Recent Advances

Geriatric Medicine

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Preventing functional decline and promoting functional independence for older adults are key goals for geriatric medicine. The increasing number of people in industrialised nations surviving into their 80s, 90s, and beyond is a tribute to the success of an increased standard of living, including better nutrition, sanitation, other public health measures, and the control of most infectious diseases during the 20th century. The increased life expectancy, however, is divided into "active life expectancy" and "dependent life expectancy." Preventive strategies to extend active life expectancy and diminish the years of functional dependence before death constitute perhaps the most important area of research relevant to geriatric medicine. Several recently published studies further our knowledge of preventive strategies relevant to aging and the health of older people.

Exercise

Physical activity has been shown to decrease mortality, but its effects on morbidity and disability are more difficult to show clearly. Fries and colleagues from Stanford University, who have had a longstanding interest in the effect of lifestyle on age related morbidity, recently published the results of an eight year prospective, longitudinal study of disability in a group of runners (aged 50 to 72 at the time of enrolment in the study) and a group of community controls.¹ Proving a causal relation between exercise and long term, positive health outcomes is difficult since an experimental, randomised exercise intervention trial over a long period would not be feasible. Cross sectional studies of disability in people who perform regular exercise compared with those who are sedentary is of limited value because of selection bias. Fries's longitudinal design, however, controlled for several types of bias in the data analysis and showed that the subjects who exercised developed disability at one fourth of the rate of those who did not, despite the fact that the exercisers had a higher rate of fractures and short term disability related to their exercise behaviours. After nine years the disability differences between the two groups persisted.² Medical care costs were also one fourth lower in the exercising group. Although this study was not designed to analyse mortality as an outcome, members of the exercise group had lower mortality than those in the control group, as had been shown in previous studies.

The beneficial effect of exercise on other outcomes has been confirmed by recent reports. The Finnish study of Lakka and colleagues showed that higher levels of leisure time physical activity in men aged 42-60 years had a strong, graded, inverse association with the risk of acute myocardial infarction.³ The Rancho

Summary points

- Exercise has protective effects: it is associated with decreased disability score and decreased rate of myocardial infarction; it is also effective in very old people
- Multifactorial interventions decrease the likelihood of falls
- Low body mass considerably increases the risk of hip fracture in older women; other risk factors include alcohol consumption, prior stroke, low activity levels, use of long acting benzodiazepines, large caffeine consumption, and visual impairment
- Alendronate decreases vertebral fractures in older women and increases bone mass
- Influenza vaccine is efficacious and cost effective
- Though the apolipoprotein E4 allele is associated with Alzheimer's disease, a preventive strategy for Alzheimer's disease remains a distant goal

Bernardo study confirmed the beneficial effect of lifetime and current leisure exercise on bone mineral density of the hip in study participants with a mean age of 73 years.⁴ Fiatarone and colleagues found that the beneficial effects of exercise apply even to the very old population: study participants who were aged 72 to 98 years old showed benefits in muscle strength, gait velocity, and stair climbing power as compared with controls.⁵

Tinetti and colleagues showed that a multifaceted intervention, including an exercise programme, resulted in a significant reduction in the risk of falling among elderly people (aged 70 years or greater) living in the community.⁶ Professor Bernard Isaacs has emphasised for many years that falls occur throughout the life span and have very different aetiologies, consequences, and incidence rates in different developmental stages.⁷ For example, toddlers fall frequently during their attempts to learn to walk. They generally have little distance to fall and do so with little velocity. This sort of fall in general has little risk or adverse outcome and is a necessary developmental event. Older adults, however, fall because of waning sensory input (visual, auditory, vestibular, tactile, proprioceptive), delayed central processing, and diminished motor response.⁸ Falls may be the non-specific harbinger of acute medical illness in a frail older adult; the result of environmental hazards; or

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related to the use of medications or alcohol. In addition to causing serious injury, including fractures, falls lead to functional decline by causing fear of falling and self limitation of activity by older adults.⁸ Tinetti's multifactorial intervention to reduce the risk of falls in older people included evaluation of postural hypotension, use of benzodiazepines or other sedative-hypnotics, use of multiple medications, safety in bathroom transfers, environmental hazards, gait training, balance, transfer, and exercise training.⁶ Such evaluation is a strategy that can be easily applied in primary care and should result in a decreased rate of falls and functional decline for older adults (box).

Wagner and colleagues showed the benefits of a one time multicomponent intervention for decreasing falls and disability in people aged 65 years and older enrolled in a health maintenance organisation.⁹ Differences between the intervention and control groups were significant at the one year follow up but diminished by the second year.

Hip fractures

Hip fracture is one of the most dreaded consequences of falling and seems to be the result of both the fall itself and of the person's bone mineral density. Hip fractures are associated with excess mortality and with significant morbidity and functional decline. They are extremely common in very old people, with 1 in 3 women having sustained a hip fracture by their 90th birthday. Strategies to prevent hip fracture should focus on preventing falls and maximising bone mineral density. Since black women in the United States have about half the age specific incidence rate of hip fracture than white women, the report of the Northeast Fracture Study Group on the risk factors for hip fracture in black women is of particular interest to geriatricians.¹⁰ This case-control study compared black women admitted with a first hip

fracture to age matched hospitalised black women and age matched community dwelling black women. Body mass was the strongest identified risk factor for hip fracture. The women in the lowest fifth for body mass index had a considerably increased risk of hip fracture compared with the women in the highest fifth (odds ratio 13.5; 95% confidence interval 4.2 to 43.3). Since the prevalence of obesity in black women in the United States is about 60%, body mass may explain some of the racial differences in the rate of hip fracture in older women. Alcohol consumption, prior stroke, and use of an aid for walking were the other risk factors for hip fracture identified in this study.

