



## Research report

# Course of suicide ideation and predictors of change in depressed older adults

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Received 7 February 2008; received in revised form 16 May 2008; accepted 17 May 2008

## Abstract

**Background:** Rates of suicide among older adults in the United States are higher than that of other age groups. Therefore, it is critically important to deepen understanding of the processes that drive suicide risk among at-risk older patients. To this end, we examined the longitudinal course of suicide ideation in a sample of treatment-seeking depressed adults 60 years of age or older. **Methods:** Secondary analyses were conducted with a longitudinal dataset including 343 older adults seeking treatment for depression in the context of a naturalistic treatment setting. Participants completed assessments of depressive symptoms and thoughts of suicide every three months for one year. Multi-level mixed models were used to examine the trajectory of suicide ideation over five waves.

**Results:** Depressive symptoms contributed significantly to change in thoughts of suicide early in treatment for depression. Age-related differences were also observed, such that increasing age was associated with significantly greater reports of suicide ideation. **Limitations:** Use of a single measure to ascertain severity of depressive symptoms and thoughts of suicide.

**Conclusions:** Clinicians should expect to see the most pronounced decrease in thoughts of suicide during the first two months of depression treatment for older adults. Further, clinicians should be especially vigilant to monitor suicide ideation for adults, with increasing vigilance for those at more advanced ages.

Published by Elsevier B.V.

**Keywords:** Suicide; Suicidal ideation; Older adults; Depression; Longitudinal

## 1. Introduction

Rates of suicide among older adults in the United States are higher than that of other age groups (CDC, 2006), and can be ascribed to age-related increases in physical frailty and attempt lethality (Conwell et al., 1998; Conwell et al., 2002). Over the next 15 years, it is anticipated that the population over 65 will increase

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dramatically; therefore, the number of deaths by suicide in older adults is likely to increase considerably. Whereas the ratio of suicide attempts to deaths by suicide for adults over age 65 is 4:1, it is in the range of 100–200:1 for adolescents and younger adults (American Association of Suicidology, 2006). The lower ratio in older adults suggests a smaller window of opportunity to intervene, as an older adult who attempts suicide has a 25% chance of dying. Therefore, it is critically important to deepen understanding of the processes that drive suicide risk among at-risk patients in this age group. To this end, we examined the longitudinal course of suicide ideation in a sample of treatment-seeking depressed older adults.

Suicide ideation (SI) in older adults confers risk for mortality by suicide (Waern et al., 1999) and other causes of death (Dewey et al., 1993; Maier and Smith, 1999). De Leo et al. (2002) found that SI and desire differentiated repeat attempters from non-repeaters in a sample of older adult (60 to 87 years of age) suicide attempters. Those with higher SI after an initial suicide attempt were more likely to re-attempt than those with lower levels of SI following a suicide attempt. Interestingly, despite the increasing incidence of death by suicide with increasing age for older adults (especially high for Caucasian men after age 85), some studies have shown that self reports of SI decrease with increasing age (De Leo et al., 2005; Duberstein et al., 1999; Gallo et al., 1994). On the other hand, SI may be more difficult to mitigate or treat with increasing age (Szanto et al., 2003; Szanto et al., 2007; Vannoy et al., 2007). For example, a recent study examining the trajectory of SI during a treatment study for late-life depression in primary care (Unutzer et al., 2002), found that older age was significantly related to the likelihood of reporting SI during treatment or follow-up (Vannoy et al., 2007). Thus, it is necessary to ascertain the trajectory of SI from older adults at different ages (e.g., 75 years old and under compared to over 75) to determine how SI changes over time, as well as factors associated with changes over time in these thoughts.

Only recently have studies begun to examine the longitudinal relation between depressive disorders and SI. Vannoy et al. (2007) found that depressed patients whose symptoms did not remit were more likely to continue endorsing SI than those whose depressive symptoms did remit. In addition, individuals who reported the emergence of SI after the start of the study (more than half of the sample) were those whose depressive symptoms failed to remit. Similarly, Szanto et al. (2003; 2007) have reported on the course of SI among participants involved in medication trials for late-life depression. The first report (Szanto et al., 2003)

showed that thoughts of suicide decreased rapidly early in treatment. By the 12th week of treatment all participants with SI at baseline reported resolution of these thoughts; however, a small percentage continued to have thoughts of death. Exploring patterns of emergent, persistent, or resolved SI, the subsequent study found that patients with persistent SI were more likely to experience recurrent depression than those whose depressive symptoms decreased during the trial (Szanto et al., 2007). Patients with either emergent or persistent SI reported greater depressive symptoms, anxiety, and agitation throughout the course of the study than those whose SI resolved. Taken together these studies confirm that SI decreases rapidly following adequate treatment of depression in older adults.

