Community-Integrated Home-Based Depression Treatment in Older Adults
A Randomized Controlled Trial

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Clinically significant depression affects 15% to 20% of elderly individuals in the United States.1,2 Older individuals are less likely than younger adults to have major depression3 but have comparable or higher rates of less severe depressive disorders such as dysthymia and minor depression. Dysthymia is a chronic depressive syndrome persisting for at least 2 years.4 According to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) Appendix of Criteria Sets and Axes Provided for Further Study, minor depression is depressed mood and/or significant loss of interest, plus 1 to 3 other depressive symptoms present nearly every day for at least 2 weeks, occurring in the absence of dysthymia.5(p710-721) Minor depression and dysthymia both lead to significant disability.5,6 Accumulating evidence from primary care set-

Context Older adults with social isolation, medical comorbidity, and physical impairment are more likely to be depressed but may be less able to seek appropriate care for depression compared with older adults without these characteristics.

Objective To determine the effectiveness of a home-based program of detecting and managing minor depression or dysthymia among older adults.

Design and Setting Randomized controlled trial with recruitment through community senior service agencies in metropolitan Seattle, Wash, from January 2000 to May 2003.

Patients One hundred thirty-eight patients aged 60 years or older with minor depression (51.4%) or dysthymia (48.6%). Patients had a mean of 4.6 (SD, 2.1) chronic medical conditions; 42% of the sample belonged to a racial/ethnic minority, 72% lived alone, 58% had an annual income of less than $10000, and 69% received a form of home assistance.

Interventions Patients were randomly assigned to the Program to Encourage Active, Rewarding Lives for Seniors (PEARLS) intervention (n=72) or usual care (n=66). The PEARLS intervention consisted of problem-solving treatment, social and physical activation, and potential recommendations to patients’ physicians regarding antidepressant medications.

Main Outcome Measures Assessments of depression and quality of life at 12 months compared with baseline.

Results At 12 months, compared with the usual care group, patients receiving the PEARLS intervention were more likely to have at least a 50% reduction in depressive symptoms (43% vs 15%; odds ratio [OR], 5.21; 95% confidence interval [CI], 2.01-13.49), to achieve complete remission from depression (36% vs 12%; OR, 4.96; 95% CI, 1.79-13.72), and to have greater health-related quality-of-life improvements in functional well-being (P=.001) and emotional well-being (P=.048).

Conclusions The PEARLS program, a community-integrated, home-based treatment for depression, significantly reduced depressive symptoms and improved health status in chronically medically ill older adults with minor depression and dysthymia.

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can be associated with increased mor-
chotherapy. Untreated depression in el-
related, homebound, or function-
ally impaired older adults, such char-
exist among medically ill, socially iso-
recognition and treatment of depres-
ence. Even among less functionally im-
paired older adults attending primary
care, few depressed patients receive
guide-line level depression treat-
ment. Of medications or psycho-
therapy. Untreated depression in el-
ders negatively influences physical functioning, adap-
tion to medical illness, and quality of life and can be associated with increased mor-
bidity and mortality, treatment non-
herence, increased health care costs, and lower satisfaction with care.

Because of the relatively high prevalence of less severe forms of depression among elderly persons, we set out to add to the evidence base on treating these disorders in community settings by con-
ducting a randomized controlled trial comparing a program for treating mi-
or depression and dysthymia, the Pro-
gram to Encourage Active, Reward-
ing Lives for Seniors (PEARLS), with usual care in medically ill, low-income, mostly homebound older adults. Since home-
based treatment can reduce depression among socially isolated, chronically ill seniors, we created a home-based intervention focusing on problem-
solving treatment (PST). We hypo-
thesized that patients receiving the PEARLS intervention would show greater improvements in depression and higher quality of life compared with pa-
tients receiving usual care. We also ex-
amined the effects of the intervention on changes in health care utilization.

METHODS

Protocol

This study was conducted in metro-

diary interview. Of 150 remaining potential participants (40%), 12 refused participation and 138 consen-
ted to participate and were en-
rolled in the study. For all partici-
pants who were excluded because of a diagnosis of major depression, a letter from the study psychiatrist (P.C.) was sent to the participant’s primary care phys-
ian indicating the diagnosis and suggesting that he/she consider this probable diagnosis in treatment of the patient.

