The NEW ENGLAND JOURNAL of MEDICINE

Institution: UNIVERSITEIT MAASTRICHT | Sign In as Individual | Contact Subscription Administrator at Your Institution | FAQ

ORIGINAL ARTICLE

Volume 331:821-827 September 29, 1994 Number 13

Next▸

A Multifactorial Intervention to Reduce the Risk of Falling among Elderly People Living in the Community

Mary E. Tinetti, Dorothy I. Baker, Gail McAvay, Elizabeth B. Claus, Patricia Garrett, Margaret Gottschalk, Marie L. Koch, Kathryn Trainor, and Ralph I. Horwitz

ABSTRACT

Background Since falling is associated with serious morbidity among elderly people, we investigated whether the risk of falling could be reduced by modifying known risk factors.

Methods We studied 301 men and women living in the community who were at least 70 years of age and who had at least one of the following risk factors for falling: postural hypotension; use of sedatives; use of at least four prescription medications; and impairment in arm or leg strength or range of motion, balance, ability to move safely from bed to chair or to the bathtub or toilet (transfer skills), or gait. These subjects were given either a combination of adjustment in their medications, behavioral instructions, and exercise programs aimed at modifying their risk factors (intervention group, 153 subjects) or usual health care plus social visits (control group, 148 subjects).

Results During one year of follow-up, 35 percent of the intervention group fell, as compared with 47 percent of the control group (P = 0.04). The adjusted incidence-rate ratio for falling in the intervention group as compared with the control group was 0.69 (95 percent confidence interval, 0.52 to 0.90). Among the subjects who had a particular risk factor at base line, a smaller percentage of those in the intervention group than of those in the control group still had the risk factor at the time of reassessment, as follows: at least four prescription medications, 63 percent versus 86 percent, P = 0.009; balance impairment, 21 percent versus 46 percent, P = 0.001; impairment in toilet-transfer skills, 49 percent versus 65 percent, P = 0.05; and gait impairment, 45 percent versus 62 percent, P = 0.07.

Conclusions The multiple-risk-factor intervention strategy resulted in a significant reduction in the risk of falling among elderly persons in the community. In addition, the proportion of persons who had the targeted risk factors for falling was reduced in the intervention group, as compared with the control group. Thus, risk-factor modification may partially explain the reduction in the risk of falling.

THIS ARTICLE

Abstract

COMMENTARY

Letters

TOOLS & SERVICES

Add to Personal Archive
Add to Citation Manager
Notify a Friend
E-mail When Cited

MORE INFORMATION

Find Similar Articles
PubMed Citation

Falling is a serious public health problem among elderly people because of its frequency, the morbidity associated with falls, and the cost of the necessary health care[1,2,3].

Approximately 30 percent of people over 65 years of age who live in the community fall each year[4,5,6]. Unintentional injury, which most often results from a fall, ranks as the sixth leading cause of death among people over 65 years of age[1]. The nonfatal results of falls include physical injury,[4,7] fear,[4] functional deterioration,[8,9,10,11,12] and institutionalization[8,9,10,11]. Although the total costs associated with falls are unknown, the yearly costs for acute care associated with fall-related fractures are estimated at $10 billion[1,2].

Several potentially modifiable risk factors for falling, such as muscle weakness, impairment in balance, and use of medications, have been identified[1,4,5,6,7]. Furthermore, the risk of falling increases with the number of risk factors present,[4,7] suggesting that a multifactorial strategy of risk-factor abatement may reduce the risk of falling.

Uncontrolled studies have reported a potential effect of such interventions on the incidence of falls,[13,14] but preventive strategies have not proved effective in controlled trials to date[15,16,17,18]. These negative results could have occurred because the subjects were either at too high or too low a risk of falling to benefit or because the interventions were not intensive enough. Alternatively, falls may not be preventable among elderly persons.

We conducted a controlled study of the effects of a program of multiple-risk-factor reduction on the incidence of falls among elderly people. The primary aim was to assess the effectiveness of the multifactorial targeted risk-abatement strategy in reducing the risk of falls among elderly persons in the community. A secondary aim was to determine whether the strategy was effective in altering the targeted risk factors themselves.

Methods

Setting and Subjects

The details of the study design and methods have been reported elsewhere and are summarized here[19]. The potential subjects were the 2522 enrollees of a health maintenance organization (HMO) in southern Connecticut who were at least 70 years of age. Sixteen of the 17 eligible physicians who cared for at least 100 of these enrollees agreed to participate. For reasons previously described, the 16 physicians were frequency-matched into four groups of 4 physicians each, on the basis of their high or low scores on two measures -- namely, the number of people at least 70 years of age among their patients (>150 vs. ≤150) and the mean number of new prescriptions written per office visit (≥ 1 vs. <1)[19]. Two physicians in each group of four were assigned randomly to the control group, and two to the intervention group. Enrolled subjects were assigned to the same study group as their physicians.

The eligibility criteria, in addition to age, included independent ambulation, residence outside a nursing home (i.e., in the community), no current enrollment in another study of aging, a score of at least 20 on the Folstein Mini-Mental State Examination,[20] no participation in vigorous sports or walking for exercise within the month before enrollment, and at least one of the risk factors described below. Enrollment took place between October 1, 1990, and April 30, 1992. By means of a random-number generator in SAS software on a PC computer, each patient was assigned a priority number within the physician's practice[21]. Patients were screened sequentially until approximately 20 eligible and consenting subjects were enrolled from each physician's practice. Of the 2229 potential subjects selected randomly, 1950 (87 percent) agreed to be screened. A total of 355 screened subjects (18 percent) met the eligibility criteria. Among these eligible subjects, 301 (85 percent) agreed to participate; 153 subjects were assigned to the intervention group, and 148 to the control group. The eligible patients who declined to participate did not differ significantly from the enrolled subjects in terms of age, sex, or group assignment.

Assessment and Intervention

The development of the assessment and intervention protocols has been described in detail elsewhere[19]. The risk factors were selected on the basis of evidence of their association with the risk of falling and the availability of assessment measures and interventions considered feasible in usual clinical practice. The risk factors we targeted and the corresponding interventions are shown in Table 1.

View this table: [in this window] [in a new window]	**Table 1.** Targeted Risk Factors and Corresponding Interventions.

The base-line assessments were conducted in the subjects' homes by the study nurse practitioner and physical therapist, who were unaware of the group assignments. The nurse practitioner obtained demographic data, a history of falls, and information on depressive symptoms,[22] the presence of chronic diseases, and the level of independence in activities of daily living[23] and administered the Falls Efficacy Scale, a measure of the subject's degree of confidence in performing 10 common activities (such as walking and stair climbing) without falling,[24] and the ambulation and mobility subscales of the Sickness Impact Profile[25]. She also assessed corrected near vision[26] and hearing[27]. The names and dosages of all prescription and nonprescription medications were recorded from the containers. The number of hazards for falling was determined by a room-by-room examination of walking paths, furniture, and stairs.

