

# Reducing Suicidal Ideation and Depressive Symptoms in Depressed Older Primary Care Patients

## A Randomized Controlled Trial

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**O**LDER AMERICANS COM-  
prise about 13% of the US  
population, yet account for  
18% of all suicide deaths.<sup>1</sup>

Among adults who attempt suicide, the elderly are most likely to die as a result.<sup>2</sup> Recent national reports emphasize the public health need for intervention trials to reduce the risk for suicide in late life.<sup>3,4</sup>

This article presents initial outcomes from the multisite, randomized trial known as PROSPECT (Prevention of Suicide in Primary Care Elderly: Collaborative Trial). PROSPECT tested the impact of a primary care-based intervention on reducing major risk factors for suicide in late life. Primary care practices were important to study because the majority of older adults who die by suicide have seen their physician within months of their death.<sup>5,6</sup>

**See also Patient Page.**

**Context** Suicide rates are highest in late life; the majority of older adults who die by suicide have seen a primary care physician in preceding months. Depression is the strongest risk factor for late-life suicide and for suicide's precursor, suicidal ideation.

**Objective** To determine the effect of a primary care intervention on suicidal ideation and depression in older patients.

**Design and Setting** Randomized controlled trial known as PROSPECT (Prevention of Suicide in Primary Care Elderly: Collaborative Trial) with patient recruitment from 20 primary care practices in New York City, Philadelphia, and Pittsburgh regions, May 1999 through August 2001.

**Participants** Two-stage, age-stratified (60-74,  $\geq 75$  years) depression screening of randomly sampled patients; enrollment included patients who screened positive and a random sample of screened negative patients. This analysis included patients with a depression diagnosis (N=598).

**Intervention** Treatment guidelines tailored for the elderly with care management compared with usual care.

**Main Outcome Measures** Assessment of suicidal ideation and depression severity at baseline, 4 months, 8 months, and 12 months.

**Results** Rates of suicidal ideation declined faster ( $P=.01$ ) in intervention patients compared with usual care patients; at 4 months, in the intervention group, raw rates of suicidal ideation declined 12.9% points (29.4% to 16.5%) compared with 3.0% points (20.1% to 17.1% in usual care [ $P=.01$ ]). Among patients reporting suicidal ideation, resolution of ideation was faster among intervention patients ( $P=.03$ ); differences peaked at 8 months (70.7% vs 43.9% resolution;  $P=.005$ ). Intervention patients had a more favorable course of depression in both degree and speed of symptom reduction; group difference peaked at 4 months. The effects on depression were not significant among patients with minor depression unless suicidal ideation was present.

**Conclusions** Evidence of the intervention's effectiveness in community-based primary care with a heterogeneous sample of depressed patients introduces new challenges related to its sustainability and dissemination. The intervention's effectiveness in reducing suicidal ideation, regardless of depression severity, reinforces its role as a prevention strategy to reduce risk factors for suicide in late life.

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PROSPECT approached suicide risk reduction from a public health perspective by targeting factors that are strongly

related to suicide risk, common in primary care, and malleable.<sup>7</sup> Depression is the principal risk factor for suicide

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in late life and for suicide's clinical precursor, suicidal ideation.<sup>2,8-14</sup> Although not all older depressed patients are suicidal, the great majority of older patients who report suicidal ideation or who die by suicide experience depression. Late-life depression is common in primary care, with the prevalence of major depression estimated at 6% to 9% of older patients in primary care settings.<sup>15-17</sup> Milder depressive symptomatology affects an additional 17% to 37%.<sup>18</sup> Similarly, more than 7% of older primary care patients report some suicidal ideation,<sup>19,20</sup> with the prevalence rising above 30% for patients with major depression.<sup>15,21</sup>

Despite the availability of efficacious pharmacological and psychosocial treatments<sup>22,23</sup> and a consensus for primary care depression treatment guidelines,<sup>24,25</sup> late-life depression frequently remains improperly diagnosed and inadequately treated.<sup>22,26</sup> Antidepressants are increasingly prescribed, yet depression pharmacotherapy often remains inadequate because of insufficient dosing and premature discontinuation by the physician as well as poor patient adherence.<sup>27-30</sup>

This disparity between knowledge and practice has stimulated interventions to reduce this gap. Examples include training physicians in assessment and treatment,<sup>31-33</sup> creating professional roles to facilitate care,<sup>34</sup> introducing technologies to enhance clinical decision making,<sup>35</sup> and integrating depression management with care of other illnesses.<sup>36-39</sup>

PROSPECT's intervention combined treatment guidelines tailored for the elderly with care management. The study's relevance to routine practice included (1) participation of community-based practices serving diverse populations and (2) random sampling and screening techniques to increase the representativeness of enrolled patients.

PROSPECT hypothesized that in a heterogeneous sample of older, depressed primary care patients, patients recruited from practices randomized to receive the intervention compared with usual care would demonstrate the fol-

lowing over 4, 8, and 12 months: (1) greater reduction in suicidal ideation and (2) greater reduction in depressive symptoms, increased response rates, and greater remission rates in depressive symptoms.

