

Long-term Cost Effects of Collaborative Care for Late-life Depression

Jürgen Unützer, MD, MPH; Wayne J. Katon, MD; Ming-Yu Fan, PhD; Michael C. Schoenbaum, PhD; Elizabeth H. B. Lin, MD, MPH; Richard D. Della Penna, MD; and Diane Powers, MA

Major depression and dysthymic disorder (chronic depression) are common in older adults. In addition to causing impairment of functioning and quality of life, depression in late life has been associated with substantial increases in total healthcare costs.^{1,2} The Improving Mood: Promoting Access to Collaborative Treatment (IMPACT) trial³ enrolled 1801 depressed older primary care patients from 8 healthcare systems in a randomized controlled trial of a collaborative care management program for depression compared with care as usual. Participants from each organization were randomly assigned to collaborative care or to care as usual.

Earlier findings from the IMPACT study³ reported that the collaborative care program was substantially more effective than care as usual in reducing depression and in improving physical and social function. Intervention patients continued to have significantly less depression than patients in usual care even at the 24-month follow-up, 12 months after the end of the intervention program.⁴ Analyses from the IMPACT trial⁵ found the collaborative care program to be substantially more cost-effective than care as usual. IMPACT participants experienced 107 more depression-free days during a 24-month period than patients assigned to care as usual. During the initial study year, total healthcare costs (including the costs of the IMPACT intervention) were slightly higher among the intervention group than among control subjects, but a slight decrease in costs among the intervention group compared with usual care patients was observed in the second year, suggesting that an initial investment in better depression care may result in long-term cost savings.⁵

In this article, we report long-term (4-year) effects of collaborative care for late-life depression on total healthcare costs from a payer's perspective. Our findings are based on cost data available from 2 participating group-model health maintenance organizations.

METHODS

Trial

Detailed information about the methodology, clinical results, and 2-year cost-effectiveness outcomes from the IMPACT trial are reported elsewhere.^{3,5-7} The institutional review boards of all participating organizations and the study coordinating center approved all study procedures, and all patients provided written informed

Objective: To determine the long-term effects on total healthcare costs of the Improving Mood: Promoting Access to Collaborative Treatment (IMPACT) program for late-life depression compared with usual care.

Study Design: Randomized controlled trial with enrollment from July 1999 through August 2001. The IMPACT trial, conducted in primary care practices in 8 delivery organizations across the United States, enrolled 1801 depressed primary care patients 60 years or older. Data are from the 2 IMPACT sites for which 4-year cost data were available. Trial enrollment across these 2 health maintenance organizations was 551 patients.

Methods: Participants were randomly assigned to the IMPACT intervention (n = 279) or to usual primary care (n = 272). Intervention patients had access to a depression care manager who provided education, behavioral activation, support of antidepressant medication management prescribed by their regular primary care provider, and problem-solving treatment in primary care for up to 12 months. Care managers were supervised by a psychiatrist and a primary care provider. The main outcome measures were healthcare costs during 4 years.

Results: IMPACT participants had lower mean total healthcare costs (\$29 422; 95% confidence interval, \$26 479-\$32 365) than usual care patients (\$32 785; 95% confidence interval, \$27 648-\$37 921) during 4 years. Results of a bootstrap analysis suggested an 87% probability that the IMPACT program was associated with lower healthcare costs than usual care.

Conclusion: Compared with usual primary care, the IMPACT program is associated with a high probability of lower total healthcare costs during a 4-year period.

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consent. A waiver of written informed consent for the use of an additional 2 years of cost data was obtained from the institutional review boards of the 2 participating healthcare organizations (group-model health maintenance organizations in California and Washington) and the study coordinating center.

Enrollment and Dropout

Participants were identified by systematic depression screening or were referred by primary care physicians. Inclusion criteria included being aged 60 years or older, meeting criteria for current major depression or dysthymia on the Structured Clinical Interview for the *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition),⁸ and planning to continue using 1 of the participating primary care medical offices during the next year. Exclusion criteria included current alcohol abuse, severe cognitive dysfunction, acute risk of suicide, and a history of bipolar disorder or psychosis. Patients were recruited into the study between July 1999 and August 2001. During this time, 2% to 3% of the older population served by the participating medical offices were enrolled in the IMPACT trial.^{3,6} Eligible patients who agreed to participate in the study were randomly assigned to the IMPACT intervention or to usual care.

