ORIGINAL ARTICLE

Clinical Determinants of Suicidal Ideation and Behavior in Geriatric Depression

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Background: The aim of this study was to find clinical characteristics that can identify elderly patients with depression at risk for suicidal ideation and to determine their prognosis.

Method: Suicidal ideation, past suicidal behavior, severity of depression, cognitive impairment, medical burden, disability, and social support were studied in 354 patients with depression aged 61 to 93 years. The patients had in-person evaluations every 6 months and telephone evaluations for a mean of 1.8 years (SD, 2.2).

Results: During the index episode, suicidal ideation was predicted by previous suicide attempts with serious intent (odds ratio [OR], 2.82; 95% confidence interval [CI], 1.37-5.80), severity of depression (OR, 1.09; 95% CI, 1.03-1.16), and poor social support (OR, 1.77; 95% CI, 1.18-2.65). Suicide attempts during the year prior to entry were reported by patients with a severe index episode (OR, 1.05; 95% CI, 1.00-1.11), impaired instrumental activities of daily living (OR, 0.78; 95% CI, 0.67-0.93), and limited impairment in activities of daily living (OR, 1.53; 95% CI, 1.10-2.14). At the initial evaluation, severity of depression, previous attempts, and seriousness of suicidal intent during previous attempts predicted the course of suicidal ideation (concordance correlation, 0.78). During follow-up, contemporaneous severity of depression was the most important determinant of suicidal ideation over time (concordance correlation, 0.88).

Conclusions: Elderly individuals with severe depression, history of suicide attempts with serious intent, and poor social support are most likely to have suicidal ideation and should be targeted for appropriate interventions. Severity of depression is the strongest predictor of the course of suicidal ideation.

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IN LATE LIFE, suicide is almost twice as frequent as in the general population.[1,2] Older age seems to be associated with more determined and carefully planned self-destructive acts and with fewer warnings of suicidal intent.[3,4] These observations suggest that aging reduces suicide attempts but increases their lethality.

Despite the high frequency of suicide in late life, suicidal ideation decreases with aging.[5,6] Suicidal ideation may be a risk factor for suicide in both young and elderly patients. In younger psychiatric outpatients, suicidal ideation seems to predict completed suicide with 53% sensitivity, 83% specificity, and 4.2% predictive value.[7] The sensitivity (80%) and predictive value (5.6%) of suicidal ideation is even higher in geriatric psychiatric outpatients.[7]

Depression increases the risk of suicide across age groups.[2,3,8] High severity of depression, as reflected by treatment setting, seems to be a predictor of suicidal behavior.[9] Suicide mortality in 35 536 individuals treated for depression within a health plan was 59 per 100 000 person-years of follow-up. Suicide risk per 100 000 person-years declined from 224 among patients who required psychiatric hospitalization for depression, to 64 among those who received outpatient psychiatric care, 43 among those treated with antidepressants in primary care, and 0 among those treated without antidepressants in primary care.[9]

Depression is the most common psychiatric diagnosis in elderly suicide victims, unlike younger adults, in whom substance abuse alone or with comorbid mood disorders is the most frequent diagnosis.[10-14] Major depression was identified in 80% of suicide victims older than 74 years, while its frequency ranged from 3.1% to 29.4% in younger victims.[14] These observations indicate that depression is the psychiatric disorder most likely to increase suicide risk in the elderly.

The clinical profile of elderly victims of suicide with depression suggests

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SUBJECTS, MATERIALS, AND METHODS

SUBJECTS

The subjects were patients of a psychiatric university hospital in suburban New York. They were consecutively recruited and signed informed consent. Of those approached, 29% refused to participate.

