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The Relationship Between Suicide Ideation and Late-Life Depression

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Objective: To describe the course of suicide ideation (SI) in primary-care based late-life depression treatment, identify predictors of SI, characterize the dynamic relationship between depression and SI, and test the hypothesis that collaborative care decreases the likelihood of reporting SI by decreasing the severity of depressive symptoms. **Methods:** This was a secondary analysis of a randomized controlled trial comparing collaborative care to usual care for late-life depression. Participants were 1,801 adults age 60 and older from eight diverse primary-care systems. Depression was measured using the Hopkins Symptoms Checklist (HSCL-20). SI was operationalized using one item from the HSCL-20. Predictors of incident SI were identified by a series of univariate analyses followed by multiple logistic regression. A mediator analysis was conducted to test the hypothesis that the effect of collaborative care on SI can be ascribed to the intervention's effect on depressive symptoms. **Results:** The prevalence of SI was 14% ($N=253$); the cumulative incidence over 24 months was 21% (385). The likelihood that SI emerged after baseline was highly dependent on change in depression (odds ratio: 5.38, 95% confidence interval: 3.93–7.36, $df=81$, $t=10.66$, $p<0.0001$). As hypothesized, the effect of collaborative care on SI was mediated by the treatment's effect on depression. **Conclusion:** SI is not uncommon in depressed older adults being treated in primary care. The likelihood that depressed older adults will report SI is strongly determined by the course of their depression symptoms. Providers should monitor SI throughout the course of depression treatment. (Am J Geriatr Psychiatry 2007; 15:1024–1033)

Key Words: Geriatric, depression, suicide

Suicide and nonfatal suicide attempts are important public health concerns, currently accounting for more than 30,000 deaths and as many as 400,000 emergency room visits per year.^{1,2} Given that suicide

ideation (SI) is a significant precursor and risk marker for suicide attempts and completed suicides,^{3–6} the need for its effective treatment is essential. Better understanding of the course and predic-

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tors of SI after patients enter depression treatment and factors that reduce the likelihood of future SI can improve the clinical management of suicide risk and may lead to effective treatment methods.

Older adults have the highest rates of death by suicide in many industrialized countries.¹ Many older adults who die by suicide were suffering with treatable mood disorders in the weeks prior to death.⁷ Few seek depression treatment; those who do are typically treated in primary care.⁸ Evidence from two large effectiveness studies of depression treatment in primary care indicate that older adults with major depression who receive collaborative care for depression have better depression outcomes and are less likely to report SI than those in usual care.^{9,10} Presumably the reduced levels of SI are a consequence of reductions in depression. Yet, without analysis of change over time, the relationship between symptom resolution and decreases SI remains speculative. Indeed, the cross-sectional association between SI and depression is well documented,^{7,11–13} but little is known about their relationship over time.^{14,15}

Szanto et al.¹⁶ recently reported on the incidence and course of SI in the context of clinical trials for late-life depression using pharmacotherapy, delivered in specialty mental health care settings. Baseline prevalence of SI in these treatment-seeking older adults was 28%. Participants who first reported SI in the 12-week observation period following treatment initiation (7.8%) were said to have treatment-emergent SI. Emergent SI was predicted by the number of self-reported prior depression episodes and was associated with poorer treatment response as defined by posttreatment scores on the Hamilton Rating Scale for Depression.¹⁷ These results suggest an association between SI and depression response, yet we know of no reports that directly link change in depression symptoms to the course of SI within the context of late-life depression treatment.

We used data from project IMPACT, a large treatment trial for depressed older adults in primary care to investigate the prevalence and incidence of SI, the relationship between the course of ideation and the course of depression, and the mediating role of depression change and treatment on SI. Specifically, we identified predictors of SI prevalence and incidence, and we hypothesized: 1) the presence of SI at sequential time points would be strongly related to the

relative change in depression intensity, and 2) that the previously reported reduction in SI for participants in the IMPACT intervention arm¹⁰ would be partially mediated by the treatment's effect on depression.