The number of dropouts because of death or disenrollment by the end of each year in the 2 centers participating in the present study were 17, 13, 57, and 27, for years 1 through 4, respectively, without significant differences in the number of dropouts between intervention and usual care patients. The resulting sample sizes were 534, 521, 464, and 437 in years 1 through 4, respectively. All available cost information was included in the analyses. For example, if a patient died between year 2 and year 3, this patient's year 1 and year 2 costs were included in the analyses.

Intervention

The IMPACT intervention was a 1-year stepped collaborative care program provided by a nurse or a psychologist care manager working in the participant's primary care clinic to support the patient's regular primary care clinician. The depression care manager completed an initial biopsychosocial history and provided education about antidepressant medication and psychotherapy treatment options. Care managers used behavioral activation with all patients; in addition, they offered a choice of treatment with an antidepressant medication or with problem-solving treatment in primary care.⁹⁻¹¹ Problem-solving treatment in primary care is a 6- to 8-session psychotherapy program designed for primary care patients⁹⁻¹¹ that has been found to be as effective as antidepressant

medication for treating major depression.¹⁰ Depression care managers received training on pharmacotherapy and problem-solving treatment in primary care during a 2-day workshop, including didactic training using a treatment manual¹¹ and role plays, and completed at least 5 videotaped training cases of problem-solving treatment in primary care supervised by a psychologist. The depression care manager participated in weekly supervision under a primary care physician with geriatric expertise and under a psychiatrist to monitor the progress of cases and to adjust treatment plans according to a stepped-care treatment algorithm.⁶ This algorithm guided acute and continuation therapy, as well as relapse prevention recommendations, during the 12-month treatment period. The depression care manager followed up patients in person or by telephone approximately every 2 weeks during the acute-phase treatment and approximately monthly during the continuation phase. At the end of the 12-month intervention period, care managers completed a relapse prevention plan with intervention participants, after which all patients continued in care as usual.

Usual Care

Patients randomly assigned to receive usual care were told that they met the criteria for major depression or dysthymia and were encouraged to follow up with their primary care provider for treatment. The primary care provider was also notified of the diagnosis. Patients with this condition were eligible to receive all treatments routinely provided for depression (antidepressant medication, supportive counseling by their physician, and self- or physician-referral to specialty mental healthcare).

Outcome Measures

All cost outcome data used for these analyses were obtained from cost-accounting systems of the 2 participating healthcare organizations. These systems track costs of all healthcare delivered directly by the organizations (including overhead costs) and costs of all paid claims for services delivered outside of the organization. They cover costs for all outpatient and inpatient health services, as well as costs for prescription medications provided by or purchased under contract by the participating health maintenance organizations. Cost data cover the period from 1999, the initial year of enrollment, through 2006 (4 years after the last patient was enrolled in the trial). Data for each participant cover a 4-year period beginning with their enrollment in the trial.

For purposes of our analyses, healthcare costs were summarized into the following categories: IMPACT intervention costs (only relevant for the intervention group in year 1),

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outpatient specialty mental health costs, pharmacy costs (all medications provided by health plan pharmacies), other outpatient costs (outpatient primary care and specialty medical and surgical visits, physical therapy, occupational therapy, urgent care, emergency department care, and other outpatient services), inpatient mental health and substance abuse treatment costs, and inpatient medical costs. Using the same methods as described in the original cost-effectiveness article from the IMPACT trial,⁵ we estimated the costs of providing the IMPACT intervention based on the following factors: detailed study records of all patient contacts (in person and by telephone), mean salary and benefit costs of depression care managers plus 30% overhead costs to account for such costs as space and administrative support (the same approach used in a similar study¹² and to account for the fact that such clinicians cannot be 100% efficient¹³), the cost of supervision and

consultation from team psychiatrists and primary care experts at each site plus 30% overhead costs, and the cost of intervention materials.⁵