Within one week of the nurse practitioner's assessment, the physical therapist visited the subjects to assess the risk factors listed in Table 1. Strength and joint impairment were identified by manual muscle testing and tests of range of motion, respectively[28,29]. The assessments of balance and transfer skills[30] involved observing the subjects for instability while they were sitting, moving to and from a chair or bed, standing, carrying objects, bending over, and reaching. Deviation from a path, missed steps, step height and length, stability in turning, trunk position, and appropriate use of walking aids were observed while the subjects walked 6.1 m (20 ft) on flat and uneven surfaces.

These assessments were repeated for 250 of the 301 participants (83 percent) a median of 4.5 months after the base-line assessment. The staff members performing the reassessments did not know the subjects' group assignments.

Intervention Group

The subjects assigned to the intervention group received the interventions listed in Table 1 as indicated in the base-line assessment[31,32,33,34]. Decision rules and priority lists were used to select standardized intervention protocols for each identified risk factor[19,30]. Recommendations to adjust medications were discussed with the subjects' primary physicians, who then made the final decisions.

Home visits for physical therapy involved gait or transfer-skill training, if needed, as well as instruction in the progressive, competency-based balance and strengthening exercise programs[30]. Simple illustrated instructions with large print were provided for each exercise program. Subjects were instructed to perform the exercises twice a day for 15 to 20 minutes per session.

The intervention phase lasted three months after the base-line assessment but was extended if the subjects had health problems that interfered temporarily with their ability to exercise. The maintenance phase, during which the study staff contacted the subjects monthly, lasted from the end of the intervention phase until six months after enrollment. Adherence to the exercise programs, as reported by the subjects, was assessed by the physical therapist on a weekly basis.

Control Group

The subjects assigned to the control group received home visits from social-work students, during which structured interviews were conducted[19,35]. The number of social visits was matched to the estimated number of visits by a nurse practitioner or physical therapist that would be required for subjects in the intervention group who had comparable risk factors.

Outcome

The primary outcome we studied was the incidence of falls,[24] as recorded on a calendar that subjects mailed to the research staff monthly. The subjects were contacted by an interviewer who was blinded to their group assignments if no calendar was returned or if a fall was indicated for any day of the month[11]. During a follow-up telephone interview, the subjects were asked about medical care sought after falls and injuries sustained. Serious injuries included fractures, head injuries requiring hospitalization, joint dislocations or severe sprains, and lacerations requiring suturing[24]. Monitoring for falls and injuries began on the day of the physical therapist's base-line assessment. Data on falls for one year of follow-up (or up to the occurrence of a fall before loss to follow-up) were available for 147 subjects in the intervention group and 144 in the control group.

Reasons for the 10 losses to follow-up included death (n = 8), severe illness (n = 1), and a decision by the subject not to continue in the study (n = 1).

Statistical Analysis

Base-line characteristics were compared in the two study groups. The length of time to the first fall was compared in the two groups with a log-rank test. The proportion of subjects in each group who fell was compared by means of a crude relative risk. Adjusted relative risks were calculated with use of a generalized linear interactive model[36] by modeling the logarithmically transformed outcome probabilities as a linear function of the covariates[37,38]. Tests of the interaction of covariates with group assignment were also examined with this model. Since it was the physicians, rather than the subjects, who were assigned randomly to the treatment groups, we tested whether our results might be due to the observed pattern of physician assignment, using a randomization test[39]. Within each block of four physicians, all permutations of physicians' assignment to the intervention and control groups were obtained (n = 1296); the associated relative risks were calculated and ranked from low to high. The calculated relative risk for the physician-assignment pattern observed in our study was contained in the lowest 5 percent of this normal distribution of relative risks, indicating that our findings were not due merely to the way in which physicians were randomly assigned. Therefore, all further analyses were conducted with the study subjects used as the unit of analysis.

The total incidence density -- that is, the total number of falls divided by the total number of person-weeks of follow-up -- was calculated as a measure of the rate of falls within each group and used to obtain crude incidence-rate ratios. Adjusted incidence-rate ratios were calculated by means of a pooled logistic-regression model[40,41] (with SAS software on a PC computer[21]). Each week of follow-up was assumed to represent an independent period of observation and was included separately for each subject. For each week, the outcome was defined as the occurrence of a fall or no fall, and base-line as well as time-dependent characteristics were included as covariates. To account for the interdependence of observations, dummy variables that modeled the number of previous falls (0, 1, 2, or $\geq$ 3) and the week of the study (1 through 52) were included as potential covariates.

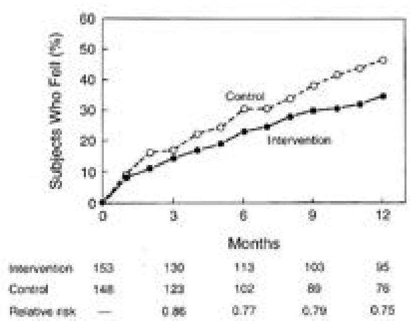
For subjects who had reassessment interviews, we examined the effect of the intervention on each of the eight risk factors by means of a chi-square test; changes in the total number of risk factors, the environmental-hazard score, and the score on the Falls Efficacy Scale were examined by analysis of covariance, with the base-line score and the study group as independent variables. All P values are two-tailed.

Results

The base-line characteristics of the subjects in the two groups were similar (Table 2), although a slightly higher proportion of the intervention group than of the control group had education beyond high school, and a lower proportion had impairment of leg strength. The mean number of risk factors per subject was similar in the two groups.

View this table:	
[in this window] [in a new window]	**Table 2.** Base-Line Characteristics of the Subjects, According to Treatment Group.

There was a significant difference between the intervention and control groups in the length of time to the first fall (P = 0.05) (Figure 1) and in the proportion of subjects who fell (35 percent vs. 47 percent, P = 0.04) (Table 3); the crude incidence-rate ratio for falls in the intervention group as compared with the control group was 0.64 (95 percent confidence interval, 0.49 to 0.83) (Table 3). The risk reduction associated with the intervention was maintained in multivariate analyses in which we adjusted for age, sex, previous falls, and number of risk factors, as well as the week of follow-up for the incidence-rate ratio (Table 3). Although the numbers were small, a similar trend toward a reduction in risk in the intervention group was seen for falls requiring medical care or resulting in serious injury (Table 3). Seven subjects in the control group (5 percent) and four subjects in the intervention group (3 percent) had fractures.



View larger version (11K):
[in this window]
[in a new window]

Figure 1. Cumulative Percentages of Subjects in the Intervention and Control Groups Who Had One or More Falls during One Year of Follow-up.

The difference between the groups was significant (P = 0.05, by the log-rank test). The numbers still at risk for a fall at 3, 6, 9, and 12 months are shown below the figure. Only 10 of the subjects were lost to follow-up: 6 in the intervention group and 4 in the control group. Data on subjects were censored after a fall. The cumulative relative risks are shown for 3, 6, 9, and 12 months of follow-up.

View this table:	
[in this window] [in a new window]	**Table 3.** Incidence of Falls and Other Events during One Year of Follow-up, According to Treatment Group.

The mean (±SD) change in the scores on the Falls Efficacy Scale, on which higher scores indicate greater self-confidence, differed significantly (P = 0.02) between the control group (-1.2 ±4.9) and the intervention group (+0.2 ±3.9), with adjustment for the base-line score. There was no significant difference between the two groups in the mean change in the Sickness Impact Profile scores.

