1.3 (0.3-3.4)</b>	<b>0.8 (0.0-2.5) *</b>
Four plus medications	209 (67.4%)	108 (70.1%)
On vitamin D supplementation	16 (5.2%)	5 (3.2%)



\* p<0.05

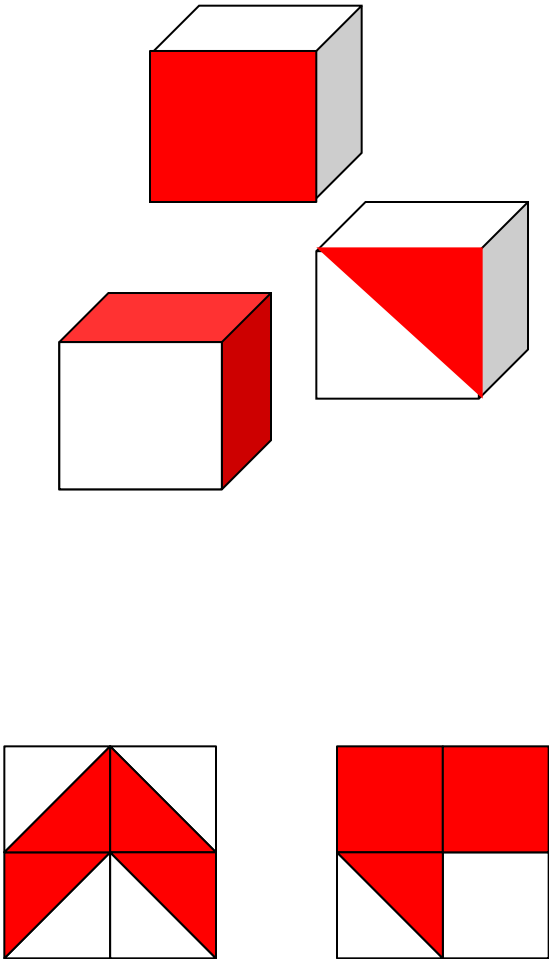
# Executive function – Trails making B test



# Visuo-spatial domain - Block design test

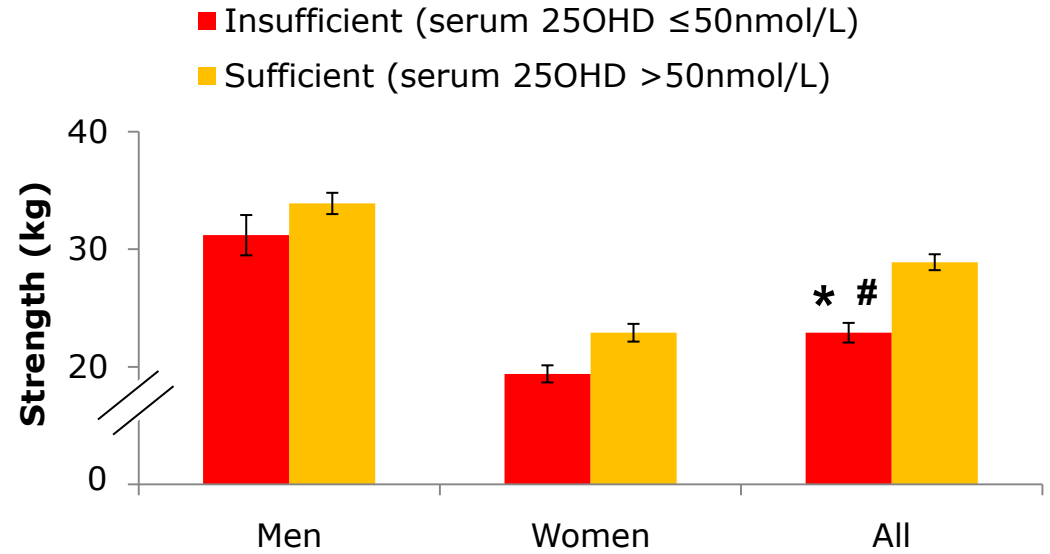
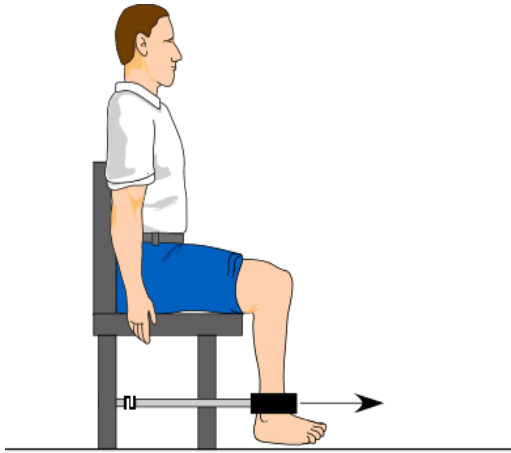


 Insufficient (serum 25OHD ≤ 50nmol/L)  
 Sufficient (serum 25OHD > 50nmol/L)