## METHODS

### Comparison Groups

**Intervention.** The PROSPECT intervention focused on 2 major components of care. First is physician knowledge, addressed by a clinical algorithm for treating geriatric depression in a primary care setting.<sup>40</sup> Second is treatment management, operationalized by depression care managers. Consistent with the predominant use of antidepressants relative to psychotherapy in primary care, the algorithm recommended a first-line trial of a selective serotonin reuptake inhibitor (SSRI). The protocol specified citalopram because it is equally efficacious with other antidepressants, has limited drug interactions, low potential for central nervous system activation, and an insignificant withdrawal syndrome. Physicians could prescribe other antidepressants if they had a clinical reason to do so. When a patient declined medication therapy, the physician could recommend interpersonal psychotherapy<sup>41</sup> from the care manager. The guidelines covered acute, continuation, and maintenance phase treatment over the course of the study year. Research funds covered the cost of interpersonal psychotherapy and citalopram, which was dispensed by the care manager, but not other treatments. This decision to structure treatment choices and to pay for the recommended ones limits analyses of patient preferences or cost barriers. However, it does permit testing outcomes achieved by specified treatments with known efficacy.

Practice-based, depression care managers collaborated with physicians by helping them recognize depression, offering guideline-based treatment recommendations, monitoring clinical status, and providing appropriate follow-up. The 15 depression care managers included trained social workers,

nurses, and psychologists. They had psychiatric backup, weekly supervision by psychiatrist investigators, and monthly interpersonal therapy cross-site supervision. Research associates introduced the depression care manager to patients directly following the baseline interview. The depression care manager interacted with patients in person or by telephone at scheduled intervals, or when clinically necessary, to monitor depressive symptoms, medication adverse effects, and treatment adherence.

**Usual Care.** The comparison condition was usual care enhanced by initially educating physicians about the treatment guidelines and notifying them when a patient met criteria for depression diagnosis. These enhancements protected patients and focused the study on depression treatment and management rather than recognition. The study did not pay for treatment in usual care.

In both intervention and usual care, physicians were informed by letter when patients reported suicidal ideation. PROSPECT had risk management guidelines for patients identified at high suicide risk during research or clinical assessments.<sup>42</sup> In these cases, physicians were notified immediately.

### Research Design

The research protocol received full review and approval from the institutional review board of each of the 3 universities. Written informed consent was obtained for all participants.

**Population and Randomization.** The study was conducted in 20 primary care practices from greater New York City, Philadelphia, and Pittsburgh. Practices varied in size (solo to medium sized), setting (rural, suburban, and urban), population type (including 2 serving primarily African American patients), and affiliation (16 community-based and 4 academic practices).

As the intervention located depression care managers on-site, the study chose a practice-randomization design to reduce potential contamination bias. Arguably, such "bias" is an intended effect of the intervention,

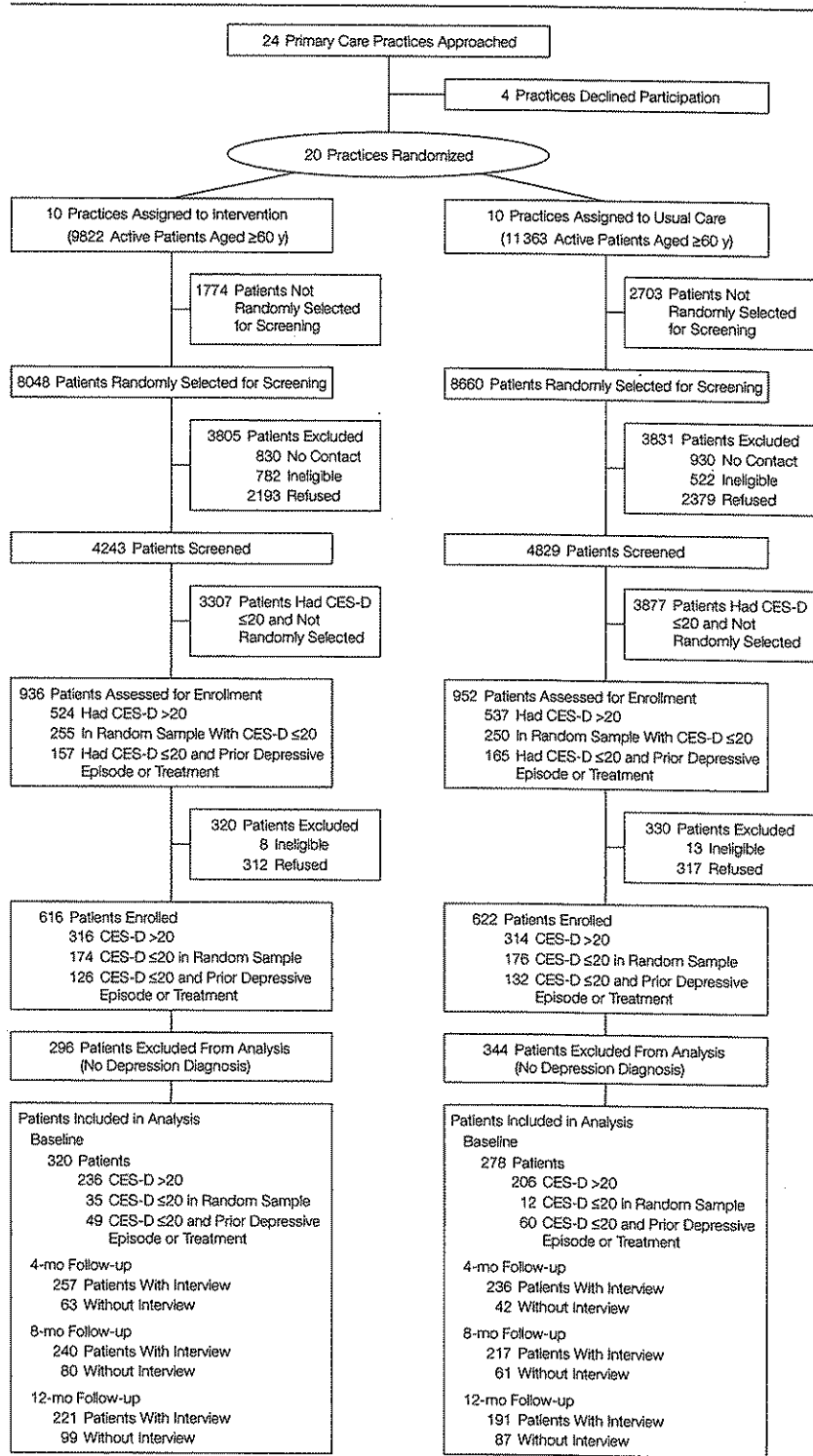
which aims to influence routine care. Practices were paired by region (urban vs suburban/rural), affiliation, size, and population type. Within the 10 pairs, practices were randomly assigned by flip of a coin to intervention or usual care.