The primary aim of the analyses reported here is to determine the stability and course of SI over a one-year period among depressed older adults participating in a naturalistic treatment study for late-life depression utilizing medication and individual or group cognitive behavior therapy. We will examine the trajectory of SI for all participants (i.e., with and without elevated SI at wave 1). It is predicted that thoughts of suicide will decrease during this one-year longitudinal study. We will then separately examine the pattern of SI for only those participants with elevated SI at wave 1. Based on the results of previous studies (Szanto et al., 2007; Vannoy et al., 2007), we hypothesize that individuals with elevated SI at wave 1 will show a marked decrease in thoughts of suicide early in the study, and reduction of depressive symptoms will be strongly associated with this reduction in SI. A second objective is to examine moderators of reduction in SI (e.g., age, depression) which may be related to changes in SI. Second, based on previous studies (Szanto et al., 2007; Vannoy et al., 2007), it is hypothesized that decreased SI will be significantly related to reductions in depressive symptoms. We will also examine the moderating effect of age on the trajectory of SI. Based on previous data (CDC, 2006), we hypothesize that age will significantly interact with depression in the prediction of SI over time. We will also explore the moderating effects of gender and race.

## 2. Method

### 2.1. Patients

Three hundred and forty three patients completed longitudinal assessments for this study as part of participation in two longitudinal studies. Depressed patients aged 60 and older were recruited by investigators at

the Duke University Medical Center into the NIMH-sponsored Mental Health Clinical Research Center for the study of Depression in Later Life (MHCRC) and into its longitudinal sister study, Neurocognitive Outcomes of Depression in the Elderly (NCODE; Steffens et al., 2004). Patients were referred to the study from the Duke Medical Center inpatient and outpatient psychiatry services and from the Duke General Internal Medicine Clinic. Diagnoses of unipolar depression were reached at a consensus diagnostic conference conforming to the LEAD standard (Longitudinal, Expert, & Available Data; Spitzer, 1983). Within this sample, 22% indicated a single episode of depression, with a total of 80% of participants reporting five or fewer lifetime episodes ( $M=5.85$ ,  $SD=11.55$ ). Twenty eight participants endorsed a previous suicide attempt. Exclusion criteria included presence of another major psychiatric illness such as schizophrenia, schizoaffective disorder, bipolar disorder, and lifetime alcohol or substance dependence. Exclusion of participants with bipolar disorder included those with a lifetime history of manic or hypomanic episodes. Patients were excluded if they had dementia or suspected dementia at wave 1 based on information available to the assigned MHCRC geriatric psychiatrist. Most (87.3%) depressed patients enrolled to date had Mini Mental State Examination (Folstein et al., 1975) scores above 24 at wave 1 assessment.

For this report, secondary analyses were conducted on data collected from 343 depressed patients enrolled between 1995 and 2003. The mean age at wave 1 is 69.7 years ( $SD=7.4$ ). At wave 1, 77% of the sample ( $N=266$ ) was 75 years old or younger. Most of the patients are women (66%) and Caucasian (86%); 11% are African-American, and 3% reported their race as 'other.' This report focuses on five waves of data collection during the first year, given the prognostic significance of relatively early treatment response (Szanto et al., 2003; Szanto et al., 2007; Vannoy et al., 2007). At the second wave ( $M=53.35$  days later,  $SD=46.81$ ), 87% ( $N=300$ ) of the wave 1 participants completed the assessment, 87% ( $N=304$ ) completing the third wave ( $M=56.00$  days after wave 2,  $SD=45.54$ ), 87% ( $N=300$ ) completing the fourth wave ( $M=64.81$  days after wave 3,  $SD=40.81$ ), and 83% ( $N=285$ ) the fifth wave ( $M=70.70$  days after wave 4,  $SD=40.34$ ).