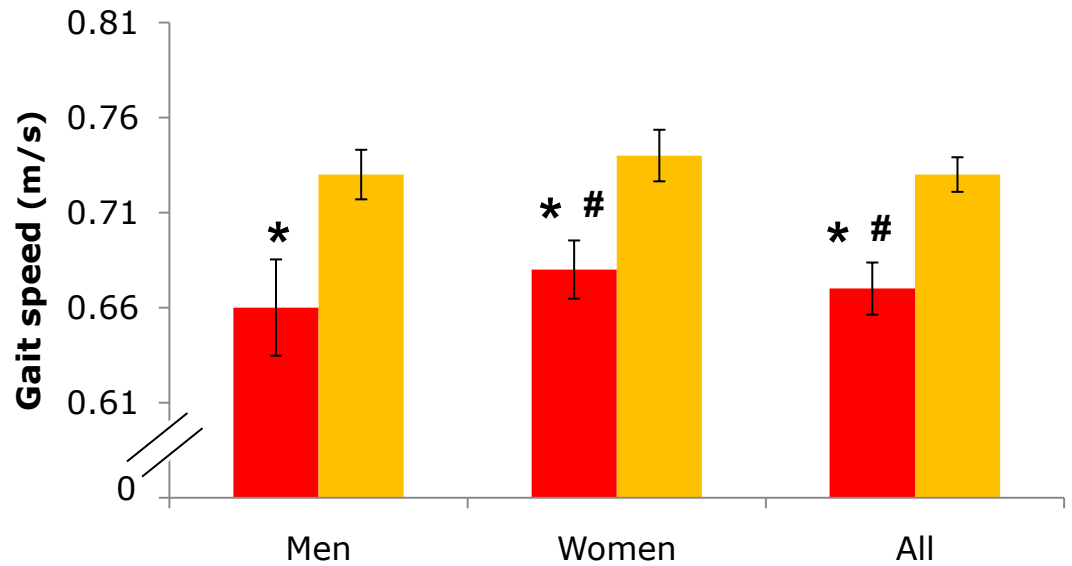


\* p<0.05 ; # p<0.05 after adjusting for age

# Quadriceps strength

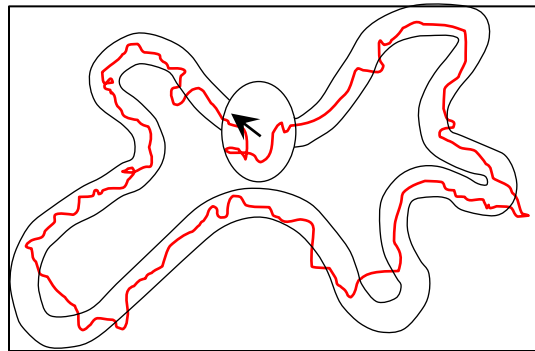
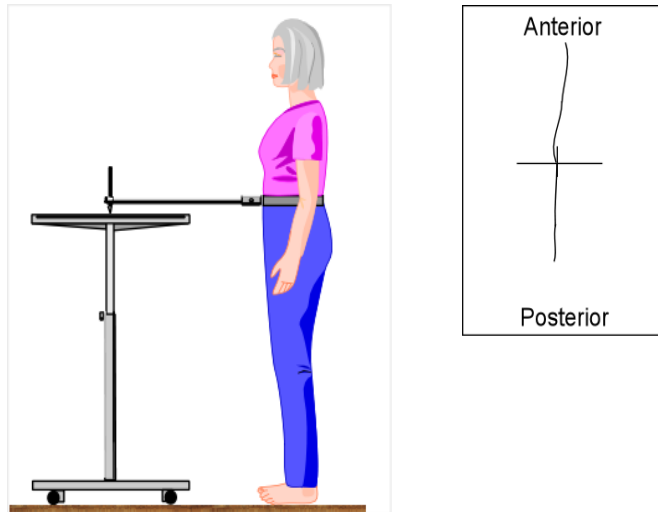


# 6-metre walking test

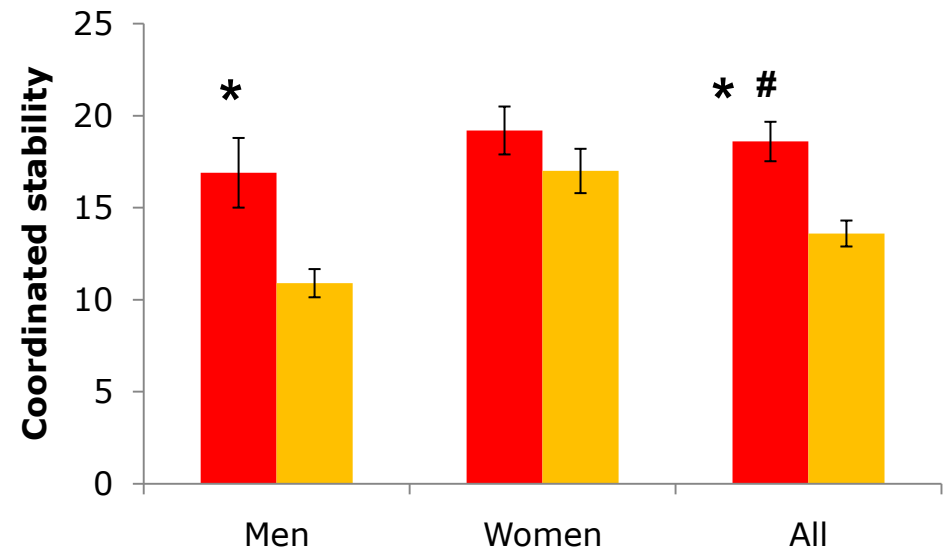
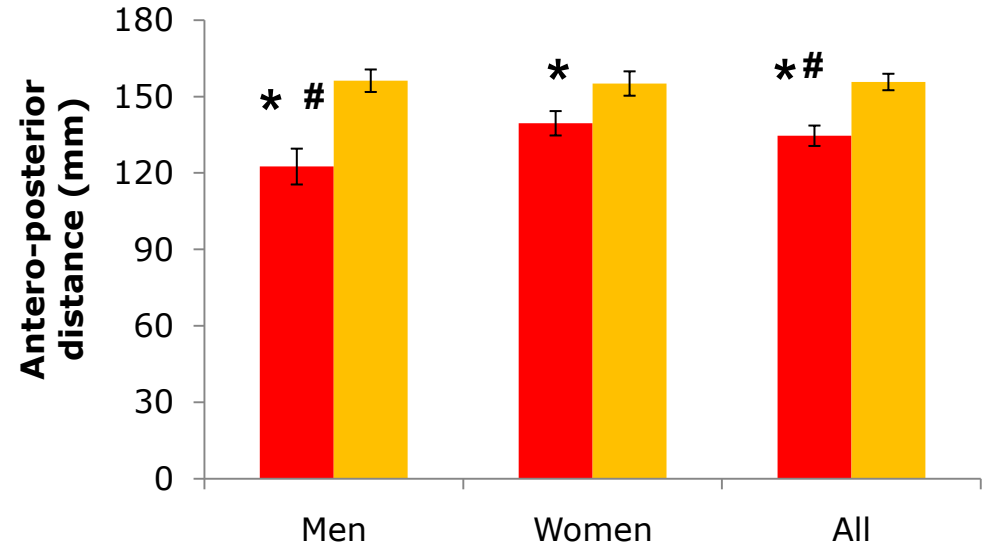


