Treatment of Depression Improves Physical Functioning in Older Adults

Christopher M. Callahan, MD,[*†] Kurt Kroenke, MD,[†] Steven R. Counsell, MD,[*] Hugh C. Hendrie, MB, ChB,*[†‡] Anthony J. Perkins, MS,*[†] Wayne Katon, MD,[§‖] Polly Hitchcock Noel, PhD,[¶#] Linda Harpole, MD, MPH,[**] Enid M. Hunkeler, MA,[††] and Jürgen Unützer, MD,[§‡‡] for the IMPACT Investigators*

(See editorial comments by Dan Blazer and Celia Hybels on pp 543–544)

OBJECTIVES: To determine the effect of collaborative care management for depression on physical functioning in older adults.

DESIGN: Multisite randomized clinical trial.

SETTING: Eighteen primary care clinics from eight healthcare organizations.

PARTICIPANTS: One thousand eight hundred one patients aged 60 and older with major depressive disorder.

INTERVENTION: Patients were randomized to the Improving Mood: Promoting Access to Collaborative Treatment (IMPACT) intervention (n = 906) or to a control group receiving usual care (n = 895). Control patients had access to all health services available as part of usual care. Intervention patients had access for 12 months to a depression clinical specialist who coordinated depression care with their primary care physician.

MEASUREMENTS: The 12-item short form Physical Component Summary (PCS) score (range 0–100) and instrumental activities of daily living (IADLs) (range 0–7).

RESULTS: The mean patient age was 71.2, 65% were women, and 77% were white. At baseline, the mean PCS was 40.2, and the mean number of IADL dependencies was 0.7; 45% of participants rated their health as fair or poor. Intervention patients experienced significantly better physical functioning at 1 year than usual-care patients as measured using between-group differences on the PCS of 1.71 (95% confidence interval (CI) = 0.96–2.46) and IADLs of −0.15 (95% CI = −0.29 to −0.01). Intervention patients were also less likely to rate their health as fair or poor (37.3% vs 52.4%, $P < .001$). Combining both study groups, patients whose depression improved were more likely to experience improvement in physical functioning.

CONCLUSION: The IMPACT collaborative care model for late-life depression improves physical function more than usual care. **J Am Geriatr Soc 53:367–373, 2005.**

Key words: depression; physical function; physical disability; collaborative care management

Depression is one of the leading causes of disability worldwide.[1] The disability associated with depression is believed to emanate from decrements in emotional and cognitive function as well as decline in physical function.[2] Depression is associated with detrimental effects on role function and physical function even when controlling for comorbid medical conditions.[3–7] Older adults with depression report greater functional impairment than those without depression, and this impairment persists over time.[8] For community-dwelling older adults, the likelihood of becoming disabled increases and the likelihood of recovering from disability decreases with each additional symptom of depression.[9]

Older adults often suffer from multiple comorbid medical conditions or age-related declines in functional reserve. This places them at particular risk for loss of independence. Thus, it is important to identify and treat aggressively reversible causes of disability in older adults. In a meta-analysis of 78 studies exploring risk factors for functional

From the [*]Indiana University Center for Aging Research, Indianapolis, Indiana; [†]Regenstrief Institute, Inc. Indianapolis, Indiana; [‡]Department of Psychiatry, Indiana University School of Medicine, Indianapolis, Indiana; [§]University of Washington School of Medicine, Seattle, Washington; [‖]Group Health Cooperative of Puget Sound, Seattle, Washington; [¶]South Texas Veterans Health Care System, San Antonio, Texas; [#]University of Texas Health Science Center at San Antonio, San Antonio, Texas; [**]Duke University School of Medicine, Durham, North Carolina; [††]Division of Research, Kaiser Permanente, Oakland, California; and [‡‡]University of California at Los Angeles, Los Angeles, California.

This study was supported by grants from the John A. Hartford Foundation, the California Healthcare Foundation, the Hogg Foundation, and the Robert Wood Johnson Foundation.