**Recruitment Procedures.** Patients were recruited using a 2-stage sampling design.<sup>43</sup> The study drew an age-stratified (60-74, ≥75 years), random sample of patients with an upcoming appointment. Physicians notified sampled patients by mail allowing patients to decline contact. Research associates telephoned the remaining sample to confirm study eligibility: age 60 years or older, ability to give informed consent, Mini-Mental State Examination (MMSE) score<sup>44</sup> of 18 or higher, and ability to communicate in English. With oral consent, eligible patients were screened for depression using the Centers for Epidemiologic Studies Depression scale (CES-D).<sup>45</sup>

The study invited all patients with a CES-D score higher than 20<sup>46</sup> as well as a 5% random sample of patients with lower scores to enroll in the research protocol. The purpose of the 5% sample was to assess for "false-negative" cases of screened depression. To increase the screen's sensitivity, patients scoring 20 or lower and not selected randomly were recruited if they responded positively to supplemental questions about prior depressive episodes or treatment. Suicidal ideation was not included in eligibility criteria. Eligible patients met at the practice with research associates who, with signed consent, administered an in-person interview.<sup>47</sup> These patients received telephone assessments at 4 and 8 months and an in-person interview at 12 months. All assessments were conducted independent from the treating clinicians.

**Enrollment Statistics.** Over approximately 2 years (May 1999-August 2001), the study sampled 78.9% (N=16 708) of patients 60 years or older with upcoming appointments (FIGURE). Of sampled patients, the study screened 9072 (54.3%); 10.5% could not be contacted, 7.8% were not eligible, and

**Figure.** Flowchart of Progress Through the Phases of the PROSPECT Trial



PROSPECT indicates Prevention of Suicide in Primary Care Elderly: Collaborative Trial; CES-D, Centers for Epidemiologic Studies Depression scale.

27.4% refused. Patients who completed the screen were more likely to be female (65.6% vs 63.9,  $P=.005$ ) and older (74.9 vs 72.7 years,  $P<.001$ ).

Of patients administered the CES-D, 1061 (11.7%) screened positive for depression. An additional 827 patients screened negative but were chosen by random (505 [5.6%]) or supplemental questioning (322 [3.5%]). Of the 1888 eligible patients, 1238 (65.6%) agreed to a baseline interview. Enrolled patients did not differ from patients who refused by CES-D scores but were more likely to be female (74.1% vs 70.1%,  $P=.09$ ) and older (74.1 vs 72.7 years,  $P=.01$ ).

This report focuses on patients targeted by the intervention: those with major depression<sup>48</sup> or clinically significant minor depression as defined by *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)* research criteria for minor depressive disorder<sup>48(pp721-721)</sup> modified by requiring 4 depressive symptoms, Hamilton Depression Rating Scale (HDRS) score 10 or higher, and duration of at least 4 weeks.<sup>49</sup> This depressed cohort included 598 patients (320 intervention; 278 usual care), including 47 recruited by random selection and 109 from supplemental questions.

### Measures

Depression diagnoses were determined by research associates (PhD, MA, or experienced BA) trained in administering the *Structured Clinical Interview for Axis I DSM-IV Disorders*<sup>50</sup> and by study psychiatrists who reviewed symptoms. The 24-item HDRS<sup>51</sup> measured depression severity. The Scale for Suicidal Ideation (SSI) measured presence and intensity of suicidal ideation. As the SSI was highly skewed, it was dichotomized at 0 vs greater than 0 to indicate any current suicidal ideation.<sup>52</sup> The inter-rater reliability (intraclass correlation coefficient under a random effects model [ICCRAND])<sup>53</sup> of assessors across the 3 study sites was 0.97 for the HDRS, 0.92 for major depression, and 0.96 for the SSI score. Reliability was monitored regularly to prevent drift.

### Follow-up Statistics

Dropout over 12 months was 30.9% (99/320) and 31.3% (87/278) for the intervention and usual care groups, respectively. Using a discrete time survival model,<sup>54</sup> dropout rates differed across all 3 follow-up visits ( $P=.04$ ), with a significant difference at 4 months ( $P=.04$ ) but not at 8 ( $P=.10$ ) or 12 months ( $P=.30$ ). We assessed the influence of group differences in dropout rates by comparing results from our analysis (below) to results under the shared parameter model, which explicitly adjusts for such differences.<sup>55</sup> The 2 sets of models produced very similar results: treatment effects did not differ by more than 5%, and  $P$  values were more significant. The proportion of subjects with missed visits was very similar between groups; differences did not exceed 2.5% points for any visit ( $P>.20$ ).