\* p<0.05 ; # p<0.05 after adjusting for age

# Leaning balance

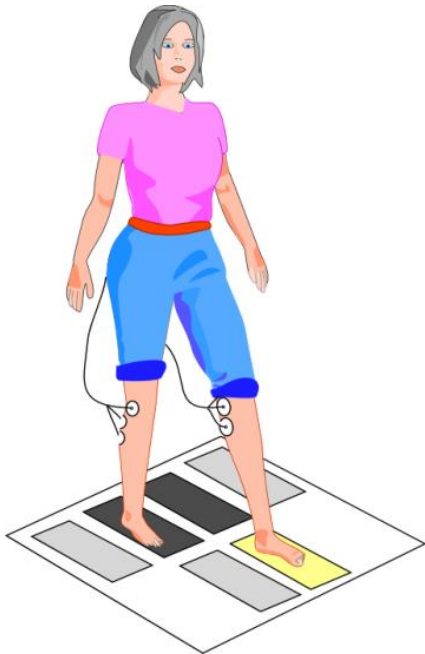
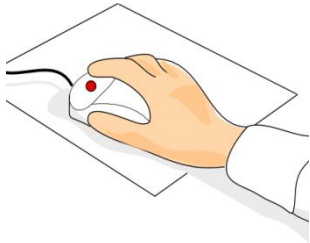


■ Insufficient (serum 25OHD  $\leq$  50nmol/L)  
■ Sufficient (serum 25OHD  $>$  50nmol/L)

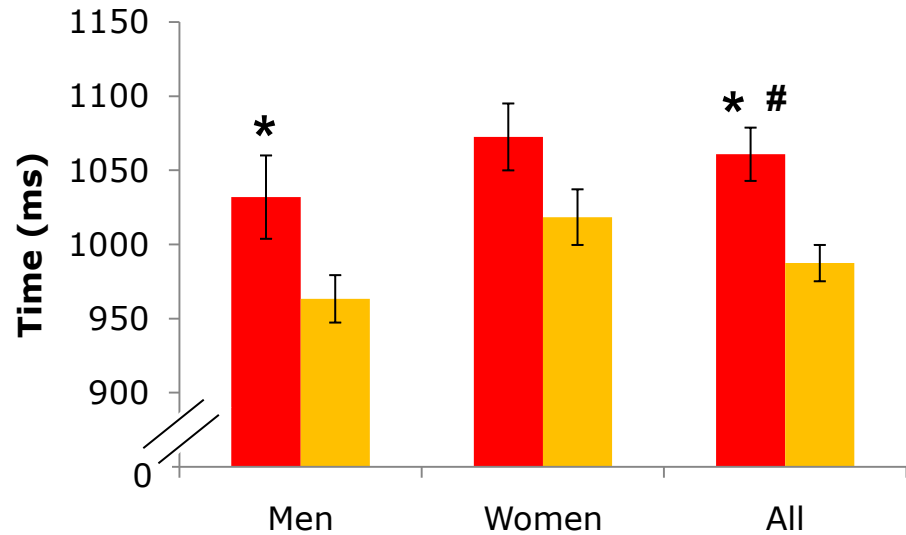
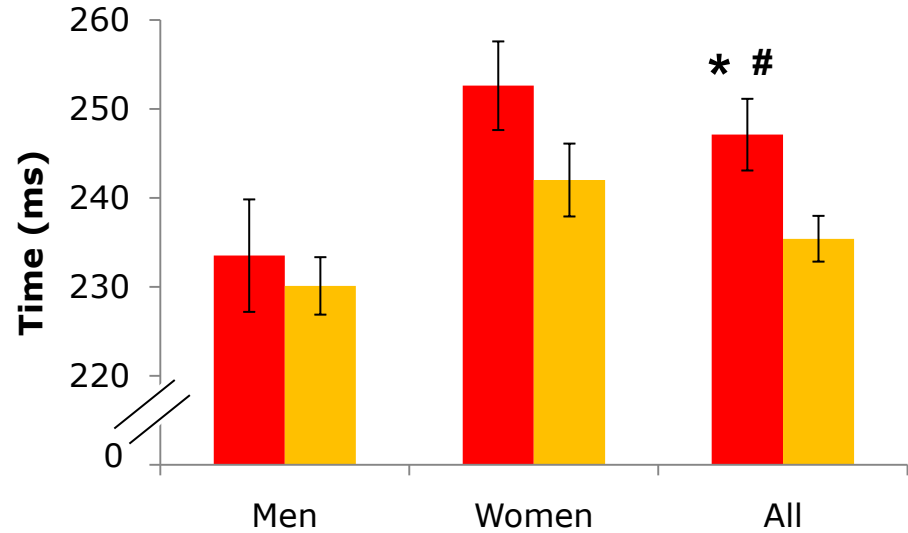


\*  $p < 0.05$  ; #  $p < 0.05$  after adjusting for age

# Reaction time



■ Insufficient (serum 25OHD  $\leq$  50nmol/L)  
■ Sufficient (serum 25OHD  $>$  50nmol/L)



