Antidepressants and Falls among Elderly People in Long-Term Care

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A B S T R A C T

All eligible residents of a long-term care facility (488 women and 147 men with a 6-month minimum stay) were prospectively followed for 1 month for the development of falls. Use of psychotropic medications (excluding as needed prescriptions), functional status, and a history of falls were assessed at the start of the study month. Results of analyses using logistic modeling procedures suggest that institutionalized women on antidepressants may have an increased risk of falling, regardless of fall history, functional status, or age. A relationship between antidepressants and falls was not found for men. These results may help target high-risk individuals for future preventive efforts. (*Am J Public Health*. 1993;83:746–749)

Introduction

Several previous studies have evaluated risk factors for falls among elderly people living in community[1-5] and institutionalized[3,6-9] settings. Psychotropic medications repeatedly appear in both populations as a factor associated with falls[1,2,4-8] and hip fractures.[10-12] This relationship may be the result of adverse effects of these drugs, including sedation, orthostatic hypotension, or dyskinesias; the underlying psychiatric illnesses the drugs are intended to treat; or an increase in mobility associated with recovery during treatment. Furthermore, the effects of these drugs may differ between men and women,[2] possibly because of differences in other risk factors such as muscle strength or body composition. Since most previous studies use retrospective or case-control study designs to determine risk factors associated with falls, it is not known whether psychotropic drug use precedes the development of falls or is a consequence of psychiatric problems associated with falling.[13]

The primary aim of this study was to prospectively test the hypothesis that psychotropic medications are a risk factor for falls in elderly people living in an institutionalized setting. A secondary aim of this study was to evaluate the effect of gender on risk factors for falls.

Methods

Subjects

All 721 people who resided at the Hebrew Rehabilitation Center for Aged, a long-term care facility in Boston, Mass, on October 1, 1990, were considered potential subjects for this study, which sought to prospectively evaluate the fall status of all subjects during October 1990. To ensure a reliable history of falling and to allow for both acclimation to the center's environment and stabilization of medications, we excluded any resident who had not lived at the center for at least 6 months prior to October 1, 1990. Eighty residents were thus excluded. Six subjects who did not fall during the study month but who did expire were also excluded from the analysis. This left a total of 635 subjects in this study.

Procedure

First, selected characteristics—age, gender, functional status,[14] the preceding 6-month fall history, and the presence of a prescription for psychotropic medications (antidepressants, antipsychotics, or benzodiazepines, excluding those prescribed "as needed")—of all 635 eligible subjects were assessed on October 1, 1990. All these data were available from demographic and pharmacy databases maintained by the long-term care facility. The daily medication records were cross-checked for all subjects identified as having an antidepressant prescription to ensure that these medications were actually administered.

Subsequently, subjects who fell during the month of October 1990 were identified from two independent, computerized documentation systems. A fall was defined as a sudden, unintentional change in position, with or without loss of consciousness, causing the victim to land on the ground. Falls not appearing on both systems were verified by a chart review. A 1-month observation period was chosen (1) to provide adequate time to detect falls, and (2) to help ensure that medication and physical status remained stable in the majority of subjects.

Data Analysis

Univariate and multivariate relationships between subject characteristics at the start of the study and the outcome variable (fall status during October 1990) were evaluated.[15,16] Multivariate analyses were performed using logistic regression techniques and included an assessment of the goodness-of-fit for the final model.[15] Low resulting P values were categorized as significant ($P \le .05$) or marginally significant ($.05 < P \le .10$).

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Results

The age, functional status, fall history, and prevalence of psychotropic medication use at the start of the study are presented in Table 1 for men and women. As is characteristic of most long-term care populations,[17] elderly men were functionally more independent than elderly women. Additionally, the prevalence of benzodiazepine use tended to be greater in men than in women ($P \leq .09$). Otherwise, men and women were comparable with respect to age, antidepressant and antipsychotic use, and fall history.

Overall, 15% of the 488 women and 16% of the 147 men fell during the study month. Of all those who fell, 27% had more than one fall during that period. However, the factors related to falls differed between gender groups (Table 2). Women with either a history of falling or antidepressant use had significantly higher fall rates than women without these factors. Men with a history of falls also had significantly higher fall rates than their nonfalling counterparts, but there was not a significant relationship between antidepressant use and fall rates in men. Among men, lower functional status and increasing age were also significantly associated with increased fall rates, yet neither of these factors appeared related to falls among women.

The distribution of antidepressant types used by the subjects is shown in Table 3. The most commonly used antidepressants were the serotonin uptake blockers and tricyclics. Among women, a larger percentage of those taking the serotonin uptake blockers fell compared with those taking tricyclics (53% vs 14%, respectively; $P \leq .003$).