Randomization

Using a 50:50 randomization alloca-
tion ratio, investigators created enve-
lopes containing concealed assign-
ment codes assigned sequentially to eligible patients in blocks of 10 by a re-
search associate. Investigators changed the allocation ratio to 60:40 after 11 blocks to ensure that the desired sample of intervention participants was re-
cruited (≥71 participants). To ac-
count for the possibility that clinical se-
verity of recruited participants may have increased over time, which would lead to greater severity in the treatment group, we included a dummy variable in all analyses denoting whether pa-
 patients were randomized using the 50:50 or 60:40 allocation scheme.

Intervention and Usual Care

Participation

Usual care participants received no additional services, but letters sent to their regular physicians and social workers reported their depression diagnosis with recommendations to continue usual care. All participants could seek additional primary or specialty mental health care. Intervention participants were scheduled to receive PST by PEARLS therapists (2 male and 1 female master’s-level social workers employed by community agency collabor-
ors). Near the end of recruitment, a female registered nurse trained in PST replaced 1 of the social workers for 1 of the 72 intervention participants. Thera-
pists thoroughly reviewed a PST treat-
ment manual, completed 8 hours of lectures, viewed videotapes, and par-
ticipated in extensive role-playing. Problem-solving treatment is a skills-enhancing behavioral depression treat-
ment based on the assumption that problems of daily life cause and main-
tain depressive symptoms, and through systematically identifying and address-
ing these problems, patients can achieve decreased depressive symptoms. Re-
cent research has shown it is not nec-
essary for a patient’s perception of prob-
lem severity to improve for PST to
work.33

Each PEARLS session included se-
lecting from a list of 250 pleasant ac-
tivities34 to engage in before the next
session. The inverse relationship be-
tween pleasant events and depression
is an important aspect of behavioral
theories of depression.35 We modified PST sessions to pro-
vide greater emphasis on social and
physical activation (S.S. and J.K.,
PEARLS Research Team, unpublished
data, January 2000). The goal of phys-
ical activation was to assist patients in
developing a regular physical activity
program consistent with national rec-
ommendations36 for moderate activity of
at least 30 minutes’ duration at least
5 d/wk. Therapists received informa-
tion on baseline physical, social, and rec-
reational activities derived from the
Community Healthy Activities Model
Program for Seniors (CHAMPS instru-
ment.37 Physical activation began dur-
ing the third or fourth PST session, al-
lowing patients to develop familiarity
with problem-solving skills. The goal of
social activation was to increase pa-
tients’ interactions outside the home by
using a resource list under the guid-
ance of the therapist. Group activities en-
couraging peer support were given high-
est priority.

Starting in September 1999, each
therapist saw 3 to 6 training cases, and,
as with all participants, these partici-
pants gave permission for audiotaping
sessions. The PST trainer (K.S.) scored
every training audiotape on 9 specific
and 1 global item from 0 (very poor) to
5 (very good). Feedback for improving
adherence to the PST method was pro-
vided. Therapists achieving global rat-

ings of at least 3 (satisfactory) on the ma-
majority of sessions with 3 training cases
were certified as PST proficient and per-
mitted to see full study participants.38 A
research coordinator sent the PST trainer
every fifth full study tape for adherence
coding and feedback. The mean global
rating for 109 sessions was 3.15.