### Analysis

The statistical analyses consisted of descriptive and intent-to-treat (ITT) modeling procedures. Descriptive statistics included means and SDs for continuous outcomes and percentages for binary outcomes. Tests and estimates of ITT differences for both continuous and binary outcomes were based on longitudinal models with random effects for clustering by patient, practice, or practice pairs. For all longitudinal suicidal ideation and depression outcomes, clustering by practice and pairs of practice was negligible and did not affect the analysis. This corresponds to previous results by Wells et al.<sup>36</sup> The longitudinal random effects models included main effect and interaction terms that represented ITT contrasts (ie, contrasts between randomized intervention and usual care) at each of the 4-, 8-, and 12-month follow-up visits. Using all data from all participants regardless of dropout or treatment adherence status, such modeling allowed us to test ITT differences at each follow-up visit (4, 8, and 12 months) separately and together with increased power and accounting for group differences with respect to dropout and baseline ideation. The "omnibus" test statistic, which tests

for significant ITT contrasts at any one of the follow-up visits, is a time by group interaction.<sup>56-58</sup> We tested for significant ITT differences in linear trend for each outcome, but the linear trend model did not fit any of the outcomes well. Hence, we rely on separate ITT tests at each visit separately and jointly using interaction tests. Interactions with site and baseline major depression status were also tested. For continuous outcomes, analyses were based on SAS PROC MIXED (SAS Institute Inc, Cary, NC). Both the PROC NLMIXED and the GLIMMIX macros in SAS were used to employ 2- and 3-level random effects models, respectively, for binary outcomes.<sup>59</sup> Given the group difference in baseline suicidal ideation, this variable was controlled for in all ITT analyses.  $P=.01$  was the level of significance.

### RESULTS

The sociodemographic characteristics of intervention and usual care patients did not differ statistically (TABLE 1). Patient age ranged from 60 to 94 years, the majority were female, and 28.4% were minorities. Although the overall percentage of minority patients did not vary between groups ( $P=.69$ ), 22.8% of the intervention's minority patients were Hispanic compared with 6.3% in usual care ( $P=.06$ ). The groups did not differ by depression diagnosis or severity; 66.2% had major depression. The mean (SD) HDRS score (18.1 [6.0]) indicated moderate severity. A larger proportion of intervention patients reported suicidal ideation than in usual care (29.4% vs 20.1%;  $P=.01$ ).

Treatments received by both groups are described in TABLE 2. Intervention patients were significantly more likely than usual care patients to report depression treatment at each follow-up period. At 4 months, for example, 89.2% of intervention patients compared with 52.5% of usual care patients reported depression treatment ( $P<.001$ ). Intervention patients had higher rates of medication-only ( $P<.001$ ) and psychotherapy-only ( $P<.001$ ) treatment. The small proportions of patients receiving combination treatment did not differ be-

tween groups ( $P = .23$ ). Similar patterns were observed at 8 months and 12 months.

**Hypothesis 1: Suicidal Ideation**

The first hypothesis concerned the impact of the intervention on the prevalence of suicidal ideation over time (TABLE 3). These comparisons were conducted among all depressed patients and then stratified by depression diagnosis.

As noted, patients in the intervention group were more likely to report suicidal ideation at baseline than patients in the usual care group (29.4% vs 20.1%,  $P = .01$ ). By 4 months and at each subsequent interview, rates of suicidal ideation no longer differed between groups reflecting a significantly greater decline in suicidal ideation in the intervention group after adjusting for the baseline difference. In the intervention group, raw rates of suicidal ideation declined 12.9% points (29.4% to 16.5%) compared with 3.0% points (20.1% to 17.1%) in usual care ( $P = .01$ ). Adjusting for the baseline difference, the omnibus trend testing ITT differences in change over time was significant among all depressed patients ( $P = .01$ ) and among patients with major depression ( $P = .006$ ). The differences were not significant among patients with minor depression ( $P = .98$ ). The interaction between the intervention and depression diagnosis on reduced suicidal ideation was not statistically significant ( $P = .64$ ).

**Hypothesis 2: Depressive Symptoms**

The second hypothesis was tested by comparing the clinical course of intervention and usual care patients using 3 sets of depression indexes. These comparisons were conducted among all depressed patients and then stratified by depression diagnosis.

The first analyses examined changes in depression severity, measured by the HDRS score (TABLE 4). Baseline depression severity did not differ between the groups. The decrease in HDRS score from baseline was greater in the intervention group than the usual

care group at 4 months (7.4 vs 3.9,  $P = .006$ ) yielding an overall significant omnibus test ( $P < .001$ ), 8 months (8.2 vs 6.2,  $P < .001$ ), and 12 months (8.8 vs 7.2,  $P < .001$ ). Among patients with major depression, the ef-

**Table 1.** Baseline Sociodemographic and Clinical Characteristics of Depressed Patients by Practice-Randomized Group Assignment

	Group Assignment, No. (%)		P Value
	Intervention (n = 320)	Usual Care (n = 278)	
<b>Sociodemographic variables*</b>			
Women	221 (69.1)	207 (74.5)	.15
Age $\geq 75$ y	102 (31.9)	82 (29.5)	.51
Race/ethnicity minority	93 (29.1)	101 (36.5)	.69
Education, mean (SD), y	12.6 (3.3)	13.0 (5.1)	.37
Poverty status	12 (3.8)	11 (4.0)	.72
Married	116 (36.2)	105 (37.7)	.51
Living alone	180 (56.2)	158 (56.7)	.87
<b>Clinical variables†</b>			
Cognitive function, mean (SD) MMSE score	27.4 (2.5)	27.3 (2.5)	.68
Depressive diagnosis	214 (66.9)	182 (65.5)	.78
Depressive severity, mean (SD) HDRS score	18.6 (6.1)	17.5 (5.8)	.24
Suicidal ideation (SSI score $> 0$ )	94 (29.4)	56 (20.1)	.01

Abbreviations: HDRS, Hamilton Depression Rating Scale; MDD, major depressive disorder; MMSE, Mini-Mental State Examination; SSI, Scale for Suicidal Ideation.