Targeted Intervention Process

The subjects in the intervention group received a mean of 7.8 ±4.0 home visits (range, 0 to 22), as compared with 6.2 ±3.8 (range, 0 to 14) for the control subjects (t = 3.62, P<0.001). Eleven subjects in the intervention group did not complete the intervention phase, including eight who declined to do so and three in whom intervening illnesses developed.

Table 4 shows the number of subjects in the intervention group with each risk factor and the types of interventions they received. The most common reason for not receiving an intervention for a risk factor was the presence of factors with a higher priority or a contraindication to the intervention.

View this table: [in this window] [in a new window]	**Table 4.** Subjects in the Intervention Group Who Received Interventions and Types of Interventions Received.

Subjects in the intervention group reported performing 73 percent of the recommended exercise sessions, for a mean of 10 sessions each week. Sixty-five percent of these subjects performed at least 70 percent of sessions; 85 percent of subjects performed over half of the exercise sessions.

Risk factors were reassessed for 131 members (86 percent) of the intervention group and 119 members (80 percent) of the control group a median of 4.5 months after the base-line assessment. The percentage of subjects in the intervention and control groups who had a risk factor at base line and continued to have it at reassessment is shown in Table 5. At reassessment, a significantly smaller percentage of the intervention group than of the control group continued to use at least four prescription medications, to transfer unsafely to bathtub or toilet, or to have impairment in balance or gait. Overall, the intervention group had a mean decline of 1.1 ±1.6 in the total number of risk factors, as compared with a decrease of 0.6 ±1.4 in the control group (P = 0.03). When the change in the number of risk factors was added to the model predicting the occurrence of falls among the 242 subjects with complete reassessment data, treatment assignment was no longer significant, and the risk of falling declined by 11 percent (adjusted relative risk, 0.89; 95

percent confidence interval, 0.79 to 1.00) for each decrease of 1.0 in the number of risk factors.

View this table: [in this window] [in a new window]	**Table 5.** Subjects with Each Risk Factor at Base Line Who Had the Risk Factor at Reassessment.

Adverse Events

As shown in Table 3, there was no significant difference in the number of subjects in the two groups who died or were hospitalized, although those in the inter-intervention group had fewer hospitalizations and fewer hospital days. The musculoskeletal symptoms of 10 subjects in the intervention group were thought to be probably related to the exercise program. All these events were self-limited.

Cost Effectiveness

The total cost of the intervention, including development, equipment, personnel, travel, and overhead costs, was $136,318, or an average of $891 per subject in the intervention group. The cost per fall prevented ($136,318 divided by 70 [164 falls in the control group - 94 in the intervention group]) was $1,947. The cost for preventing one fall that required medical care was $12,392.

Discussion

Contrary to the results of earlier intervention trials,[15,16,17,18] the targeted-intervention strategy reported here was associated with a reduction in the proportion of subjects who fell and in the incidence of falls. Although the numbers were small, the subjects in the intervention group also reported fewer injuries and fewer episodes of medical care associated with falls. Selecting study subjects at risk for falling, targeting multiple modifiable risk factors, and implementing the interventions ourselves may all have contributed to the effectiveness of the intervention. Although it is not possible to determine whether risk-factor reduction was definitely responsible for the decrease in falls, the reduction in the number of risk factors in a larger proportion of the intervention group than of the control group, the reduction in the effect of treatment when the change in risk factors was added to the model, and the relation between the change in the number of risk factors and the incidence of falls all suggest that risk-factor reduction at least partially explained the decrease in the occurrence of falls.

The greatest difference between the two groups was among subjects with impairments in balance or transfer skills and among those who took four or more prescription medications. The effect on medications in the subjects in the intervention group could have resulted directly from the nurse's counseling the patients and contacting physicians. In addition, several physicians reported a heightened awareness of the relation between medications and falling and of the frequency of postural hypotension. Similar proportions of subjects in the control and intervention groups reported no longer using sedatives at the time of reassessment, perhaps reflecting intermittent use of these medications.

The absence of a greater effect of the interventions on muscle strength could be explained by the fact that manual muscle testing is insensitive to change. Also, because of the priorities assigned to the various risk factors, some subjects with muscle weakness did not receive instructions for a strengthening exercise program. Even for the muscle groups exercised, the intensity or duration of the exercise program may not have been great enough to effect improvement.

As is often observed in clinical trials, a high proportion of control subjects had reductions or improvement in the risk factors[42]. Inherent variability in the risk factors, heightened motivation among subjects participating in a trial, and reassessment selectively biased toward healthier subjects could all explain the improvement in the control subjects. Regardless of the reasons, the higher proportion of subjects in the intervention group who had improvement in blinded assessments suggests that the intervention did have a positive effect on these risk factors.

Several of our methods deserve comment. The use of a matched-block design, rather than purely random sampling, was necessary to prevent the contamination of results that might have occurred if physicians had cared for subjects in both control and intervention groups[19]. The groups appeared well matched, and simulation modeling revealed a similar effect of the intervention among all the physicians' patient groups.

As is typical of patients enrolled in HMOs, a high proportion of the subjects were white and had more than a high-school education. We believe the selection of the HMO setting was essential to ensure that the physicians seen by the subjects were an integral part of the medication protocols. The generalizability of the effects of the intervention will need to be determined in other health care settings.

More complete reporting of falls could have occurred in the intervention group than in the control group because of the greater attention received by the subjects in the intervention group, whereas underreporting could have occurred if those subjects had perceived that investigators wanted to see a reduction in falls. Bias alone, however, is unlikely to explain fully the differences between the two groups, since similar trends were seen in terms of falls requiring medical care and falls causing injury, events less susceptible to reporting bias.

This risk-reduction strategy could readily be implemented as part of the clinical care of elderly patients. Third-party reimbursement will be more likely if there is evidence of savings due to treatments that were prevented. For falls requiring medical care, the cost per fall prevented -- $12,392 -- compares favorably with a mean charge of $11,800 per hospitalization for injuries caused by falls among persons 65 years of age or older[43]. Indeed, a complete analysis of total and fall-related health care costs may show the intervention to result in a net cost savings.

Finally, because many of the risk factors for falling also contribute to immobility and functional decline, the strategy studied here could result in a reduction in the incidence of falls as well as in an improvement in functional independence among elderly patients. This improvement in function is likely, since the intervention not only reduced the number of risk factors and decreased the incidence of falls, but also increased the subjects' confidence in performing daily activities -- an important independent determinant of daily functioning[44].

Supported by a grant (UO1 AG09087) from the National Institute on Aging. Dr. Tinetti was a Kaiser Family Foundation Faculty Scholar.

We are indebted to Leo Cooney, M.D., for reviewing the manuscript, to Margaret Carlson and Betty McLellan for assistance in the preparation of the manuscript, and to the physicians and staff of the Community Health Care Plan for their outstanding cooperation in carrying out this study.

Source Information

From the Departments of Medicine (M.E.T., P.G., R.I.H.) and Epidemiology and Public Health (G.M., E.B.C., K.T.), Yale University School of Medicine, and the Yale University School of Nursing (D.I.B.), New Haven, Conn.; the Department of Rehabilitation Services, Yale-New Haven Hospital, New Haven, Conn. (M.G.); and the Department of Physical Therapy, Quinnipiac College, Hamden, Conn. (M.L.K.).