Characteristics of the PST Sessions
Patients were scheduled for eight 50-
minute in-home sessions over 19 weeks,

Figure. Flow of Study Participants

<table>
<thead>
<tr>
<th>1419 Potential Participants</th>
<th>1238 Identified by Social Service Agencies</th>
<th>191 Self-referred</th>
</tr>
</thead>
<tbody>
<tr>
<td>1045 Excluded</td>
<td>35 Unreachable</td>
<td>14 Self-referred</td>
</tr>
<tr>
<td>254 Refused</td>
<td>209 Agency-Identified</td>
<td>25 Self-referred</td>
</tr>
<tr>
<td>771 Ineligible</td>
<td>761 Agency-Identified</td>
<td>10 Self-referred</td>
</tr>
<tr>
<td>5 Died</td>
<td>4 Agency-Identified</td>
<td>1 Self-referred</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>374 Completed Second-Level SCID Eligibility Screen</th>
<th>243 Agency-Identified</th>
<th>131 Self-referred</th>
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</thead>
<tbody>
<tr>
<td>224 Ineligible</td>
<td>109 No Symptoms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>64 Agency-Identified</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45 Self-referred</td>
<td></td>
</tr>
<tr>
<td></td>
<td>78 Had Major Depression</td>
<td></td>
</tr>
<tr>
<td></td>
<td>53 Agency-Identified</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25 Self-referred</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16 Had Bipolar Disorder</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 Agency-Identified</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 Self-referred</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 Had Psychosis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 Agency-Identified</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 Self-referred</td>
<td></td>
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<tr>
<td></td>
<td>1 Had Substance Abuse</td>
<td></td>
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<tr>
<td></td>
<td>(Agency-Identified)</td>
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<tr>
<td></td>
<td>12 Had Cognitive Impairment</td>
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<tr>
<td></td>
<td>9 Agency-Identified</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 Self-referred</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>150 Eligible</th>
<th>105 Agency-Identified</th>
<th>45 Self-referred</th>
</tr>
</thead>
<tbody>
<tr>
<td>138 Randomized</td>
<td>99 Agency-Identified</td>
<td>39 Self-referred</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>66 Assigned to Receive Usual Care</th>
<th>6-mo Follow-up</th>
<th>69 Respondents</th>
<th>1 Refused</th>
<th>1 Unreachable</th>
<th>2 Died</th>
</tr>
</thead>
<tbody>
<tr>
<td>72 Assigned to Receive Intervention</td>
<td>6-mo Follow-up</td>
<td>67 Respondents</td>
<td>1 Refused</td>
<td>1 Unreachable</td>
<td>1 Died</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>66 Included in Primary Analysis</th>
<th>12-mo Follow-up (Cumulative)</th>
<th>60 Respondents</th>
<th>2 Refused</th>
<th>2 Unreachable</th>
<th>2 Died</th>
</tr>
</thead>
<tbody>
<tr>
<td>72 Included in Primary Analysis</td>
<td>12-mo Follow-up (Cumulative)</td>
<td>67 Respondents</td>
<td>1 Refused</td>
<td>1 Unreachable</td>
<td>3 Died</td>
</tr>
</tbody>
</table>

SCID indicates Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders, Fourth
Edition.
in weeks 1, 2, 3, 5, 7, 11, 15, and 19. Increasing time between later sessions gave patients more opportunities to practice PST skills. The Patient Health Questionnaire 9 (PHQ-9) was administered at the beginning of sessions to track depression change. After 19 weeks, therapists maintained monthly brief telephone contact with patients, during which they would administer the PHQ-9 and assess patients’ use of PST.

**Depression Management Team Sessions**

All intervention cases were reviewed weekly or biweekly by the study psychiatrist (P.C.) during depression management team sessions, which all therapists attended. Therapists carried 3 to 8 active cases and each case required 5 to 10 minutes of discussion and supervision. For cases lacking continued improvement after 4 to 5 weeks (most recent PHQ-9 scores >50% of baseline and continuing or recurring dysphoria oranhedonias), the psychiatrist contacted patients’ primary care physicians to recommend initiating or adjusting antidepressants and to assess potential medical and substance abuse etiologies for depression. This is consistent with evidence-based chronic care models using stepped-care targeted communication between specialists and primary care physicians or specialists and patients for cases with unremitting symptoms.

The psychiatrist also reviewed medical problems and medications for all patients, occasionally clarifying details by contacting primary care physicians. The psychiatrist infrequently called patients, after discussion at team sessions, to clarify clinical issues (eg, suicidal ideation, diagnostic uncertainty). The availability of such telephone contacts with physicians or patients optimized patient safety and increased the comprehensiveness of the intervention.

