

which successfully extended standard nursing practice to prevent falls in inpatients. A similar programme may be effective in Britain. STRATIFY may be applicable to many acute hospital elderly units. Further study is needed to determine whether the falls of inpatients identified as high risk can be prevented by a targeted intervention.

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- Rubenstein L, Josephson K, Robbins A. Falls in the nursing home. *Ann Intern Med* 1994;121:442-51.
- Morse K. *Preventing inpatient falls*. London: Sage Publications, 1996.
- De Vincenzo D, Watkins S. Accidental falls in a rehabilitation setting. *Rehabil Nurs* 1987;12(5):248-52.
- Baker S, Harvey A. Fall injuries in the elderly. *Clin Geriatr Med* 1985;1:501-12.
- Murphy J, Isaacs B. The post-fall syndrome. A study of 36 elderly inpatients. *Gerontology* 1982;28:265-70.
- Vetter N, Ford D. Anxiety and depression scores in elderly fallers. *Int J Geriatr Psychiatry* 1989;4:158-63.
- Liddle J, Gilleard C. The emotional consequences of falls for patients and their families. *Age Ageing* 1984;23(suppl 4):17.
- Bates D, Pruess K, Souney P, Platt R. Serious falls in hospitalised patients; correlates and resource utilisation. *Am J Med* 1995;99:137-43.

- Werner P, Koroknay V, Braun J. Individualised care alternatives in the process of removing physical restraints in the nursing home. *J Am Geriatr Soc* 1994;42:321-5.
 - Waterlow JA. A risk assessment card. *Nurs Times* 1985;81:48, 49-55.
 - Preventing falls and subsequent injury in older people. *Effective Health Care Bull* 1996;2(4):1-15.
 - Hindmarsh JJ, Estes EJ. Falls in older persons. Causes and interventions. *Arch Intern Med* 1989;149:2217-22.
 - Kapoor WN. Diagnostic evaluation of syncope. *Am J Med* 1991;90:91-106.
 - Nevitt MC, Cummings SR. Risk factors for recurrent non-syncopal falls. *JAMA* 1989;261:2663-8.
 - Schmid N. Reducing patient falls; a research-based comprehensive falls prevention programme. *Mil Med* 1990;155:202-7.
 - Morse J, Iyko S. Characteristics of the fall prone patient. *Gerontologist* 1987;27:516-22.
 - Gluck T, Rai G, Wientjes H. An evaluation of risk factors for falls in an acute and rehabilitation elderly care ward. *Gerontology* 1996;42(2):104-7.
 - Hodkinson HM. Evaluation of a mental test score for assessment of mental impairment in the elderly. *Age Ageing* 1972;1:233-8.
 - Collin C, Wade DT, Davies S, Horne V. The Barthel ADL index: a reliability study. *Int Disability Stud* 1988;10:61-9.
 - Streiner DL, Norman GR, Blum HM. *PDQ Epidemiology*. Toronto: B C Decker, 1989:33-8.
 - Cannard G. Falling trend. *Nurs Times* 1996;92(2):36-7.
 - Brady R, Chester F, Pierce L, Salter J, Schreck R, Radziewicz R. Geriatric falls; prevention strategies for the staff. Metro Health falls prevention programme. *J Gerontol Nurs* 1993;19(9):26-32.
 - Hendrich A. An effective unit-based fall prevention plan. *J Nurs Qual Assur* 1988;3(1):28-36.
 - Morton D. Five years of fewer falls. *Am J Nurs* 1989;6:204-5.
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Impact of mild cognitive impairment on survival in very elderly people: cohort study