Subjects were included if they were 60 years or older, met Research Diagnostic Criteria[17] for major depressive disorder, and had a 24-item Hamilton Depression Rating Scale (HDRS)[18] score of 17 or higher. Patients were excluded if they had a history of psychiatric disorders (except anxiety and personality disorders) diagnosed prior to the onset of the first depressive episode; alcohol or substance abuse; severe or acute medical illness (ie, metastatic cancer; decompensated cardiac, liver, or kidney failure; major surgery; stroke; or myocardial infarction), 6 months prior to study entry; delirium, vascular dementia, Parkinson disease, spinocerebellar degeneration, or Huntington chorea; cognitive dysfunction for longer than 6 months prior to the onset of depression, and a Mini-Mental State Examination[19] score lower than 15; severe overall behavioral disability rated as complete impairment by the Philadelphia Multilevel Assessment Instrument (MAI)[20]; and absence of a person who could function as informant. Data from informants were obtained when the patient report was doubtful. If inconsistencies were found between patients and informants, the raters interviewed both patients and informants again to ascertain reasons for discrepancies. These findings were later reviewed at a research conference and the best possible judgment was entered in the database.

Within 7 days of entry, the Schedule for Affective Disorders and Schizophrenia (SADS)[21] was administered. Then, the Research Diagnostic Criteria and the *DSM-IV* were used to determine diagnosis by psychiatrists or psychologists trained in the use of these instruments.

ASSESSMENT OF SUICIDAL IDEATION AND BEHAVIOR

At entry, suicidal ideation was assessed with the suicide item (graded 0-4) of the HDRS. History of suicidal behavior was rated with the following 3 SADS items: the number of discrete suicidal gestures or attempts during the present episode (up to 1 year); seriousness of suicidal intent (from 1, obviously no intent, to 6, every expectation of death); and medical lethality (from 1, no effects [eg, held pills in hand], to 6, extreme [eg, prolonged coma]).

ASSESSMENT OF DEPRESSION, MEDICAL BURDEN, DISABILITY, AND SOCIAL SUPPORT

Severity of depression was assessed with the 24-item HDRS. Cognitive impairment was rated with the Mini-Mental State Examination and the Mattis Dementia Rating Scale.[22] The Mattis Dementia Rating Scale permits sensitive discrimination of mild dementia from no dementia.[23]

Medical burden, disability, and poor social support may promote suicidal ideation or behavior. For this reason, the impact of these factors was studied. The MAI was used to assess these variables; it has been validated in a variety of elderly populations.[20] Accordingly, medical burden was rated with the MAI physical health domain, which assesses self-rated health, health conditions, and health behavior. Disability was rated with 3 MAI indexes: instrumental activities of daily living (IADL), activities of daily living (ADL), and mobility index. Instrumental activities of daily living consist of ability to use the telephone, travel, shop, prepare meals, do housework or handyman work, do the laundry, take medicine, and manage money. Activities of daily living consist of ability to eat, dress, groom, walk, get in and out of bed, and bathe. The mobility index assesses how often subjects leave their buildings or neighborhoods and whether they drive a car. Social support was assessed with an MAI index that rates interactions with family and friends.

FOLLOW-UP ASSESSMENTS

After the initial evaluation, the patients had in-person evaluations every 6 months. In addition, the subjects were interviewed by telephone 3 months after each in-person session. Therefore, patients had contact with the investigators every 3 months. Suicidal ideation (HDRS item), severity of depression (total HDRS), medical burden (MAI), cognitive impairment (Mini-Mental State Examination, Mattis Dementia Rating Scale), disability (MAI: IADL, ADL, mobility index), and social support (MAI) were rated during in-person evaluations. Informants were used when the subjects were unable to recall information needed for the assessment of medical burden and disability.