Address reprint requests to Dr. Tinetti at 333 Cedar St., P.O. Box 208025, New Haven, CT 06520-8025.

References

1. Sattin RW. Falls among older persons: a public health perspective. Annu Rev Public Health 1992;13:489-508.[CrossRef][Medline]

2. Falls in older persons: risk factors and prevention. In: Berg RL, Cassells JS, eds. The second fifty years: promoting health and preventing disability. Washington, D.C.: National Academy Press, 1990:263-90.

3. Healthy people 2000: national health promotion and disease prevention objectives. Washington, D.C.: Department of Health and Human Services, 1990. (DHHS publication no. (PHS) 91-50213.)

4. Tinetti ME, Speechley M, Ginter SF. Risk factors for falls among elderly persons living in the community. N Engl J Med 1988;319:1701-1707.[Abstract]

5. Blake AJ, Morgan K, Bendall MJ, et al. Falls by elderly people at home: prevalence and associated factors. Age Ageing 1988;17:365-372.[Abstract]

6. Campbell AJ, Borrie MJ, Spears GF. Risk factors for falls in a community-based prospective study of people 70 years and older. J Gerontol 1989;44:M112-M117.[Medline]

7. Nevitt MC, Cummings SR, Kidd S, Black D. Risk factors for recurrent nonsyncopal falls: a prospective study. JAMA 1989;261:2663-2668.[Abstract]

8. Wolinsky FD, Johnson RJ, Fitzgerald JF. Falling, health status, and the use of health services by older adults: a prospective study. Med Care 1992;30:587-597.[Medline]

9. Kiel DP, O'Sullivan P, Teno JM, Mor V. Health care utilization and functional status in the aged following a fall. Med Care 1991;29:221-228.[Medline]

10. Dunn JE, Rudberg MA, Furner SE, Cassel CK. Mortality, disability, and falls in older persons: the role of underlying disease and disability. Am J Public Health 1992;82:395-400.[Abstract]

11. Tinetti ME, Liu WL, Claus EB. Predictors and prognosis of inability to get up after falls among elderly persons. JAMA 1993;269:65-70.[Abstract]

12. Kosorok MR, Omenn GS, Diehr P, Koepsell TD, Patrick DL. Restricted activity days among older adults. Am J Public Health 1992;82:1263-1267.[Abstract]

13. Wolf-Klein GP, Silverstone FA, Basavaraju N, Foley CJ, Pascaru A, Ma PH. Prevention of falls in the elderly population. Arch Phys Med Rehabil 1988;69:689-691.[Medline]

14. Neufeld RR, Tideiksaar R, Yew E, et al. A multidisciplinary falls consultation service in a nursing home. Gerontologist 1991;31:120-123.[Abstract]

15. Rubenstein LZ, Robbins AS, Josephson KR, Schulman BL, Osterweil D. The value of assessing falls in an elderly population: a randomized clinical trial. Ann Intern Med 1990;113:308-316.[Medline]

16. Reinsch S, MacRae P, Lachenbruch PA, Tobis JS. Attempts to prevent falls and injury: a prospective community study. Gerontologist 1992;32:450-456.[Abstract]

17. Vetter NJ, Lewis PA, Ford D. Can health visitors prevent fractures in elderly people? BMJ 1992;304:888-890.[Medline]

18. Hornbrook MC, Stevens VJ, Wingfield DJ, Hollis JF, Greenlick MR, Ory MG. Preventing falls among community-dwelling older persons: results from a randomized trial. Gerontologist 1994;34:16-23.[Abstract]

19. Tinetti ME, Baker DI, Garrett PA, Gottschalk M, Koch ML, Horwitz RI. Yale FICSIT: risk factor abatement strategy for fall prevention. J Am Geriatr Soc 1993;41:315-320.[Medline]

20. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state": a practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res 1975;12:189-198.[CrossRef][Medline]

21. SAS/STAT user's guide: release 6.03 ed. Cary, N.C.: SAS Institute, 1988.

22. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. Appl Psychol Meas 1977;1:385-401.

23. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. Gerontologist 1969;9:179-186.[Medline]

24. Buchner DM, Hornbrook MC, Kutner NG, et al. Development of the common data base for the FICSIT trials. J Am Geriatr Soc 1993;41:297-308.[Medline]

25. Bergner M, Bobbitt RA, Carter WB, Gilson BS. The Sickness Impact Profile: development and final revision of a health status measure. Med Care 1981;19:787-805.[Medline]

26. Spaeth EB, Fralick FB, Hughes WF Jr. Estimation of loss of visual efficiency. Arch Ophthalmol 1955;54:462-468.

27. Macphee GJA, Crowther JA, McAlpine CH. A simple screening test for hearing impairment in elderly patients. Age Ageing 1988;17:347-351.[Abstract]

28. Hoppenfeld S. Physical examination of the spine and extremities. New York: Appleton-Century-Crofts, 1976.

29. American Academy of Orthopedic Surgeons. Method of measuring and recording. Chicago: American Academy of Surgeons, 1965.

30. Koch M, Gottschalk M, Baker DI, Palumbo S, Tinetti ME. An impairment and disability assessment and treatment protocol for community-living elderly persons. Phys Ther 1994;74:286-294.[Medline]

31. Lipsitz LA. Orthostatic hypotension in the elderly. N Engl J Med 1989;321:952-957.[Medline]

32. Prinz PN, Vitiello MV, Raskind MA, Thorpy MJ. Geriatrics: sleep disorders and aging. N Engl J Med 1990;323:520-526.[Medline]

33. Gottlieb GL. Sleep disorders and their management: special considerations in the elderly. Am J Med 1990;88:Suppl 3A:29S-33S.[Medline]

34. Spielman AJ, Saskin P, Thorpy MJ. Treatment of chronic insomnia by restriction of time in bed. Sleep 1987;10:45-56.[Medline]

35. Merriam SB. The structure of simple reminiscence. Gerontologist 1989;29:761-767.[Abstract]

36. Baker RJ, Nelder JA. The GLIM system: release 3. Oxford, England: Royal Statistical Society, 1978.

37. Wacholder S. Binomial regression in GLIM: estimating risk ratios and risk differences. Am J Epidemiol 1986;123:174-184.[Abstract]

38. Risch HA, Weiss NS, Clarke EA, Miller AB. Risk factors for spontaneous abortion and its recurrence. Am J Epidemiol 1988;128:420-430.[Abstract]

39. Edgington ES. Randomization tests. New York: Marcel Dekker, 1980.

40. O'Loughlin JL, Robitaille Y, Boivin J-F, Suissa S. Incidence of and risk factors for falls and injurious falls among the community-dwelling elderly. Am J Epidemiol 1993;137:342-354.[Abstract]

41. Hosmer DW Jr, Lemeshow S. Applied logistic regression. New York: John Wiley, 1989:238-45.

42. Multiple Risk Factor Intervention Trial Research Group. Multiple risk factor intervention trial: risk factor changes and mortality results. JAMA 1982;248:1465-1477.[Abstract]