Statistical Analysis

For each cost category, we provide the mean cost during the 4-year period for the intervention and usual care groups. The difference in mean costs between these 2 groups and its 95% confidence interval are provided. We also generated 1000 bootstrap samples to estimate the probability that total health-care costs were lower in the intervention group than in the usual care group during the 4-year time frame. The probability was estimated by dividing the number of bootstrap samples in which the intervention group had higher total healthcare costs than the usual care group by 1000. The analyses were performed using SAS 9.1 (SAS Institute Inc, Cary, NC).

■ **Table 1.** Baseline Sociodemographic and Clinical Characteristics*

Characteristic	Overall	Randomized Group		P
		Intervention	Usual Care	
Sociodemographic				
Referred by primary care provider	306 (56)	154 (55)	152 (56)	.93
Female sex	399 (72)	194 (70)	205 (75)	.13
Age, mean (SD), y	72.7 (7.8)	72.7 (7.8)	72.6 (7.9)	.13
Married or living with partner	256 (47)	132 (47)	124 (46)	.73
Racial/ethnic minority	47 (9)	22 (8)	25 (9)	.65
≥High school graduate	489 (89)	247 (89)	242 (89)	.89
Medicare coverage	440 (80)	223 (80)	217 (80)	>.99
Insurance coverage for prescription medications	491 (89)	249 (89)	242 (89)	>.99
Clinical				
Depression status[†]				
Major depression	133 (24)	66 (24)	67 (25)	.55
Dysthymia	164 (30)	89 (32)	75 (28)	
Both	254 (46)	124 (44)	130 (48)	
≥2 Prior episodes of depression	356 (65)	182 (65)	174 (64)	.79
Depression severity score, mean (SD) [‡]	1.7 (0.5)	1.7 (0.5)	1.7 (0.6)	.79
Cognitive impairment	167 (30)	79 (28)	88 (32)	.31
Chronic disease count, mean (SD), from a list of 10	3.1 (1.7)	3.1 (1.8)	3.1 (1.7)	.31
Overall functional impairment, mean (SD), score range of 0-10	4.3 (2.5)	4.2 (2.5)	4.3 (2.6)	.33
Functional impairment from pain	355 (64)	174 (62)	181 (67)	.33

*Data are given as number (percentage) unless otherwise indicated.

[†]Structured Clinical Interview for the *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition).

[‡]Twenty-item Hopkins Symptom-Check List (score range, 0-4).

RESULTS

The IMPACT sample of depressed older adults included 551 patients enrolled in the 2 health plans with available long-term cost data. Study participants in this long-term cost analysis (Table 1) were clinically and sociodemographically diverse but were generally representative of the larger IMPACT sample,³ without significant differences between the intervention and control groups. The mean (SD) age of participants was 72.7 (7.8) years. Most (72%) were women, 9% reported belonging to a racial/ethnic minority group, 47% were married or living with a partner, and 89% were high school graduates. More than 80% had Medicare coverage and prescription drug coverage. All patients met Structured Clinical Interview for the *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition) criteria for major depression or dysthymia, and 46% of the sample met criteria for both. Thirty percent showed some evidence of mild cognitive impairment on a 6-item screen. On average, patients reported a moderate amount of functional impairment on a composite index of the disability score by Sheehan et al,¹⁴ and 64% reported physical pain that caused functional impairment. Participants endorsed a mean of 3.1 chronic medical conditions (from a list of 10).

Intervention patients had 4-year mean total healthcare costs of \$29 422 (95% confidence interval, \$26 479-\$32 365),

and usual care patients had mean total healthcare costs of \$32 785 (95% confidence interval, \$27 648-\$37 921), representing a cost savings among intervention patients of \$3363 (95% confidence interval, \$-928 to \$2557) per patient on average during 4 years (Table 2). Intervention patients had lower healthcare costs than usual care patients in every cost category observed (outpatient and inpatient mental health specialty costs, outpatient and inpatient medical and surgical costs, pharmacy costs, and other outpatient costs). Intervention costs for IMPACT participants during the initial 12 months were \$522 (95% confidence interval, \$495-\$550) per patient and are included in the total cost estimates.