Address correspondence to Christopher M. Callahan, MD, Indiana University Center for Aging Research, Regenstrief Institute, Inc. 1050 Wishard Blvd, RG6, Indianapolis, IN 46202. E-mail: ccallaha@iupui.edu

0002-8614/05/$15.00

decline in community-dwelling older adults, depression was identified as one of the risk factors with the highest strength of evidence.[10] The effects of depression-specific treatment on the loss of physical function associated with depression remains unclear. Prior clinical trials of quality improvement for depression treatment in primary care have reported improvement in role and emotional functioning but not physical functioning.[11–14]

Until the late 1990s, most clinical trials of depression treatment in primary care focused on depression-specific outcomes.[15] This narrow focus did not allow researchers to test whether treatments that reduced depressive symptoms could improve function. Improving Mood: Promoting Access to Collaborative Treatment (IMPACT), the largest clinical trial of late-life depression reported to date, enrolled 1,801 subjects from diverse medical practices and geographic settings. Intervention patients were significantly more likely than usual-care patients to receive guideline-concordant depression care and to recover from depression.[16] By design, Project IMPACT included measures of physical function and related constructs to determine whether successful depression treatment translated into important improvements in physical function. This article examines the effects of collaborative care management on physical function in depressed older adults. It was hypothesized that older adults who received an effective depression treatment would experience improvement in physical functioning.

METHODS

The institutional review boards at each study site and at the study coordinating center site approved the study. All participants gave written informed consent. Detailed descriptions of the study design, methods, and intervention have been published elsewhere.[16,17]

Briefly, the seven study sites represented eight diverse healthcare organizations with a total of 18 primary care clinics in five states. A two-pronged strategy was used to recruit study participants at each site from July 1999 to August 2001.[16] The first strategy relied on referrals of depressed older adults from primary care practitioners. The second method employed systematic depression screening of older adult primary care patients using a two-item depression screener. Inclusion criteria were age 60 and older, intention to use one of the participating clinics as the main source of general medical care in the coming year, and a diagnosis of current major depression or dysthymic disorder according to the Structured Clinical Interview for the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (SCID).[18] The two methods identified 2,102 eligible older adults with major depression or dysthymic disorder from the participating clinics; 1,801 (86% of those eligible) were enrolled in the study. All completed a structured baseline interview.

After the baseline interview, participants were randomly assigned to an intervention or to a control group receiving usual care. Control patients had access to all primary care and specialty mental health services available as part of usual care. Intervention participants received a 20-minute educational videotape and a booklet about late-life depression. Care managers were nurses or psychologists who received special training for the study as depression clinical specialists (DCSs). During the initial visit, the DCS took a clinical and psychosocial history; reviewed the educational materials; and discussed patient preferences for depression treatments, including antidepressant medications and problem-solving treatment in primary care, a brief, structured form of psychotherapy for depression.[19] The progress of intervention patients was discussed with a supervising team psychiatrist and a liaison primary care physician during weekly team meetings. The DCS then worked with the patient and his or her regular primary care provider to establish a treatment plan according to a recommended treatment algorithm and patient preference.

DCSs attempted to follow patients for up to 12 months, monitoring treatment response with the Patient Health Questionnaire (PHQ-9)[20] and a Web-based clinical information system. During the acute treatment phase, in-person or telephone follow-up contacts at least every other week were suggested. Patients who achieved recovery from depression ($\geq$50% reduction in the PHQ-9 score and fewer than 3/9 symptoms of major depression) were engaged in developing a relapse prevention plan and then followed up monthly by the DCS. The clinical team developed a "Step 2" treatment plan using the study algorithm for patients who did not respond to initial treatment. Team psychiatrists were encouraged to see patients who presented with significant psychiatric comorbidity or who had persistent depression. The team again reviewed patients who did not respond after 10 weeks of Step 2 treatment, and additional treatments were considered.