STATISTICAL ANALYSES

Data analysis focused first on the relationship of suicidal ideation and past suicidal behavior to cross-sectional clinical and demographic characteristics of the subjects during the index episode. Stepwise logistic regression was applied to construct parsimonious models of variables associated with suicidal ideation and history of suicidal behavior assessed at baseline. Longitudinal analyses used mixed-effects models to address 2 clinical questions: What characteristics should clinicians consider in determining the prognosis of suicidal ideation when they first see an elderly patient? and What clinical characteristics should clinicians use to determine the risk of suicidal ideation during follow-up visits? The mixed-effects statistic modeled the average profile of suicidal ideation over time and considered heterogeneity in suicidal ideation both at baseline and during follow-up. The concordance correlation[24] was used to evaluate the goodness of fit estimated by predictive models to fluctuations of observed suicidal ideation. Concordance correlation is analogous to linear regression but, because it includes multiple sources of variability as part of the mixed-effect models, it cannot yield a multivariate coefficient of determination. Two-tailed significance tests were used.

that their prognosis would be more favorable with treatment. Most elderly victims of suicide have a mild to moderately severe depression, no previous depressive episodes, and no comorbid substance abuse or personality disorders.[2,10,14] These characteristics predict good response to treatment.

Most elderly patients who commit suicide see their physicians within a few months of their death and more

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Baseline Demographic and Clinical Characteristics of 354 Elderly Patients With Unipolar Major Depression*

	Entire Sample (N = 354)†		Men (n = 129)†		Women (n = 225)†	
	Mean (SD)	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)	Median (Range)
Age, y	74.17 (7.20)	74 (61-93)	73.26 (7.19)	73 (61-93)	74.69 (7.17)	75 (61-94)
Education, y	12.85 (3.29)	12 (2-22)	13.19 (3.71)	13 (2-21)	12.65 (3.02)	12 (3-22)
Suicidality‡						
HDRS suicide item	0.83 (1.05)	0 (0-4)	0.95 (1.09)	1 (0-4)	0.76 (1.02)	0 (0-4)
SADS No. of attempts	0.69 (0.60)	1 (0-3)	0.66 (0.63)	1 (0-3)	0.70 (0.60)	1 (0-3)
SADS medical lethality	1.26 (0.93)	1 (0-6)	1.38 (1.07)	1 (1-6)	1.20 (0.87)	1 (0-6)
Severity of depression‡						
HDRS total	24.82 (6.82)	23 (17-44)	24.82 (7.04)	23 (17-40)	24.82 (6.72)	23.50 (17-44)
Medical burden‡						
MAI physical health index	63.86 (4.78)	64 (50-74)	63.34 (4.30)	65 (50-72)	63.59 (5.04)	64 (50-74)
Cognitive‡						
MMSE	26.92 (3.92)	28 (15-30)	26.98 (4.04)	28 (15-30)	26.88 (3.85)	28 (15-30)
DRS	132.39 (12.27)	137 (67-144)	134.19 (11.10)	138 (67-144)	131.32 (12.83)	136 (77-144)
Disability‡						
MAI IADL index	24.28 (3.72)	26 (11-27)	25.11 (3.21)	27 (12-27)	23.81 (3.91)	26 (11-27)
MAI ADL index	20.53 (1.29)	21 (13-21)	20.69 (0.93)	21 (15-21)	20.43 (1.46)	21 (13-21)
MAI mobility index	19.08 (5.42)	22 (3-24)	20.74 (4.43)	23 (9-24)	18.14 (5.72)	19 (3-24)
Social support‡						
MAI social support index	56.44 (13.73)	57 (26-97)	56.04 (13.20)	56 (26-88)	56.67 (14.07)	57 (27-97)

*HDRS indicates Hamilton Depression Rating Scale; SADS, Schedule for Affective Disorders and Schizophrenia; MAI, Philadelphia Multilevel Assessment Instrument; MMSE, Mini-Mental State Examination; DRS, Mattis Dementia Rating Scale; IADL, instrumental activities of daily living; ADL, activities of daily living; and SSI-C, Scale for Suicidal Ideation-Change.

†The ethnicity of the sample was as follows: 282 (92%) were white, 16 (5%) were African American, and 9 (3%) were Hispanic; for men, 106 (93%) were white, 3 (3%) were African American, and 5 (4%) were Hispanic; and for women, 176 (91%) were white, 13 (7%) were African American, and 4 (2%) were Hispanic.

