

Update on Calcium, Vitamin D and Hip Protectors in ACFs

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Calcium metabolism

- Postmenopausal obligatory losses
 - Approx 320 mg/day (140 mg in urine; 140 mg in faeces; 40 mg from skin)
- Absorb approx. 25% of oral calcium carbonate (more of citrate)
- Need oral intake of 1400 mg in postmenopause to be in positive balance
 - 300 mg calcium in 250 mls of milk; 150 gm of yoghurt; 30-40 gm cheese
 - 600 mg in Caltrate; Calsup; 325 mg in Citracal
- Calcium levels fall, PTH rises and bone resorption increases at night
 - take oral calcium at night
- Chronic calcium deficiency causes osteoporosis

Evidence that calcium reduces bone loss

- Calcium with oestrogen has greater effect than oestrogen alone
- Trials of vitamin D or bisphosphonates always include calcium
- Calcium rarely given in adequate amounts to ensure positive balance
- Very few randomised controlled trials of calcium
 - no incentive for pharmaceutical companies

Risk of cardiac disease with calcium

- One study only. Dozens of studies involving calcium have not shown this link
- The effect on heart disease was a secondary end point
 - The primary purpose of the study was the effect of calcium on bone density and fractures
- 1000 mg calcium given routinely to 750 postmenopausal women without regard to calcium intake
 - 750 controls took placebo

Risk of cardiac disease with calcium

- Women in intervention group had:
 - more current or former smokers
 - higher LDL cholesterol and total cholesterol
 - more hypertension, IHD, other vascular disease
- From self reports, 36 of women taking calcium had heart attack compared with 22 of those taking placebo
 - 4.8% c.f. 2.9% (significant)
- From hospital records, no significant difference in heart attacks or other vascular events

Recommendation for calcium in aged care facilities

- All older women should have daily intake of 1500 mg
- All older men should have daily intake of 1000 mg
- Almost all women will need supplementation of 600-1200 mg
 - restrict to 600 mg if has ischaemic heart disease
- Almost all men will need supplementation of 600 mg
 - be conservative if history of ischaemic heart disease
- Calcium should be taken at night if one tablet only
 - second tablet should be taken at midday
- Calcium should not be taken with breakfast or within hours of a bisphosphonate

Vitamin D metabolism

- Vitamin D is made in the skin assisted by sunlight
- Vitamin D is converted in the liver and then in the kidney to its active metabolite
- Vitamin D is required for calcium absorption from food
- Low vitamin D causes a rise in parathyroid hormone (PTH)
- Hyperparathyroidism causes osteoporosis and osteomalacia
- Low vitamin D levels cause muscle weakness and poor balance
- Low vitamin D levels increase risk of breast, colon and prostate cancer and of diabetes and hypertension

Vitamin D deficiency and older people

- Vitamin D levels fall with age
 - thin skin; lack of sunlight; poor renal function
- Low vitamin D levels are associated with muscle weakness and poor balance
- Low vitamin D levels are associated with fractures
- Almost all people in high care are vitamin D deficient
- 40% of people in low care are vitamin D deficient
- People with hip fractures are almost all vitamin D deficient

Vitamin D inadequacy is common in residential care in Australia¹

- 97% of all residents had a serum 25OHD below the healthy reference range (serum 25OHD < 90 nmol/L)
- 22% of women in low-level care and 45% in high-level care were markedly vitamin D deficient (serum 25OHD < 25 nmol/L)
- serum 25OHD level was independently associated with falls
 - Higher serum levels (better vitamin D status) were associated with a lower risk for falling (HR = 0.74, $p < 0.01$)
 - This implies a 20% reduction in risk of falling with doubling of vitamin D level
- No major difference in vitamin D levels in nursing homes across different latitudes in Australia

