Antidepressant Use in Elderly Suicide Victims in New York City: An Analysis of 255 Cases

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Objective: We examined postmortem evidence of antidepressant, analgesic, and anxiolytic-hypnotic drugs in suicide victims aged 65 years and older.

Method: We assessed data on Medical Examiner-certified suicide victims aged 65 years or older from 2001 through 2004 who had resided and died in New York City and who underwent toxicologic investigation for antidepressant, analgesic, and anxiolytic-hypnotic drugs. We calculated annual population-based suicide rates and rates of positive toxicologic findings for each of the 3 classes of medications across 3 age strata: 65 to 74, 75 to 84, and 85 years and older.

Results: There were 255 certified suicide victims among New York City residents aged 65 years or older from 2001 through 2004. Results of toxicologic testing were available for 63.5% (162) of suicide victims. Antidepressants were detected in 22.0% of suicide victims aged 65 to 74 years, 26.8% of those aged 75 to 84 years, and 16.7% of those aged 85 years and older. The oldest age stratum had both the highest suicide rates in the over–65-years population at 10.7 per 100,000 and the lowest percentage of antidepressant use among all geriatric suicide victims.

Conclusion: Rates of detection of antidepressant medication were low for all geriatric suicide victims, especially the oldest. Analgesics and anxiolytic-hypnotics may have been taken in lieu of antidepressants by suicide victims aged 85 years and older. Assuming that many of the suicide victims had clinically treatable depression, these findings implicate problems in the delivery of specific antidepressant pharmacologic treatment to the "old-old."

J Clin Psychiatry 2009;70(3):312–317

Received March 26, 2008; accepted May 15, 2008. From the Departments of Psychiatry (Drs. Abrams, Leon, Tardiff, and Marzuk and Mr. Li) and Public Health (Drs. Leon and Tardiff), and the Division of Geriatrics and Gerontology (Dr. Abrams), Weill Cornell Medical College, New York, N.Y.; and the University of Michigan School of Public Health, Ann Arbor (Dr. Galea).

This research was funded, in part, by National Institutes of Health grants MH060447 (Dr. Leon) and DA06534 (Dr. Tardiff) and by a grant from the American Philanthropic Foundation (Dr. Abrams).

The authors acknowledge the assistance of Angela Bucciarelli-Prann, M.P.H, statistical consultant, of the New York City Department of Health. Ms. Bucciarelli-Prann reports no financial or other relationship relevant to the subject of this article.

Dr. Leon is a member of the U.S. Food and Drug Administration Psychopharmacologic Drug Advisory Committee and is a member of Data and Safety Monitoring Boards for Pfizer and Organan. In 2006–2007 he served as a consultant to Eli Lilly and the National Institute of Mental Health. Drs. Abrams, Tardiff, Marzuk, and Galea and Mr. Li report no additional financial or other relationship relevant to the subject of this article.

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Suicide rates in the United States are highest among those 65 years of age and older.[1] In several studies, late-life suicide has been shown to be predominantly among white men and to be more closely associated with depression and physical illness than suicide in younger adults.[2,3] Geriatric suicide attempts also have a marked seriousness of intent, with a higher proportion of completed suicides to attempts than in younger adults.[4] The actual choice of method may be location-specific, with firearms predominating nationally[1] and fall from height most frequent in New York City.[5]

In this study we compared the frequency of toxicologically detected antidepressant, analgesic, and sedative-hypnotic medications in geriatric suicide victims of different ages. Recent reports based on postmortem examinations,[6,7] including one from New York City,[8] have suggested that the frequency of antidepressant use among adult suicide victims is low; this finding is in contrast to general population surveys that found the use of analgesics[9] and anxiolytic-hypnotics[10,11] to increase with age. Taking into consideration the high rates of suicide in the geriatric population[1] and the distinctive difficulties of recognizing and treating depression in very old patients,[12,13] we hypothesized that the oldest geriatric suicide victims (85 years and older) would less frequently have toxicologic evidence of antidepressant medication or metabolites and also show different patterns of analgesic and

anxiolytic-hypnotic use compared to victims aged 65 to 74 or 75 to 84 years.

METHOD

Classification of Subjects

The study was conducted at the Office of the Chief Medical Examiner of New York City, which has jurisdiction over the unnatural deaths that occur in New York City. All deaths from 2000 through 2004 among residents of New York City aged 65 years or older that occurred within city limits and were certified as suicides by the Office of the Chief Medical Examiner were considered to be subjects. The medical files of each suicide meeting these criteria were reviewed by our research group. Suicide victims whose domicile could not be verified, New York City residents who committed suicide outside of city limits, and nonresidents who committed suicide in New York City were all excluded.