**Data Collection**

Outcome assessments were conducted in person at baseline and at 6 and 12 months by trained interviewers not involved in the intervention and included sociodemographic characteristics and a count of medical conditions. Depression was assessed using the Health Status Questionnaire (HSCL-20), which is validated in medical patients and found to be highly reliable. With a 0-to-4 severity range, an HSCL-20 cutoff score of 1.72 has previously been associated with the highest positive predictive value for diagnosis of major depression in adult primary care patients. Since neuroticism predicts persistence of depression in primary care and an increased risk for late-life depression associated with disability, the NEO neuroticism scale items were administered at baseline.

Health-related quality of life in functional, physical, social, and emotional well-being domains was assessed at baseline and 12 months using the Functional Assessment of Chronic Illness Therapy: General (FACT-G). The FACT-G is a generic core questionnaire of 27 items for health-related quality-of-life questionnaires targeted to management of chronic illness and used and validated in cancer, other chronic conditions, and the general population.

Health care utilization was assessed in three 6-month periods from 6 months before to 12 months after baseline using the Cornell Services Index and was dichotomized by creating indicator-dependent variables for each period based on having any emergency department visits, any medical hospitalizations, or at least 5 outpatient visits (median number of baseline outpatient visits). The proportion of patients with any form of home assistance (eg, home aid, nursing, or meal delivery) was determined at baseline.

Patients were asked whether they used antidepressants during all 3 assessments. Six- and 12-month depression outcomes included mean HSCL-20 depression scores; treatment response, defined as at least a 50% decrease in HSCL-20 score from baseline; and complete depression remission, defined as HSCL-20 score less than 0.5. Costs of providing PEARLS were based on direct personnel salaries and included the costs of time to conduct in-person contacts and associated travel time, all therapist and psychiatric telephone contacts, depression management team sessions, and maintenance of PST quality by the PST trainer.

**Statistical Analysis**

Two-tailed t tests and χ2 tests were used to compare the intervention and usual care groups at baseline. To evaluate group differences of HSCL-20 and FACT-G domain scores at assessment points, we used mixed-effects regression analyses. To evaluate treatment group differences in depression treatment response, depression remission, or health care utilization at all assessment points, we used mixed-effects ordinal regression analyses.

These procedures permit inclusion of patients with missing data, ensuring an intention-to-treat analysis as randomized. Age, sex, NEO neuroticism scale score, dysthymia, and randomization allocation scheme were fixed covariates for each analysis. In all models, the intercept was always assumed to be random, and the time effect (baseline, 6 months, and 12 months or baseline and 12 months) was fixed. Marginal maximum likelihood methods generated maximum likelihood estimates for group, time, and group × time interaction effects. Models were evaluated using a z statistic (maximum likelihood estimate divided by standard error). In the case of a nonsignificant group × time interaction, the models were refit without an interaction.

For regression analyses evaluating depression treatment response and depression remission, 6 cases were missing outcome data at both 6 and 12 months, so the method of last observation carried forward was first used, ensuring an intention-to-treat analysis. As a sensitivity analysis, the mixed-effects ordinal regression analysis was run without the 6 cases as a completer analysis, and results were identical.

When significant interaction or group effects were detected in various models, the following were calculated for each follow-up assessment point: for HSCL-20 score differences, multiple re-
gression analyses were used to estimate the adjusted group mean change; and for depression treatment response, depression remission, or health care utilization, logistic regression was used to obtain adjusted odds ratios. For the FACT-G subscales, adjusted mean change scores over the year were computed for each treatment group.

MIXOR, version 2.0, and MIXREG, version 1.2 (Don Hedeker and Robert D. Gibbons, University of Illinois at Chicago) as well as SPSS, version 11.0 (SPSS Inc, Chicago, Ill) were used for analyses. \( P < .05 \) was considered statistically significant.