Description of Main Outcome Measures

Changes in severity of depressive symptoms over time were measured using the 20-item Symptom Checklist (SCL-20) from the SCL-90.[21] Possible scores on the SCL-20 range from 0 to 4. Positive treatment response was defined as a more than 50% reduction in SCL-20 scores from baseline to 12-month follow-up.[22] Patient outcomes measured using the SCL-20 and the Sheehan disability scale have been previously reported.[16] This report focuses on two measures of physical function. The first measure is the instrumental activities of daily living (IADLs), which was originally developed to assess the functional abilities needed for independent living and as a more sensitive measure of function than the traditional activities of daily living (ADLs). There are multiple versions of the IADL scales.[23] In the present study, subjects were asked whether they received help from family members or friends in any of seven areas: preparing hot meals, shopping for groceries, making telephone calls, taking medications, cleaning house, managing their money, or any other important activities. The range of scores on the IADLs is 0 to 7. Second, the 12-item Short Form (SF-12) was included, along with its two component summary scores. The SF-12 was derived from the 36-item Short Form Health Survey (SF-36) using regression methods.[24] Summary scores are calculated for two scales: a Physical Component Summary (PCS) score and a Mental Component Summary (MCS) score. Information from all 12 items is used in calculating these two summary scales, but the items are weighted differently in the calculation of the two separate scales. The scales are not intended to be summed. The developers concluded that the SF-12

summary scores were highly correlated with analogous scores on the physical and mental functioning subscales from the SF-36.[24,25] The PCS measures physical functioning, role physical, bodily pain, and general health perception. The MCS measures vitality, social functioning, role emotional, and mental health. The range of scores on the SF-12 scales is 0 to 100, with higher scores indicating better functioning.

Because many of the older adults enrolled in this study suffered from multiple chronic conditions, summary measures were chosen to describe both the burden of illness and self-rated health. The Chronic Disease Score (CDS) is a comorbidity measure based on dispensed medications.[26,27] The CDS score increases with the number of different chronic diseases as inferred from the subject's medication profile. Medications used in the management of acute diseases (antibiotics) or common symptoms (nasal congestion) are not included in the scoring. Individual medications are mapped to medication classes, which are then mapped to different chronic diseases, and the chronic diseases are weighted according to severity. The CDS has been demonstrated to predict health services utilization.[27] The single item self-rated health measure was used to assess health perceptions.

Data Analysis

Bivariate analyses were conducted to compare demographic and clinical characteristics of intervention and usual-care subjects at baseline (Table 1). The primary hypothesis was that older adults in the intervention group would experience better physical function outcomes than usual-care subjects. This hypothesis was tested by comparing changes in the PCS and IADLs over time between the intervention and usual-care groups. For both measures, an intention-to-treat analysis of repeated measures was conducted. Mixed-effects regression models were employed using baseline and 3-, 6-, and 12-month follow-up data. In the mixed-effects models, time was treated as a categorical variable, and the fixed effects of time and intervention condition and their interactions were examined. The covariance structure was specified within subjects using an unstructured model to account for the within-subject correlation over time. The models were repeated controlling for each subjects' CDS but this did not change the results.

The design of the clinical trial allowed whether the IMPACT intervention resulted in significantly better physical functioning outcomes than usual care as described in the analysis plan above to be specifically tested. However, not all of the intervention patients experienced recovery of depression, and a substantial number of usual-care patients received depression-specific treatment and recovered from their depression. The control group in this study received care as usual, not a placebo. For this reason, a secondary analysis of these clinical trial data was conducted to estimate the magnitude of improvement in physical functioning associated with effective treatment of depression. Effective treatment was defined as a more than 50% reduction in SCL-20 score from baseline to 12-month follow-up. Regardless of randomization status, these responders were compared with nonresponders to determine concomitant change in physical functioning.

Table 1. Baseline Patient Characteristics

Characteristic	Intervention n = 906	Usual Care n = 895	*P*-value
Age, mean ± SD	71.0 ± 7.4	71.4 ± 7.6	.33
Female, %	64.1	65.6	.52
Race, %			
White	78.3	76.0	.16
African American	12.6	12.1	
Hispanic	6.2	9.1	
Other	3.0	2.9	
Married, %	44.3	48.5	.09
High school education, %	80.5	81.1	.75
Cognitive impairment, %*	34.6	36.3	.54
Chronic disease score, mean ± SD	5.4 ± 3.5	5.5 ± 3.8	.80
Study diagnosis, %			
Major depression only	17.8	16.2	.35
Dysthymia only	28.6	31.8	
Both	53.6	52.0	
Symptom Checklist – 20 score, mean ± SD	1.7 ± 0.6	1.7 ± 0.6	.75
Sheehan disability, mean ± SD	4.7 ± 2.6	4.6 ± 2.6	.43
Instrumental activities of daily living impairments, mean ± SD	0.7 ± 1.4	0.6 ± 1.3	.24
SF-12 physical, mean ± SD	40.4 ± 7.4	40.1 ± 7.4	.35
SF-12 mental, mean ± SD	42.4 ± 7.2	42.2 ± 7.5	.50
Self-rated health	3.3 ± 1.1	3.3 ± 1.1	.30
Self-rated health fair or poor, %	47.1	43.1	.09