Relationships between risk factors and falls were further explored by building logistic models for each gender group (Table 4). The final age-adjusted model for predicting falls in women included a history of falls and antidepressant use. Models that adjusted for the presence of any other psychotropic medications or any two-factor interactions were also evaluated, but the incorporation of these variables failed to improve the model for women significantly. Finally, the fit of the model was checked and judged adequate ($\chi^2 = 486$, $n = 488$). After adjusting for both age and fall history, antidepressants remained marginally related to the incidence of falls with an adjusted odds ratio of 1.84 (95% confidence interval = 0.91, 3.69).

The final predictive model for falls among men included age, history of falls, and impaired functional status. Again, this model was shown to fit the data adequately ($\chi^2 = 144$, $n = 147$).

Discussion

Using a prospective study design and multiple sources of data to ensure that medications were actually administered and falls actually occurred, we found that antidepressant use was predictive of falls in elderly institutionalized women. The risk appeared greatest among women using serotonin uptake blockers and tricy-

TABLE 1—Subject Characteristics

	Women (n = 488)	Men (n = 147)	P^a
Average age, y ± SD	88.9 ± 6.0 [70–105]	88.1 ± 6.6 [72–101]	NS
Functional status, no. (%)			
Most independent	71 (15)	40 (27)	<.001
Semi-independent	153 (31)	45 (31)	
Least independent	264 (54)	62 (42)	
History of falls (at least one fall in the past 6 months), no. (%)	199 (41)	62 (42)	NS
Psychotropic medications, no. (%)			
Antidepressants	62 (13)	18 (12)	NS
Antipsychotics	48 (10)	10 (7)	NS
Benzodiazepines	94 (19)	38 (26)	≤.09
At least one type	176 (36)	52 (35)	NS
Fell during October 1990, no. (%)	75 (15)	23 (16)	NS

^aP values were obtained from Student's t-test results (age) or Pearson's χ^2 test results (all other variables).

TABLE 2—Variables Associated with Falls in Men and Women

	Women (75/488 Fell)	Men (23/147 Fell)
Average age, y ± SE		
Fallers	88.9 ± 6.0	91.1 ± 5.4
Nonfallers	88.5 ± 6.1	87.5 ± 6.7
P^a	NS	.02
Functional status		
Most independent	17% (12/71)	3% (1/40)
Semi-independent	18% (28/153)	13% (6/45)
Least independent	13% (35/264)	26% (16/62)
P	NS	.006
History of falls (at least one fall in the past 6 months)		
Yes	29% (58/199)	31% (19/62)
No	6% (17/289)	5% (4/85)
P	.001	.001
Psychotropic medications		
Antidepressant		
Yes	24% (15/62)	6% (1/18)
No	14% (60/426)	17% (22/129)
P	.04	NS
Antipsychotics		
Yes	19% (9/48)	0% (0/10)
No	15% (66/440)	17% (23/137)
P	NS	NS
Benzodiazepines		
Yes	19% (18/94)	13% (5/38)
No	14% (57/394)	17% (18/109)
P	NS	NS

Note. Percentages are those of subjects who fell. Numbers in parentheses are no. of fallers/total no. of subjects, for that variable.
^aP values were obtained from Student's t test results (age) or Pearson's χ^2 test or Fisher's Exact Test results (all other variables).

TABLE 3—Distribution of Antidepressant Types and Corresponding Fall Rates

Antidepressant Type	Women		Men	
	%	Ratio	%	Ratio
Monoamine oxidase inhibitors	100	1/1	0	0/1
Serotonin uptake blockers	53	9/17	0	0/7
Tetracyclics (maprotiline)	0	0/1	0	0/0
Tricyclics	14	5/35	20	1/5
Lithium	0	0/4	0	0/2
Concomitant use of at least two types	0	0/4	0	0/3

Note. Percentages are those of the medicated subjects who fell. Numbers in parentheses are no. of fallers/total no. of subjects on the medication.

clics, although the meaning of these trends is limited by the small numbers of people taking these medications. The overall increased risk persisted—albeit at a marginal level of significance—even after adjusting for age, fall history, and other psychotropic medications. These results suggest that there is an increased risk of falling for women on antidepressants compared with women not on these drugs. Possible reasons for this increased risk include hypotensive side effects, sedation, and underlying depression.[18]

Among men taking antidepressants, the 1-month fall rate was actually lower than that of men not taking antidepressants; however, this difference was not significant. These findings are supported by those of Campbell et al.,[2] who also found a relationship between psychotropic medications and falls for women but not for men. The combination of antidepressant medication effects or the underlying depression itself with other characteristics of institutionalized women (e.g., decreased lower extremity strength in women compared with men[19]) may ex-

plain the difference in association with falls between women and men.