In each case, the determination of suicide as intentional, non-accidental death and the estimation of the time of survival following the fatal injury, or injury-death interval (IDI), were based on evidence gathered by the investigator on the site. When available, autopsy data and information from corroborative sources, such as reports from police and family members, were also taken into account. International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes E950 through E959 were used to designate cases of suicide.

Subjects were grouped into one of 3 age categories: "young-old" (65–74 years), "old" (75–84 years), and "old-old" (85 years and older), a scheme based on established differences in physical, cognitive, and functional status.[14] Four racial/ethnic groups, defined for the 2000 U.S. Census,[15] were used: non-Hispanic white; non-Hispanic African American; Hispanic; and all other races, comprised principally of non-Hispanic Asians but also including small numbers of non-Hispanic American Indians and non-Hispanic Native Hawaiians or Pacific Islanders.

Suicide methods were classified according to the categories used by Leon et al.[8]: hanging, jumping (fall from height), firearm, train, drug overdose, drowning, or other.

Toxicologic Testing Procedures

Toxicologic assays of blood were used to determine whether subjects had been taking antidepressant, analgesic or anxiolytic-hypnotic medications at or close to the time they committed suicide. These drugs and their principal metabolites were screened by gas chromatography using a nitrogen phosphorous detector. All positive findings were confirmed by gas chromatography mass spectrometry.

Medications were categorized according to the indication for which they were approved rather than by pharmacologic class. Three categories were used: (1) antidepressants, including tricyclics, selective serotonin reuptake inhibitors (SSRIs), serotonin-norepinephrine reuptake inhibitors (SNRIs), and novel antidepressants; (2) analgesics, including narcotics and nonnarcotics, aspirin, acetaminophen, and nonsteroidal anti-inflammatory agents; and (3) anxiolytic-hypnotics, including benzodiazepine and non-benzodiazepine anti-anxiety drugs and benzodiazepine and non-benzodiazepine sleep medications. The assays targeted all of the drugs within these 3 categories that were available in the United States during the study period. Although analgesics and anxiolytic-hypnotics are prescribed for some depressed patients, and antidepressants are occasionally taken for indications other than depression, for the purposes of the study we regarded only those subjects with postmortem evidence of antidepressants or antidepressant metabolites as having been treated specifically for depression.

Following procedures established for investigations of suicide,[16,17] the IDI was estimated and rounded to the nearest hour in each case. Subjects were required to have IDI estimates of 72 hours or less. This time frame was chosen to reflect the elimination half-lives of the pharmacologic agents studied.[17] The IDI was regarded as a critical interval, because processes of drug metabolism and elimination are presumed to continue, although possibly at a reduced rate, from injury until the time of death.[17]

Data Analysis

Mean annual population-based suicide rates, stratified by age, gender, and race/ethnicity, were calculated for the 4-year period from 2001 through 2004 and expressed per 100,000 population with 95% CIs using the method of Armitage et al.[18] These suicide rates were based on denominators derived from the 2000 U.S. Census counts for New York City (accessed at www.infoshare.org).

χ^2 tests were used to compare the availability of toxicologic findings across groups defined by gender, race/ethnicity, suicide method, and age category. χ^2 tests were also used to compare the proportions of toxicologically positive findings for antidepressant, analgesic, and anxiolytic-hypnotic medications across age groups and genders. McNemar tests were used for within–age-group comparisons across medication classes. A 2-tailed α level of .05 was used for each statistical test.

All analyses of data were conducted using SAS software version 8.2 (SAS Institute, Cary, N.C.).

RESULTS

Two hundred fifty-five residents of New York City 65 years of age and older, predominantly male, were confirmed to have committed suicide within city limits from 2001 through 2004 (Tables 1 and 2). Jumping (fall from height) was the most frequent suicide method used (Table 1).