*Two or more errors on the six-item screen.[37]
SD = standard deviation; SF-12 = 12-item Short Form.

An alternative hypothesis that measures of functional status (e.g., PCS) may contain items that focus on emotional health and are therefore highly responsive to depression treatment was then also considered. Improvements in these emotional items, rather than physical items within these functional status scales, might explain improvement in measures of physical function. In calculating the PCS or MCS from the SF-12 items, all 12 items are included, but the items are weighted differently. Regression models initially conducted using the summary scales were repeated using each of the unweighted single items. In these analyses, the goal was to determine whether only those items related to emotional health (accomplished less because of emotional problems, did not do work as carefully because of emotional problems, felt calm and peaceful, felt downhearted and blue) or items that measure both emotional and physical health (self-rated health, pain, have a lot of energy, and physical health or emotional problems interfere with social activities) explain the improvements on the PCS rather than items tapping physical function. Mixed-effect logistic regression models were used for the individual binary IADL variables. For all outcomes, multiple imputation of item level and wave-level missing data were used to impute missing values.[16]

RESULTS

Table 1 shows the baseline characteristics of the sample. The mean age was 71, and 34.9% of the sample was aged 75 and older. The combination of major depressive disorder with chronic medical conditions is reflected in the self-reports of disability. Forty-five percent of the patients rated their health as fair or poor. The mean number of IADL impairments ± standard deviation was 0.7 ± 1.4, and 30% of subjects reported at least one impairment in IADLs at baseline. Overall, 19.3% of the usual-care group experienced a substantial improvement in depression (at least 50% reduction in depressive symptoms from baseline), compared with 44.6% of the intervention group.

Table 2 compares the outcomes in physical function of the intervention and usual-care groups at baseline and at the 3-, 6-, and 12-month follow-up assessments. Consistent with the findings for depression symptoms, physical functioning in those in the intervention group was significantly better than in those receiving usual care. For self-rated health at 12 months, fewer subjects in the intervention group rated their health as fair or poor (37.3%) than in the usual-care group, where this percentage rose over time (52.4%).

A secondary analysis of the clinical trial data was conducted to estimate the magnitude of improvement in physical functioning associated with improvement in depression (≥50% reduction in symptoms). In this secondary analysis, shown in Table 3, the groups are defined by improvement in depressive symptoms and not by randomization status. Patients experiencing significant reduction in depressive symptoms were much more likely to report improvement on the SF-12 physical components and more likely to report no IADL impairments (87.3% vs 75.4%, $P < .001$) at 12 months.

The analyses shown in Table 2 were repeated except that each item was analyzed as a single outcome measure rather than as part of a summary scale (data not shown). These analyses were conducted to determine whether a few key items or only those reflecting emotional functioning caused the improvement in functional status. For the SF-12 items, each item showed significant improvement over time in the intervention group but not in the usual-care group. For IADLs, improvement in managing medications and money appears to largely explain the improvement seen at 12 months.

DISCUSSION

Sources of reversible functional decline merit aggressive diagnosis and treatment in older adults. These offer the promise of improving independence and quality of life. This is important for families and communities that must provide assistance to disabled older people as well as for individual patients. Older adults provided with collaborative care management for late-life depression experienced better physical functioning over 1 year than those who received usual care. The magnitude of this improvement corresponds to the magnitude of reduction in depressive symptoms. The findings of this study are important not only because they demonstrate the effectiveness of a model for treating late-life depression, but also because they demonstrate that some of the functional decline found in patients with late-life depression and multiple chronic medical disorders is reversible. The intervention group showed significant improvement on the SF-12 and avoided decline over time in IADLs, whereas the usual-care group did not.