## 2.2. Measures

*Montgomery-Åsberg Depression Rating Scale* (MADRS; Montgomery and Åsberg, 1979). The MADRS is a 10-item interviewer rating scale for de-

pressive symptoms (rated on a 0 to 6 scale). The SI item served as the dependent measure in this study. The interviewer rated the extent to which the patient felt that life is not worth living, a natural death would be welcome, thoughts of suicide, and preparations for suicide on a scale ranging from 0 ("Enjoys life or takes it as it comes.") to 6 ("Explicit plans for suicide when there is an opportunity. Active preparations for suicide."). The remaining nine items were summed to yield an index representing depressive symptom severity (MADRS-adj). The mean MADRS-adj score at wave 1 was 27.15 ( $SD=7.89$ ). All raters were trained on completion of the MADRS, and high inter-rater reliability ( $\kappa>.9$ ) was established.

## 2.3. Procedures

The MHCRC operates in a naturalistic treatment milieu using treatment guidelines established by the Duke Affective Disorders Program (Steffens et al., 2002a). Treatment modalities available include antidepressant medications, electro-convulsive therapy, and individual and group cognitive-behavioral psychotherapy. Patients are evaluated when clinically indicated, and at least every three months while enrolled in the study. At wave 1, a geriatric psychiatrist interviewed each depressed patient and completed standardized clinical assessments, including the MADRS.

## 2.4. Statistical analysis

To examine changes in SI over time and moderators of change, a series of repeated measures multi-level models were employed, using the SAS 9.1 Proc Mixed Procedure (SAS Inc., Cary, NC). These models allow the longitudinal observations of SI, and depressive symptoms to be nested within individuals to account for the non-independence of the observations, and are robust to differences in number of longitudinal observations between individuals enabling the inclusion of participants with missing data (Littell et al., 2006).

A repeated measures multi-level model included all patients and examined the moderating effects of changes in depressive symptoms on thoughts of suicide, as well as interactions between change in symptoms and demographic variables (age, race, and sex). A similar model was also run with only participants with elevated SI at wave 1 to determine whether the pattern of change over time in SI was consistent across the entire sample and within those having elevated SI. These models were performed on longitudinal observations of MADRS SI over 5 waves of assessment during the first year of

Table 1

Descriptive statistics and bivariate correlations for participants with elevation on suicide ideation at wave 1

|                  | 1      | 2      | 3      | 4      | 5      | 6     | 7      | 8      | 9      | 10    |
|------------------|--------|--------|--------|--------|--------|-------|--------|--------|--------|-------|
| 1. SI W1         | –      |        |        |        |        |       |        |        |        |       |
| 2. SI W2         | .33*** | –      |        |        |        |       |        |        |        |       |
| 3. SI W3         | .25*** | .56*** | –      |        |        |       |        |        |        |       |
| 4. SI W4         | .24*** | .43*** | .50*** | –      |        |       |        |        |        |       |
| 5. SI W5         | .09    | .36*** | .40*** | .44*** | –      |       |        |        |        |       |
| 6. MADRS-adj W1  | .35*** | .08    | –.03   | –.02   | .01    | –     |        |        |        |       |
| 7. MADRS-adj W2  | .09    | .66*** | .36*** | .33*** | .34*** | .15*  | –      |        |        |       |
| 8. MADRS-adj W3  | .11    | .45*** | .68*** | .37*** | .33*** | .08   | .56*** | –      |        |       |
| 9. MADRS-adj W4  | .09    | .37*** | .32*** | .58*** | .36*** | .09   | .56*** | .60*** | –      |       |
| 10. MADRS-adj W5 | .05    | .36*** | .36*** | .34*** | .63*** | .08   | .59*** | .50*** | .58*** | –     |
| Mean             | 2.05   | .77    | .60    | .53    | .56    | 27.24 | 15.67  | 12.78  | 11.21  | 11.53 |
| SD               | 1.03   | 1.02   | .98    | .90    | .98    | 7.25  | 8.92   | 8.70   | 7.80   | 8.66  |

Note. \* =  $p < .05$ , \*\*\* =  $p < .001$ . SI = Suicide ideation; MADRS = Montgomery–Åsberg Depression Rating Scale; W1 = wave 1; W2 = wave 2; W3 = wave 3; W4 = wave 4; W5 = wave 5.

participation. Change in depressive symptoms at each successive wave of assessment was the predictor for SI at the corresponding time point. Inspection of covariance parameter estimates for the repeated measures mixed models described below indicates mostly significant  $Z$  values for all estimates. Significant parameter estimates indicate significant variability in intercepts and slopes for the models as specified.