RESULTS

Baseline Characteristics

The sample (Table 1) consisted mostly of women (79%), and had a mean age of 73 years (SD, 8.5 years). Few patients (11%) were married or living with a partner, and 72% lived alone. Forty-two percent belonged to a racial/ethnic minority (African American, 36%; Asian American, 4%; Hispanic, 1%; and American Indian, 1%), 58% had an annual income of less than $10,000, 42% had an education level below or equivalent to high school, and 69% received home assistance.

About half of patients (48.6%) had dysthymia and half (51.4%) had minor depression, with a sample mean HSCL-20 score of 1.3 (SD, 0.5), which is consistent with subthreshold depression and lower than the score (1.72) previously associated with major depression in primary care.\(^{42} \) Patients reported having a mean of 4.6 (SD, 2.1) of 10 chronic medical conditions (median, 5.0; range, 0-10; 4 had no chronic medical conditions). Since the intervention group had significantly more dysthymia than the usual care group (61% vs 35%; \( \chi^2 = 9.5; P = .002 \)) and less neuroticism (NEO neuroticism scale range, 1-5; mean scores, 2.9 [SD, 0.7] vs 3.1 [SD, 0.7]; \( t_{35} = 2.1; P = .04 \)), we controlled for these differences in subsequent analyses. There were no significant baseline differences in cognitive screening or in health care utilization in the prior 6 months in the domains of mental health, medical outpatient and emergency department use, medical hospitalizations, or use of home assistance.

Process of Care

Intervention patients received, during the 19-week active phase, a mean of 6.6 visits (SD, 2.5; median, 8.0; range, 0-8; 3 had no visits) and, during the 33-week follow-up phase, a mean of 3.5 telephone contacts (SD, 2.7; median, 5.0 contacts; range, 0-7; 23 patients could not be or asked not to be contacted). No patients were seen in person by the psychiatrist. However, the psychiatrist made 52 telephone contacts during the intervention, 37 with patients’ physicians to discuss the following: antidepressant recommendations (19), laboratory tests (10), cognition (7), other medications (4), alcohol abuse rehabilitation (2), sleep apnea (1), falls (1), and pain complaints (1). Fifteen antidepressant-related calls occurred during the active phase and 4 during the follow-up phase and involved care of 14 patients. Eleven calls (8 in the active and 3 in the follow-up phases) were recommendations to start an antidepressant, and 8 (7 in the active and 1 in the follow-up phases) were recommendations to adjust medications. Nine psychiatrist calls were made to patients to assess study participation (7), suicidal thoughts (1), and confusion (1). One call to a pa-

<table>
<thead>
<tr>
<th>Table 1. Baseline Participant Characteristics*</th>
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</thead>
<tbody>
<tr>
<td>Characteristics</td>
</tr>
<tr>
<td>Self-referred to PEARLS</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Age, mean (SD), y</td>
</tr>
<tr>
<td>Living alone</td>
</tr>
<tr>
<td>Married or living with partner</td>
</tr>
<tr>
<td>Racial/ethnic minority</td>
</tr>
<tr>
<td>Education beyond high school</td>
</tr>
<tr>
<td>Household income &lt;$10,000 annually</td>
</tr>
<tr>
<td>HSCL-20 score, mean (SD) (range, 0-4)</td>
</tr>
<tr>
<td>Depressive status (SCID diagnosis)</td>
</tr>
<tr>
<td>Dysthymia</td>
</tr>
<tr>
<td>Minor depression</td>
</tr>
<tr>
<td>Current antidepressant treatment</td>
</tr>
<tr>
<td>NEO neuroticism scale score, mean (SD)</td>
</tr>
<tr>
<td>No. of chronic diseases (of 10 total), mean (SD)</td>
</tr>
<tr>
<td>Cognitive screening score (of 6 items from the MMSE), mean (SD)</td>
</tr>
<tr>
<td>Health care utilization</td>
</tr>
<tr>
<td>Outpatient visits in past 6 mo, mean (SD)</td>
</tr>
<tr>
<td>Any mental health visits in past 6 mo</td>
</tr>
<tr>
<td>Any medical hospitalizations in past 6 mo</td>
</tr>
<tr>
<td>Any emergency department visits in past 6 mo</td>
</tr>
<tr>
<td>Any home nursing, home aid, or home meals in past 6 mo</td>
</tr>
<tr>
<td>Moderate exercise, mean (SD), h/wk†</td>
</tr>
<tr>
<td>FACT-G score, mean (SD)</td>
</tr>
<tr>
<td>Functional well-being</td>
</tr>
<tr>
<td>Emotional well-being</td>
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<tr>
<td>Physical well-being</td>
</tr>
</tbody>
</table>