43. Covington DL, Maxwell JG, Clancy TV. Hospital resources used to treat the injured elderly at North Carolina trauma centers. J Am Geriatr Soc 1993;41:847-852.[Medline]

44. Tinetti ME, Mendes de Leon CF, Doucette JT, Baker DI. Fear of falling and fall-related efficacy in relationship to functioning among community-living elders. J Gerontol 1994;49:M140-M147.[Medline]

Related Letters:

Reducing the Risk of Falls among the Elderly
Kaplan M. S., Burtscher M., Bettigole R., Tinetti M., Baker D.I.
Extract | Full Text
N Engl J Med 1995; 332:268-269, Jan 26, 1995.
Correspondence

This article has been cited by other articles:

- Warburton, D. E.R., Nicol, C. W., Bredin, S. S.D. (2006). Health benefits of physical activity: the evidence. *Can Med Assoc J* 174: 801-809 [Abstract] [Full Text]
- Wolf, S. L., O'Grady, M., Easley, K. A., Guo, Y., Kressig, R. W., Kutner, M. (2006). The Influence of Intense Tai Chi Training on Physical Performance and Hemodynamic Outcomes in Transitionally Frail, Older Adults. *J Gerontol A Biol Sci Med Sci* 61: 184-189 [Abstract] [Full Text]
- Royal, S, Smeaton, L, Avery, A J, Hurwitz, B, Sheikh, A (2006). Interventions in primary care to reduce medication related adverse events and hospital admissions: systematic review and meta-analysis. *Qual Saf Health Care* 15: 23-31 [Abstract] [Full Text]
- Volpato, S., Leveille, S. G., Blaum, C., Fried, L. P., Guralnik, J. M. (2005). Risk Factors for Falls in Older Disabled Women With Diabetes: The Women's Health and Aging Study. *J Gerontol A Biol Sci Med Sci* 60: 1539-1545 [Abstract] [Full Text]
- Droge, W. (2005). Oxidative Aging and Insulin Receptor Signaling. *J Gerontol A Biol Sci Med Sci* 60: 1378-1385 [Abstract] [Full Text]
- Holland, S. K., Greenberg, J., Tidwell, L., Malone, J., Mullan, J., Newcomer, R. (2005). Community-Based Health Coaching, Exercise, and Health Service Utilization. *J Aging Health* 17: 697-716 [Abstract]
- Yardley, L., Beyer, N., Hauer, K., Kempen, G., Piot-Ziegler, C., Todd, C. (2005). Development and initial validation of the Falls Efficacy Scale-International (FES-I). *Age Ageing* 34: 614-619 [Abstract] [Full Text]
- Campbell, A J., Robertson, M C., La Grow, S. J, Kerse, N. M, Sanderson, G. F, Jacobs, R. J, Sharp, D. M, Hale, L. A (2005). Randomised controlled trial of prevention of falls in people aged >=75 with severe visual impairment: the VIP trial. *BMJ* 331: 817- [Abstract] [Full Text]

- Rosen, C. J. (2005). Postmenopausal Osteoporosis. *NEJM* 353: 595-603 [Full Text]
- Kallin, K., Gustafson, Y., Sandman, P.-O., Karlsson, S. (2005). Factors Associated With Falls Among Older, Cognitively Impaired People in Geriatric Care Settings: A Population-Based Study. *AJGP* 13: 501-509 [Abstract] [Full Text]
- Giresi, P. G., Stevenson, E. J., Theilhaber, J., Koncarevic, A., Parkington, J., Fielding, R. A., Kandarian, S. C. (2005). Identification of a molecular signature of sarcopenia. *Physiol. Genomics* 21: 253-263 [Abstract] [Full Text]
- Li, F., Harmer, P., Fisher, K. J., McAuley, E., Chaumeton, N., Eckstrom, E., Wilson, N. L. (2005). Tai Chi and Fall Reductions in Older Adults: A Randomized Controlled Trial. *J Gerontol A Biol Sci Med Sci* 60: 187-194 [Abstract] [Full Text]
- Huggett, D. L., Connelly, D. M., Overend, T. J. (2005). Maximal Aerobic Capacity Testing of Older Adults: A Critical Review. *J Gerontol A Biol Sci Med Sci* 60: 57-66 [Abstract] [Full Text]
- Gagnon, N., Flint, A. J., Naglie, G., Devins, G. M. (2005). Affective Correlates of Fear of Falling in Elderly Persons. *AJGP* 13: 7-14 [Abstract] [Full Text]
- Kovacs, C. R. (2005). Age-Related Changes in Gait and Obstacle Avoidance Capabilities in Older Adults: A Review. *Journal of Applied Gerontology* 24: 21-34 [Abstract]
- Harwood, R H, Foss, A J E, Osborn, F, Gregson, R M, Zaman, A, Masud, T (2005). Falls and health status in elderly women following first eye cataract surgery: a randomised controlled trial. *Br. J. Ophthalmol.* 89: 53-59 [Abstract] [Full Text]
- Newcomer, R., Maravilla, V., Faculjak, P., Graves, M. T. (2004). Outcomes of Preventive Case Management Among High-Risk Elderly in Three Medical Groups: A Randomized Clinical Trial. *Eval Health Prof* 27: 323-348 [Abstract]
- Barnett, L. M., van Beurden, E., Eakin, E. G., Beard, J., Dietrich, U., Newman, B. (2004). Program sustainability of a community-based intervention to prevent falls among older Australians. *Health Promot. Int.* 19: 281-288 [Abstract] [Full Text]
- Kenny, R A, Shaw, F E, O'Brien, J T, Scheltens, P H, Kalaria, R, Ballard, C (2004). Carotid sinus syndrome is common in dementia with Lewy bodies and correlates with deep white matter lesions. *J. Neurol. Neurosurg. Psychiatry* 75: 966-971 [Abstract] [Full Text]
- Penson, R. T., Daniels, K. J., Lynch, T. J. Jr. (2004). Too Old to Care?. *Oncologist* 9: 343-352 [Abstract] [Full Text]
- Clark, D. O., Stump, T. E., Damush, T. M. (2003). Outcomes of an Exercise Program for Older Women Recruited through Primary Care. *J Aging Health* 15: 567-585 [Abstract]
- Rowe, M. A., Fehrenbach, N. (2004). Injuries Sustained by Community-Dwelling Individuals With Dementia. *Clin Nurs Res* 13: 98-110 [Abstract]
- Lipsitz, L. A. (2004). Physiological Complexity, Aging, and the Path to Frailty. *SCI AGING KNOWL ENVIRON* 2004: pe16-pe16 [Abstract] [Full Text]
- Chang, J. T, Morton, S. C, Rubenstein, L. Z, Mojica, W. A, Maglione, M., Suttorp, M. J, Roth, E. A, Shekelle, P. G (2004). Interventions for the prevention

of falls in older adults: systematic review and meta-analysis of randomised clinical trials. *BMJ* 328: 680- [Abstract] [Full Text]