Table 1. Demographic Characteristics of Geriatric Suicide Victims in New York City, 2001–2004

	Total		Toxicology Available		Toxicology Unavailable[a]				
Characteristic	N	%	N	%	N	%	χ^2	df	p Value
Total	255	100.0	162	63.5	93	36.5			
Sex									
Male	183	71.8	117	63.9	66	36.1	0.0459	1	.8304
Female	72	28.2	45	62.5	27	37.5			
Race/ethnicity									
White	173	67.8	109	63.0	64	37.0	2.7263	3	.4358
Black	17	6.7	12	70.6	5	29.4			
Hispanic	24	9.4	18	75.0	6	25.0			
Other	41	16.1	23	56.1	18	43.9			
Suicide method									
Hanging	64	25.1	38	59.4	26	40.6	9.9376	6	.1273
Jumping (fall from height)	98	38.4	61	62.2	37	37.8			
Firearm	38	14.9	30	78.9	8	21.1			
Train	10	3.9	4	40.0	6	60.0			
Drug overdose	18	7.1	11	61.1	7	38.9			
Drowning	5	2.0	5	100.0	0	0.0			
Other	22	8.6	13	59.1	9	40.9			
Age, y									
65–74	110	43.1	82	74.5	28	25.5	12.9781	2	.0015
75–84	93	36.5	56	60.2	37	39.8			
≥ 85	52	20.4	24	46.2	28	53.8			

[a]Toxicology results were not available or the injury-death interval exceeded 72 hours.

Table 2. Population-Based[a] Geriatric Suicide Rates (per 100,000) Stratified by Age, Sex, and Race/Ethnicity, New York City, 2001–2004

Characteristic	Total Rate (95% CI)	65–74 y Rate (95% CI)	75–84 y Rate (95% CI)	≥ 85 y Rate (95% CI)
Total	6.8 (6.0 to 7.7)	5.6 (4.6 to 6.7)	7.2 (5.8 to 8.9)	10.7 (8.0 to 14.0)
Sex				
Male	12.7 (10.9 to 14.7)	10.1 (8.1 to 12.5)	14.1 (10.9 to 17.9)	23.8 (16.4 to 33.5)
Female	3.1 (2.4 to 3.9)	2.3 (1.5 to 3.3)	3.3 (2.2 to 4.8)	5.5 (3.3 to 8.5)
Race/ethnicity				
White	8.1 (6.9 to 9.4)	6.5 (5.0 to 8.3)	9.2 (7.2 to 11.5)	10.4 (7.3 to 14.5)
Black	2.2 (1.3 to 3.5)	1.8 (0.8 to 3.5)	1.2 (0.2 to 3.5)	7.4 (2.7 to 16.1)
Hispanic	4.3 (2.8 to 6.4)	4.5 (2.6 to 7.4)	2.5 (0.7 to 6.5)	8.7 (2.4 to 22.3)
Other	15.1 (10.8 to 20.4)	12.5 (7.7 to 19.0)	16.2 (8.6 to 27.8)	29.7 (11.9 to 61.1)

[a]Population estimates based on 2000 Census for New York City.

The annual suicide rate for the over-65 population in New York City was 6.8 per 100,000. The suicide rate was most pronounced in men aged 85 years and older—23.8 per 100,000. Among race/ethnicity groups, population-based suicide rates for "other races" were highest for subjects 85 years and older (Table 2). Suicide rates for blacks and Hispanics were lower for the 75 to 84 than for the 65 to 74 or 85 years and older age groups. Within the overall geriatric population, suicide rates increased with age, but the increase was not greater than would be expected to occur by chance (Table 2).

Toxicology

Of the 255 confirmed suicides aged 65 years and older, 93 (36.5%) were excluded for one of the following reasons: IDI estimate was greater than 72 hours, IDI was not known, or the decedent did not undergo toxicologic testing for the medications under study. The 93 subjects for whom timely toxicologic testing results were unavailable did not differ significantly in distribution of gender and race/ethnicity from those subjects who were included in the analysis of medication use (Table 1). However, the proportion of available toxicologic test results differed significantly across the 3 age groups; subjects aged 85 years and older were less likely to have such information ($\chi^2 = 12.9781$, df = 2, p = .0015) (Table 1).

Of all suicide victims aged 65 years or older who met IDI criteria and underwent toxicologic testing, women had higher percentages than men of positive results for antidepressant, analgesic, and anxiolytic-hypnotic medications, but these differences were not significant (Table 3). Antidepressants were detected in 22.0% of those aged

Table 3. Drug Classes Detected in Toxicologic Analyses Among Geriatric Suicide Victims Stratified by Age and Sex, New York City, 2001–2004

	Total Toxicology Available	Antidepressants Detected				Analgesics Detected				Anxiolytic-Hypnotics Detected			
Characteristic	N	N	Stratum, %	χ^2	p Value	N	Stratum, %	χ^2	p Value	N	Stratum, %	χ^2	p Value
Total	162	37	22.8	1.294	.255	32	19.8	0.240	.625	57	35.2	0.063	.426
Male	117	24	20.5			22	18.8			39	33.3		
Female	45	13	28.9			10	22.2			18	40.0		
Age, y				1.050	.591			10.32	.006			0.520	.771
65–74	82	18	22.0			10	12.2			28	34.1		
75–84	56	15	26.8			12	21.4			19	33.9		
≥ 85	24	4	16.7			10	41.7			10	41.7		

65 to 74, 26.8% of those aged 75 to 84, and 16.7% of those aged 85 years or older (Table 3).