Results of this study also indicate that a history of falls is predictive of future falls in both men and women. Whatever factors were associated with the initial fall quite possibly were associated with the fall recorded during the study month. Additionally, some fallers may have developed a "post-fall" syndrome, resulting in an increased fall incidence due to both increased anxiety and abnormal gait and balance.[13]

Among men, the most dependent residents had significantly higher odds of falling than those with the highest level of independence. Also, increased age was associated with increased fall risk in men. Age may be a proxy for underlying physical and functional impairments in institutionalized men.

The results failed to show associations between age or functional status and falls among women. The residents who were the most dependent in functional status were also people with severe cognitive and physical impairments. Possibly the

distribution of impairments manifested by these subjects and the relationship of those impairments to the risk of falls differed between men and women. Unfortunately, the sample size of this study did not permit further investigation of this possibility.

One limitation of this study was our inability to examine potential confounding psychiatric factors such as depression, confusion, or cognitive impairment. However, other studies have found that, after controlling for these factors, the association between psychotropic medications and an increased risk of falls or hip fracture persists.[5,6,11,12] The risk factors for falls found from our analyses cannot be considered causative. However, this limitation does not undermine the importance of our study in identifying people at risk of falling.

The main strength of this study is that data were evaluated prospectively for an institutionalized population of elderly people. This design minimizes bias and strengthens the validity of the study's conclusions. The ability of the logistic models generated by these data to predict falls in other institutionalized populations merits further investigation, as does the differences in risk factors for falls between gender groups.

Extrapolation of the results of this study to clinical practice must take into account the balance between the potential benefit of antidepressants and the risk of falling among women that is associated with the presence of these medications. The message presented from this study is not that women would be better off without antidepressants, but that women on antidepressants may have an increased

TABLE 4—Relative Risk and Adjusted Odds of Falling, from Results of Logistic Models

	Unadjusted Risk Ratio (95% CI[a])	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)	Adjusted P[b]
Women (n = 488)				
Age[c]	...	0.88 (0.58, 1.32)	0.84 (0.54, 1.32)	NS
History of falls	4.95 (2.89, 8.25)	6.58 (3.69, 11.73)	6.67 (3.72, 11.93)	.0001
Antidepressants	1.72 (1.04, 2.84)	1.95 (1.02, 3.70)	1.84 (0.91, 3.69)	.09
Men (n = 147)				
Age[c]	...	2.52 (1.15, 5.50)	2.86 (1.13, 7.16)	.03
History of falls	6.51 (2.33, 18.19)	8.95 (2.86, 27.97)	5.84 (1.78, 19.15)	.004
Functional status (most independent, semi-independent, least independent)				
Semi vs most	5.33 (0.67, 42.42)	6.00 (0.69, 52.19)	3.68 (0.39, 34.38)	NS
Least vs most	10.32 (1.42, 74.83)	13.57 (1.72, 106.95)	9.92 (1.16, 85.10)	.04

[a]Confidence intervals (CIs) for risk ratio were calculated using the method described by Katz et al.[16]
[b]P values for Wald χ^2 statistics from logistic model.
[c]Odds ratios are for 10-year age increments.

risk of falling. Therefore, health care professionals caring for such individuals in long-term care facilities should be alert to their risk of falls and should consider increased surveillance, physical assistance, and monitoring of adverse medication effects as potential interventions to ameliorate this risk. □

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Anergy Compromises Screening for Tuberculosis in High-Risk Populations

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ABSTRACT

Anergy may occur in groups at high risk for tuberculosis, compromising tuberculin skin testing. Within New York City's correctional system, anergy prevalence was 25% among opiate users referred to detoxification programs and 3% in the general population. Correlates of anergy were recent weight loss and needle sharing. The high prevalence of anergy among opiate users compromises the utility of tuberculosis screening and suggests the need for routine chest x-rays to detect pulmonary tuberculosis in some high-risk populations. (*Am J Public Health.* 1993;83:749–751)

Introduction

The incidence of tuberculosis (TB) in jails and prisons has risen and its intramural spread in these enclosed, often overcrowded facilities is well documented.[1–4] Recently, eight deaths due to multidrug-resistant TB occurred in the New York State prison system.[5]

Tuberculin skin testing is the standard method of identifying individuals infected with TB. However, with human immunodeficiency virus (HIV) infection, cell-mediated immune function is impaired and anergy—unresponsiveness to skin test antigens—occurs.[6] It is possible, therefore, that an individual may have a negative reaction to the tuberculin skin test yet be infected with TB. Although the

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