Abbreviations: FACT-G, Functional Assessment of Cancer Therapy Scale–General; HSCL, Hopkins Symptom Checklist; MMSE, Mini-Mental State Examination; PEARLS, Program to Encourage Active, Rewarding Lives for Seniors; SCID, Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.

*Data are presented as No. (%) unless otherwise indicated.
†Moderate exercise was defined as walking briskly, jogging, dancing, golfing, playing tennis, performing heavy housework, gardening, bicycling, swimming, or doing aerobics.
Treatment Difference

Table 2. Depression Outcome Measures

<table>
<thead>
<tr>
<th>Outcome Measures</th>
<th>Unadjusted Estimates</th>
<th>Treatment Difference</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Usual Care (n = 66)</td>
<td>Intervention (n = 72)</td>
</tr>
<tr>
<td></td>
<td>Coefficient or Odds Ratio (95% CI)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P Value</td>
<td></td>
</tr>
<tr>
<td>HSCL-20 depression score, mean (SD) (range, 0-4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>1.2 (0.5)</td>
<td>1.3 (0.5)</td>
</tr>
<tr>
<td>6-mo Follow-up</td>
<td>1.17 (0.53)</td>
<td>0.71 (0.60)</td>
</tr>
<tr>
<td>12-mo Follow-up</td>
<td>1.01 (0.46)</td>
<td>0.82 (0.62)</td>
</tr>
<tr>
<td>Response (≥50% decrease in HSCL-20 depression score from baseline), No. (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-mo Follow-up</td>
<td>5 (8)</td>
<td>37 (54)</td>
</tr>
<tr>
<td>12-mo Follow-up</td>
<td>9 (15)</td>
<td>29 (43)</td>
</tr>
<tr>
<td>Complete remission of depression symptoms (HSL-20 score &lt;0.5), No. (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-mo Follow-up</td>
<td>6 (10)</td>
<td>30 (44)</td>
</tr>
<tr>
<td>12-mo Follow-up</td>
<td>7 (12)</td>
<td>24 (36)</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; HSCL, Hopkins Symptom Checklist.

Table 2. Depression Outcome Measures

Unadjusted Estimates | Treatment Difference
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Value</td>
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Intervention Outcomes

For HSCL-20 depression score, there was a significant group × time interaction (z = −2.40; P = .02) due to significant group differences in HSCL-20 at 6 months (t = −4.85; P < .001) and 12 months (t = −2.20; P = .03) (Table 2). For depression treatment response and depression remission, there were no significant group × time interactions (z = −1.91; P = .06 and z = −0.90; P = .37, respectively), so the models were re-fit, resulting in significant group effects (z = 4.19; P < .001 and z = 3.00; P = .003, respectively) and nonsignificant time effects (z = −0.45; P = .65 and z = −0.82; P = .41, respectively). Table 2 shows that these significant group effects are due to the odds of a 50% depression treatment response or of complete remission being significantly higher for the intervention group at 6 and 12 months.

There were significant group × time interactions for the FACT-G functional well-being (z = 3.22; P = .001) and emotional well-being (z = 1.97; P = .048) domains at 12 months. For functional well-being, these results were due to a significant mean change in the intervention group’s scores (0.52; 95% confidence interval [CI], 0.29-0.74) but not in that of the usual care group (0.09; 95% CI, −0.14 to 0.33) over 12 months. For emotional well-being, these results were due to a significant mean change in the intervention group’s scores (0.33; 95% CI, 0.14-0.52) but not in that of usual care group (0.11; 95% CI, −0.09 to 0.31) over 12 months. For FACT-G social and physical well-being, there were no significant group × time interactions or time or group effects.