In the conceptual framework employed for the analyses, depression was viewed as a disease that not only caused depressive symptoms but also precipitated functional decline, which then could increase depressive symptoms. Multiple previous studies have suggested such a vicious cycle in the interrelationship between depression and disability.[28,29] This study demonstrated that this cycle can be interrupted through the effective treatment of depression. Most of these older adults also suffered from multiple comorbid chronic medical conditions. Given that the two treatment groups varied only by the collaborative care management for depression, improving depression outcomes may represent an important source of reversible disability in older adults.

Self-reported measures of functional status may contain items that tap emotional health and are therefore

Table 2. Predicted Differences Between Usual Care and Intervention at Each Time Point Using Summary Measures of Functional Status

Measure of Functional Status	Usual Care (Mean ± Standard Deviation)	Intervention (Mean ± Standard Deviation)	Between-Group Difference (95% Confidence Interval)	*P*-value
SF-12				
Baseline (n = 1,801)	40.11 ± 7.40	40.43 ± 7.44	0.33 (− 0.36–1.02)	.35
3-month follow-up (n = 1,787)*	39.49 ± 7.33	40.57 ± 7.53	1.08 (0.36–1.80)	.003
6-month follow-up (n = 1,769)*	39.27 ± 7.90	40.85 ± 7.99	1.57 (0.78–2.34)	<.001
12-month follow-up (n = 1,732)*	39.17 ± 7.23	40.91 ± 7.33	1.71 (0.96–2.46)	<.001
Instrumental activities of daily living†				
Baseline	0.61 ± 1.31	0.68 ± 1.37	0.08 (− 0.05–0.21)	.24
3-month follow-up	0.82 ± 1.36	0.84 ± 1.36	0.03 (− 0.11–0.16)	.70
6-month follow-up	0.84 ± 1.47	0.78 ± 1.39	− 0.06 (− 0.22–0.10)	.43
12-month follow-up	0.89 ± 1.50	0.73 ± 1.28	− 0.15 (− 0.29 to − 0.01)	.04

* Number of surviving patients.
† Sample sizes at each wave same as those listed for 12-item Short Form Physical (SF-12).

Table 3. Predicted Differences Between Patients with No Improvement in Depressive Symptoms at 1 Year and Those with Improvement at Each Time Point Using Summary Measures of Functional Status*

Measure of Functional Status	No Improvement n = 1,186	Depression Improvement n = 546	Between-Group Difference (95% Confidence Interval)	*P*-value
	Mean			
12-item Short Form Physical				
Baseline	39.89	41.62	1.73 (0.83–2.63)	<.001
3-month follow-up	39.14	42.25	3.11 (2.22–4.00)	<.001
6-month follow-up	38.92	42.72	3.80 (2.94–4.66)	<.001
12-month follow-up	38.49	43.37	4.88 (4.06–5.70)	<.001
Instrumental activities of daily living				
Baseline	0.62	0.58	−0.05 (−0.22 − 0.12)	.58
3-month follow-up	0.87	0.63	−0.24 (−0.40 to −0.09)	.003
6-month follow-up	0.86	0.64	−0.22 (−0.37 to −0.08)	.002
12-month follow-up	0.95	0.52	−0.43 (−0.59 to −0.28)	<.001

* Of 1,732 subjects surviving to 12-month follow-up.

highly responsive to depression treatment. Improvements in these emotional items, rather than physical items within these functional status scales, could explain improvement in global measures of function. The data do not support this alternative hypothesis. It is possible that improvement in depression provides patients with the perception that their function has improved when it has not. These data cannot directly refute this alternative hypothesis because performance-based data on physical function were not collected. As has been suggested though, factors such as motivation or social roles can also influence performance-based measures.[29] For example, depression has been found to be associated with distance walked in the 6-minute walk test for patients with congestive heart failure even when controlling for measures of cardiorespiratory function.[30] Whether the self-reported dysfunction is real or imagined, it still impairs the patient's functional capacity. Indeed, although the goal of this article has been to examine physical function, the authors do not hold up physical function as the most important health outcome. Patients report that they value mental and social health nearly as much as they value physical health.[31]

