Nutritional concepts for the prevention and treatment of osteoporosis: what, for whom, when?

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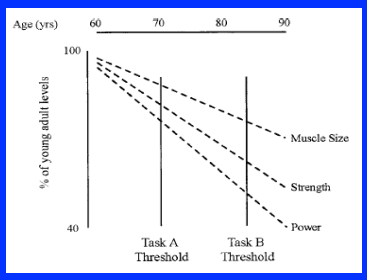
Disclosures: Amgen, DSM, Nestle, Opko, Pfizer, Roche, Tricida

Objectives

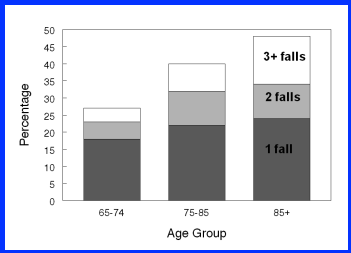
- Vitamin D and falls
- Calcium, vitamin D and fractures
- Safety – kidney stones, CVD, mortality
- Approach to the individual patient

Interrelationships of muscle size, strength and power



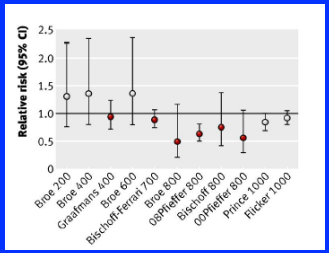
Barry BK. J Gerontol 2004;59A:730-754.

Proportions of older community-dwelling women who reported falling in a 12-month period (The Randwick Study)



Lord SR. Australian J Pub Health 1993;17:240-5

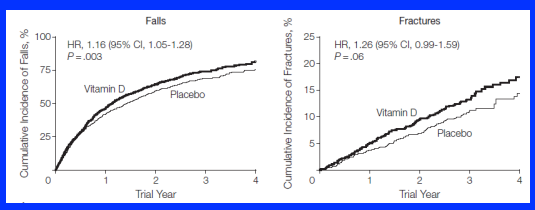
RCTs: Vitamin D and Falls



Bischoff-Ferrari HA 2011 BMJ:342:d2 608 doi:10.1136/bmj.d2608.

Effect of High Dose Vitamin D on Falls and Fractures in 2,256 Women age 70+

(500,000 IU orally once per year)



Sanders KM. JAMA 2010;303:1815-1822.

RCT: Vitamin D to prevent functional decline
(n=200, age 70+ years, fall in last yr; 1 yr trial)

	A	B	C	P value
Dose	24,000 IU/mo	60,000 IU/mo	A + calcifediol	
	(800 IU/d)	**(2,000 IU/d)**	**(350 µg/mo)**	
25OHD,ng/ml				
baseline	18.7 (47 nmol/L)	20.9	18.4	
12 mo Δ	11.7	19.2	25.8	<0.001
SPPB				
baseline	9.96	9.81	9.34	
12-mo Δ	0.38	0.10	0.11	0.26
Fallers, %	**47.9**	**66.9***	**66.1**	**0.048**

Bischoff-Ferrari H. JAMA 2016; doi:10.1001/jamainternmed.2015.7148

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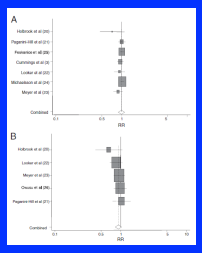
Meta-analysis: Calcium Supplementation and Hip Fracture Risk
(170,991 men and women, 2954 fractures)

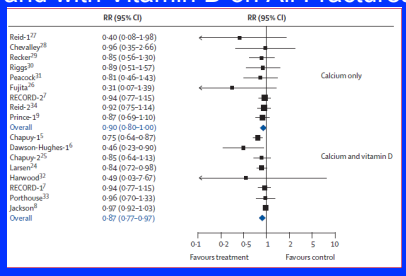
Women
RR 1.01 [0.97, 1.05]

Men
RR 0.92 [0.82, 1.03]



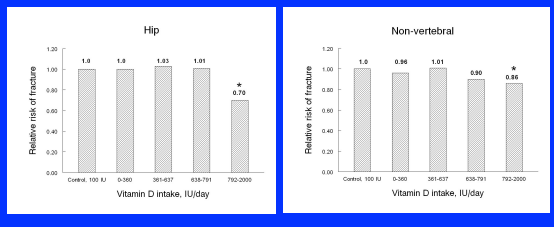
Bischoff-Ferrari H. AJCN 2010;86:1780-90.

Meta-Analysis: Effects of Calcium Alone and with Vitamin D on All Fractures



Tang BM. Lancet 2007;370:657-666.

Risk of Fracture by quartile of vitamin D intake
Meta-analysis of individuals from RCTs
(31,022 persons, mean age 76 yrs)



Bischoff-Ferrari H. New Engl J Med 2012;367:40-49.

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Calcium intake and risk of kidney stones

(Harvard Nurses Study, N= 91,731; age 34-59 yrs; 864 cases)

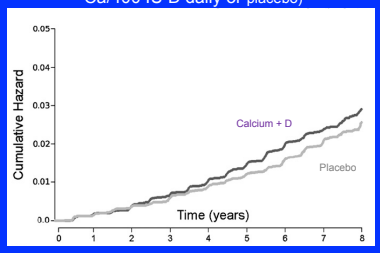
	Q1	Q5
Food Ca	<488 mg	>1098 mg
	1.0	0.65*
	No	**Yes**
Supp Ca	0 mg	>500 mg
	1.0	1.21*

* P for trend < 0.05

Curran GC. Ann Int Med 1997;126:497-504.