For emergency department visits and medical outpatient visits there were no significant group × time interactions (z = −0.25; P = .80 and z = −1.29; P = .20, respectively), so models were re-fit for main effects; there were still no group effects (z = −1.09; P = .28 and z = −0.18; P = .86, respectively) or time effects (z = −1.32; P = .19 and z = −1.19; P = .23, respectively). For hospitalizations, there was no group × time interaction (z = −0.70; P = .48); with re-fit models there was no time effect (z = 0.57; P = .57), but there was a trend-level group effect (z = −1.82; P = .07) (Table 3).

Program Costs

Mean costs per patient of providing the PEARLS intervention were $422 for PST sessions, $28 for follow-up telephone calls, $12 for psychiatric telephone calls, $87 for psychotherapy quality assurance, and $81 for depression management team sessions. Total mean cost per patient was $630.

COMMENT

The PEARLS intervention resulted in significantly lower severity and greater remission of depression compared with usual care at 6 and 12 months. Six-month outcomes are comparable with those of a multisite trial of elderly primary care patients with major depression or dysthymia that included PST, in significance group difference at baseline and 6 months (t = −2.20; P = .03) (Table 2).
which more than 63% of intervention patients took antidepressants by 6 months\textsuperscript{23} compared with less than 40% in PEARLS. A nonsignificant increase in depression in the intervention group by 12 months may have resulted from a significant decrease in therapist-guided problem solving and physical and social activation in these relatively disabled and socially isolated individuals, though the influence of decreased non-specific supportive contact with therapists in the follow-up period cannot be ruled out as contributing. Future studies may benefit from extra PST sessions, focusing on activation, in patients relapsing or not remitting during follow-up. On the other hand, a previous study of younger primary care patients with major depression has shown 6 sessions of PST over 11 weeks to be effective\textsuperscript{24}, it is possible that patients responding more quickly to the PEARLS intervention (in the active phase) may be able to switch to monthly telephone check-ins earlier in treatment.

Relatively few patients initiated antidepressants and no net increase in antidepressant use occurred between groups. Adequacy of dosing may have been better and duration of use longer in intervention patients, but we report only categorical use of antidepressants over 6-month periods. Ensuring timely antidepressant refills and providing greater patient and physician education about dealing with adverse effects and stigma related to antidepressants may further enhance adequacy in this effectiveness intervention.

Despite the significant effect of the PEARLS intervention, only a third of patients in the intervention group and 12% in the usual care group experienced remission. This is similar to other late-life depression studies using antidepressants and psychotherapy\textsuperscript{25} and may result from a reduced capacity of such patients to respond fully to depression treatment. Psychosocial conditions that increase the risk for depression (eg, low income, disability, social isolation) are not likely to have changed substantially during the intervention.

Our program resulted in significant improvements in functional well-being (eg, acceptance of illness, enjoyment of recreational activities) and emotional well-being (eg, increased satisfaction in coping with chronic conditions) at 12 months. Despite our focus on physical and social activation, quality of life in physical and social well-being domains did not differ significantly between groups, possibly because of significant physical disability and social isolation in this population.

Recent studies suggest that depression is associated with higher health care costs and utilization among the elderly. Unutzer et al\textsuperscript{26} have shown that depression is associated with higher ambulatory medical costs in older adults over 4 years. A recent study of 9000 elderly patients screened for a depression trial by Katon et al\textsuperscript{27} demonstrated 47% to 51% higher total ambulatory and inpatient medical costs in depressed compared with nondepressed patients after adjustment for chronic medical illness. We found trend-level group differences, with the intervention group less likely than the usual care group to report having any medical hospitalizations during the study period. Depressed patients report more physical symptoms,\textsuperscript{22} and untreated depression may result in poorer medical outcomes in patients with cardiovascular disease,\textsuperscript{26,27} diabetes,\textsuperscript{28,29} and other chronic illnesses. Such factors may have contributed to a greater likelihood of hospitalizations in patients in whom depression was less effectively treated, and this should be explored further in studies with larger sample sizes.