Comparisons across age groups. Comparisons across age groups did not reveal a statistically significant difference in rates of antidepressants detected ($\chi^2 = 1.050$, df = 2, p = .591) (Table 3). Similarly, there were no significant age-group differences in rates of detection of anxiolytic-hypnotics ($\chi^2 = 0.520$, df = 2, p = .771). However, analgesics were significantly more likely to be found in the 85 years and older group than in the 65 to 74 years or 75 to 84 years age groups ($\chi^2 = 10.32$, df = 2, p = .006).

Comparisons within age groups. Within–age-group analyses revealed that the oldest suicide victims, those aged 85 years and older, were marginally less likely to have toxicologic evidence of antidepressants than of analgesic or anxiolytic-hypnotic medications (McNemar $\chi^2 = 3.769$, df = 1, p = .052 for antidepressants versus analgesics; and $\chi^2 = 3$, df = 1, p = .083 for antidepressants versus anxiolytic-hypnotics). Thus, while the 85 years and older age stratum had the highest rate of suicide in the overall geriatric population, these subjects also had somewhat lower rates of toxicologically detected antidepressants than of analgesics or anxiolytic-hypnotics.

Within each of the other 2 age strata, neither anxiolytic-hypnotics nor analgesics were more likely to be found than antidepressants (for analgesics versus antidepressants, McNemar $\chi^2 = 2.333$, df = 1, p = .127 for age 65 to 74 years, and $\chi^2 = 1.471$, df = 1, p = .225 for age 75 to 84 years; and for anxiolytic-hypnotics versus antidepressants, McNemar $\chi^2 = 2.462$, df = 1, p = .117 for age 65 to 74 years, and $\chi^2 = 0.053$, df = 1, p = .819 for age 75 to 84 years).

On the other hand, within both the 65 to 74 years and 75 to 84 years age groups, anxiolytic-hypnotics were significantly more frequently found than analgesics (McNemar $\chi^2 = 10.714$, df = 1, p = .001 for age 65–74 years; and $\chi^2 = 3.6$, df = 1, p = .058 for age 75–84 years), while in the 85 years and older group anxiolytic-hypnotics and analgesics were found at the same relative frequency (McNemar $\chi^2 = 0.2$, df = 1, p = .655) (Table 3).

DISCUSSION

Overview

The principal finding of this study is that only a small proportion of New York City suicide victims aged 65 years and older had postmortem evidence of antidepressants. A majority of suicide victims did not receive pharmacologic interventions shortly before suicide. This may reflect low rates of depression treatment in the elderly, nonadherence, or a trend toward prescription of anxiolytic-hypnotics or analgesics in lieu of antidepressants. Assuming that depressive disorders were widely prevalent among the suicide victims,[2,3] what we have observed is the failure of specific antidepressant treatment to reach them. If some of the suicides might have been prevented by timely and sustained therapy with antidepressant medications, then an opportunity to intervene was missed in those cases.

Of particular interest, despite marginal statistical significance, was the fact that the oldest suicide victims, those aged 85 years and older, were less likely to have toxicologic evidence of antidepressant medications than of analgesics or anxiolytic-hypnotics. That the oldest subjects also had the highest suicide rates in the geriatric population suggests that deficiencies in the delivery of psychiatric services may apply most directly to this age stratum. Such deficiencies could include problems in case identification, diagnosis, suicide risk assessment, antidepressant prescribing, the monitoring of adherence, or a combination of the above.

Although comparisons across the 3 geriatric age groups did not show significant differences in the rates of antidepressants detected on toxicologic testing, a fuller picture emerges when the study's "within age group" and "across age group" analyses are taken together. That is, the somewhat lower rates of antidepressants compared to analgesics and anxiolytic-hypnotics within the 85 years and older age group, coupled with the significantly higher rates of analgesics in the 85 years and older compared to the younger 2 geriatric groups, together suggest a pattern of substitutive prescription of analgesics or anxiolytic-hypnotics, in lieu of antidepressants, to elderly patients who committed suicide. The evidence for this pattern is

most apparent in the oldest suicide victims. To explain this finding, we considered that the "old-old" may present more of the problems associated with the use of antidepressant medications. For example, the "old-old" are more likely to be medically compromised, vulnerable to antidepressant side effects, and perhaps less motivated than "young-old" patients to pursue the long-term treatment required to maintain remission from late-life depression.[19] We suspect that many primary care physicians either failed to diagnose depression or else considered pain syndromes, insomnia, or anxiety to be more compelling or less complicated to treat than depression in their oldest patients.