A recent review of the literature found an association between late-life depression and physical disability.[2] This review was limited only to studies that used ADLs as the primary measure of physical disability. Five intervention studies were identified, and all were limited in their design in that subjects were followed for only 6 to 12 weeks. These studies fairly consistently demonstrated short-term improvements in disability, particularly those that enrolled patients with specific chronic conditions such as chronic obstructive pulmonary disease or tinnitus. In studies assessing outcomes over 1 year, findings of improved physical function have been elusive.[13] Several depression intervention studies have demonstrated improvement in emotional or role functioning[11–14,32,33] but preservation or improvement of physical function over 1 year in older adults has not been previously reported. The finding of preservation of IADL function, rather than reversal of impairments, is consistent with other comprehensive geriatric interventions designed to prevent functional decline in older adults.[34–36] One reason for the mixed results for improvement in ADLs in the literature may be the low base rate of impairment in the studied cohorts. The current study, which enrolled only older adults, may have enrolled a cohort that was sufficiently impaired at baseline to allow for a measurable improvement.

This study has several limitations. First, about half of the patients in the intervention group remained depressed at 12 months. Clearly, there is much room for improvement in treatment options for late-life depression in primary care. Notably, many of the study participants had been in treatment for many years before enrollment. Thus, the patients in this study may have been more chronically impaired than those in other studies. Second, the intervention was specifically designed and tested as a multicomponent package that operated as a synergistic whole rather than component parts that could be disassembled or identified as more or less important. Third, the magnitude of the difference in physical function between the study groups, although statistically significant, was modest. Nevertheless, although the group differences were small, these differences represent the difference between impairment in one or two IADLs at the level of individual patients, which can make the difference between independence and dependence. Indeed, the IADLs that showed the greatest differences between controls and intervention were managing money and managing medications. Also, if these small effect sizes could be achieved at a population level for such a prevalent condition, this would be an important public health success story in terms of improving a reversible source of functional decline. Finally, although effect sizes for the clinical trial results are smaller, many patients in the usual-care group were receiving treatment for depression and experienced improvement in their depression symptoms. Thus, in assessing the potential magnitude of improvement in physical function attributable to improvement in depression, the between-group differences in those with and without improvement in depressive symptoms were (Table 3) substantially more impressive.

Collaborative care management for late-life depression reduces depression, and this reduction is associated with improvement in, or preservation of, physical functioning.

These improvements are found in older adults with multiple comorbid medical conditions and a high level of disability at baseline. Patients with late-life depression often experience a downward spiral of worsening depression and function. Effective treatment of late-life depression by a collaborative stepped-care program in primary care may interrupt this downward spiral.

ACKNOWLEDGMENTS

The IMPACT Investigators include (in alphabetical order): Patricia Arean, PhD (Co-PI); Thomas R. Belin, PhD; Noreen Bumby, DO; Christopher Callahan, MD (PI); Paul Ciechanowski, MD, MPH; Ian Cook, MD; Jeffrey Cordes, MD; Steven R. Counsell, MD; Richard Della Penna, MD (Co-PI); Jeanne Dickens, MD; Michael Getzell, MD; Howard Goldman, MD, PhD; Lydia Grypma, MD (Co-PI); Linda Harpole, MD, MPH (PI); Mark Hegel, PhD; Hugh Hendrie, MB, ChB, DSc (Co-PI); Polly Hitchcock Noel, PhD (Co-PI); Marc Hoffing, MD, MPH (PI); Enid M. Hunkeler, MA (PI); Wayne Katon, MD (PI); Kurt Kroenke MD; Stuart Levine, MD, MHA (Co-PI); Elizabeth H. B. Lin, MD, MPH (Co-PI); Tonya Marmon, MS; Eugene Oddone, MD, MHSc (Co-PI); Sabine Oishi, MSPH; R. Jerome Rauch, MD; Michael Sands, MD; Michael Schoenbaum, PhD; Rik Smith, MD; David C. Steffens, MD, MHS; Christopher A. Steinmetz, MD; Lingqi Tang, PhD; Iva Timmerman, MD; Jürgen Unützer, MD, MPH (PI); John W. Williams, Jr., MD, MHS (PI); Jason Worchel, MD; Mark Zweifach, MD.