‡Maximum scores for each scale were as follows: HDRS suicide item, 4; SSI-C total, 38; SADS medical lethality, 6; SADS seriousness of intent, 6; HDRS total, 74; MAI physical health index, 74; MMSE, 30; DRS, 144; MAI IADL index, 27; MAI ADL index, 48; MAI mobility index, 24; and MAI social support index, 117.

than a third within the week of their suicide.[10,15,16] Therefore, reliable assessment of suicide risk is critical; protective measures may avert suicide.

The principal aim of this study was to determine which clinical characteristics can be used to assess suicidality in elderly patients with depression. First, the study examined clinical and demographic characteristics associated with suicidal ideation and behavior during the index depressive episode with the goal to help clinicians identify patients with high suicide potential. The course of suicidal ideation and predictors of change were then studied in order to provide information that clinicians can use to determine the prognosis of suicidal ideation and plan their interventions.

RESULTS

Three hundred fifty-four elderly subjects studied met RDC criteria for unipolar major depressive disorder (**Table**). At study entry, 77.6% of subjects were inpatients and 22.4% were outpatients.

DETERMINANTS OF SUICIDE POTENTIAL AT CROSS-SECTIONAL EVALUATION

Past Suicidal Behavior

Approximately 60% of men and 62% of women had a history of at least 1 suicide attempt. Male sex was associated with previous suicide attempts with serious intent (seriousness of intent z, −2.04; P = .04). However, there were no significant sex differences in the number and lethality of attempts.

Stepwise logistic regression was used to examine whether the dimensional variables of severity of depression (HDRS minus the suicide item [HDRS − S]), ADL, IADL, mobility index, and social support could identify patients who had made suicide attempts during the year prior to entry. Severity of depression during the index episode (odds ratio [OR], 1.05; 95% confidence interval [CI], 1.00-1.11; P = .04), IADL (OR, 0.78; 95% CI, 0.67-0.93, P = .004), and ADL (OR, 1.53; 95% CI, 1.10-2.14; P = .01) correctly classified 71% of the subjects (χ^2_3 = 19.44; P = .002). These data suggest that elderly patients with severe depression and impaired IADLs are most likely to report history of previous suicide attempts, but ADL impairment reduces the probability of past attempts.

Suicidal Ideation

In this sample of elderly patients, sex or age did not significantly influence the distribution of suicidal ideation assessed with the HDRS item, perhaps because of the rather narrow age range (Table). At entry, 51% of men and 43% of women reported suicidal ideation (ie, had an HDRS suicide item score >0). There were no significant sex or age by sex effects on suicidal ideation.

Stepwise logistic regression was used to discriminate subjects with (46%) from those without (54%) suicidal ideation. Potential predictors were the SADS items of the number of attempts, seriousness of intent of pre-

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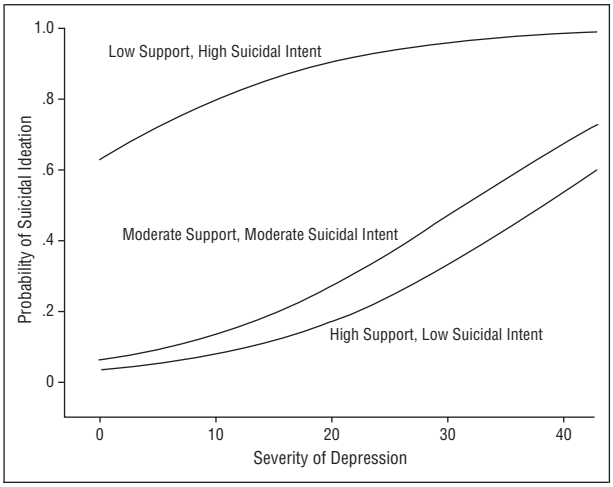