METHODS

The IMPACT trial was conducted in 18 primary care clinics affiliated with eight diverse health care organizations in five states. The IMPACT intervention entailed promotion of collaborative care by utilizing a depression care manager (DCM), usually a nurse or social worker, who disseminated patient education, performed systematic monitoring of treatment response, delivered problem-solving treatment if desired by the patient, assured that the primary care physician was aware of the patient's depression status, consulted with a study psychiatrist for treatment-resistant cases, and made suggestions about treatment plan modifications to the primary care physicians in resistant cases. Patients assigned to usual care were free to pursue any form of depression treatment they desired; no restrictions were placed on their treatment. The DCM facilitated collaborative care for 12 months, and usual care was provided for the following 12 months. A complete description of the IMPACT trial methods has been provided elsewhere.¹⁸ The institutional review boards from each participating organization approved the study procedures, and all participants gave written informed consent.

Participants were identified using systematic depression screening or referred by primary care providers. Eligible participants were aged 60 and older; met criteria for current major depression, dysthymia, or both on the Structured Clinical Interview for the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (SCID);¹⁹ and planned to use one of the participating primary care clinics over the following year. Exclusion criteria included current alcohol abuse, severe cognitive impairment, a history of bipolar disorder (identified by a two-question screen²⁰) or psychosis (identified by a two-question screen²⁰), and acute risk of suicide. Fewer than 1% of potential subjects were excluded due to acute risk for suicide that required immediate clinical intervention as determined by a clinical interview conducted by a

project psychiatrist. Eighty-six percent of participants who met eligibility criteria for the study (N = 1,801) agreed to participate and were randomly assigned to the IMPACT intervention or to usual care; of these, 117 died during the study (none due to suicide) and were excluded from this analysis.

Measures

Participants were assessed at baseline by trained interviewers, and at 3, 6, 12, 18, and 24 months by a telephone survey team blinded to intervention status.^{18,20} Baseline interviews included demographic characteristics, indicators of socioeconomic status, self-reports of 10 common medical disorders, and screening questions for panic disorder and posttraumatic stress disorder (PTSD)^{18,20} Trait neuroticism was measured using seven items from the NEO-PI-R Neuroticism Scale rated on a 5-point Likert-type scale.^{21,22}

Assessing Depression and Suicide Ideation

To assess depressive symptoms, the IMPACT study utilized 20 items from the Hopkins Symptoms Checklist (HSCL-20),²³ a 5-point Likert-type scale that asks respondents to indicate how much they have been distressed by each symptom during the past month. Answers are ordered as not at all (0), a little bit (1), moderately (2), quite a bit (3), or extremely (4). In this study, SI was assessed using one item, "In the past month, how much were you distressed by thoughts of ending your life?" SI was coded as present if the participant reported feeling distressed a little bit (1), moderately (2), quite a bit (3), or extremely (4). We selected this criterion to represent the situation faced by health care providers who must respond to SI when it is present at *any* (nonzero) level of intensity. Hence, we are using the item as a screen for the presence of SI, not an assessment of the extent of SI or the potential risk for suicidal behavior. Establishing a clinically relevant risk level would require further assessment¹⁵ and judgments about suicide risk should never be made solely on the basis of a single self-report item. To evaluate hopelessness as a covariate of SI, we used one item from the HSCL-20, "In the past month, how much were you distressed by thoughts of feeling hopeless about the future?" To calculate depression

scores on the HSCL, we removed the SI question and computed an average item score of the remaining 19 items of the HSCL-20, referred to here as the SCL-19.

Turning to our definition of depression status, participants with an average SCL-19 score ≥ 0.75 and endorsing items 1 or 2 (depressed mood or loss of interest items on the SCL-19) were considered positive for depression. As with SI, we chose these clinically relevant criteria to match clinical indication for depression treatment. Participants whose average SCL-19 score was < 0.75 , or who did not endorse items 1 or 2, are referred to as "not depressed." For analyses that involved hopelessness, we removed the hopelessness item from the SCL-19 and computed an average item score of the remaining 18 items, referred to here as the SCL-18.