\*Poverty status as defined by the US Department of Health and Human Services guidelines, based on total annual household income (see "The 2001 HHS Poverty Guidelines" at <http://aspe.hhs.gov/poverty/01poverty.htm>). Minority defined as race or ethnicities other than non-Hispanic white (n = 402) (Hispanic [n = 26], non-Hispanic black [n = 158], Asian [n = 4], and other non-Hispanic [n = 8]).

†Major depressive disorder = *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV)* major depression vs severe minor depression (defined as 4 *DSM-IV* symptom groups, HDRS score  $> 9$ , and 4-week duration). The range of scores for the MMSE is 0 to 30 (inclusion criteria limited range to 18-30), with high scores indicating less cognitive impairment; HDRS range, 0 to 76, with high scores indicating greater depressive symptoms; and SSI range, 0 to 38, with high scores indicating greater suicidal ideation.

**Table 2.** Types of Treatment Received by Intervention vs Usual Care Patients Over Time\*

	Unadjusted Estimates, No. (%)		Adjusted Analysis for Intervention vs Usual Care		
	Intervention	Usual Care	Odds Ratio (95% Confidence Interval)	$\chi^2$	P Value
<b>4 Months</b>					
Medication and psychotherapy	14 (5.8)	19 (8.5)	0.46 (0.13-1.66)	1.39	.23
Medication only	139 (57.7)	90 (40.4)	4.91 (2.13-11.33)	13.91	$< .001$
Psychotherapy only	62 (25.7)	8 (3.6)	43.93 (11.59-166.42)	31.02	$< .001$
No treatment	26 (10.8)	106 (47.5)	0.003 (0.00-0.02)	51.69	$< .001$
<b>8 Months</b>					
Medication and psychotherapy	22 (9.7)	18 (8.9)	1.29 (0.39-4.30)	.17	.68
Medication only	130 (57.0)	80 (39.4)	4.20 (1.77-9.96)	10.56	$< .001$
Psychotherapy only	47 (20.6)	2 (1.0)	163.48 (21.90-1220.57)	24.70	$< .001$
No treatment	29 (12.7)	103 (50.7)	0.004 (0.00-0.02)	53.14	$< .001$
<b>12 Months</b>					
Medication and psychotherapy	14 (6.8)	21 (13.6)	0.25 (0.07-0.96)	4.12	$< .001$
Medication only	128 (66.3)	68 (44.2)	7.21 (2.86-18.18)	17.47	$< .001$
Psychotherapy only	29 (15.0)	2 (1.3)	41.15 (6.22-272.39)	14.82	$< .001$
No treatment	23 (11.9)	63 (40.9)	0.02 (0.00-0.07)	30.14	$< .001$

\*Odds ratios, 95% confidence intervals, and P values are derived from models described in "Methods" section. Odds ratios are adjusted for baseline Hamilton Depression Rating Scale and Scale for Suicidal Ideation scores; odds ratios compare specific treatment group to other types combined. The discrepancies between visit 4-, 8-, and 12-month denominator numbers and Figure (bottom) are due to incomplete or missing data on the scale for Suicidal Ideation among some participants who were interviewed at these times.

fects of the intervention remained significant at each time period ( $P < .03$ ) and overall ( $P < .001$ ). Among patients with minor depression, the effect was less pronounced and not significant at any follow-up period. The overall omnibus trend for minor depression only was not significant ( $P = .39$ ). The interaction between group and depression diagnosis on change in de-

pression severity was statistically significant ( $P = .008$ ).

The second outcome was response to depression treatment as measured by a 50% or more decrease in HDRS score from baseline (TABLE 5). These results mirrored those for depression severity. A larger proportion of intervention patients had depression responses compared with usual care patients at 4

months (42.7% vs 29.1%,  $P = .001$ ), 8 months (46.2% vs 35.5%,  $P = .02$ ), and 12 months (52.1% vs 42.0%,  $P = .02$ ); the overall omnibus trend was significant ( $P = .003$ ). Again, the impact of the intervention was significant in patients with major depression but not minor depression, although the interaction between group and diagnosis was not statistically significant ( $P = .30$ ).

**Table 3.** Rates of Suicidal Ideation Over Time

	No. With Suicidal Ideation/ No. Analyzed (%)*		Odds Ratio (95% CI)	P Value	Omnibus Test†
	Intervention	Usual Care			
All depressed patients					
Baseline	94/320 (29.4)	56/278 (20.1)			Model $\chi^2_3 = 10.9$ ; $P = .01$
4 mo	41/248 (16.5)	39/228 (17.1)	2.8 (1.2-6.2)	.01	
8 mo	41/233 (17.2)	40/210 (18.6)	3.5 (1.5-8.0)	.003	
12 mo	31/213 (14.6)	25/186 (13.4)	2.1 (0.8-5.0)	.12	
Major depression					
Baseline	79/214 (36.9)	48/182 (26.4)			Model $\chi^2_3 = 12.5$ ; $P = .006$
4 mo	34/170 (20.0)	32/145 (22.1)	3.5 (1.4-8.9)	.008	
8 mo	33/160 (20.6)	34/135 (25.2)	4.7 (1.8-12.1)	.002	
12 mo	23/146 (15.8)	18/117 (15.4)	2.3 (0.8-6.6)	.12	
Clinically significant minor depression only					
Baseline	15/106 (14.2)	8/96 (8.3)			Model $\chi^2_3 = 0.2$ ; $P = .98$
4 mo	7/78 (9.0)	7/83 (8.4)	1.4 (0.3-7.5)	.72	
8 mo	7/73 (9.6)	5/75 (6.7)	1.5 (0.2-9.4)	.66	
12 mo	8/67 (11.9)	7/69 (10.1)	1.4 (0.2-7.8)	.73	

Abbreviation: CI, confidence interval.