\*  $p < 0.05$  ; #  $p < 0.05$  after adjusting for age

# Falls

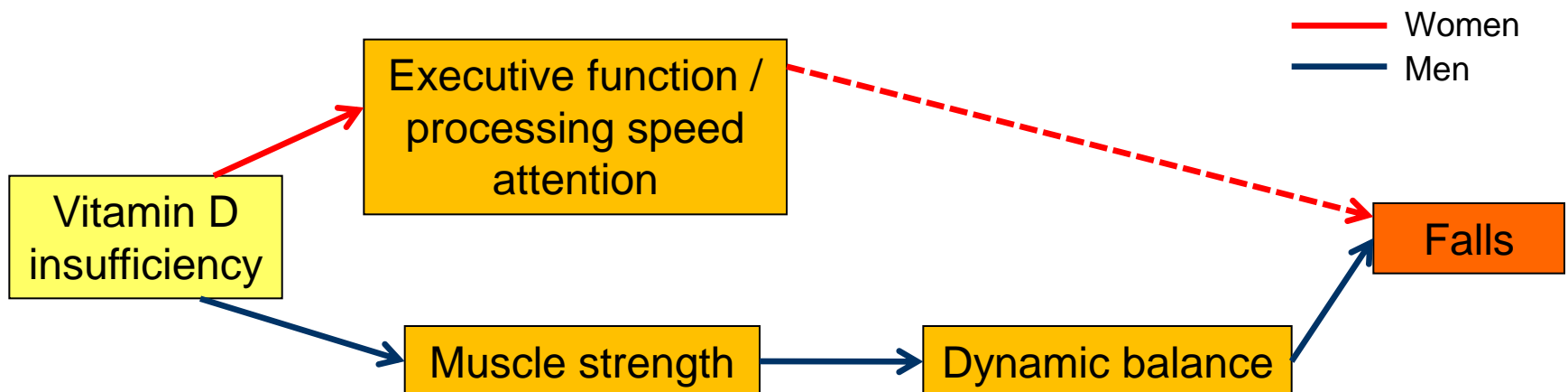
---

- 35% fallers (33% men & 36% women)
- No increase in risk of falling for vitamin D insufficiency group (RR=1.21, 95% CI=0.94–1.57)
- **Increased risk of falling for men with vitamin D insufficiency (RR=1.63, 95% CI=1.10–2.40)**

# Vitamin D insufficiency

---

- 30% prevalence among community living older people
- Small association with cognitive function
- Strongly related with poorer neuromuscular function and balance
- Associated with increased injurious and multiple falls in men only



---

# Preventing falls in hospitals

# Cochrane Review

---

*Interventions for preventing falls in older people in nursing care facilities*

---

1

## **Cover sheet**

### **Title**

Interventions for preventing falls in older people in nursing care facilities and hospitals