Data Analysis

Two-sample *t*-tests and χ^2 tests were used to compare the intervention and usual care groups on baseline characteristics. Missing values (except for missing due to death) were previously imputed using a comprehensive and methodologically rigorous multiple imputation technique,²⁴ which resulted in five imputed data sets. All our analyses were performed on the five imputed data sets and the results were combined according to the method proposed by Rubin.²⁵ A detailed description of the imputation methodology has been reported previously.²⁴

Predictors of Emerging (Incident) Ideation

Univariate analyses were conducted to identify predictors of SI that occurred during the course of the 24-month study. We distinguished those who had SI at baseline and reported SI during treatment or follow-up from those who denied ideation at baseline and then reported SI during treatment or follow-up (emergent SI). The following variables, which have been associated with suicide,^{3,5,7,26–30} were tested in univariate analyses: age, sex, minority status, education (achieved high school diploma), total household income, married or living with a partner, living alone, presence of a confidante, currently doing unpaid work, diagnosed with major depression, diagnosed with dysthymia, self-reported number of prior depression episodes, positive score on cognitive impairment screener³¹ (scores less than

three indicated exclusion from the study, between 3 and 5 indicated positive for impairment, greater than 5 considered no impairment), anxiety (indicated by positive screen to either panic disorder or PTSD), neuroticism (sum of 7 items from the NEO-PI-R^{21,22} Neuroticism scale), number of 10 common chronic illnesses, hopelessness (HSCL-20 hopelessness item), and baseline depression scores (SCL-18). We also tested treatment arm (collaborative care or usual care) as a potential predictor. A multiple logistic regression model was then performed including all variables that were significantly associated with SI status in the univariate analysis. We included all variables that were significant at $p = 0.05$ from the univariate analysis, without correction for multiple testing, as this was a preliminary step aimed at evaluating the relationship between baseline characteristics with SI, not to test hypotheses about this relationship.

Modeling the Relationship Between Depression Change and Suicide Ideation

Patients' reports of suicide ideation fluctuated over time and our first hypothesis proposed that the course of suicide ideation would be closely related to change in depression status. As noted in the Measures section, depressed status was operationally defined as the presence of either sad mood or lack of interest (indicated by self-report on item one or two of the SCL-19 > 1) and a mean score of at least 0.75 on the SCL-19. We utilized the five assessment periods (0–3, 3–6, 6–12, 12–18, and 18–24 months) to evaluate the relationship between initial depression and SI status to follow-up status. To characterize initial status, we created four categories: 1) depressed with SI, 2) depressed without SI, 3) not depressed with SI, and 4) not depressed without SI. Results were then averaged across the five time periods to create one 4×4 table indicating the averaged likelihood that an individual would report SI based on initial category and follow-up depression status.

Mediator Model

The effect of the IMPACT intervention on SI at 24 months has been documented.¹⁰ To test the hypothesis that this effect was due, in part, to the intervention's effect on depressive symptoms more broadly, we conducted a mediator analysis based on the method

proposed by Baron and Kenny.³² Specifically, we examined whether change in depression severity as measured by the difference in SCL-19 scores at baseline and 24 months mediated the relationship between the intervention and SI at 24 months.

All analyses were performed using SAS 9.1 (SAS Institute, Inc. Cary, NC) And SPSS V 12.0 (SPSS Inc. Chicago, IL).

RESULTS

Detailed characteristics of the sample have been reported previously.¹⁸ The mean age was 71.2 (SD: 7.5) years and 65% were women. Approximately 23% were from ethnic minority groups. Comorbid major depression and dysthymic disorder was present in 52.9%, and 70.7% reported having two or more prior depressive episodes. The mean HSCL-20 depression score was 1.7 (0.6), indicating moderate to severe depression. More than one third (35.4%) screened positive for cognitive impairment and 29.0% screened positive for anxiety. Of the 10 common medical conditions listed on a self-report questionnaire, participants reported a mean of 3.2 (1.7).

Prevalence and Cumulative Incidence of Suicide Ideation

Results of the univariate analysis to identify potential predictors of postbaseline SI are presented in Table 1. The prevalence of SI at baseline was 14% ($N = 253$) of the participants. Among these participants with SI at baseline, the likelihood of reporting SI over the subsequent 24 months was significantly lower in those assigned to collaborative care (odds ratio [OR]: 0.49, $t = -2.47$, $df = 1322$, $p = 0.014$) and higher in those who were feeling hopeless about the future ($OR = 1.32$, $t = 2.25$, $df = 903$, $p = 0.024$).