For unclear reasons, possibly including New York's strict gun-control laws, annual rates for late-life suicide during the period from 2001 through 2004 were lower in New York City than nationally.[1] The national suicide rate per 100,000 population from 2001 to 2004 for the 65 years and older age group was 14.97 (crude rate) versus 6.8 in New York City; for the 85 years and older age group, the national suicide rate per 100,000 was 17.46 (crude rate) versus 10.7 in New York City.

In the comparison of racial and ethnic categories, the highest suicide rates in New York City were shown for the "other races" category, not for whites, as in national data.[1] However, "other races" in our study comprised the smallest, most ethnically heterogeneous group. Also, in New York City, jumping (fall from height) was the most frequent method of suicide used by those aged 65 years and older, as was reported by our group in a previous study[4]; in contrast, firearms predominated nationally in this age category from 2001 through 2004.[1] Otherwise, geriatric suicide in New York City reflected key national trends for the period. For example, in both New York City and nationally, elderly suicide victims were predominantly male, and the highest annual suicide rates in both were for ages 85 years and older.[1]

Inadequate recognition and treatment of late-life depression appear to be underlying problems. Geriatric depression can present with anxiety or somatic pain that may be more prominent than the affective picture.[3,13] The indications for antidepressants may be further obscured by dementia, which is found in 35% to 45% of those aged 85 years or older,[20] or medical comorbidities. Frequently, however, elderly patients are not asked about mood symptoms at medical office visits.[2] Most elders in the United States are treated for depression by their primary care physicians, if they are treated at all.[19] Guidelines have been developed to assist primary care providers in identifying geriatric depression, initiating treatment, monitoring adherence, and intervening in situations of high suicidal risk.[12,13,19] However, these are still early efforts.

Limitations and Implications

There were several limitations in this study. First, despite the fact that this population-based study was situated in the largest city in the United States, geriatric suicide remains an infrequent event, and the statistical power to detect between–age-group and within–age-group differences was limited. In addition, subjects were lost because not all confirmed suicide victims underwent toxicologic investigation, and of those that did, some either lacked estimates of the IDI or had IDIs greater than 72 hours. The loss of so many cases was unsurprising, given the tendency to perform fewer autopsies in elderly than in younger adults.[21] Leon et al.,[8] who also investigated toxicologic evidence of antidepressants in New York City suicide victims from 2001 through 2004 but studied the entire adult population over age 18, excluded only 18.4% of subjects using the same criteria (compared to the geriatric exclusion rate here of 36.4%). Still, based on demographics of individuals for whom toxicology was unavailable, it is not clear that findings would differ if all geriatric suicides had been included. Also, the use of a single medical-examiner jurisdiction assured uniformity of procedures used in the determination of suicide.

Another limitation was the unavailability of pharmacy records, antidepressant doses, and other indicators of the intensity of antidepressant treatment.

We also lacked information regarding geriatric patients who were successfully treated with antidepressants during the study period and, as a consequence, did not commit suicide.

Although it is likely that many elderly suicide victims in our study who had been depressed failed to receive or adhere to antidepressant prescriptions, other explanations are possible. For example, not every suicide victim was necessarily depressed. Conceivably, patients with terminal medical conditions, absent depression meeting threshold criteria, could still become suicidal. Social problems or circumstances other than affective state can contribute to suicidal risk.[2] In some cases, anxiolytic-hypnotics or analgesics may have represented the most readily accepted or best-tolerated pharmacologic intervention. Finally, other individuals may have received interventions such as psychotherapy or social support but not psychopharmacologic antidepressant treatment. In that regard, antidepressant medication detected postmortem might best be viewed as a marker, but not a definitive indicator, that depression had been clinically addressed.

Nevertheless, when one considers the abundance of resources in New York City, these findings speak to problems in the delivery of antidepressant medication to the oldest patients. This report also highlights an opportunity to prevent, on a public health scale, suicides among elders, particularly males aged 85 years and older. The suicides to be targeted for intervention are those that could be prevented with vigorous treatment of depression. Screening for depression and suicidality during geriatric patients' medical visits seems warranted. Requiring window guards and terrace barriers in elders' high-rise residences might

also be helpful. However, the most obvious approach would be to foster fluency in the pharmacologic treatment of late-life depression among primary care practitioners who provide first-line medical care for the elderly.

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