We would like to acknowledge the contributions and support of patients, primary care providers, and staff at the study coordinating center and at all participating study sites, which include Duke University, Durham, NC; The South Texas Veterans Health Care System, San Antonio, TX; The Central Texas Veterans Health Care System, Austin, TX; The San Antonio Preventive and Diagnostic Medicine Clinic, San Antonio, TX; Indiana University School of Medicine, Indianapolis, IN; Health and Hospital Corporation of Marion County, Indianapolis, IN; Group Health Cooperative of Puget Sound in cooperation with the University of Washington, Seattle, WA; Kaiser Permanente of Northern California, Oakland and Hayward, CA; Kaiser Permanente of Southern California, San Diego, CA; Desert Medical Group, Palm Springs, CA. This study is the result of work supported in part with patients, resources, and the use of facilities at the South Texas Veterans Health Care System and the Central Texas Veterans Health Care System. The views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs.

We would also like to acknowledge the contributions the IMPACT study advisory board (Lisa Goodale, ACSW, Richard C. Birkel, PhD, Howard Goldman, MD, PhD, Thomas Oxman, MD, Lisa Rubenstein, MD, MSPH, Cathy Sherbourne, PhD, Kenneth Wells, MD, MPH) and programming support by Tonya Marmon, MS.

REFERENCES

1. Murray CJ, Lopez AD. The Global Burden of Disease. A Comprehensive Assessment of Mortality and Disability from Diseases. Injuries and Risk Factors in 1990 and Projected to 2020. Harvard School of Public Health on Behalf of The World Health Organization and the World Bank: Cambridge, MA: 1996.
2. Lenze EJ, Rogers JC, Martire LM et al. The association of late-life depression and anxiety with physical disability: A review of the literature and prospectus for future research. Am J Geriatr Psychiatry 2001;9:113–135.
3. Farmer ME, Locke BZ, Moscicki EK et al. Physical activity and depressive symptoms: The NHANES I Epidemiologic Follow-up Study. Am J Epidemiol 1988;128:1340–1351.
4. Wells KB, Stewart A, Hays RD et al. The functioning and well-being of depressed patients: Results from the Medical Outcomes Study. JAMA 1989;262:914–919.
5. Broadhead WE, Blazer DG, George LK et al. Depression, disability days, and days lost from work in a prospective epidemiologic survey. JAMA 1990;264:2524–2528.
6. Spitzer RL, Kroenke K, Linzer M et al. Health-related quality of life in primary care patients with mental disorders. Results from the PRIME-MD 1000 Study. JAMA 1995;274:1511–1517.
7. Kessler RC, Berglund P, Demler O et al. The epidemiology of major depressive disorder: Results from the National Comorbidity Survey Replication. JAMA 2003;289:3095–3105.
8. Callahan CM, Wolinsky FD, Stump TE et al. Mortality, symptoms, and functional impairment in late-life depression. J Gen Intern Med 1998;13:746–752.
9. Cronin-Stubbs D, de Leon CF, Mendes CF et al. Six-year effect of depressive symptoms on the course of physical disability in community-living older adults. Arch Intern Med 2000;160:3074–3080.
10. Stuck AE, Walthert JM, Nikolaus T et al. Risk factors for functional status decline in community-living elderly people: Systematic literature review. Soc Sci Med 1999;48:445–469.
11. Miranda J, Chung JY, Green BL et al. Treating depression in predominantly low-income young minority women: A randomized controlled trial. JAMA 2003;290:57–65.
12. Hendrick SC, Chaney EF, Felker B et al. Effectiveness of collaborative care depression treatment in Veterans Affairs primary care. J Gen Intern Med 2003;18:9–16.
13. Williams JW, Barrett J, Oxman T et al. Treatment of dysthymia and minor depression in primary care: A randomized controlled trial in older adults. JAMA 2000;284:1519–1526.
14. Katzelnick DJ, Simon GE, Pearson SD et al. Randomized trial of a depression management program in high utilizers of medical care. Arch Fam Med 2000;9:345–351.
15. Callahan CM, Hendrie HC, Tierney WM. The recognition and treatment of late-life depression: A view from primary care. Int J Psych Med 1996;26: 155–171.
16. Unützer J, Katon W, Callahan CM et al. Collaborative care management improves treatment and outcomes of late-life depression: A multi-site randomized trial with 1,801 depressed older adults. JAMA 2002;288:2836–2845.
17. Unützer J, Katon W, Williams JW et al. Improving primary care for depression in late life: The design of a multi-center randomized trial. Med Care 2001;39:785–799.
18. Williams JB, Gibbon M, First MB et al. The structured clinical interview for DSM III-R (SCID). Multisite test-retest reliability. Arch Gen Psychiatry 1992;49:630–636.
19. Hegel MT, Barrett JE, Oxman TE et al. Problem-Solving Treatment for Primary Care (PST-PC): A Treatment Manual for Depression. Hanover, NH: Dartmouth University, 1999.
20. Kroenke K, West SL, Swindle R et al. Similar effectiveness of paroxetine, fluoxetine, and sertraline in primary care: A randomized trial. JAMA 2001;286:2947–2955.
21. Derogatis LR, Lipman RS, Covi L. SCL-90: An outpatient psychiatric rating scale. Psychopharmacol Bull 1973;9:13–28.
22. Frank E, Prien RF, Jarrett RB et al. Conceptualization and rationale for consensus definitions of terms in major depressive disorder. Remission, recovery, relapse and recurrence. Arch Gen Psychiatry 1991;48:851–855.
23. McDowell I, Newell C. Measuring Health. A Guide to Rating Scales and Questionnaires, 2nd Ed. New York: Oxford University Press, 1996.
24. Ware JE, Kosinki M, Keller SDA. 12-item Short-Form Health Survey. Construction of scales and preliminary tests of reliability and validity. Med Care 1996;34:220–233.
25. Gandek B, Ware JE, Aaronson NK et al. Cross-validation of item selection and scoring for the SF-12 Health Survey in nine countries: Results from the IQOLA Project. J Clin Epidemiol 1998;51:1171–1178.
26. Von Korff M, Wagner EH, Saunders K. A chronic disease score from automated pharmacy data. J Clin Epidemiol 1992;45:197–203.
27. Clark DO, Von Korff M, Saunders K et al. A chronic disease score with empirically derived weights. Med Care 1995;33:783–795.
28. Aneshensel CS, Frerichs RR, Huba GJ. Depression and physical illness: A multiwave, nonrecursive causal model. J Health Soc Behav 1984;25:350–371.