For those who did not report SI at baseline ($N = 1,534$), the cumulative incidence of reporting SI one or more times from 3 to 24 months (emergent SI) was 21% ($N = 385$). In this group, the likelihood of reporting SI during treatment or follow-up was higher in older participants ($OR = 1.04$, $t = 3.57$, $df = 57$, $p = 0.0007$), men ($OR = 2.32$, $t = 5.53$, $df = 207$, $p < 0.0001$), those assigned to usual care ($OR = 1.64$, $t = 3.15$, $df = 29$, $p = 0.004$), and those with higher neuroticism scores at baseline ($OR = 0.95$, $t = -2.93$, $df = 71$, $p = 0.004$).

TABLE 1. Univariate Predictors of SI Following Baseline

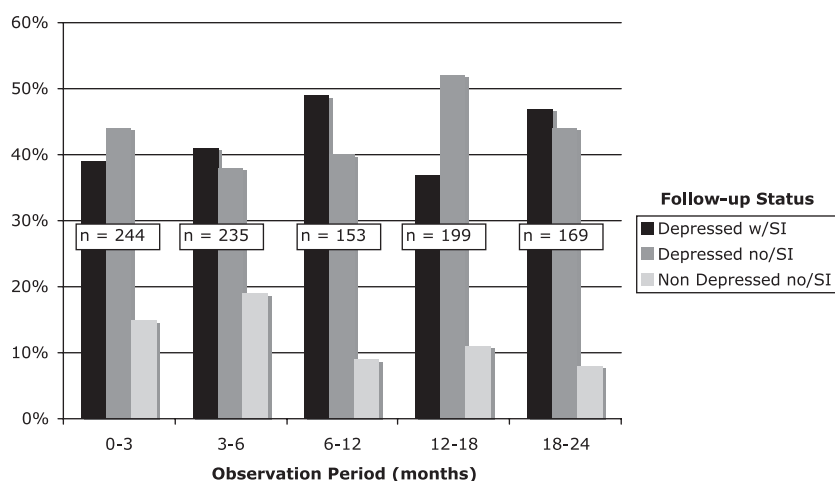
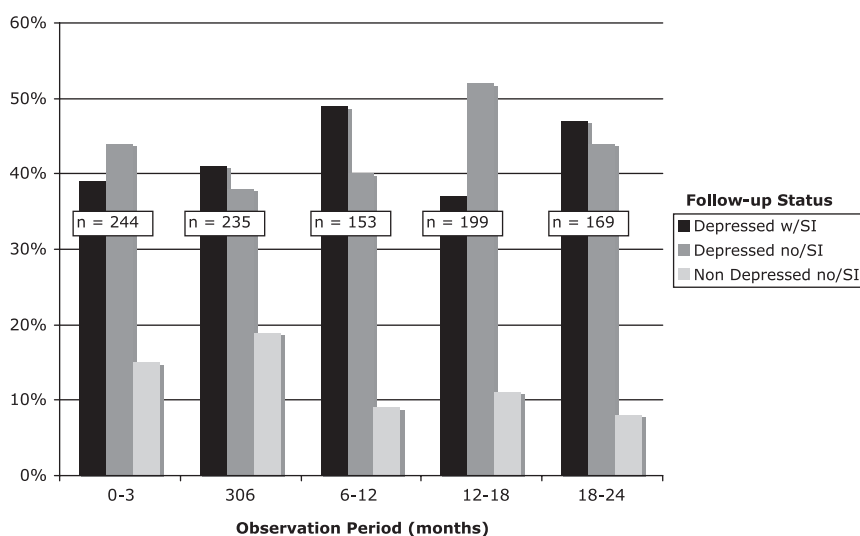
Variables	With Baseline SI			Without Baseline SI (Any SI in 3–24 Months)		
	Any SI in 3–24 Months	No SI in 3–24 Months	p	Any SI in 3–24 Months	No SI in 3–24 Months	p
Type of care			0.008			0.003
Usual care	88 (75%)	29 (25%)		227 (29%)	546 (71%)	
Collaborative care	80 (59%)	56 (41%)		158 (21%)	604 (79%)	
Age, mean years (SD)	70.7 (0.6)	69.9 (0.9)	0.459	72.4 (0.4)	70.9 (0.2)	0.004
Sex			0.613			<0.001
Female	104 (65%)	56 (35%)		212 (21%)	790 (79%)	
Male	64 (68%)	29 (32%)		173 (32%)	359 (68%)	
Race/ethnicity			0.709			0.585
White	128 (66%)	67 (34%)		292 (25%)	890 (75%)	
Nonwhite	39 (69%)	18 (31%)		93 (26%)	260 (74%)	
High school diploma			0.544			0.018
No	22 (61%)	14 (39%)		94 (31%)	212 (69%)	
Yes	146 (67%)	71 (33%)		291 (24%)	938 (76%)	
Live alone			0.203			0.926
No	106 (63%)	61 (37%)		240 (25%)	719 (75%)	
Yes	61 (72%)	24 (28%)		145 (25%)	430 (75%)	
Volunteer			0.052			0.156
No	123 (70%)	52 (30%)		305 (26%)	868 (74%)	
Yes	45 (57%)	33 (43%)		80 (22%)	281 (78%)	
Annual household income, mean US\$ (SD)	40366 (6113)	39935 (4193)	0.957	31095 (2428)	38693 (2048)	0.121
Married			0.103			0.768
No	95 (72%)	38 (28%)		204 (25%)	621 (75%)	
Yes	72 (60%)	47 (40%)		181 (25%)	529 (75%)	
Major depression			0.458			0.783
No	31 (62%)	19 (38%)		125 (26%)	363 (74%)	
Yes	137 (67%)	66 (33%)		260 (25%)	786 (75%)	
Dysthymia			0.984			0.110
No	25 (66%)	13 (34%)		54 (20%)	212 (80%)	
Yes	143 (66%)	72 (34%)		331 (26%)	937 (74%)	
Prior episodes			0.110			0.110
No	46 (65%)	25 (35%)		118 (26%)	334 (74%)	
Yes	122 (67%)	60 (33%)		267 (25%)	816 (75%)	
Anxiety			0.194			0.035
No	87 (63%)	52 (37%)		264 (23%)	860 (77%)	
Yes	80 (71%)	33 (29%)		121 (29%)	290 (71%)	
Neuroticism (SD)	25.1 (0.4)	25.1 (0.6)	0.934	23.1 (0.3)	21.8 (0.2)	<0.001
Hopelessness (SD)	2.7 (0.1)	2.3 (0.1)	0.015	2.0 (0.1)	1.6 (0.1)	<0.001
Confidante			0.607			0.118
No	53 (68%)	24 (32%)		128 (28%)	326 (72%)	
Yes	112 (65%)	61 (35%)		255 (24%)	821 (76%)	
Cognitive impairment			0.173			0.082
No	113 (64%)	65 (36%)		231 (24%)	748 (76%)	
Yes	54 (73%)	20 (27%)		154 (28%)	402 (72%)	
Chronic diseases, mean no. (SD)	4.1 (0.2)	3.6 (0.2)	0.064	4.1 (0.1)	3.6 (0.1)	<0.001
Depression severity: SCL-18 score (SD)	2.2 (0.04)	2.1 (0.04)	0.552	1.8 (0.02)	1.6 (0.02)	0.002