\*The discrepancies between visit 4-, 8-, and 12-month denominator numbers and Figure (bottom) are due to incomplete or missing data on the Scale for Suicidal Ideation among some participants who were interviewed at these times.

†Differences with respect to longitudinal change since baseline.

**Table 4.** Depression Severity Over Time

	Mean (SD) HDRS Score		Group Difference in Change From Baseline (95% CI)	P Value	Omnibus Test*
	Intervention	Usual Care			
All depressed patients (n = 598)					
Baseline	18.61 (6.12)	17.55 (5.79)		.88	Model $\chi^2_3 = 32.4$ ; $P < .001$
4 mo	11.24 (7.51)	13.61 (8.42)	-3.5 (-4.7 to -2.3)	<.001	
8 mo	10.45 (7.39)	11.38 (7.49)	-2.1 (-3.4 to -0.9)	<.001	
12 mo	9.77 (7.28)	10.35 (6.78)	-1.8 (-3.1 to -0.5)	.006	
Major depression (n = 396)					
Baseline	21.05 (5.74)	19.72 (5.53)		.89	Model $\chi^2_3 = 33.1$ ; $P < .001$
4 mo	12.58 (7.74)	15.87 (8.44)	-4.6 (-6.2 to -3.1)	<.001	
8 mo	11.69 (7.93)	12.85 (7.27)	-2.5 (-4.1 to -0.9)	.003	
12 mo	10.42 (7.62)	11.21 (7.11)	-2.0 (-3.7 to -0.4)	.02	
Clinically significant minor depression only (n = 202)					
Baseline	13.69 (3.23)	13.44 (3.65)		.82	Model $\chi^2_3 = 3.0$ ; $P = .39$
4 mo	8.34 (6.07)	9.50 (6.77)	-1.3 (-3.1 to 0.5)	.15	
8 mo	7.81 (5.23)	8.72 (7.20)	-1.4 (-3.2 to 0.5)	.15	
12 mo	8.39 (6.33)	8.86 (5.91)	-1.0 (-2.9 to 0.8)	.28	

Abbreviations: CI, confidence interval; HDRS, Hamilton Depression Rating Scale.

\*P values calculated using Wald statistic adjusting for baseline ideation and HDRS scores.

The third outcome tested was remission from depression, defined as HDRS score less than 10 (TABLE 6).<sup>60,61</sup> Among all patients, 4-month remission rates were significantly higher in the intervention practices compared with usual care (48.2% vs 34.2%,  $P < .001$ ). The difference between the 2 groups narrowed and was not significant at 8

**Table 5.** Depression Response Over Time

	No. With 50% HDRS Decline/ No. Analyzed (%) <sup>*</sup>		Odds Ratio (95% CI)	P Value	Omnibus Test <sup>†</sup>
	Intervention	Usual Care			
All depressed patients					Model $\chi^2_3 = 13.9$ ; $P = .003$
4 mo	108/253 (42.7)	68/234 (29.1)	2.7 (1.5-4.9)	.001	
8 mo	109/236 (46.2)	76/214 (35.5)	2.1 (1.1-3.8)	.02	
12 mo	113/217 (52.1)	79/188 (42.0)	2.0 (1.1-3.8)	.02	
Major depression					Model $\chi^2_3 = 15.7$ ; $P < .001$
4 mo	71/173 (41.0)	36/151 (23.8)	3.9 (1.8-8.5)	<.001	
8 mo	73/161 (45.3)	40/138 (29.0)	3.0 (1.4-6.4)	.006	
12 mo	81/148 (54.7)	54/119 (45.4)	1.9 (0.9-4.1)	.12	
Clinically significant minor depression only					Model $\chi^2_3 = 2.3$ ; $P = .51$
4 mo	37/80 (46.3)	32/83 (38.6)	1.6 (0.6-4.4)	.36	
8 mo	36/75 (48.0)	36/76 (47.4)	1.2 (0.4-3.4)	.72	
12 mo	32/69 (46.4)	25/69 (36.2)	2.2 (0.7-6.6)	.16	

Abbreviations: CI, confidence interval; HDRS, Hamilton Depression Rating Scale.

<sup>\*</sup>The discrepancies between visit 4-, 8-, and 12-month denominator numbers and the Figure (bottom) are due to incomplete or missing data on the scale for Suicidal Ideation among some participants who were interviewed at these times.

<sup>†</sup>P values calculated using Wald statistic adjusting for baseline ideation and HDRS scores.