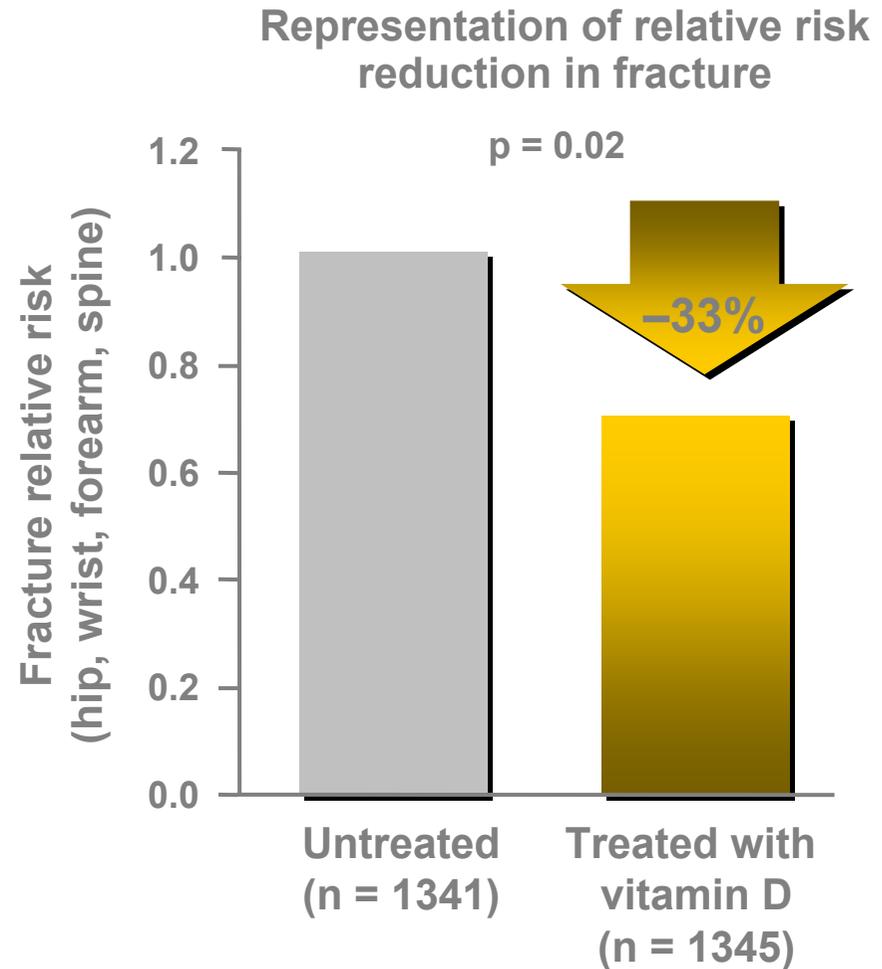
Vitamin D3 and calcium prevent hip fractures in aged care facilities

- French study of 3270 ambulant women, mean age 84 in aged care homes
- Intervention group received 1200 mg calcium and 800IU Vitamin D3 for 18 months
- Reduction in fractures in intervention group
 - 30% reduction in hip fractures (43% if completed trial)
 - 25% reduction in all non-vertebral fractures (32% if completed trial)

Ref: Chapuy NEJM, 1992;327:1637-42

Vitamin D supplementation may decrease fracture risk*

- Five-year pilot, randomised, double-blind, controlled trial
- Men and women living in the community
- n = 2686
- Age 65–85 years
- Vitamin D = 100,000 IU once every four months (equivalent to 800 IU/day)
- Significant reduction in fractures of hip, wrist and forearm
- Non-significant reductions in total mortality (RR=0.88) and hip fractures (RR=0.85)



*This trial was too small for any decisive effect on fractures to be expected.

Studies not showing an effect of vitamin D and/or calcium

- UK study of 3314 women over age 70 in community
 - intervention group given 1000mg calcium and 800IU vit D
 - followed for 24 months
 - no significant reduction in fracture rate
 - no reduction in falls
- Dutch study of 2578 men and women
 - intervention group given 400IU vit D
 - no reduction in fractures
- UK study of 9440 men and women
 - intervention group given 300,000IU vit D annually
 - no reduction in fractures

Vitamin D reduces falls

- Australian trial of 625 residents of aged care facilities
 - intervention group received 600 mg calcium and 1000IU Vit D daily for 2 years
 - rate of falling reduced in intervention group by 27%
Ref: Flicker L, et al. JAGS.2005;53:1881-3
- Other trials of vitamin D 800IU and calcium 1200 mg reduced falls
 - but not number of fallers
Ref: Pfeifer M, et al. J Bone and Min Res. 2000; 15:1113-8
- Vitamin D alone may not reduce the risk of falling
 - 800IU reduced falls in four studies and ineffective in four
 - Calcitriol (1,25 dihydroxy D3) reduced falls in people with GFR<60 mls/min. Ref: Gallagher JC, et al. J Clin Endocrin Metab. 2006; Oct 10.

Recommendations for vitamin D in ACFs

- All high care residents should receive vitamin D supplementation
 - 1000 IU Vitamin D3 daily
 - 50,000 IU Vitamin D3 monthly
- All low care residents should have their vitamin D level measured
 - supplement as for high care if less than 80
 - if less than 25, give 3000 IU daily or 50,000 IU weekly for one month then supplement as above
- Unless there is a contraindication, calcium should be also given

Evidence for hip protectors in ACFs

- 11 trials including 6 cluster-randomised studies
 - meta-analysis showed reduced risk of hip fracture of 33%
- 3 trials of individually randomised participants
 - no reduction of hip, pelvic or other fractures
 - no adverse effects
 - compliance was poor – 20-92% (median 56%)
- Few hip fractures in people wearing hip protectors
 - estimated that they prevent 70% of hip fractures

What can we say about hip protectors

- They seem to prevent hip fractures if worn correctly
- They do not cause any adverse effects
- They may make staff more conscious of falls injury prevention
 - change care patterns
- They may give residents more confidence and encourage mobility
- Most families are prepared to pay for them
- Compliance is difficult
 - more work on design