Notes: If a SCID interview revealed two or more prior episodes of depression, “Prior episodes” was coded positive. “Anxiety” was coded positive if the participant endorsed any item on the panic disorder or PTSD screener. “Chronic diseases” is the sum of 10 common chronic illnesses.

The frequency of when patients first reported SI was highest at baseline, and generally decreased over time (baseline = 14.3%, 3 months = 8.7%, 6 months = 2.8%, 12 months = 4.3%, 18 months = 2.8%, and 24 months = 2.8%).

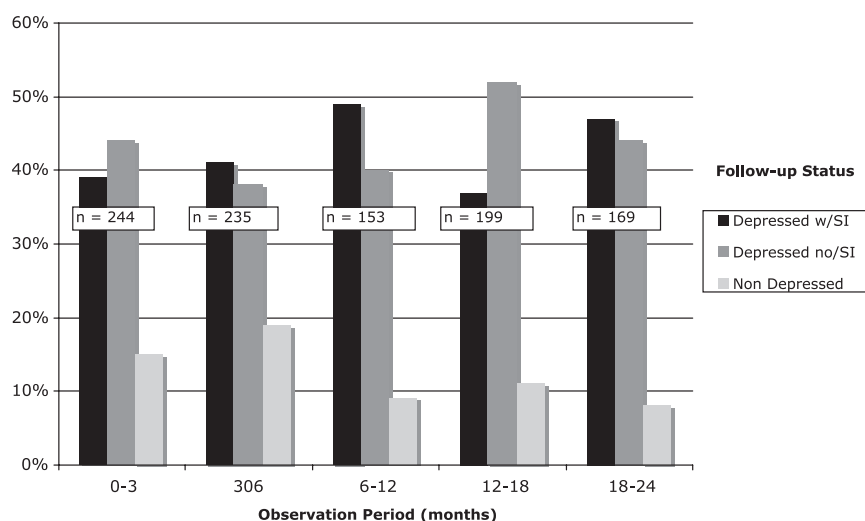
Modeling the Dynamic Relationship Between Depression and Suicide Ideation