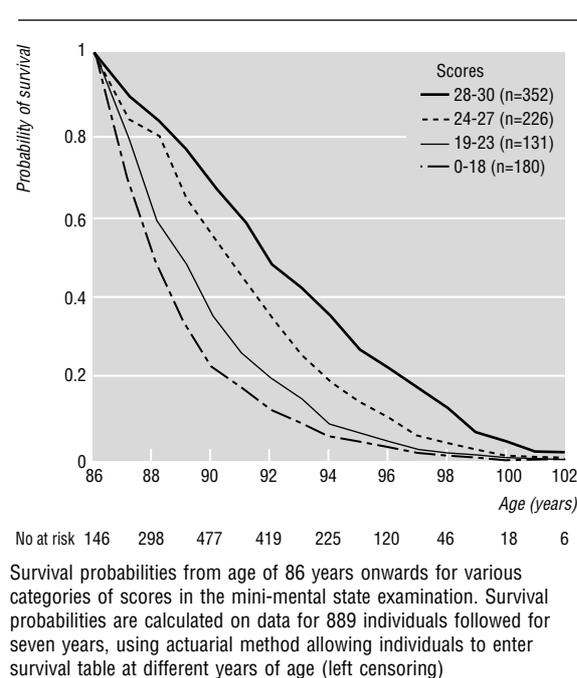
J Gussekloo, R G J Westendorp, E J Remarque, A M Lagaay, T J Heeren, D L Knook

Severe cognitive impairment is associated with increased mortality, but the impact of mild cognitive impairment on survival remains unclear.^{1,2} Although there is doubt whether a simple test such as the mini-mental state examination has sufficient discriminatory power to detect mild cognitive impairment in elderly people,³ we determined the impact of borderline scores in this particular examination on survival in very elderly people.

Subjects, methods, and results

As part of the Leiden 85-plus study⁴ we followed a cohort of 891 subjects (641 women, 250 men) aged 85 years and over (median age 90 (range 85-103) years) from 1986 onwards. At entry to the study the score on the mini-mental state examination (Dutch version) was assessed by a physician during a home visit. In cooperation with the local government all but two subjects were followed for survival up to 1 October 1996. In all, 790 subjects died. Relative risks of mortality were estimated in a Cox proportional hazards model, which was adjusted for sex and for age at baseline.

During the first year of follow up, the annual mortality risk for subjects with mild cognitive impairment (score 24-27 points, n = 226) was twice as high (relative risk 1.8 (95% confidence interval 1.1 to 3.0)) as the annual mortality risk for subjects with a normal cognitive function (score 28-30 points, n = 352). This difference in risk remained similar until the seventh year of follow up, after which the annual mortality risk decreased to unity.



Survival probabilities from age of 86 years onwards for various categories of scores in the mini-mental state examination. Survival probabilities are calculated on data for 889 individuals followed for seven years, using actuarial method allowing individuals to enter survival table at different years of age (left censoring)

The cumulative mortality risk of the subjects with a mild cognitive impairment during the first seven years of follow up was 1.7 (1.4 to 2.0). This risk estimate was similar for men and women and for subjects below and over 90 years of age at baseline. Compared with subjects with a normal cognitive function, the cumulative mortality risk for subjects with a moderate cognitive impairment (score 19-23 points, n = 131) was

Section of Gerontology and Geriatrics, Department of General Internal Medicine, University Hospital Leiden, P-3-Q, PO Box 9600, 2300 RC Leiden, Netherlands

J Gussekloo, general practitioner
E J Remarque, research fellow
A M Lagaay, senior registrar
D L Knook, professor

Clinical Epidemiology Leiden, University Hospital Leiden
R G J Westendorp, senior registrar

Department of Psychiatry, University of Utrecht, Utrecht
T J Heeren, professor

Correspondence to: Dr Gussekloo geronto@worldonline.nl

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2.5 (2.0 to 3.1), and for subjects with a severe cognitive impairment (score 0-18 points, n=180) the risk was 2.8 (2.3 to 3.4).

The association of scores in the mini-mental state examination and mortality is further illustrated in the figure representing the survival probabilities of subjects, calculated from the age of 86 years onwards.

Comment

In contrast with general belief, borderline scores in the mini-mental state examination cannot be considered to be normal and are associated with a significant decreased survival. Subjects with mild cognitive impairment may further deteriorate in cognitive function,⁵ which is again associated with a lower survival.

It is not likely that all observed excess mortality is due to an effect of mild cognitive impairment. It may well be that milder cognitive impairments are associated with physical illness and disabilities, which could by themselves account for the decreased survival. A typical example is that atherosclerosis underlies decline of cognition, as well as cardiovascular disease. It is therefore difficult to determine which part of the

observed mortality is due to atherosclerosis and which part to the mild impaired cognition.