### 3. Results

Preliminary descriptive analyses were conducted to examine the change in SI over time for patients with wave 1 elevation on MADRS SI (see Table 1) compared to those with no reported SI on the MADRS at wave 1 (see Table 2). Patients who did not report elevated SI at wave 1, the mean group score at each of the five waves of assessment was .12 (scale range 0 to 6; compared to

.94 for those with elevated SI at wave 1). Examination of SI scores at each time point indicates that patients who did not initially experience SI during a depressive episode were unlikely to begin reporting it at a subsequent assessment wave. Depressive symptoms for those with elevated SI was significantly greater at wave 1 than those without elevated SI,  $t(341) = -6.56$ ,  $p < .001$  ( $M = 27.24$  elevated;  $M = 21.95$  not elevated, effect size = .37). At four of the five waves of assessment (waves 1, 2, 3, and 5) those without SI reported significantly lower depressive symptoms ( $ps < .05$ ). Effect sizes ranged from .05 to .23.

#### 3.1. Analyses on the impact of depressive symptoms for the full sample

The first series of analyses were conducted with all participants, regardless of clinician-rated SI on the

Table 2

Descriptive statistics and bivariate correlations for participants without elevation on suicide ideation at wave 1

|                  | 1   | 2      | 3      | 4      | 5      | 6     | 7      | 8      | 9      | 10   |
|------------------|-----|--------|--------|--------|--------|-------|--------|--------|--------|------|
| 1. SI W1         | –   |        |        |        |        |       |        |        |        |      |
| 2. SI W2         | –   | –      |        |        |        |       |        |        |        |      |
| 3. SI W3         | –   | .04    | –      |        |        |       |        |        |        |      |
| 4. SI W4         | –   | –.04   | .03    | –      |        |       |        |        |        |      |
| 5. SI W5         | –   | –.05   | .33**  | .46*** | –      |       |        |        |        |      |
| 6. MADRS-adj W1  | –   | .09    | .13    | .09    | .08    | –     |        |        |        |      |
| 7. MADRS-adj W2  | –   | .41*** | .09    | .32*** | .37*** | .20** | –      |        |        |      |
| 8. MADRS-adj W3  | –   | .16    | .35*** | .35*** | .33*** | .16** | .58*** | –      |        |      |
| 9. MADRS-adj W4  | –   | –.05   | .07    | .53*** | .33*** | .10   | .51*** | .57*** | –      |      |
| 10. MADRS-adj W5 | –   | .12    | .19    | .35*** | .63*** | .13*  | .59*** | .50*** | .59*** | –    |
| Mean             | .00 | .17    | .20    | .13    | .12    | 21.95 | 11.87  | 10.22  | 10.41  | 7.86 |
| SD               | .00 | .48    | .60    | .40    | .39    | 5.96  | 7.42   | 8.05   | 7.79   | 7.00 |

Note. \* =  $p < .05$ , \*\* =  $p < .01$ , \*\*\* =  $p < .001$ . SI = Suicide ideation; MADRS = Montgomery–Åsberg Depression Rating Scale; W1 = wave 1; W2 = wave 2; W3 = wave 3; W4 = wave 4; W5 = wave 5.