While our therapists worked for the participating community agencies, the intervention, including team meetings, was provided as a parallel health service to usual case management. We believe PEARLS can be disseminated within community agencies already providing care for isolated, low-income older adults by adding depression management to established case management. Most social service agencies have psychiatric and mental health consultants who, with minimal training, could provide appropriate oversight and quality assurance of case managers also trained to provide the PEARLS intervention, and deliver targeted brief telephone communication with physicians and, possibly, with patients with more severe or complex depression (eg, significant medical or psychiatric comorbidity or suicidal ideation).

There were several limitations to this study. The sample size was moderate and limited to 1 urban geographical area. Similar multisite studies in larger, more representative samples would improve generalizability. Also, in this study we did not have access to automated health care records, relying instead on self-reported medical comor-

### Table 3. Health Care Utilization in Usual Care vs Intervention Groups

<table>
<thead>
<tr>
<th>Health Care Utilization</th>
<th>Usual Care, No. (%)</th>
<th>Intervention, No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥5 Outpatient visits in prior 6 mo</td>
<td>30 (46)</td>
<td>40 (56)</td>
</tr>
<tr>
<td>Baseline</td>
<td>22 (36)</td>
<td>17 (25)</td>
</tr>
<tr>
<td>6-mo Follow-up</td>
<td>28 (47)</td>
<td>29 (43)</td>
</tr>
<tr>
<td>Any emergency department visits in prior 6 mo</td>
<td>25 (38)</td>
<td>29 (40)</td>
</tr>
<tr>
<td>Baseline</td>
<td>19 (32)</td>
<td>22 (33)</td>
</tr>
<tr>
<td>6-mo Follow-up</td>
<td>21 (34)</td>
<td>15 (22)</td>
</tr>
<tr>
<td>Any hospitalizations in prior 6 mo†</td>
<td>19 (29)</td>
<td>20 (28)</td>
</tr>
<tr>
<td>Baseline</td>
<td>21 (35)</td>
<td>18 (27)</td>
</tr>
</tbody>
</table>

*Percentages are based on available data.
†Based on mixed-effects ordinal regression analyses, group effect, \( z = -1.82; P = .07 \); time effect, \( z = 0.57; P = .57 \); and group \( \times \) time interaction, \( z = -0.70; P = .48 \).
bidity and health care utilization, which is susceptible to social desirability and recall biases. However, use of retrospective reports of health care utilization has been found to yield valid results,60-66 and recall bias may have been reduced by our assessment of categori- cal use of any services vs none in the domains of emergency department and hospital utilization. Future studies us- ing Medicare utilization data or auto- mated pharmacy data will improve as- sessment of health care utilization and adequacy of medications and allow for cost-effectiveness analyses of the PEARLS intervention. Future studies will also be invaluable in determining the relative contribution of the inter- vention’s components—PST, behav- ioral/social activation, pleasant activ- ity scheduling, antidepressant use, and supportive contact with ther- apists—in successfully decreasing de- pression severity. Finally, despite ran- dom assignment, we had unequal baseline proportions of dysthymia and minor depression, with intervention participants having a greater propor- tion of dysthymia at baseline com- pared with usual care participants. We controlled for this difference in base- line dysthymia prevalence in all sub- sequent analyses.

This is one of the first studies to show that by partnering with community agencies, it is possible to target and effec- tively treat depressed, frail, elderly adults using primarily nonpharmacolo- gical treatments such as psycho- therapy. Dissemination of PEARLS within existing community social ser- vice programs has the potential to sig- nificantly improve the well-being and function of depressed older adults served by these programs.

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REFERENCES


Author Contributions: Dr Ciechanowski had full ac- cess to all of the data in the study and takes respon- sibility for the integrity of the data and the accuracy of the data analysis.

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Analysis and interpretation of data: Ciechanowski, Wagner, Schmaling, Schwartz, Williams, Kulzer.

Drafting of the manuscript: Ciechanowski, Schmaling, Schwartz, Williams, Kulzer.
For me, words are a form of action, capable of influencing change.

— Ingrid Bengis (1944- )