**Table 6.** Depression Remission Over Time

	Intervention <sup>*</sup>	Usual Care <sup>*</sup>	Odds Ratio (95% CI)	P Value	Omnibus Test <sup>†</sup>
All depressed patients					Model $\chi^2_3 = 12.8$ ; $P < .001$
4 mo	122/253 (48.2)	80/234 (34.2)	3.7 (1.7-7.7)	<.001	
8 mo	117/236 (49.6)	93/214 (43.5)	2.0 (0.9-4.1)	.08	
12 mo	119/217 (54.8)	99/188 (52.7)	1.5 (0.7-3.3)	.26	
Major depression					Model $\chi^2_3 = 17.1$ ; $P < .001$
4 mo	69/173 (40.0)	34/151 (22.5)	6.7 (2.5-17.9)	<.001	
8 mo	70/161 (43.5)	47/138 (34.1)	2.4 (0.9-6.2)	.08	
12 mo	75/148 (50.7)	58/119 (48.7)	1.3 (0.5-3.5)	.59	
Clinically significant minor depression only					Model $\chi^2_3 = 1.7$ ; $P = .64$
4 mo	51/80 (63.8)	46/83 (55.4)	2.8 (0.5-14.4)	.25	
8 mo	47/75 (62.7)	46/76 (60.5)	3.2 (0.7-16.0)	.45	
12 mo	44/69 (63.8)	41/69 (59.4)	1.1 (0.2-6.0)	.31	
					No. With HDRS Score <7/No. Analyzed (%)
All depressed patients					Model $\chi^2_3 = 7.6$ ; $P = .06$
4 mo	82/253 (32.4)	58/234 (24.8)	2.0 (1.0-3.8)	.04	
8 mo	97/236 (41.1)	68/214 (31.8)	2.1 (1.1-4.2)	.02	
12 mo	87/217 (40.1)	62/188 (33.0)	1.9 (0.9-3.7)	.07	
Major depression					Model $\chi^2_3 = 11.2$ ; $P = .01$
4 mo	46/173 (26.6)	23/151 (15.2)	3.6 (1.4-9.4)	.007	
8 mo	58/161 (36.0)	31/138 (22.5)	3.2 (1.3-7.9)	.01	
12 mo	53/148 (35.8)	38/119 (31.9)	1.4 (0.6-3.6)	.42	
Clinically significant minor depression only					Model $\chi^2_3 = 3.4$ ; $P = .33$
4 mo	36/80 (45.0)	35/83 (42.2)	1.1 (0.4-2.9)	.86	
8 mo	39/75 (52.0)	37/76 (48.7)	1.3 (0.5-3.5)	.60	
12 mo	34/69 (49.3)	24/69 (34.8)	2.6 (0.9-7.4)	.08	

Abbreviations: CI, confidence interval; HDRS, Hamilton Depression Rating Scale.

<sup>\*</sup>The discrepancies between visit 4-, 8-, and 12-month denominator numbers and the Figure (bottom) are due to incomplete or missing data on the Scale for Suicidal Ideation among some participants who were interviewed at these times.

<sup>†</sup>P values calculated using Wald statistic adjusting for baseline ideation and HDRS scores.

months (49.6% vs 43.5%,  $P=.08$ ) or 12 months (54.8% vs 52.7%,  $P=.26$ ). This pattern over time yielded a statistically significant overall omnibus trend ( $P<.001$ ). Similar results were observed among patients with major depression but not minor depression. When remission was redefined as HDRS score less than 7, the pattern of results was similar. The statistical interaction between the intervention and depression diagnosis was not significant using HDRS score less than 10 ( $P=.23$ ) or HDRS score less than 7 ( $P=.08$ ).

### Post-Hoc Stratification

Two sets of post-hoc analyses examined the effect of the PROSPECT intervention stratified by both depression diagnosis and suicidality. Among patients who reported suicidal ideation at baseline, suicidal ideation had resolved by 4 months in 66.7% of 75 intervention patients compared with 58.7% of 46 patients receiving usual care ( $P=.34$ ). The difference between groups was more pronounced and statistically significant at 8 months (70.7% vs 43.9%,  $P=.005$ ). By 12 months, more than two thirds of both groups no longer expressed suicidal ideation (68.7% vs 65.8%,  $P=.89$ ). Consistent with the group difference peaking at 8 months, the omnibus test for change across time was significant ( $P=.03$ ). The pattern was similar within the major depression and minor depression subgroups, although the omnibus test did not reach statistical significance in either group (major depression,  $P=.09$ ; minor depression,  $P=.09$ ).

Intervention patients had significantly greater decreases in HDRS scores compared with patients receiving usual care whether at baseline they reported suicidal ideation (all depressed,  $n=150$ ,  $P<.001$ ; major depression,  $n=127$ ,  $P<.001$ ) or no suicidal ideation (all depressed,  $n=448$ ,  $P<.001$ ; major depression,  $n=269$ ,  $P<.001$ ). The majority (87% [179/202]) of patients with minor depression did not report suicidal ideation, and the impact of the intervention on their depressive symptoms was not significant overall ( $P=.72$ ). In

contrast, for patients with minor depression but also suicidal ideation ( $n=23$ ), the intervention was associated with a significantly greater overall decrease in depressive severity relative to usual care ( $P=.03$ ).

### COMMENT

The principal finding of this multisite, randomized primary care trial is that suicidal ideation resolved more quickly in patients from practices randomly assigned to receive the intervention compared with patients receiving usual care. Additionally, intervention patients had a more favorable course of depression as measured by severity of depressive symptoms, response to depression treatment, and depression remission. The impact of the intervention on depressive symptoms was greater among patients with major depression than for patients with mild depression unless suicidal ideation was also present.

Rates of suicide are highest among the very old, especially old white men. Although individual primary care clinicians infrequently experience suicides among their patients,<sup>62,63</sup> the devastating nature of these events underscores the importance of developing effective approaches to minimize suicide risk. While suicide itself occurs too infrequently in primary care to measure the intervention's impact on completed suicides (and the PROSPECT study was not designed to do so), the intervention did achieve a faster reduction in rates of suicidal ideation than observed in usual care. One patient in the intervention group died by suicide; the follow-up methodology did not permit us to know reliably the causes of death for patients in the usual care group. Two patients, 1 in the intervention group and 1 in the usual care group, made suicide attempts. While it is reasonable to hope from our findings that the rate of completed suicides in a large group of treated patients would be favorably affected, no study has explicitly demonstrated that connection.