The Figure summarizes total healthcare costs among intervention and control patients during years 1 and 2 and during years 3 and 4 of follow-up, illustrating that the cost savings observed in the IMPACT group occur during the long term (in years 3 and 4) rather than during the short term. Results of a bootstrap analysis suggested an 87% probability that the IMPACT intervention was associated with lower total healthcare costs compared with care as usual.

DISCUSSION

Long-term cost analyses from this trial suggest that the IMPACT program for late-life depression is associated with a high probability of cost savings during a 4-year period. Earlier

■ **Table 2.** 4-Year Healthcare Costs*

Cost Category	Cost, \$			
	Overall Mean	Randomized Group		Difference
		Intervention	Usual Care	
Outpatient				
IMPACT intervention	—	522 (495 to 550)	0 (0 to 0)	522 (495 to 550)
Mental health	661	558 (362 to 753)	767 (561 to 974)	-209 (-494 to 75)
Pharmacy	7284	6942 (6062 to 7822)	7636 (6287 to 8984)	-694 (-2304 to 916)
Other	14 306	14 160 (12 899 to 15 421)	14 456 (12 909 to 16 002)	-296 (-2291 to 1700)
Total†	22 516	22 182 (20 368 to 23 996)	22 859 (20 470 to 25 247)	-677 (-3676 to 2323)
Inpatient				
Medical	8452	7179 (5450 to 8908)	9757 (6455 to 13 059)	-2578 (-6305 to 1149)
Mental health and substance abuse	114	61 (-8 to 129)	169 (-2 to 340)	-108 (-292 to 76)
Total Healthcare During 4 y				
Overall Total	31 082	29 422 (26 479 to 32 365)	32 785 (27 648 to 37 921)	-3363 (-9282 to 2557)

IMPACT indicates Improving Mood: Promoting Access to Collaborative Treatment.

*Data are given as mean (95% confidence interval) unless otherwise indicated.

†Total outpatient costs include IMPACT intervention costs which only apply in the intervention group.

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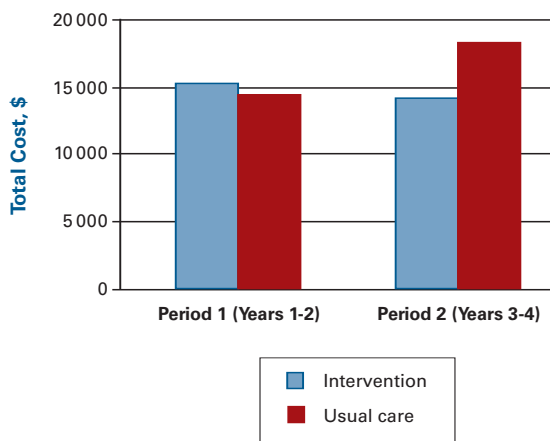
cost-effectiveness analyses from this trial⁵ showed slightly higher costs for intervention patients compared with usual care patients in the initial year (the year that intervention services were provided) and somewhat lower costs in the second year of the study. The present long-term cost analysis (extending the earlier follow-up period by an additional 24 months) suggests that cost savings observed after the conclusion of the 12-month intervention continued in subsequent years, resulting in a high probability of lower total healthcare costs among intervention patients than control patients during 4 years. Lower costs were observed for the intervention group in each cost category examined, a finding that is consistent with results of observational studies^{1,2} suggesting that depression is associated with higher healthcare costs across various cost categories.