- Knapik, J J, Bullock, S H, Canada, S, Toney, E, Wells, J D, Hoedebecke, E, Jones, B H (2004). Influence of an injury reduction program on injury and fitness outcomes among soldiers. *Inj Prev* 10: 37-42 [Abstract] [Full Text]
- Latham, N. K., Bennett, D. A., Stretton, C. M., Anderson, C. S. (2004). Systematic Review of Progressive Resistance Strength Training in Older Adults. *J Gerontol A Biol Sci Med Sci* 59: M48-61 [Abstract] [Full Text]
- Tsilimingras, D., Rosen, A. K., Berlowitz, D. R. (2003). Review Article: Patient Safety in Geriatrics: A Call for Action. *J Gerontol A Biol Sci Med Sci* 58: M813-819 [Abstract] [Full Text]
- Close, J C T, Hooper, R, Glucksman, E, Jackson, S H D, Swift, C G (2003). Predictors of falls in a high risk population: results from the prevention of falls in the elderly trial (PROFET). *Emerg Med J* 20: 421-425 [Abstract] [Full Text]
- Levine, S. A., Boal, J., Boling, P. A. (2003). Home Care. *JAMA* 290: 1203-1207 [Full Text]
- Jensen, J., Lundin-Olsson, R. L., Gustafson, R. Y. (2002). Prevention of Falls and Injuries in Residential Care. *Ann Intern Med* 137: 857-857 [Full Text]
- Rubenstein, L. Z., Powers, C. M., MacLean, C. H. (2001). Quality Indicators for the Management and Prevention of Falls and Mobility Problems in Vulnerable Elders. *Ann Intern Med* 135: 686-693 [Full Text]
- Bates, D. W., Gawande, A. A. (2000). Error in Medicine: What Have We Learned?. *Ann Intern Med* 132: 763-767 [Full Text]
- Tinetti, M. E., Williams, C. S., Gill, T. M. (2000). Dizziness among Older Adults: A Possible Geriatric Syndrome. *Ann Intern Med* 132: 337-344 [Abstract] [Full Text]
- Choy, N. L., Brauer, S., Nitz, J. (2003). Changes in Postural Stability in Women Aged 20 to 80 Years. *J Gerontol A Biol Sci Med Sci* 58: M525-530 [Abstract] [Full Text]
- LaStayo, P. C., Ewy, G. A., Pierotti, D. D., Johns, R. K., Lindstedt, S. (2003). The Positive Effects of Negative Work: Increased Muscle Strength and Decreased Fall Risk in a Frail Elderly Population. *J Gerontol A Biol Sci Med Sci* 58: M419-424 [Abstract] [Full Text]
- Brannan, S, Dewar, C, Sen, J, Clarke, D, Marshall, T, Murray, P I (2003). A prospective study of the rate of falls before and after cataract surgery. *Br. J. Ophthalmol.* 87: 560-562 [Abstract] [Full Text]
- Brown, J. P., Josse, R. G. (2003). Lignes directrices de pratique clinique 2002 pour le diagnostic et le traitement de l'osteoporose au Canada. *Can Med Assoc J* 168: SF1-38 [Abstract] [Full Text]
- Kannus, P., Parkkari, J., Koskinen, S., Niemi, S., Palvanen, M., Jarvinen, M., Vuori, I. (1999). Fall-Induced Injuries and Deaths Among Older Adults. *JAMA* 281: 1895-1899 [Abstract] [Full Text]
- Greenspan, S. L. (1999). A 73-Year-Old Woman With Osteoporosis. *JAMA* 281: 1531-1540 [Full Text]

- Man-Son-Hing, M., Nichol, G., Lau, A., Laupacis, A. (1999). Choosing Antithrombotic Therapy for Elderly Patients With Atrial Fibrillation Who Are at Risk for Falls. *Arch Intern Med* 159: 677-685 [Abstract] [Full Text]
- Bates, D. W., Evans, R. S., Murff, H., Stetson, P. D., Pizziferri, L., Hripcsak, G. (2003). Detecting Adverse Events Using Information Technology. *J. Am. Med. Inform. Assoc.* 10: 115-128 [Abstract] [Full Text]
- Gill, T. M., DiPietro, L., Krumholz, H. M. (2000). Role of Exercise Stress Testing and Safety Monitoring for Older Persons Starting an Exercise Program. *JAMA* 284: 342-349 [Abstract] [Full Text]
- Jensen, J., Lundin-Olsson, L., Nyberg, L., Gustafson, Y. (2002). Fall and Injury Prevention in Older People Living in Residential Care Facilities: A Cluster Randomized Trial. *Ann Intern Med* 136: 733-741 [Abstract] [Full Text]
- Rothschild, J. M., Bates, D. W., Leape, L. L. (2000). Preventable Medical Injuries in Older Patients. *Arch Intern Med* 160: 2717-2728 [Abstract] [Full Text]
- Chaves, P. H. M., Garrett, E. S., Fried, L. P. (2000). Predicting the Risk of Mobility Difficulty in Older Women With Screening Nomograms: The Women's Health and Aging Study II. *Arch Intern Med* 160: 2525-2533 [Abstract] [Full Text]
- Stuck, A. E., Minder, C. E., Peter-Wuest, I., Gillmann, G., Egli, C., Kesselring, A., Leu, R. E., Beck, J. C. (2000). A Randomized Trial of In-Home Visits for Disability Prevention in Community-Dwelling Older People at Low and High Risk for Nursing Home Admission. *Arch Intern Med* 160: 977-986 [Abstract] [Full Text]
- Iezzoni, L. I. (2000). A 44-Year-Old Woman With Difficulty Walking. *JAMA* 284: 2632-2639 [Full Text]
- Tinetti, M. E., Baker, D., Gallo, W. T., Nanda, A., Charpentier, P., O'Leary, J. (2002). Evaluation of Restorative Care vs Usual Care for Older Adults Receiving an Acute Episode of Home Care. *JAMA* 287: 2098-2105 [Abstract] [Full Text]
- Smith, R. G. (2003). Fall-Contributing Adverse Effects of the Most Frequently Prescribed Drugs. *J Am Podiatr Med Assoc* 93: 42-50 [Abstract] [Full Text]
- Stuck, A. E., Egger, M., Hammer, A., Minder, C. E., Beck, J. C. (2002). Home Visits to Prevent Nursing Home Admission and Functional Decline in Elderly People: Systematic Review and Meta-regression Analysis. *JAMA* 287: 1022-1028 [Abstract] [Full Text]
- Shaw, F. E, Bond, J., Richardson, D. A, Dawson, P., Steen, I N., McKeith, I. G, Kenny, R. A. (2003). Multifactorial intervention after a fall in older people with cognitive impairment and dementia presenting to the accident and emergency department: randomised controlled trial. *BMJ* 326: 73-73 [Abstract] [Full Text]
- Tinetti, M. E. (2003). Preventing Falls in Elderly Persons. *NEJM* 348: 42-49 [Full Text]
- Brown, J. P., Josse, R. G. (2002). 2002 clinical practice guidelines for the diagnosis and management of osteoporosis in Canada. *Can Med Assoc J* 167: s1-34 [Abstract] [Full Text]
- GRENIER-SENNELIER, C., LOMBARD, I., JENY-LOEPER, C., MAILLET-GOURET, M.-C., MINVIELLE, E. (2002). Designing adverse event prevention

programs using quality management methods: the case of falls in hospital. *Int J Qual Health Care* 14: 419-426 [Abstract] [Full Text]