Suicidal ideation ranges from mild, passive ideation to severe and active. In

primary care, the low prevalence of active ideation reduces the feasibility of comparing outcomes by severity of ideation or conducting trials only for active ideation. In contrast, evidence suggests that mild ideation is more persistent and more difficult to treat.<sup>64</sup> These findings underscore the challenges in reducing overall suicide risk in primary care and the importance of designing primary care interventions that address the range in severity of suicidal ideation.

A potential limitation to these study results is the higher baseline prevalence of suicidal ideation reported in intervention practices compared with usual care. We have not been able to explain this difference. It may have resulted from failure of the practice-level randomization (despite no group differences in depression), rater bias (although ongoing monitoring suggested none), another methodological factor, or chance. Model-based regression adjustments chosen to compensate for this baseline difference still demonstrated an effect of the intervention on both suicidal ideation and depression. We note that depression at baseline did not differ between groups. Another potential limitation to the study's generalizability is the fact that depression treatment was provided at no cost to participants.

In the intervention group, over two thirds of patients expressing suicidal ideation were no longer suicidal at 4 months, an improvement rate resembling that observed among specialty mental health patients in an academic-based clinic.<sup>64</sup> The depression response rate of intervention patients was also similar to rates observed in randomized efficacy trials of SSRIs.<sup>65,66</sup> These findings are important given study methodology chosen to increase the relevance of PROSPECT's findings to real world practice. First, the study was conducted in a variety of practices, most of which were nonacademic, relatively small, and serving heterogeneous populations. Second, although refusals reduced the sample's strict representativeness, the sampling and screening procedures re-

sulted in more heterogeneity than generally achieved in randomized trials. Further, the protocol included patients regardless of factors that are typically excluded in most randomized controlled trials, such as mild cognitive impairment, medical comorbidity, concurrent medical treatments, or, perhaps most important, suicidality. We argue that this heterogeneity increases the relevance of the findings to actual practice.

This study's application of formal depression screening and diagnostic procedures differs from traditional clinical practice<sup>67</sup> where identification of depression is unstructured and often dependent on patients volunteering pertinent information. Consequently, many patients may have been reluctant to accept a depression diagnosis or initiate treatment. In this context, the intervention's positive impact on patient outcomes using ITT analyses is encouraging and consistent with recent clinical guidelines that suggest that routine depression screening in primary care has the potential to improve patient outcomes if followed with appropriate treatment and care management.<sup>67</sup>

PROSPECT was designed to evaluate the total impact of its intervention, which contains 2 major elements. First is the implementation of treatment guidelines modified to address the nuances of treating depression in older patients where "uptake of antidepressants," vulnerability to adverse effects, competing medical morbidity, functional disability, cognitive impairments, and social stigma can complicate prescribing, treatment initiation, and treatment adherence.<sup>68-73</sup> Second is the addition of a depression care manager, a role consistent with recent trends in using master's-level clinicians to manage a range of chronic medical conditions.<sup>74,75</sup> Future analyses will attempt both to determine which components of PROSPECT's intervention were important to its therapeutic effects and to determine the extent to which patient clinical or psychosocial characteristics modify the intervention's effectiveness.

These findings are consistent with evidence that interventions can improve the quality of depression care in primary care. Most of these studies have been conducted in younger or mixed-aged samples.<sup>36,76,77</sup> By targeting the elderly, PROSPECT is similar to the Improving Mood-Promoting Access to Collaborative Treatment (IMPACT) trial in demonstrating the positive effect of a multicomponent primary care intervention.<sup>37</sup> Despite differences in key design features (eg, unit of randomization, sample selection, clinical measures), both studies reported comparable short-term (3-4 months) effects on response rates (ie, 50% decline in depression severity) in each study's intervention group vs usual care (PROSPECT, 41.0% vs 23.8%; IMPACT, 31.8% vs 14.8%). These findings underscore the potential value of such primary care interventions for resolving depression, improving quality of life and, as in PROSPECT, reducing risk factors for suicide in late life. They also underscore the importance of building on these successful trials by developing effective strategies to sustain these interventions in routine practice, to increase their efficacy further (allowing more patients to achieve response and remission), and to disseminate them more broadly.

The intervention's impact in reducing suicidal ideation argues that care management should be added as an empirically demonstrated effective intervention in suicidal behavior practice guidelines.<sup>26</sup> Importantly, much of the intervention's impact was on the speed of patient improvement, which is relevant for reducing both the risk for suicidal behavior and ongoing suffering among patients and families. Thus, intervention patients experienced not only more "depression free days,"<sup>78</sup> but also days free from suicidal ideation.

The finding that the intervention's effect differed by depression severity suggests the clinical utility of focusing on patients with major depression. This point has several caveats, however. First, patients with minor depression who reported suicidal ideation benefited from

the intervention, albeit this subgroup was small. Second, the demarcation between major and minor depression is more conventional than absolute so that the findings offer a guide rather than a prescription to clinical decision making. Third, not every patient with minor depression remitted over time, suggesting that "watchful waiting" may be useful for identifying symptoms that persist or exacerbate.

In summary, the multisite PROSPECT demonstrated that an intervention consisting of guideline treatment managed by a master's-level clinician is both feasible and effective in significantly reducing suicidal ideation in geriatric patients suffering depression in primary care. The intervention was also effective in reducing depressive symptoms in patients with major depression and, when suicidal ideation was present, minor depression. Together, these findings indicate that efforts to improve the quality of depression treatment for geriatric primary care patients can focus on patients with suicidal ideation or major depression with the expectation that appropriate management will reduce depressive symptoms, suicidal ideation, and the risk of suicide in late life.

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