Figure 1. *Probability of suicidal ideation as a function of depression (N = 354). Fitted values are shown for low (10th percentile), moderate (50th percentile), and high (90th percentile) levels of social support and seriousness of suicidal intent during previous suicide attempts. Suicidal ideation was rated with the Hamilton Depression Rating Scale suicide item (present vs absent); severity of depression was assessed by the Hamilton Depression Rating Scale total score minus the suicide item. Social support was assessed with a multiphasic assessment instrument. Suicidal intent was assessed with the Schedule for Affective Disorders and Schizophrenia.*

vious attempts, medical lethality, severity of depression (HDRS-S), and sex. All predictors were dimensional except for sex. The final logistic model correctly classified 62% of elderly subjects with suicidal ideation ($\chi^2_2 = 16.6$; $P = .002$). Significant individual predictors were seriousness of intent (OR, 2.5; 95% CI, 1.24-5.02; $P = .01$) and total HDRS-S (OR, 1.07; 95% CI, 1.01-1.13; $P = .02$).

A second logistic regression analysis examined whether medical burden, disability, and social support added to the prediction of suicidal ideation. The model included the dimensional MAI indexes of physical health and social support as well as seriousness of suicide intent (SADS) and severity of depression (HDRS-S). This model correctly classified 69% of the subjects ($\chi^2_3 = 28.8$; $P < .001$). Significant individual predictors were seriousness of intent (OR, 2.82; 95% CI, 1.37-5.80; $P = .005$), severity of depression (OR, 1.09; 95% CI, 1.03-1.16; $P = .005$), and social support (OR, 1.77; 95% CI, 1.18-2.65; $P = .006$). Poor social support was associated with suicidal ideation in patients with history of serious suicide attempts, even when their depression was mild (**Figure 1**). However, severity of depression was the main determinant of suicidal ideation in patients with moderate or strong social support and history of less serious or no suicide attempts.

DETERMINANTS OF THE COURSE OF SUICIDAL IDEATION

Of the 354 elderly subjects with depression, 308 (age mean, 74.1 years [SD, 7.1 years]; range, 61-93 years) agreed to be evaluated. As this is an ongoing study, follow-up ranged from 6 months to 7 years (mean, 1.8 years [SD, 2.2]).

During follow-up, 3 subjects committed suicide, 40 died by causes other than suicide, and 40 were lost to follow-up (mainly because of relocation). The length of follow-up for subjects who died (mean, 1.5 years [SD, 2.2 years]) or were lost to follow-up (mean, 1.4 years [SD, 1.8 years]) was indistinguishable from that of the subjects who remained alive and continued to participate in the study (mean, 1.9 [SD, 2.3]; analysis of variance $F_{2,302}$, 1.4; $P = .25$).

The subjects who committed suicide had a history of 1 previous suicide attempt, a wide range of depressive symptoms (HDRS scores: 17, 38, and 39) at entry, clinically significant medical burden (MAI index scores: 58, 63, and 64), disability (IADL index scores: 23, 24, and 26 and mobility index scores: 10, 19, and 24), and poor social support (MAI index scores: 59, 59, and 64).

Initial Assessment

During the initial examination, clinicians need to know which of the available clinical findings can most effectively determine the prognosis of suicidal ideation. To address this concern, the relationship between baseline clinical characteristics and the course of suicidal ideation was studied. Mixed-effects model analysis showed that age ($z = 0.96$; $P = .33$), sex ($z = 1.28$; $P = .20$), and age by sex interaction (age $z = 0.80$; $P = .42$) were not significantly associated with the course of suicidal ideation (HDRS suicide item). A model consisting of suicidal ideation at baseline ($z = 15.37$; $P < .001$), number of previous suicide attempts ($z = 2.49$; $P = .01$), and seriousness of intent during previous attempts ($z = 1.62$; $P = .11$), along with linear and quadratic terms to represent trends over time, had a high concordance correlation (0.78) with the fluctuations in observed suicide ideation during follow-up. These observations suggest that history of suicidal behavior is an important determinant of the prognosis of suicidal ideation.