29. Bruce ML. Depression and disability in late life: Directions for future research. Am J Geriatr Psychiatry 2001;9:102–112.
30. Sullivan M, Levy WC, Russo JE et al. Depression and health status in patients with advanced heart failure: A prospective study in tertiary care. J Card Fail 2004;10:390–396.
31. Sherbourne CD, Sturm R, Wells KB. What outcomes matter to patients? J Gen Intern Med 1999;14:357–363.
32. Lin EH, VonKorff M, Russo J et al. Can depression treatment in primary care reduce disability? A stepped care approach. Arch Fam Med 2000;9:1052–1058.
33. Coulehan JL, Schulberg HC, Block MR et al. Treating depressed primary care patients improves their physical, mental, and social functioning. Arch Intern Med 1997;157:1113–1120.
34. Cohen HJ, Feussner JR, Weinberger M et al. A controlled trial of inpatient and outpatient geriatric evaluation and management. N Engl J Med 2002;346: 905–912.
35. Stuck AE, Egger M, Hammer A et al. Home visits to prevent nursing home admissions and functional decline in elderly people: Systematic review and meta-regression analysis. JAMA 2002;287:1022–1028.
36. Gill TM, Baker DI, Gottschalk M et al. A program to prevent functional decline in physically frail, elderly persons who live at home. N Engl J Med 2002;347:1068–1074.
37. Callahan CM, Unverzagt FW, Hui SL et al. A six-item screener to identify cognitive impairment among potential subjects for clinical research. Med Care 2002;40:771–781.