### **Reviewers**

Cameron ID, Murray GR, Gillespie LD, Cumming RG, Robertson MC, Hill KD, Kerse N

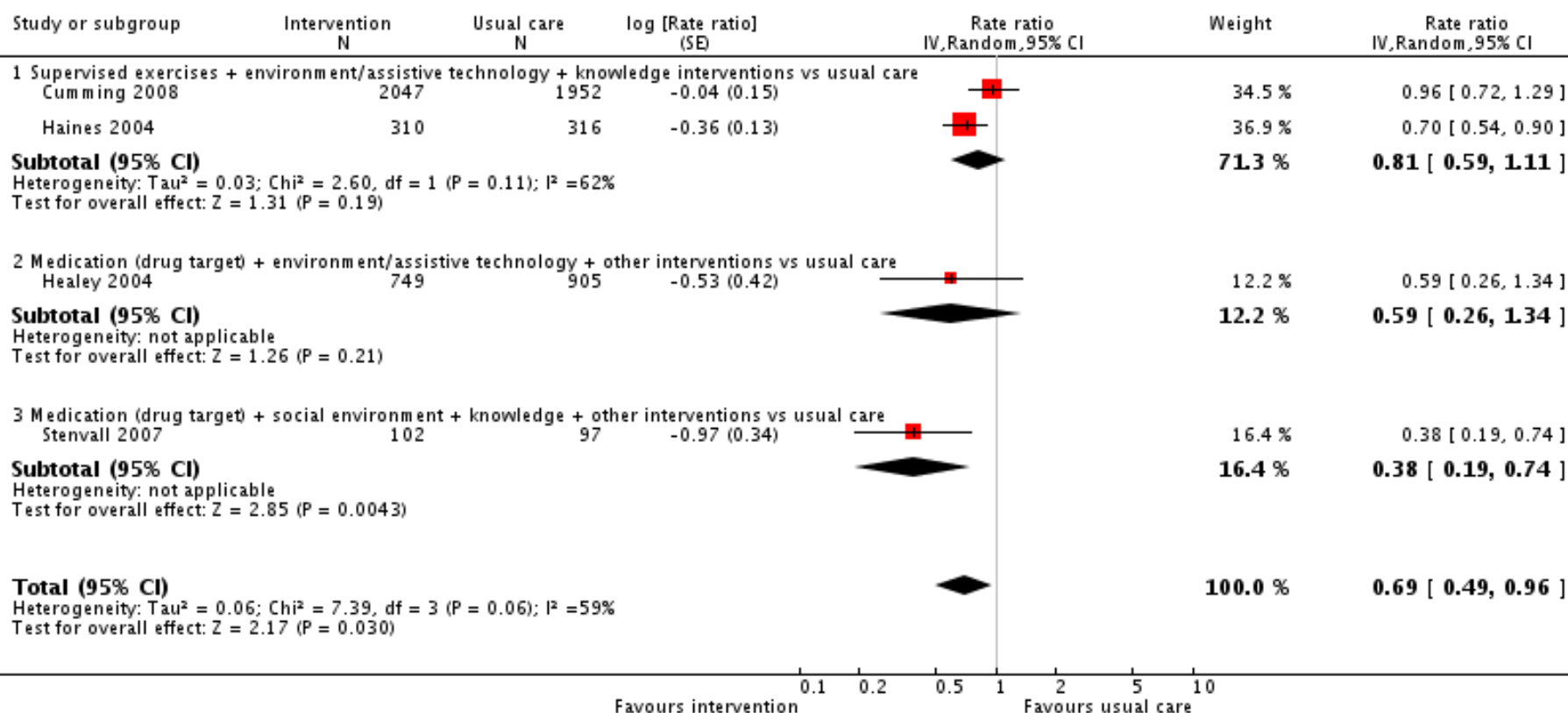
### **Dates**

Date edited: 22/06/2008

Date of last substantive update: 25/02/2008

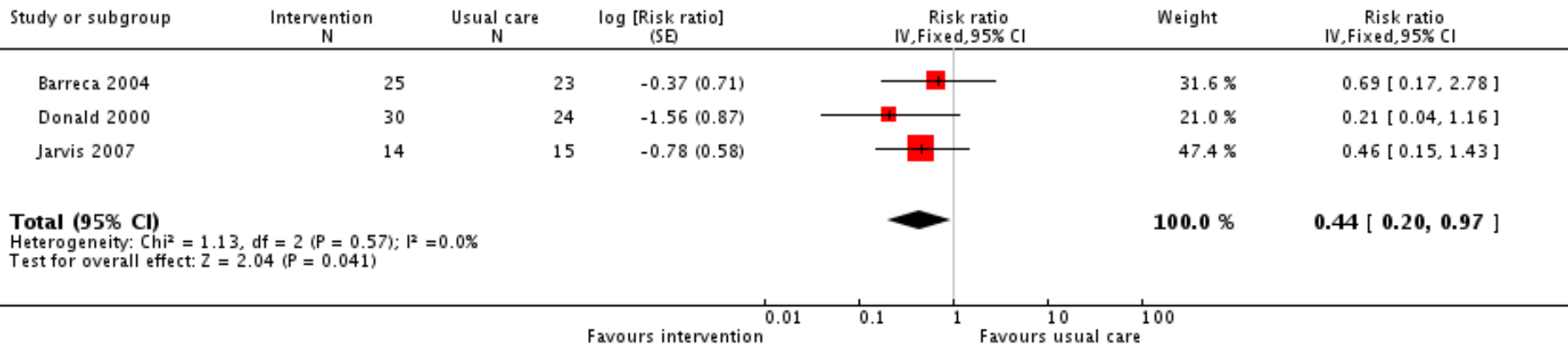
# Multifactorial interventions

Review: Interventions for preventing falls in older people in nursing care facilities and hospitals  
 Comparison: 10 Multifactorial interventions vs usual care (hospitals)  
 Outcome: 1 Rate of falls



# Supervised exercise

Review: Interventions for preventing falls in older people in nursing care facilities and hospitals  
Comparison: 9 Supervised exercises vs usual care (hospitals)  
Outcome: 1 Number of fallers



# Main results

---

- Multifactorial interventions reduced the rate of falls (RaR 0.69, 95% CI 0.49 to 0.96; 4 trials, 6478 participants) and risk of falling (RR 0.73, 95% CI 0.56 to 0.96; 3 trials, 4824 participants)
- Supervised exercise interventions showed a significant reduction in risk of falling (RR 0.44, 95% CI 0.20 to 0.97; 3 trials, 131 participants)

# Reviewers' conclusions

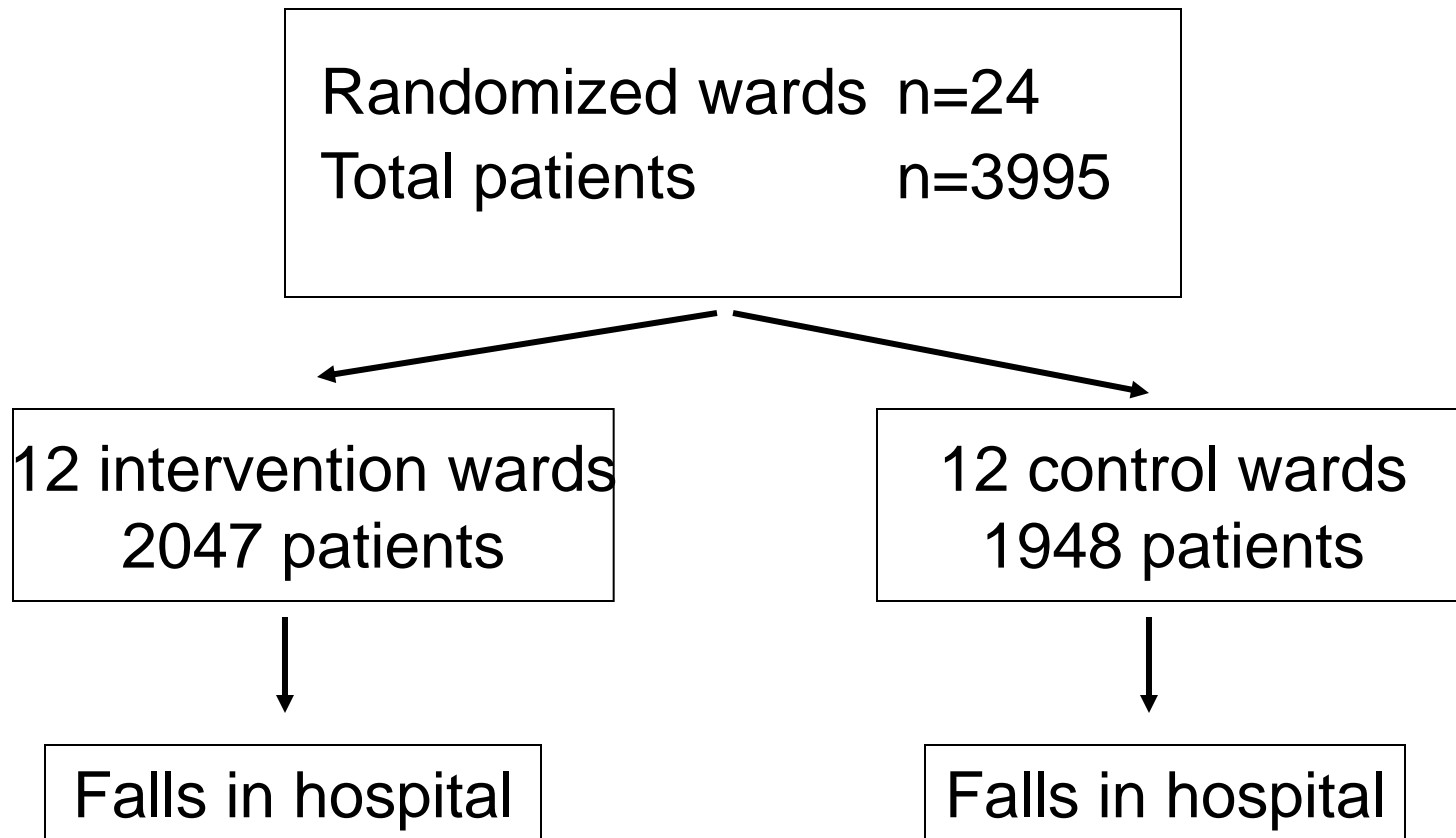
---

- There is evidence that multifactorial interventions reduce falls and risk of falling in hospitals
- Exercise in subacute hospital settings appears effective
- Limitations of the review: small number of studies, difficulty isolating effects of multifactorial interventions, variability of interventions