Assessment During Follow-up

During follow-up, clinicians evaluate their patients' suicide potential by assessing their clinical state at each visit. To identify clinical characteristics that may be used to assess suicidal ideation during follow-up, the contemporaneous relationship of clinical variables to suicidal ideation was studied longitudinally. A model consisting of severity of depression, medical burden, IADL, and social support was significantly associated with contemporaneously occurring suicidal ideation (likelihood ratio $\chi^2_4 = 934.4$; $P < .001$). The concordance correlation between observed values of suicidal ideation and values estimated by this model was 0.89. However, contemporaneous severity of depression alone was associated with the course of suicidal ideation ($z = 15.03$, $P < .001$) with a concordance correlation of 0.88 (**Figure 2**). The model of contemporaneous medical burden, IADLs, and social support was also associated with suicidal ideation over time (likelihood ratio $\chi^2_3 = 843.9$; $P < .001$) with a concordance correlation of 0.47 (Figure 2). Adding medical burden, IADLs, and social support to depression increased the concordance correlation from 0.88 to 0.89. These observations suggest that contemporaneous severity of depression is the most important determinant of the course of suicidal ideation.

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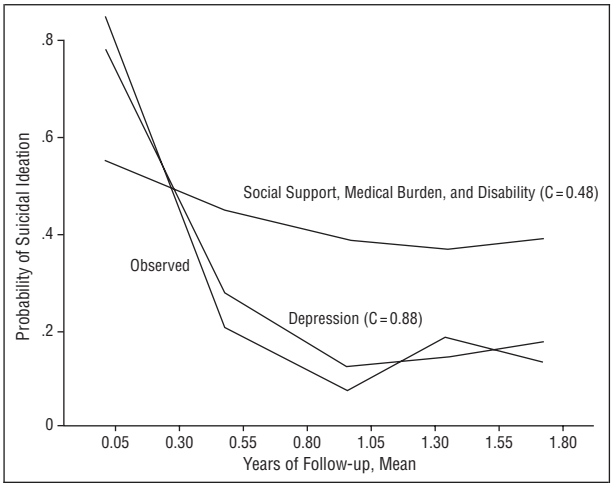

Figure 2. *Mean level of suicidal ideation, observed vs predicted (N = 308). Suicidal ideation was rated with the Hamilton Depression Rating Scale suicide item; severity of depression was assessed by the Hamilton Depression Rating Scale total score minus the suicide item. Disability, medical burden, and social support were assessed with the Philadelphia Multiphasic Assessment Instrument. The concordance correlation (C) measure evaluated the goodness of fit estimated by predicative models to fluctuations of observed suicidal ideation.*

COMMENT

The principal contribution of this study is the identification of clinical characteristics that can assess the risk and predict the course of suicidal ideation in elderly patients with depression. During episodes of depression, suicidal ideation was associated with severity of depression, poor social support, and history of serious suicide attempts. Patients with severe depression and IADL impairment were more likely to have a history of suicide attempts. Poor social support and a history of serious suicide attempts were associated with suicidal ideation, even in the context of mild depression. Suicidal ideation during the index episode and history of serious suicide attempts were strong predictors of the course of suicidal ideation and can be used to determine the prognosis of suicidal ideation at the initial evaluation. During follow-up, severity of depression, medical burden, disability, and social support predicted most of the variance in suicidal ideation. However, severity of concurrent depression was the main determinant of fluctuations in suicidal ideation over time. The strong relationship of geriatric depression to suicidal ideation suggests that identification and appropriate treatment of depression can improve suicidal ideation and ultimately lower the risk of suicide. However, the efficacy and effectiveness of acute, continuation, and maintenance antidepressant treatment on suicidality needs direct investigation.