- Campbell, A. J. (2002). Preventing fractures by preventing falls in older women. *Can Med Assoc J* 167: 1005-1006 [Full Text]
- Yeap, S. S., Hosking, D. J. (2002). Management of corticosteroid-induced osteoporosis. *Rheumatology* 41: 1088-1094 [Abstract] [Full Text]
- Tuck, S P, Francis, R M (2002). Osteoporosis. *Postgrad Med J* 78: 526-532 [Abstract] [Full Text]
- Gill, T. M., Baker, D. I., Gottschalk, M., Peduzzi, P. N., Allore, H., Byers, A. (2002). A Program to Prevent Functional Decline in Physically Frail, Elderly Persons Who Live at Home. *NEJM* 347: 1068-1074 [Abstract] [Full Text]
- Kannus, P., Palvanen, M., Niemi, S. (2001). Time Trends in Severe Head Injuries Among Elderly Finns. *JAMA* 286: 673-674 [Full Text]
- McGwin, G. Jr, May, A. K., Melton, S. M., Reiff, D. A., Rue III, L. W. (2001). Recurrent Trauma in Elderly Patients. *Arch Surg* 136: 197-203 [Abstract] [Full Text]
- Kenny, R. A. M., Richardson, D. A., Steen, N., Bexton, R. S., Shaw, F. E., Bond, J. (2001). Carotid sinus syndrome: a modifiable risk factor for nonaccidental falls in older adults (SAFE PACE). *JACC* 38: 1491-1496 [Abstract] [Full Text]
- Day, L., Fildes, B., Gordon, I., Fitzharris, M., Flamer, H., Lord, S. (2002). Randomised factorial trial of falls prevention among older people living in their own homes. *BMJ* 325: 128-128 [Abstract] [Full Text]
- Singh, M. A. F. (2002). Exercise Comes of Age: Rationale and Recommendations for a Geriatric Exercise Prescription. *J Gerontol A Biol Sci Med Sci* 57: M262-282 [Full Text]
- Dannenberg, A. L, Fowler, C. J (1998). Evaluation of interventions to prevent injuries: an overview. *Inj Prev* 4: 141-147 [Abstract] [Full Text]
- Hogan, D. B., MacDonald, F. A., Betts, J., Bricker, S., Ebly, E. M., Delarue, B., Fung, T. S., Harbidge, C., Hunter, M., Maxwell, C. J., Metcalf, B. (2001). A randomized controlled trial of a community-based consultation service to prevent falls. *Can Med Assoc J* 165: 537-543 [Abstract] [Full Text]
- Lipsitz, L. A. (2002). Dynamics of Stability: The Physiologic Basis of Functional Health and Frailty. *J Gerontol A Biol Sci Med Sci* 57: B115-125 [Abstract] [Full Text]
- Eastell, R., Reid, D.M., Compston, J., Cooper, C., Fogelman, I., Francis, R.M., Hay, S.M., Hosking, D.J., Purdie, D.W., Ralston, S.H., Reeve, J., Russell, R.G.G., Stevenson, J.C. (2001). Secondary prevention of osteoporosis: when should a non-vertebral fracture be a trigger for action?. *QJM* 94: 575-597 [Abstract] [Full Text]
- Ellis, A. A., Trent, R. B. (2001). Do the Risks and Consequences of Hospitalized Fall Injuries Among Older Adults in California Vary by Type of Fall?. *J Gerontol A Biol Sci Med Sci* 56: M686-692 [Abstract] [Full Text]
- Herbert, R. D, Maher, C. G, Moseley, A. M, Sherrington, C. (2001). Regular review: Effective physiotherapy. *BMJ* 323: 788-790 [Full Text]
- Elkan, R., Kendrick, D., Dewey, M., Hewitt, M., Robinson, J., Blair, M., Williams, D., Brummell, K., Egger, M. (2001). Effectiveness of home based

support for older people: systematic review and meta-analysis Commentary: When, where, and why do preventive home visits work?. *BMJ* 323: 719-719 [Abstract] [Full Text]

- Weigand, J. V., Gerson, L. W. (2001). Preventive Care in the Emergency Department: Should Emergency Departments Institute a Falls Prevention Program for Elder Patients? A Systematic Review. *Acad Emerg Med* 8: 823-826 [Abstract] [Full Text]
- Robertson, M C., Devlin, N., Scuffham, P., Gardner, M. M, Buchner, D. M, Campbell, A J. (2001). Economic evaluation of a community based exercise programme to prevent falls. *J Epidemiol Community Health* 55: 600-606 [Abstract] [Full Text]
- Khan, K M, Liu-Ambrose, T, Donaldson, M G, McKay, H A (2001). Physical activity to prevent falls in older people: time to intervene in high risk groups using falls as an outcome. *Br J Sports Med* 35: 144-145 [Full Text]
- Cummings, S. R., Nevitt, M. C. (1994). Falls. *NEJM* 331: 872-873 [Full Text]
- Campion, E. W. (1996). Home Alone, and in Danger. *NEJM* 334: 1738-1739 [Full Text]
- Cooper, C., Barker, D. J.P. (1995). Risk Factors for Hip Fracture. *NEJM* 332: 814-815 [Full Text]
- Ikegami, N. (1995). Functional Assessment and Its Place in Health Care. *NEJM* 332: 598-599 [Full Text]
- Kaplan, M. S., Burtscher, M., Bettigole, R., Tinetti, M., Baker, D.I. (1995). Reducing the Risk of Falls among the Elderly. *NEJM* 332: 268-269 [Full Text]
- Fields, S. D (2001). Weekly urge urinary incontinence was associated with increased risk for falls and non-spinal fractures in older women. *Evid Based Med* 6: 59-59 [Full Text]
- Rivara, F. P., Grossman, D. C., Cummings, P. (1997). Injury Prevention- Second of Two Parts. *NEJM* 337: 613-618 [Full Text]
- Stuck, A. E., Aronow, H. U., Steiner, A., Alessi, C. A., Bula, C. J., Gold, M. N., Yuhas, K. E., Nisenbaum, R., Rubenstein, L. Z., Beck, J. C. (1995). A Trial of Annual in-Home Comprehensive Geriatric Assessments for Elderly People Living in the Community. *NEJM* 333: 1184-1189 [Abstract] [Full Text]
- Cummings, S. R., Raisz, L. G., Reichert, S. F., Burger, C., Prokop, A., Rehm, K.E., Raaymakers, E. L.F.B., Zuckerman, J. D., Rosenberg, A. D. (1996). Hip Fracture. *NEJM* 335: 1994-1996 [Full Text]
- Campion, E. W. (1997). Can House Calls Survive?. *NEJM* 337: 1840-1841 [Full Text]
- Tinetti, M. E., Williams, C. S. (1997). Falls, Injuries Due to Falls, and the Risk of Admission to a Nursing Home. *NEJM* 337: 1279-1284 [Abstract] [Full Text]
- Swift, C. G (2001). Care of older people: Falls in late life and their consequences{---}implementing effective services. *BMJ* 322: 855-857 [Full Text]