The confidence intervals for the estimates of differences in healthcare costs include 0, which means that observed cost differences are not significant at $P < .05$. We used bootstrapping, a procedure of generating random samples by resampling the observation from the study data (in this case 1000 times), to simulate the distribution of the data and to compute parameter estimates (eg, mean costs) based on estimates from the bootstrap samples. Given the wide variation in healthcare costs, bootstrapping is often used to estimate the probability of intervention vs control cost differences in studies with small samples. We recorded the results derived from the 1000 bootstrap samples and divided the number of cost-saving bootstrap samples by 1000 to estimate the probability that a similar study would yield a cost-saving result. An 87% probability suggests that we have substantial but not absolute confidence that a study like ours would find the IMPACT intervention to be cost-saving compared with care as usual.

To our knowledge, our study provides the longest-term follow-up data to date on healthcare costs associated with collaborative care programs for depression. Other studies that have provided long-term follow-up data include the study by Simon and colleagues,¹² which reported lower total healthcare costs among patients with depression and diabetes mellitus receiving collaborative care during a 2-year follow-up period, and a long-term follow-up study by Katon and colleagues¹⁵ among primary care patients with depression, which had similar findings. Our findings of cost savings are consistent with a replication study¹⁶ (using a different sample of depressed patients) completed by 1 of 2 participating health plans after the IMPACT study ended. This study reported a cost savings of approximately \$1117 associated with IMPACT care during a 12-month follow-up period.

Limitations of this study include the fact that our long-term cost data are limited to 2 of the organizations participating in

■ **Figure.** Total Healthcare Costs



the original trial. We report long-term (4 year) cost findings on all study participants from the 2 participating health plans for whom such data were available. The sample is drawn from an insured, largely educated population of white race/ethnicity, and further research should be performed among lower-income, underinsured populations predominantly of minority races/ethnicities to see if our findings are generalizable to such populations. However, the patients at the 2 participating study sites were generally representative of the overall IMPACT sample,³ and intervention effects on clinical outcomes and costs during 2 years of patient follow-up were consistent across each of the 8 participating healthcare organizations, including the 2 examined herein.³⁻⁵ Earlier analyses of the program's effectiveness suggest that participants of minority race/ethnicity benefited as much from the intervention as those of white race/ethnicity,¹⁷ and similar investigations in low-income countries show that collaborative care programs for depression are not only effective but also cost-effective in such settings.¹⁸ Study participants who died or disenrolled from the health plan during the 4-year follow-up period contributed cost data for the periods during which such data were available, but we do not have access to complete cost data for a small number of participants who left the health plan before the end of the 4-year follow-up period. Other limitations include the fact that we do not have long-term clinical follow-up data on depression outcomes with which to conduct cost-effectiveness analyses, but findings from an earlier study⁴ that examined differences between intervention and control patients at 18 and 24 months (12 months after the end of the intervention) suggest that the clinical benefits of the intervention continue well beyond the original 1-year intervention period. Our cost analyses are from a payer's perspective and do not consider other societal costs, including costs of informal healthcare and other services, or other indirect costs.

Take-away Points

Evidence-based collaborative care management programs for depression in primary care have been shown to be more effective and more cost-effective than care as usual.

- This study demonstrates that during a 4-year period older adults with depression and comorbid medical disorders who participated in a collaborative care program had lower total healthcare costs than those in care as usual.
- The findings add to the arguments for widely implementing such programs and for policies that facilitate coverage and reimbursement for such evidence-based care management programs.

More than 35 randomized controlled trials have established that collaborative care for depression is more effective and more cost-effective than usual care.¹⁹ Findings from our study suggest that, for older adults with depression, collaborative care not only produces substantial clinical improvements but also carries a high likelihood of long-term cost savings compared with care as usual.

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Author Affiliations: From the Department of Psychiatry and Behavioral Sciences, University of Washington School of Medicine (JU, WJK, M-YF, DP), and Center for Health Studies, Group Health Cooperative (EHBL), Seattle; National Institute of Mental Health, Bethesda, Md (MCS); and Kaiser Permanente, Oakland, Calif (RDDP).

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Address correspondence to: Jürgen Unützer, MD, MPH, Department of Psychiatry and Behavioral Sciences, University of Washington School of Medicine, Box 356560, 1959 NE Pacific St, Seattle, WA 98195-6560. E-mail: unutzer@u.washington.edu.

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