Kidney Stones in WHI

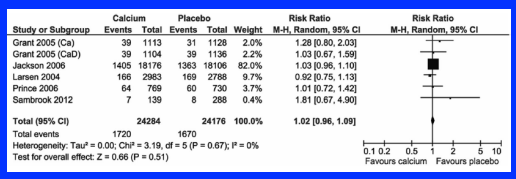
(36,282 postmenopausal women, 50-79 yrs; Rx with 1000 mg Ca/400 IU D daily or placebo)



Wallace RB. AJCN 2011;doi 10. 3945/ajcn.110.0023350.

Do calcium supplements increase risk of coronary heart disease?

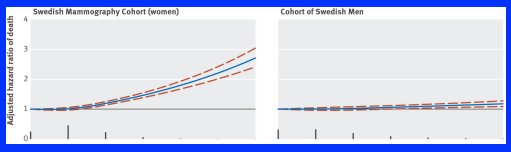
Lewis meta-analysis: calcium supplementation and *verified* coronary heart disease (18 trials in 63,563 postmenopausal women)



Lewis, JR. JBMR 2015;30:165-175.

Does drinking milk increase risk of death?

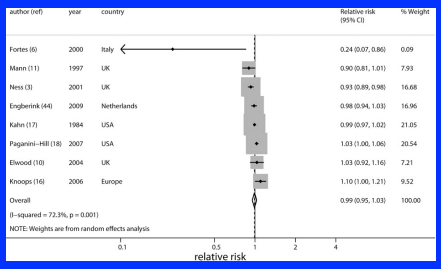
Milk intake (glasses per day) and risk of death in large Swedish cohorts



Michaelsson K. BMJ 2014; 349:g6015.

Milk intake and all cause mortality

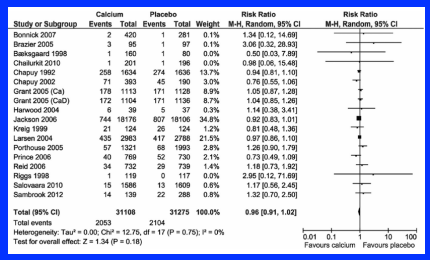
(meta-analysis of 8 cohort studies in 62,779 adults)



Soedamah-Muthu SS. Am J Clin Nutr 2011;93:158-71.

Lewis meta-analysis of RCTs: Calcium supplements (with and without D) and mortality risk in postmenopausal women

(17 RCTs, 4157 deaths)



Lewis JR. JBMR 2015;30:165-175.

Calcium intake and vitamin D intakes in Swiss adults, age 34-74 yrs

	Men	Women
• Diet calcium, mg/d*	1,126	1,008
• Calcium supp use**	1.8%	10.9%
• Vitamin D, IU*	118	114
• Multivitamin use**	11.8%	27.0%

*Marquez-Vidal P. Nutrients 2015;7:9558-9572.
**Marquez-Vidal P. Europ J Clin Nutr 2009;63:273-281.

Calcium and Vitamin D: The approach to the individual patient

- Calcium supplementation is generally ***not*** needed in Swiss seniors.
- Vitamin D supplementation ***is*** generally needed. Current evidence suggests that a supplement dose of 800 IU is sufficient to reduce risk of falls and fractures. Higher doses may *increase* risk of falling.
- Combined calcium and vitamin D may lower fracture risk by 15 to 20%.

Individuals at Increased Risk for Low 25OHD Levels

- Osteoporosis
- Obese
- Little sun exposure
- Dark skin
- High latitude
- Sunscreen use
- Malabsorption
- Anti-epileptics (increase metabolism)

Effects of Vitamin D_2 and D_3 on 25(OH)D Levels

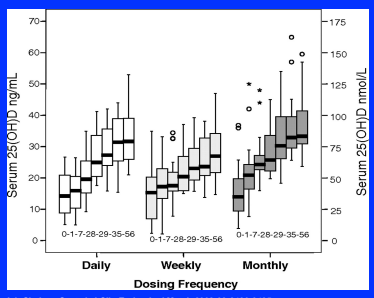
(4000 IU/d for 2 weeks; N=17 (D_2) and 55 (D_3); mean age 38 yrs)

	Serum 25(OH)D, nmol/L		
	Vit D_2	Vit D_3	Controls
Baseline	44	41	40
Final	57	65	43
Change	14	24*	3

∗Greater change than for D_2, P=003

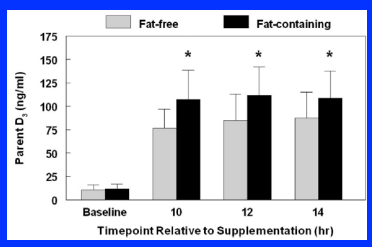
Trang HM. Am J Clin Nutr 1998; 68: 854-8.

Effects of the same cumulative dose of vitamin D_3, equivalent to 1500 IU/d, but given once daily, once weekly, or once monthly, on serum 25(OH)D



Ish-Shalom, S. et al. J Clin Endocrinol Metab 2008;93:3430-3435

Vitamin D absorption is 30% greater when supplement is taken with a meal containing fat vs no fat
(fat content tested = 30% of calories)



Dawson-Hughes B. J Acad Nutr Diet 2015;115:225-230.

Conclusions

- Meeting the calcium requirement from food sources is optimal. However, supplements are available to fill any gap.
- Most older adults need supplemental vitamin D.
- Vitamin D is more effective in seniors who have adequate calcium intake.
- It appears that 800 IU of vitamin D provides the full benefit to bone and muscle, reducing risk of falls and fractures by about 20%.
- Vitamin D_3 is more effective than vitamin D_2.
- Vitamin D supplements are best taken daily with a meal containing some fat.