# Falls Prevention in Hospitals

## POPI Study 2003-2006

---



# Design and Intervention

---

- Research team
  - nurse and physiotherapist (25 hours per wk)
  - research assistant
- 3 month intervention period
- Intervention levels
  - patient-based
  - ward-based

# Nursing Interventions

---

- Falls risk assessment of all patients
- Staff education: group and individual sessions
- Patient and family education
- Arrange provision of aids eg walking aids, glasses
- Environmental modification: ward and bedside
- Assessment, liaison with and referral to other staff about medications, confusion, foot problems
- Arrange increased supervision
- Foot alarms

# Physiotherapy Interventions

---

- Exercises designed to enhance balance and functional task ability
  - for those at increased risk
  - in addition to intervention provided by ward physiotherapy staff
  - group and individual sessions
- Practice of safe mobility within ward environment
- Negotiation with staff, patient and family about safe mobility in ward
  - use of walking aids
  - amount of supervision needed

# Falls and Fallers

---

- 9.2 falls per 1000 bed days

- Falls frequency:

0 falls 92.5%

1 fall 6.1%

2 falls 1.0%

3+ falls 0.4%

Acute wards: 6.2% fell

Rehab. wards: 10.9% fell

7.5% fell at least once

# RESULTS - individual level analyses

---

	<b>Incidence rate ratio</b>	<b>95% CI</b>	<b>p value</b>
<b>Unadjusted</b>	<b>1.02</b>	<b>0.70-1.48</b>	<b>0.93</b>
<b>Adjusted for past falls</b>	<b>0.96</b>	<b>0.72-1.28</b>	<b>0.79</b>

# Possible explanations for negative finding

---

- Extra staff are required - 24 hours a day, 7 days a week?
- Longer intervention period needed?
- Absence of sitters?
- Whole system approach, including work practice changes?

---

ONLINE FIRST

# Patient Education to Prevent Falls Among Older Hospital Inpatients

*A Randomized Controlled Trial*

*Terry P. Haines, PhD; Anne-Marie Hill, MS; Keith D. Hill, PhD; Steven McPhail, BS; David Oliver, MD; Sandra Brauer, PhD; Tammy Hoffmann, PhD; Christopher Beer, MBBS*

*Arch Intern Med.*

*Published online November 22, 2010.*

*doi:10.1001/archinternmed.2010.444*

---

# Methods

---

Older hospital patients (n=1206) admitted to acute (orthopedic, respiratory, and medical) and subacute (geriatric and neuro-rehab) hospital wards at 2 Australian hospitals

The interventions were a multimedia patient education program based on the health-belief model combined with trained health professional follow-up (complete program), multimedia patient education materials alone (materials only), and usual care (control)

Falls data were collected by reviewing hospital incident reports, hand searching medical records, and weekly patient interviews

---

# Main findings

**Table 2. Between-Group Comparisons on Fall-Related Outcomes**

Outcome	Control	Materials Only	Complete Program
	<b>Total Sample</b>		
Falls/injurious falls/falls resulting in fracture, No.	81/25/2	96/40/2	70/32/1
Falls per 1000 patient-days	9.27	8.61	7.63
Fallers, No. (%) <sup>a</sup>	54 (14)	56 (13)	44 (11)
Injurious falls per 1000 patient-days	2.86	3.59	3.49
	<b>Cognitively Intact Participants</b>		
Falls/injurious falls/falls resulting in fracture, No.	46/15/2	61/25/1	25/10/0
Falls per 1000 patient-days	8.72	8.18	4.01
Fallers, No. (%) <sup>a</sup>	30 (11)	32 (10)	20 (6)
Injurious falls per 1000 patient-days	2.84	3.34	1.60
	<b>Cognitively Impaired Participants</b>		
Falls/injurious falls/falls resulting in fracture, No.	35/10/0	35/15/1	45/22/1
Falls per 1000 patient-days	10.10	9.47	15.30
Fallers, No. (%) <sup>a</sup>	24 (24)	24 (22)	24 (26)
Injurious falls per 1000 patient-days	2.89	4.06	7.49

# Conclusions

---

Multimedia patient education with trained health professional follow-up reduced falls among patients with intact cognitive function admitted to a range of hospital wards

---

---

# Sustained reduction in serious fall-related injuries in older people in hospital

David Fonda, Jennifer Cook, Vivienne Sandler and Michael Bailey

MJA 2006; 184 (8): 379-382

---

# Design, setting and participants

---

Three-year quality improvement project comparing data at baseline (2001) and at 2-year follow-up (2003) after interventions to reduce falls. All patients admitted to the Aged Care Services wards at Caulfield General Medical Centre, Melbourne, between January 2001 and December 2003 were included.

# Interventions

---

Multistrategy approach phased in over 3 months from September 2001 and involving data gathering, risk screening with appropriate interventions, work practice changes, environmental and equipment changes, and staff education.

---

# Results

---

Over a 2-year period, there was a 19% reduction in the number of falls and a 77% reduction in the number of falls resulting in serious (P < 0.001) Staff compliance with completing the falls risk assessment tool increased from 42% to 70%, and 60% of staff indicated they had changed their work practices to prevent falls

---

# Conclusions

---

A multistrategy falls prevention program in an aged care hospital setting produced a significant reduction in the number of falls and a marked reduction in serious fall-related injuries.