Geriatric depression occurs in the context of medical illnesses[25,26] and worsens their outcomes.[27-29] Medical burden increases the risk of suicide,[2] but 70% of medically ill victims of suicide also have psychiatric disorders.[2] The exclusion criteria of our study prevented the investigation of the effect of severe or acute medical illnesses on suicidality. However, other investigators have reported that patients with cancer have twice the risk of suicide as others in the population.[30,31] Even in patients with terminal illnesses, serious suicidal ideation usually occurs in the context of depression.[32] These findings suggest that antidepressant treatment may reduce suicide risk, both by reducing depression and perhaps suicide risk from the excess medical morbidity related to depression.

In this study, ADL impairment reduced the probability of past suicide attempts, perhaps by interfering with the ability to effect suicidal behavior. Unlike ADL, IADL impairment and severity of depression were associated with suicide attempts and were predictors of the course of suicidal ideation. Geriatric depression is related to functional disability[33-35]; treatment of depression can reduce functional disability.[36,37] Recognition and treatment of depression and behavioral rehabilitation may decrease suicidal behavior by ameliorating both depression and disability.

Poor social support was associated with increased suicidal ideation, even in the context of mild depression. This effect was pronounced in elderly patients with a history of serious suicide attempts. Patients with poor social support and a history of serious suicide attempts should be carefully evaluated for suicidality and precautions be taken even when their depression is mild.

This study has several limitations, including an exclusive focus on past suicidal behavior and ideation, uncontrolled treatment design, and use of a nonspecific measure of social support.

Suicidal ideation and attempts were the focus of this study because of their potential relationship to suicide, particularly in geriatric patients.[7] It is less clear, however, whether suicidal ideation and attempts increase the risk of suicide in the elderly. The Collaborative Program on the Psychobiology of Depression evaluated 954 patients with major mood disorders for an average of 4 years and observed that suicidal ideation during the index episode, suicide attempts during the current or past episodes, and lethality of prior attempts did not distinguish patients who committed suicide during the study from those who remained alive.[38] Most subjects of this study were young adults.[38] The relationships among suicidal ideation, attempts, and suicide require investigation in the elderly with longitudinal designs focusing both on attempted and completed suicides. Such studies need to consider the effect of demographic factors, since suicide increases disproportionally in elderly white men and the trajectory from risk factors to suicide may differ across sexes and races.

Our assessment of past suicide attempts did not offer information on their exact timing. Suicidal ideation at entry may have been influenced by the ideation that led to a recent attempt. However, the number and seriousness of past suicide attempts influenced the course of suicidal ideation over a follow-up period ranging from 6 months to 7 years. This effect is less likely to be the tail end of suicidal ideation remaining after a previous attempt.

Antidepressant treatment was not controlled in this study. Its objective was to evaluate the relationship of suicidal ideation and behavior to depression and clinical parameters that influence and are influenced by depression. This goal was served by a naturalistic treatment design; naturalistic treatment, in most cases, is of low in-

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tensity[39] and allows depression and related clinical parameters to vary so that potential relationships among them can be investigated.

The relationship of social support to suicidal behavior and depression requires further study. Poor social support may contribute to depression,[40] and depression itself may influence the perception or availability of social support.[41,42] These observations suggest that the effect of social support on suicidal ideation may in part be mediated by depression. However, this study required that its subjects have a person who can function as an informant and may not permit conclusions about patients with unavailable social support.

CONCLUSIONS

This study demonstrates that elderly patients with severe depression, poor social support, and history of serious suicide attempts have high suicide potential. Poor social support is associated with suicidal ideation in patients with history of serious suicide attempts, even when their depression is mild. History of suicide attempts is most likely to be reported by elderly patients with severe depression and functional disability. These observations can be used by clinicians to identify patients with the highest suicide potential and to guide in the provision of appropriate interventions. The prognosis of suicidal ideation depends to a large extent on the severity of depression, but medical burden, disability, and poor social support are also contributing factors. Therefore, recognition and treatment of geriatric depression may be the most effective measure against suicidal ideation. Enhancing social support and offering behavioral rehabilitation in patients with disabilities may be of additional help.

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