Nevertheless borderline scores in the mini-mental state examination discriminate subjects with a higher risk of mortality. In practice, this easy to administer questionnaire seems to be useful as a screening instrument for mild cognitive impairment, and its scores may act as an important predictor of survival in very elderly people.

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- 1 Kelman HR, Thomas C, Kennedy GJ, Cheng J. Cognitive impairment and mortality in older community residents. *Am J Public Health* 1994;84:1255-60.
- 2 Liu IY, LaCroix AZ, White LR, Kittner SJ, Wolf PA. Cognitive impairment and mortality: a study of possible confounders. *Am J Epidemiol* 1990;132:136-43.
- 3 Tombaugh TN, McIntyre NJ. The mini-mental state examination: a comprehensive review. *J Am Geriatr Soc* 1992;40:922-35.
- 4 Heeren TJ, Lagaay AM, van Beek WCA, Rooijmans HGM, Hijmans W. Reference values for the mini-mental state examination (MMSE) in octo- and nonagenarians. *J Am Geriatr Soc* 1990;38:1093-6.
- 5 Izaks GJ, Gussekloo J, Dermout KMT, Heeren TJ, Ligthart GJ. Three-year follow-up of mini-mental state examination score in community residents aged 85 and over. *Psychol Med* 1995;25:841-8. (Accepted 24 June 1997)

Foot morbidity and exposure to chiropody: population based study

Ian Harvey, Stephen Frankel, Ronald Marks, David Shalom, Maria Morgan

Department of Social Medicine, Canynge Hall, Bristol BS8 2PR
Ian Harvey, senior lecturer in epidemiology and public health medicine

Stephen Frankel, professor of epidemiology and public health medicine

Department of Dermatology, University of Wales College of Medicine, Cardiff CF4 4XN

Ronald Marks, professor of dermatology

David Shalom, dermatology research registrar

Centre for Applied Public Health Medicine, Temple of Peace and Health, Cathays Park, Cardiff CF1 3NW

Maria Morgan, research officer

Correspondence to: Dr Harvey
i.harvey@bris.ac.uk

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Although one third of pensioners receive chiropody care, the NHS gives low priority to foot problems. Health economic assessment suggests that the cost effectiveness of chiropody surpasses other interventions.¹ While rationing of chiropody is well documented,² it is unknown whether delivery of service is targeted to those in greatest need. We investigated whether the extent of foot morbidity is a predictor of receipt of chiropody and whether chiropody is needs led or distributed according to less appropriate determinants.

Subjects, methods, and results

A random sample of 792 subjects aged 60 years and over from South Glamorgan Health Authority's register were contacted in 1988-91.³ Information about chiropody in the preceding 12 months was obtained, and their feet were examined for toe deformities (hallux valgus and lesser toe deformities), corns and callosities, ingrowing toenails, and toenail thickening. A foot morbidity index (index 1, range 0-5) was constructed with one point scored for each problem present (on either foot).

The analysis entailed modelling the impact of this index and of possible confounding variables on a binary outcome variable denoting receipt of chiropody care in the past year. Because a negative finding might be due to the effectiveness of care in remedying treatable conditions, a second index (index 2, range

0-2) including only bony disorders which chiropody care cannot correct was also modelled. Logistic regression was performed with spss for Windows.

In total 71% (560/792) of subjects responded (mean age 71.2), with no difference in age or sex composition between responders and the original population. The mean foot index scores were 2.5 (index 1) and 1.1 (index 2). Three or more foot problems were found in 53% (291/553), though only 33% (182/559) had received chiropody within the previous year.

Before adjustment the probability of receiving chiropody was higher among women, older subjects, those living alone, and those with more foot problems (table). There was no significant difference across social classes. Adjustment produced two important changes: both indices of foot problems ceased to be significantly associated, due mainly to adjustment for age; and subjects who lived alone become significantly less likely to receive chiropody, owing mainly to adjustment for age and sex.

Comment

Two fifths of those assessed as needing chiropody care do not receive it.¹ The gap in care is filled by spouses or children. The informal criteria that are used to determine how this service is rationed are unknown. This study indicates that foot morbidity—unlike demographic (age, sex) and social factors (whether subjects live alone)—is not an independent determinant of