Incorporating a falls prevention program into all levels of an organisation, as part of daily care, is crucial to the success and sustainability of falls prevention.

---

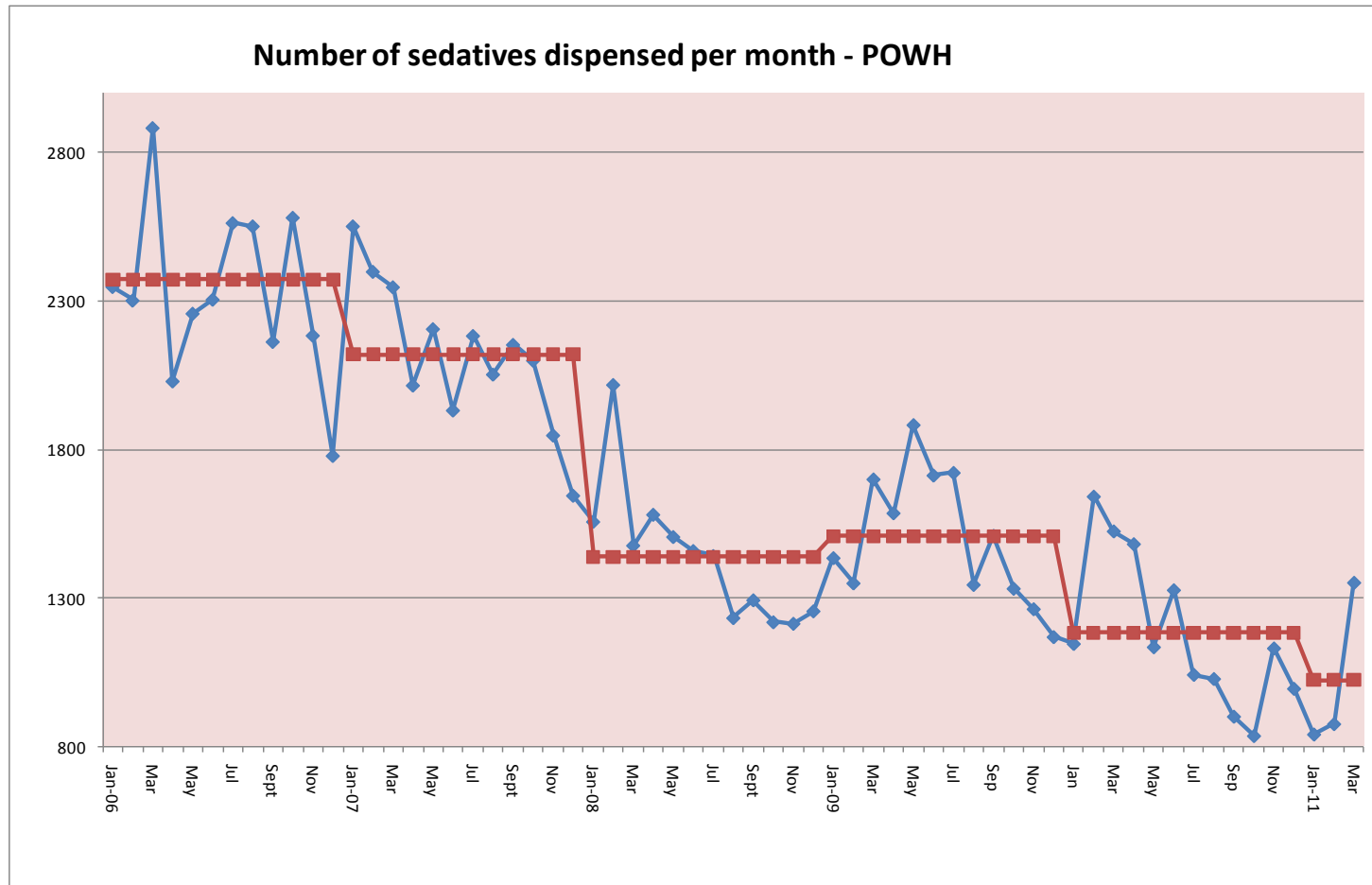
---

# Translating Research Into Practice

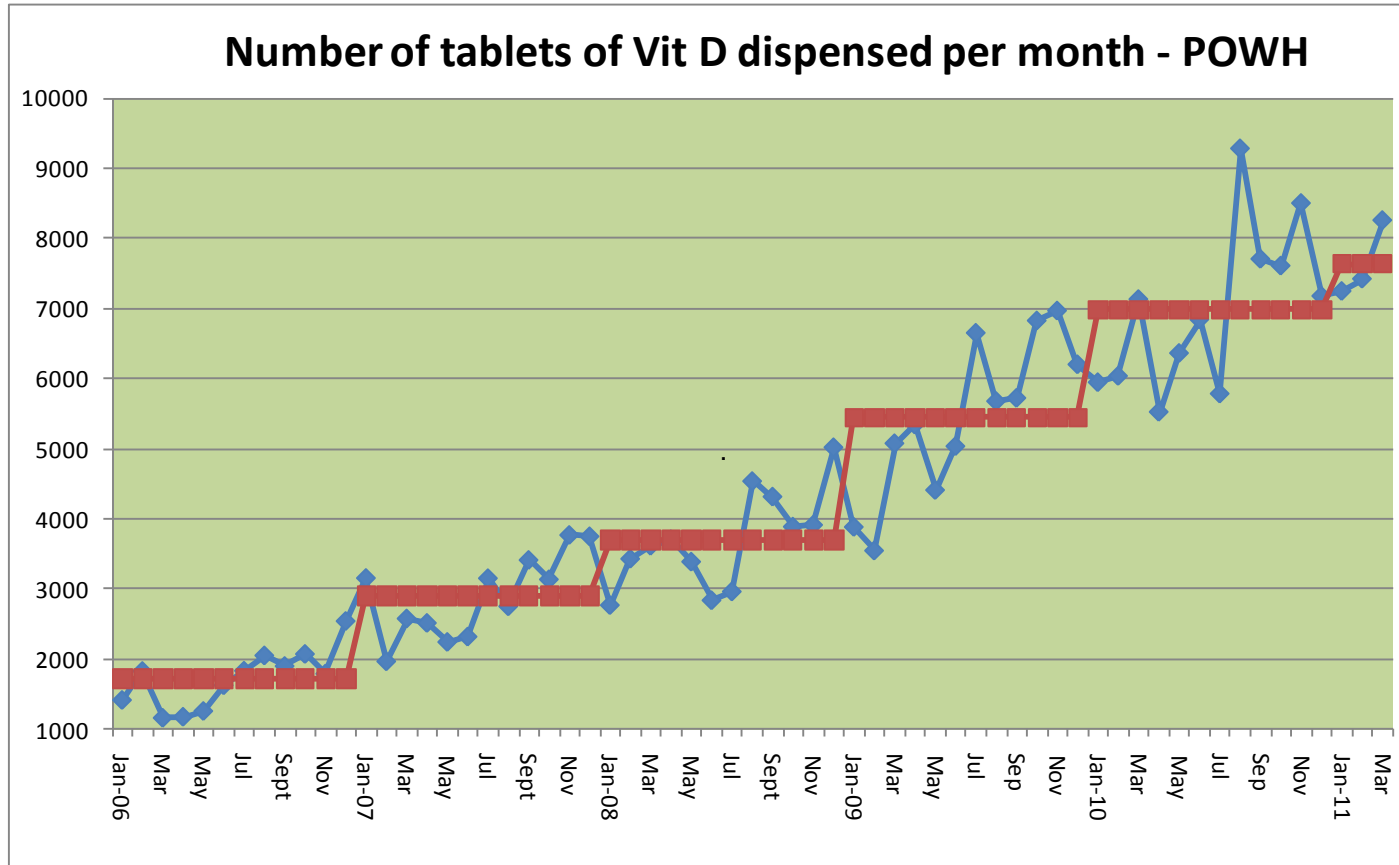
The Prince of Wales Hospital Experience

---

# Hypnotic use - POWH

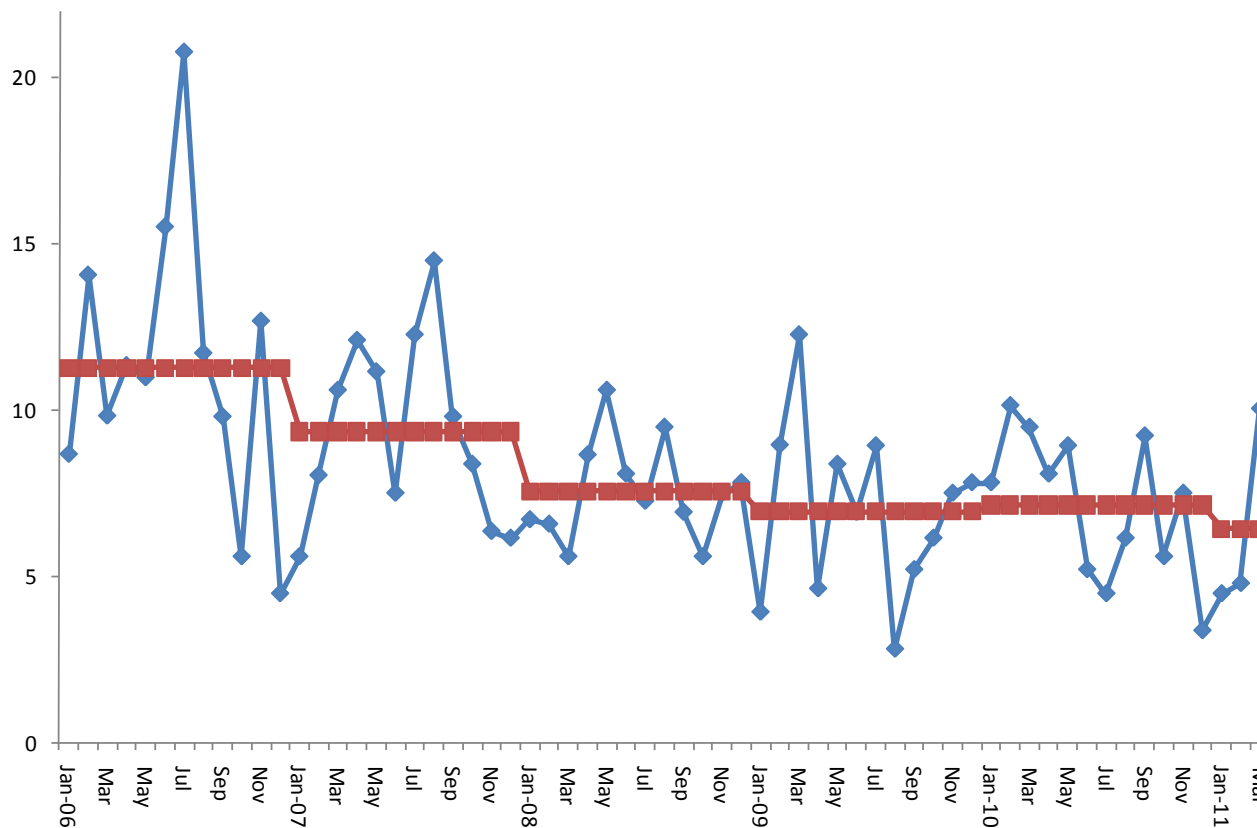


# Vit D use - POWH



# All Aged Care

## Falls Rates - Aged Care (All)



# Acknowledgements

---



**Neuroscience  
Research Australia**

*Discover. Conquer. Cure.*

- Understanding Fear of Falling and Risk taking in Older People, NeuRA – NHMRC project Grant (No. 400941)
  - Brain and Ageing Program, School of Psychiatry, UNSW- NHMRC Program Grant (No. 350833)
  - NeuRA Falls and Balance Research Group
  - Sydney Memory & Ageing Study team
-