MADRS at wave 1. The first model included the main effects for depressive symptoms, wave, age, sex, and race, as well as the interaction between MADRS-adj depressive symptoms and the demographic variables. Examination of the contribution of variables included in the model indicated significant main effects for depressive symptoms,  $F(1, 343) = 17.73$ ,  $p < .0001$ , and age,  $F(1, 343) = 4.63$ ,  $p < .05$ , but no significant interactions. This suggests that MADRS-adj depressive symptoms across the entire study period had a dramatic impact on changes in MADRS SI in this sample. Simple slope analyses were conducted using regression to examine depressive symptoms as a predictor of SI at each wave to ascertain whether the effect of depressive symptoms was significant at all time points. These analyses indicated that at wave 1 (St.  $\beta = .44$ ,  $t = 9.09$ ,  $p < .001$ ), wave 2 (St.  $\beta = .63$ ,  $t = 13.84$ ,  $p < .001$ ), wave 3 (St.  $\beta = .61$ ,  $t = 13.51$ ,  $p < .001$ ), wave 4 (St.  $\beta = .53$ ,  $t = 10.84$ ,  $p < .001$ ), and wave 5 (St.  $\beta = .63$ ,  $t = 13.79$ ,  $p < .001$ ), lower depressive symptoms were significantly predictive of lower thoughts of suicide. The interaction between depressive symptoms and time was not significant, suggesting that while depressive symptoms at each time point were concurrently associated with thoughts of suicide, changes in depressive symptoms from one time point to the next were not associated with changes in thoughts of suicide beyond the main effect previously described. Examination of the pattern of findings for age suggested that increasing age was associated with significantly greater reports of SI.

### 3.2. Analyses on the impact of depressive symptoms for participants with elevated thoughts of suicide at wave 1

Next, we re-ran the analyses among participants with elevated SI at wave 1. Significant main effects were found for MADRS-adj depressive symptoms,  $F(1, 238) = 30.27$ ,  $p < .001$ , wave,  $F(4, 238) = 3.69$ ,  $p < .01$ , and age,  $F(1, 238) = 5.62$ ,  $p < .05$ . As in the previously reported results, these findings indicate that lower depressive symptoms and younger age were associated with lower levels of SI on the MADRS. The main effect of wave reflects the significant pattern of decreasing SI over the five waves of assessment for those who initially had elevated thoughts of suicide. Consistent with the previous analysis, the interaction between depressive symptoms and time was not significant beyond the main effects previously described. A significant interaction was found between MADRS-adj depressive symptoms and age,  $F(1, 238) = 6.34$ ,  $p < .05$ . Simple slope analyses were conducted to determine the impact of depressive symptoms at each time point for participants who were

younger (age  $\leq 75$ ) compared to those who were older (age  $> 75$ ). Across all five time points, MADRS-adj depressive symptoms significantly predicted thoughts of suicide for those who were younger (all  $ps < .05$ ), with greater standardized  $\beta$ s than for older participants. This suggests that younger age was associated with greater depression-related decreases in thoughts of suicide over the five waves of assessment in this study.

## 4. Discussion

This study aimed to enhance generalizability to treatment settings by examining longitudinal changes in thoughts of suicide in the context of a naturalistic treatment study that included a flexible treatment plan that was chosen by the treating psychiatrist to meet the individual needs of patients. Importantly, this study found significant changes in thoughts of suicide over the five waves of assessment included in this treatment study. Examination of the pattern of change in thoughts of suicide for this sample indicated that clinician-rated SI decreased from a mean of 1.42 to .58 between the first and second waves of assessment. Following the second assessment, thoughts of suicide stayed consistently around a mean of .4. Among participants with elevated SI at wave 1, clinician-rated SI decreased from a mean of 2.05 at wave 1 to .77 at wave 2. During subsequent waves the mean was between .53 and .60. This pattern of results suggests that a steep decline in SI occurred between waves 1 and 2 and then leveled off throughout the remainder of the study. Treatment-related reductions in SI were less pronounced with increasing age.

Our findings suggest that clinicians should expect the greatest changes in SI during the first two months of treatment. Subsequently, residual low level SI is likely to remain consistent for most individuals. This pattern also suggests that a change in treatment plan should be considered for patients who have not had a resolution of SI by the end of two months of treatment. If SI has not been resolved and significant depressive symptoms remain at this time point, then a shift in treatment plan may be warranted.