- Eastell, R. (1998). Treatment of Postmenopausal Osteoporosis. *NEJM* 338: 736-746 [Full Text]

- Yates, S. M., Dunnagan, T. A. (2001). Evaluating the Effectiveness of a Home-Based Fall Risk Reduction Program for Rural Community-Dwelling Older Adults. *J Gerontol A Biol Sci Med Sci* 56: 226M-230 [Abstract] [Full Text]
- Covinsky, K. E., Kahana, E., Kahana, B., Kercher, K., Schumacher, J. G., Justice, A. C. (2001). History and Mobility Exam Index to Identify Community-Dwelling Elderly Persons at Risk of Falling. *J Gerontol A Biol Sci Med Sci* 56: 253M-259 [Abstract] [Full Text]
- Robertson, M C., Devlin, N., Gardner, M. M, Campbell, A J. (2001). Effectiveness and economic evaluation of a nurse delivered home exercise programme to prevent falls. 1: Randomised controlled trial. *BMJ* 322: 697-697 [Abstract] [Full Text]
- Robertson, M C., Gardner, M. M, Devlin, N., McGee, R., Campbell, A J. (2001). Effectiveness and economic evaluation of a nurse delivered home exercise programme to prevent falls. 2: Controlled trial in multiple centres. *BMJ* 322: 701-701 [Abstract] [Full Text]
- Kannus, P., Parkkari, J., Niemi, S., Pasanen, M., Palvanen, M., Jarvinen, M., Vuori, I. (2000). Prevention of Hip Fracture in Elderly People with Use of a Hip Protector. *NEJM* 343: 1506-1513 [Abstract] [Full Text]
- Rubenstein, L. Z., Josephson, K. R., Trueblood, P. R., Loy, S., Harker, J. O., Pietruszka, F. M., Robbins, A. S. (2000). Effects of a Group Exercise Program on Strength, Mobility, and Falls Among Fall-Prone Elderly Men. *J Gerontol A Biol Sci Med Sci* 55: 317M-321 [Abstract] [Full Text]
- Schenkman, M., Morey, M., Kuchibhatla, M. (2000). Spinal Flexibility and Balance Control Among Community-Dwelling Adults With and Without Parkinson's Disease. *J Gerontol A Biol Sci Med Sci* 55: 441M-445 [Abstract] [Full Text]
- Kanis, J., Oden, A., Johnell, O. (2001). Acute and Long-Term Increase in Fracture Risk After Hospitalization for Stroke. *Stroke* 32: 702-706 [Abstract] [Full Text]
- Parry, S W, Steen, N, Galloway, S R, Kenny, R A, Bond, J (2001). Falls and confidence related quality of life outcome measures in an older British cohort. *Postgrad Med J* 77: 103-108 [Abstract] [Full Text]
- Gardner, M. M, Robertson, M C., Campbell, A J. (2000). Exercise in preventing falls and fall related injuries in older people: a review of randomised controlled trials. *Br J Sports Med* 34: 7-17 [Abstract] [Full Text]
- van Haastregt, J. C M, Diederiks, J. P M, van Rossum, E., de Witte, L. P, Voorhoeve, P. M, Crebolder, H. F J M (2000). Effects of a programme of multifactorial home visits on falls and mobility impairments in elderly people at risk: randomised controlled trial. *BMJ* 321: 994-998 [Abstract] [Full Text]
- Feder, G., Cryer, C., Donovan, S., Carter, Y. (2000). Guidelines for the prevention of falls in people over 65. *BMJ* 321: 1007-1011 [Full Text]
- Francis, R.M., Baillie, S.P., Chuck, A.J., Crook, P.R., Daymond, T., Dunn, N., Fordham, J.N., Kelly, C., Rodgers, A. (2000). Management of osteoporosis in patients with hip fractures. *QJM* 93: 501-506 [Full Text]
- Balducci, L., Extermann, M. (2000). Management of Cancer in the Older Person: A Practical Approach. *Oncologist* 5: 224-237 [Abstract] [Full Text]

- Steinberg, M., Cartwright, C., Peel, N., Williams, G. (2000). A sustainable programme to prevent falls and near falls in community dwelling older people: results of a randomised trial. *J Epidemiol Community Health* 54: 227-232 [Abstract] [Full Text]
- Elon, R. D (1996). Recent Advances: Geriatric Medicine. *BMJ* 312: 561-563 [Abstract] [Full Text]
- van Haastregt, J. C M, Diederiks, J. P M, van Rossum, E., de Witte, L. P, Crebolder, H. F J M (2000). Effects of preventive home visits to elderly people living in the community: systematic review. *BMJ* 320: 754-758 [Abstract] [Full Text]
- Kempton, A., van Beurden, E., Sladden, T., Garner, E., Beard, J. (2000). Older people can stay on their feet: final results of a community-based falls prevention programme. *Health Promot. Int.* 15: 27-33 [Abstract] [Full Text]
- Salkeld, G, Cameron, I D, Cumming, R G, Easter, S, Seymour, J, Kurrle, S E, Quine, S, Ameratunga, S. N, Brown, P. M (2000). Quality of life related to fear of falling and hip fracture in older women: a time trade off study • Commentary: Older people's perspectives on life after hip fractures. *BMJ* 320: 341-346 [Abstract] [Full Text]
- McWilliam, C. L., Stewart, M., Brown, J. B., McNair, S., Donner, A., Desai, K., Coderre, P., Galajda, J. (1999). Home-based health promotion for chronically ill older persons: results of a randomized controlled trial of a critical reflection approach. *Health Promot. Int.* 14: 27-41 [Abstract] [Full Text]
- Kannus, P., Palvanen, M., Kaprio, J., Parkkari, J., Koskenvuo, M. (1999). Genetic factors and osteoporotic fractures in elderly people: prospective 25 year follow up of a nationwide cohort of elderly Finnish twins. *BMJ* 319: 1334-1337 [Abstract] [Full Text]
- Feder, G., Carter, Y., Donovan, S., Cryer, C., Seeman, E, Kannus, P. (1999). Preventing osteoporosis, falls, and fractures among elderly people. *BMJ* 318: 1695-1695 [Full Text]
- Overstall, P. W (1995). Falls after strokes. *BMJ* 311: 74-75 [Full Text]
- Forster, A., Young, J. (1995). Incidence and consequences offalls due to stroke: a systematic inquiry. *BMJ* 311: 83-86 [Abstract] [Full Text]
- Nyberg, L., Gustafson, Y. (1996). Using the Downton Index to Predict Those Prone to Falls in Stroke Rehabilitation. *Stroke* 27: 1821-1824 [Abstract] [Full Text]
- Nyberg, L., Gustafson, Y. (1997). Fall Prediction Index for Patients in Stroke Rehabilitation. *Stroke* 28: 716-721 [Abstract] [Full Text]
- Tutuarima, J.A., van der Meulen, J.H.P., de Haan, R.J., van Straten, A., Limburg, M. (1997). Risk Factors for Falls of Hospitalized Stroke Patients. *Stroke* 28: 297-301 [Abstract] [Full Text]

Comments and questions? Please contact us.

The New England Journal of Medicine is owned, published, and copyrighted © 2006 Massachusetts Medical Society. All rights reserved.