The likelihood of future depression and future SI based on one of four initial states (depressed with

FIGURE 1. Course of Depression and SI When Starting a Period of Depression With SI**FIGURE 2. Course of Depression and SI When Starting a Period of Depression Without SI**

SI, depressed without SI, depressed and no SI, not depressed and no SI) is relatively constant over all five observation periods (0–3, 3–6, 6–12, 12–18, and 18–24 months) as illustrated in Figures 1 to 3, respectively. We then aggregated the five observation periods by computing averages for each cell in the 4×4 table across the five observation periods (Table 2). Participants whose initial status was depressed with SI were likely to continue presenting SI if their depression did not remit (average = 43%), but were unlikely to endorse SI if their de-

pression did remit (average = 12%). Participants whose initial status was depressed with no SI were unlikely to develop SI even if their depression did not remit (average = 9%), and were highly unlikely to develop SI if their depression did remit (average = 0.4%). Participants whose initial status was not depressed with SI were unlikely to report SI at follow-up even if they crossed the threshold into depressed status (average = 3.4%), and they were highly unlikely to develop SI if their depression remained subthreshold (average = 0.6%).

FIGURE 3. Course of Depression and SI When Starting a Period of no Depression Without SI**TABLE 2.** Course of Depression and SI Based on Initial Status Averaged Over Five Observation Periods

Initial Status	Depressed		Not Depressed		Average Number of Observations
	SI Present	SI Absent	SI Present	SI Absent	
Depressed with SI	43% (37-49)	44% (38-52)	2% (0-3)	12% (8-19)	204
Depressed without SI	9% (5-11)	70% (65-75)	0% (0-1)	20% (16-30)	1072
No Depression or SI	3% (2-4)	37% (24-43)	1% (0-1)	59% (53-73)	451

Notes: Data are means (ranges) over the five observation periods (0-3, 3-6, 6-12, 12-18, and 18-24 months). "Average Number of Observations" indicates the average number of participants who started out the observation period with that row's initial status; specific number of observations are presented in Figures 1 to 3.

Mediator Model

The mediation model indicated that depression change did mediate the relationship between intervention arm and SI (Table 3). Applying the Baron and Kenny³² mediator analysis model, regressing depression change onto intervention arm verifies that the intervention is related to change in depression ($\beta = -0.236$, $t = -5.84$, $df = 10$, $p = 0.0002$). Second, regressing SI at 24 months, including adjustment of baseline SI, onto the intervention arm verifies that the intervention is related to change in SI status ($OR = 0.661$, $t = -2.44$, $df = 160$, $p = 0.016$). Finally, we regressed SI at 24 months onto both intervention arm and depression change, controlling for baseline depression scores. Intervention status was no longer significant ($OR = 0.93$, $t = -0.39$, $df = 71$, $p = 0.699$), while depression

change was significant ($OR = 5.38$, $t = 10.66$, $df = 81$, $p < 0.0001$).

DISCUSSION

SI is not uncommon in older adults presenting for depression treatment in primary care settings. The likelihood that participants will report SI after the initiation of treatment is strongly determined by the course of their depression symptoms. Only a very small number of participants have SI without reporting clinically significant depression symptoms.