To understand the decline in SI from wave 1 to wave 2, the effect of depressive symptoms was investigated. The significant main effect for depressive symptoms on changes in thoughts of suicide was consistent across both the entire sample, as well as when only those participants with elevated SI at wave 1 were included in the analysis. This pattern of results indicates that depressive symptoms were concurrently associated with thoughts of suicide and were also significantly associated with changes in thoughts of suicide over time. To determine whether changes in depressive symptoms were associated with

*changes* in thoughts of suicide, we also conducted analyses examining the interaction between depressive symptoms and wave. Results indicated that *changes* in depressive symptoms were not independently associated with changes in thoughts of suicide. This seems contrary to the obvious reduction in SI between waves one and two that mirrors a dramatic reduction in depressive symptoms between these two time points; however, following wave 2, very little additional reduction in either depressive symptoms or thoughts of suicide was observed. Given this stability, the longitudinal analyses of the relation between changes in depressive symptoms over time and changes in thoughts of suicide were not significant. One could argue that suicidal thoughts may continue unaltered after initial (emotional) improvement due to age-related increases in cognitive rigidity. In other words, this phenomenon is driven more by neurocognitive than emotional processes. In addition, our findings are consistent with the results of a previous study of treatment emergent suicide risk that have demonstrated that this experience is more common among those with early onset major depressive episode and bipolar disorder (Rihmer and Aksikal, 2006).

The patterns of results in this study are consistent with other studies that examined the longitudinal course of SI. Specifically, as in Vannoy et al. (2007) and Szanto et al. (2003; 2007), we found that thoughts of suicide were significantly associated with depressive symptoms. In addition, we found that the marked change in depressive symptoms early in this treatment study was associated with a large change in thoughts of suicide. This pattern has now been shown in samples of older adults whose depression was treated within a collaborative primary care model (Vannoy et al., 2007), short-term medication trials (Szanto et al., 2003; 2007), and within a naturalistic study of medication and psychotherapy. The diversity of treatment approach, setting, participant demographics, and care providers included within these studies bolsters the conclusion that treatment of depression is a necessary element of any suicide prevention program for depressed older adults.

Increasing age was associated with a trajectory of increasing thoughts of suicide over time. This pattern was observed for both the analysis of the entire sample, as well as in the analysis that included only participants with elevated SI at wave 1. The association between older age and increasing reports of suicide is consistent with the previously described study by Vannoy et al. (2007). Thoughts of death and suicide appear to be more treatment resistant in this age group for men and women, regardless of race. This may be attributable to age-related increases in attempts to suppress unwanted thoughts or

emotions, which have been shown to be associated with increased suicide ideation among depressed older adults (Cukrowicz et al., 2008; Lynch et al., 2004). Neither gender nor race moderated the impact of depressive symptoms on thoughts of suicide. Older women may be more willing to report even mild thoughts of suicide when queried by an interviewer, whereas older men may be reluctant to do so (Burge et al., 1994). This difference in reporting pattern would obscure any gender differences that might exist. We also found no effect of race, probably due to limitations in the demographic diversity of participants in this sample (86% Caucasian).

Despite the clear importance of this study, limitations must be noted. The MADRS was utilized in this study to assess both depressive symptoms and thoughts of suicide. We chose to utilize this measure due to the strength of clinician-rated outcomes; however, it is possible that the use of a single scale may, on account of shared method variance, inflate the relation between depressive symptoms and thoughts of suicide. Another limitation that should be noted is the exclusion of older adults with alcohol and substance use given the potential contributions to late-life suicide risk of these substances (Waern, 2003). It should also be noted that mortality by suicide was not included in this study. Although mortality data for this sample were provided in Steffens et al. (2002b), more recent examination of sample mortality has not been conducted.

A few studies have examined the trajectory of SI in depressed older adults enrolled in treatment. Future studies should build on the present results by including more comprehensive assessments of thoughts of suicide. A number of well validated scales exist for SI that include self- and interview-based reporting of death and SI. A longitudinal study of this variety would allow for a more thorough examination of the nature of changes in SI that occurs when depressive symptoms change.

#### Role of funding source

Funding for this study was provided by the United States Public Health Service Grants T32AG000029 to P50MH60451, R01MH54846, K24MH70027, K24MH072712, and KL2RR025015; the NIH had no further role in the study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the paper for publication.

#### Conflict of interest

All authors declare that they have no conflicts of interest.

#### Acknowledgments

The authors would like to thank the reviewers of this manuscript for their helpful comments regarding this manuscript.

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