In 1995 the Study of Osteoporotic Fractures Research Group reported its prospective study of the risk factors for hip fracture in white women.¹¹ They confirmed that heavier women have a lower risk of hip fracture and found that women who gained weight after age 25 had a lower risk of fracture. Women who weighed less than they did at age 25 had a doubled risk of hip fracture. Maternal history of hip fracture was also associated with a doubled risk of hip fracture. Low activity levels, use of long acting benzodiazepines, large caffeine consumption, and visual impairment were also identified as risk factors for hip fracture in this group. Risk factor identification is the first step to devising and testing prospectively a multifactorial intervention to decrease the rate of hip fracture in older women.¹²

Osteoporosis

The primary prevention of osteoporosis must begin early in life with attention to diet, exercise, and body weight. The value of oestrogen replacement therapy with calcium intake of 1 gram a day is well established for the prevention of postmenopausal osteoporotic fractures when begun in the perimenopausal years.

Targeted risk factors and corresponding interventions for decreasing falls and disability in people over 65

RISK FACTOR

Assessed by a nurse

Postural hypotension: drop in systolic blood pressure 20 mm Hg or to <90 mm Hg on standing

Use of any benzodiazepine or other sedative-hypnotic agent

Use of four or more prescription drugs
Inability to transfer safely to bathtub or toilet

Environmental hazards for falls or tripping

Assessed by a physical therapist

Any impairment in gait

Any impairment in transfer skills or balance

Impairment in leg or arm muscle strength or range of motion (hip, ankle, knee, shoulder, hand, elbow‡)

INTERVENTION

Behavioral recommendations, such as ankle pumps or hand clenching and elevation of head of bed; decrease in dosage, discontinuation, or substitution for drugs that may contribute to hypotension*

Education about the appropriate use of sedative-hypnotic agents; non-pharmacological treatment of sleep problems, such as sleep restriction; tapering and discontinuation of drugs*

Review of drugs with primary physician*

Training in transfer skills; environmental alterations, such as grab bars or raised toilet seats

Appropriate changes, such as removal of hazards, safer furniture (correct height, more stable), installation of structures such as grab bars or handrails on stairs

Gait training; use of an appropriate assistive device; balance or strengthening exercises†

Balance exercises‡; training in transfer skills; environmental alterations

Exercises with resistive bands and putty†

*Final decision on adjustments in drugs and dosage to be made by primary physician.

†Resistive and balance exercises to be performed twice daily for 15 to 20 minutes.

‡Listed in descending order of priority.

Adapted from E H Wagner *et al*;⁶ reprinted by permission of *New England Journal of Medicine*, copyright 1994, Massachusetts Medical Society.

Elderly people who exercise regularly develop disability at a quarter the rate of those who don't—and their medical care is less costly

The best strategy for secondary prevention in women aged 80 years or more with diminished bone mineral density and risk of fracture, or for tertiary prevention for the 80 year old who has already sustained a fracture, has been less clear. Recent studies confirm the beneficial effect of interventions for improving bone mineral density in older women. The beneficial effect of 400 IU of vitamin D3 supplementation daily over a two year period on increasing the femoral neck bone mineral density in women aged 70 years and older was confirmed by Ooms and colleagues,¹³ and alendronate has been found to have a beneficial effect on bone mineral density¹⁴ and on reducing the rate of vertebral fractures.¹⁵

Chesnut and colleagues showed that alendronate, a potent bisphosphonate, can produce significant reductions in markers of bone resorption and formation: in women up to 75 years in age it increased bone mass at the lumbar spine (7.21%), hip (5.27%), and total body (2.53%) over a 24 month period; subjects receiving placebo had decreased bone mass.¹⁴ The Alendronate Phase III Osteoporosis Treatment Study Group reported that alendronate increased bone mineral density in women aged up to 80 years and was associated with a 48% reduction in the proportion of women with new vertebral fractures, a decreased progression of spinal deformity, and a reduced loss of height.¹⁵ Since vertebral fractures are a cause of considerable pain, as well as functional decline, this report is an important clinical advance relevant to geriatricians treating older women. This study showed a trend towards reduced non-vertebral fractures at 36 months; it would be interesting to know if this trend would continue and gain statistical significance if studied longer. The effects of bisphosphonates on elderly osteoporotic men warrant more attention.

Influenza vaccination

Influenza vaccination is a preventive strategy of proved benefit for older people, but each year more than half of elderly Americans do not receive influenza vaccine. Studies from Minnesota and New York that evaluated the cost effectiveness of influenza vaccination found that it reduced hospitalisation and deaths from influenza and its complications in elderly people.^{16 17} The group from Minnesota also showed the effective-

ness of the influenza vaccine for healthy, working adults (including both health and economic benefits).¹⁸ Although influenza vaccination is currently recommended for health workers caring for older patients, it is often difficult to convince the younger workers that they should take the vaccine along with their patients; perhaps this study will help convince younger health workers of the benefits.

Alzheimer's disease

One of the most important causes of functional dependence and perhaps the most dreaded condition in old age is Alzheimer's disease. Although the association of apolipoprotein E with Alzheimer's disease is of considerable interest,¹⁹ understanding the pathogenesis of this age related disease remains illusive. To effectively decrease the number of years of dependent life expectancy for older adults, a preventive strategy for Alzheimer's disease will be needed. This remains a distant goal.

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Correction

The number needed to treat: a clinically useful nomogram in its proper context

An editorial error occurred in this article by Chatellier *et al* (17 February, p 426). On p 427 the formula for the odds ratio should have read:

$$\frac{P/(1-P)}{P_c/(1-P_c)}$$