Among those participants whose depression remits, few report SI. Interestingly, 21% of depressed participants who enter treatment denying SI report

TABLE 3. The Mediation Model

	β	OR	95% CI	df	t	p
Step 1. Regress depression change onto intervention arm						
Intercept	0.840		0.730-0.949	21.5	15.97	<0.0001
Intervention	-0.236		-0.326 to -0.146	10.0	-5.84	0.0002
Baseline depression	-0.676		-0.738 to -0.614	15.0	-23.32	<0.0001
Step 2. Regress suicide ideation onto intervention arm						
Intercept		0.122	0.095-0.156	94.2	-16.79	<0.0001
Intervention		0.661	0.473-0.924	160.0	-2.44	0.0158
Baseline SI		4.148	2.852-6.035	106.9	7.52	<0.0001
Step 3. Regress ideation onto both intervention and depression change						
Intercept		0.01	0.005-0.023	120.6	-12.24	<0.0001
Intervention		0.927	0.628-1.369	71.0	-0.39	0.6995
Baseline SI		4.441	2.808-7.023	74.5	6.48	<0.0001
Depression change		5.377	3.929-7.358	81.2	10.66	<0.0001
Baseline depression		4.232	2.916-6.142	99.6	7.69	<0.0001

Notes: Intervention indicates whether participants were assigned to collaborative care or to usual care.

ideation three or more months after treatment has been initiated. In this study, 639 individuals reported SI at least once; of those, a majority (N=385, 60%) did so only after treatment had begun.

Collaborative care has been shown to be more effective at treating depression than usual care, and to yield greater reductions in SI, but little is known about the effective ingredients contributing to better outcomes related to suicide ideation. Collaborative care is a systemic approach to treatment that includes patient education, systematic monitoring of treatment response, and patient involvement in treatment planning, all of which could affect the course of depression and SI. In this analysis, when comparing collaborative care and usual care, it was the improvement in depression symptoms that mediated the relationship between intervention and SI. Our analysis indicated full mediation, yet we believe this should be interpreted with caution. We did not quantify, and hence test directly, the various process variables that distinguish collaborative care from usual care. This sort of investigation should be conducted before ruling out possible mechanism of change for reducing SI.

Although older adults can be effectively treated for depression in primary care, their response rates are typically not as high as young and middle-aged adults. Furthermore they are less likely to report SI,

and even when they do, barriers such as ageism may reduce their access to adequate care.³³

Limitations

Depression status and SI were assessed via structured telephone interviews, and data on suicide attempts were unavailable. Although telephone assessment of a sensitive topic such as depression or SI might have disadvantages due to the absence of non-verbal communication and possibly lower levels of trust between patient and interviewer, there is evidence that it is comparable to in-person interviews, particularly with the HSCL-20.³⁴ The advantages of telephone interviews include greatly reducing barriers such as travel burden, and minimization of site variability among raters because one central assessment team collected all study data. Collecting accurate data on suicide attempts requires combining self-reports, informants, and medical records. It is possible that some patients did attempt suicide during this study, but such data are not available to us.

SI was assessed with one self-report item from the HSCL-20, which asked patients to rate how disturbed they have been by thoughts of ending their life in the past two weeks. There is evidence that older adults are more likely to plan their suicide attempts for longer periods of time and in more detail.³⁵ Hence the sensitivity of our screen for SI

may be low in this population. The error in this case is conservative, indicating that the relatively common occurrence of SI that we report in depressed older adults may underestimate the overall risk in this population.

Emergent SI in this study represented the majority of ideation. However, we cannot determine if emergent SI is truly a new experience for the patient, or if it is a latent report of something that was present at baseline, but not self-reported. Determining the difference would be an extremely valuable endeavor, but due to the subjective nature of SI, all assessment methods are vulnerable to this limitation. Our study illustrates that even with a very simple screen, expressed SI in depressed older adults is relatively common over an extended period of time while receiving treatment for depression.

Although there is evidence from psychological autopsy studies³⁵ that older adults are less likely to communicate the presence of SI prior to suicide, those who do communicate SI are likely to be at an elevated level of risk.³⁶ At the same time, age bias may be a barrier to receiving clinical attention for suicide risk even when it is indicated.³³

In our review of the literature we could find no comparable studies evaluating SI in a primary care setting over an extended duration as in IMPACT. Suicide prevention research continues to be challenged by a lack of “gold standards” for measuring SI. Such standards would provide metrics such as predictive probabilities, and the ability to both replicate and compare studies across populations and treatment settings.

CONCLUSION

The management of suicide risk in primary care is a formidable challenge^{37,38} but effective depression treatment appears to be a powerful tool for reducing SI in older primary care patients and should be considered a high priority for the clinical management of suicide risk.

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