The Effect of Depression Treatment on Work Productivity

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Depression is prevalent and is associated with such indirect costs as increased work absence, impaired productivity while at work, and decreased job retention across a wide variety of occupations.[1-4] In addition, several studies have shown that even minor or subthreshold depression (including dysthymia) is related to lowered work performance.[5-7]

Fortunately, high-quality depression treatment has been found to reduce symptoms, to improve work function, and to be cost-effective.[8-14] Much of this evidence comes from clinical trials or cross-sectional studies of the effectiveness of antidepressants[15,16] or depression-care management interventions.[17] Aikens et al[18] analyzed trajectories of improvement in depressive symptoms and work function (among other patient-reported outcomes) following antidepressant treatment and found that work performance improves in proportion to depression symptom remission. Results from the study by Woo et al of Korean employees diagnosed with major depressive disorder showed that their depressive symptoms and lost productive time decreased significantly after 8 weeks of antidepressant treatment.[19] Randomized trials of non-pharmacologic enhanced depression-care management also demonstrated improved symptom and work function following the interventions.[8,10]

Despite the encouraging findings of work function improving with depression symptom remission, less is known about this relationship in primary care settings that are not involved in clinical trials, though recently published work does suggest that collaborative care for depression is associated with symptom remission and improvement in work function.[20] The goal of the present study was to investigate the relationship between changes in depression symptom severity and changes in productivity loss following routine outpatient depression treatment provided to a large sample of patients receiving care at 77 clinics in Minnesota.

METHODS

Setting

Data were obtained from patients participating in the DIAMOND (Depression Improvement Across Minne-

ABSTRACT

Objectives

Depression is associated with lowered work functioning, including absence, productivity impairment at work, and decreased job retention. Although high-quality depression treatment provided in clinical trials has been found to reduce symptoms and improve work function, the effectiveness of routine treatment for depression in primary care has received less attention.

Study Design

This prospective cohort study investigated the relationship between improvements in both depression symptoms and productivity in outpatients from 77 clinics in Minnesota following routine depression treatment.

Methods

Data were obtained from patients receiving usual care for depression prior to initiation of a statewide quality improvement collaborative called DIAMOND (Depression Improvement Across Minnesota: Offering a New Direction). Patients started on antidepressants were surveyed on depression symptom severity (Patient Health Questionnaire [PHQ-9]), productivity loss (Work Productivity and Activity Impairment questionnaire [WPAI]), health status, and demographics. Data were collected again 6 months later to assess changes in depression symptoms and productivity.

Results

Data from 432 employed patients with complete baseline and outcome data showed significant reductions in depression symptoms and increases in productivity (P <.0001) over 6 months. Greater improvements in productivity at 6 months were associated with greater improvement in depression symptoms as well as with greater depression severity (P <.0001) and poorer productivity (P <.0001) at baseline.

Conclusions

This study demonstrated a significant relationship between improvement in depression symptoms and improvements in productivity following routine primary care depression treatment. These findings underscore the benefit of depression care to improve work outcomes and to yield a potential return on healthcare investment to employers.

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sota, Offering a New Direction) Study, an evaluation of a statewide depression quality improvement initiative in Minnesota that included 88 clinics from 23 medical groups. Details on the study design and methods have been published elsewhere.[21] The results presented here represent baseline and 6-month outcome data for patients who received usual care for depression at 77 of the these clinics prior to implementation of the DIAMOND program.

Take-Away Points

Routine treatment of depression in primary care settings is effective in significantly reducing depression symptoms and improving productivity at work.

- Although high-quality depression treatment provided in clinical trials has been found to reduce symptoms and improve work function, the effectiveness of routine treatment for depression in primary care has received less attention.
- Patients with more significant baseline depression symptoms and productivity loss improved the most on these measures 6 months after treatment.
- Productivity improvements at 6 months were greatest for patients showing response or remission following depression treatment.
- Employers may realize a positive return on investment for depression care based on productivity gains following depression treatment.

Patient Recruitment and Enrollment

All patients with health plan claims data showing them to be newly started on antidepressant medications at one of the participating clinics were identified on a weekly basis by the health plans and sent a letter about the study, providing a 1-week opportunity to opt out before being called by the research survey center to determine eligibility for participation and to complete a baseline survey by phone. Patients were eligible if they were 18 years or older, had filled a new antidepressant prescription (and none in the prior 4 months) from a primary care clinician at one of the participating clinics for the treatment of depression, and had a depression symptom severity score of 7 or greater on the Patient Health Questionnaire 9-item screen (PHQ-9)[22]. Employment was not an eligibility criterion for patient participation in the larger DIAMOND Study, so for the purpose of this analysis, we included only the subset of patients employed for wages at least part-time at baseline and 6 months, and who had baseline and 6-month data on both the PHQ-9 and the Work Productivity and Activity Impairment Questionnaire (WPAI),[2] the measure used to assess productivity loss. Data from the baseline and 6-month surveys were analyzed to assess changes in depression symptoms and productivity loss following treatment.

The study protocol was reviewed, approved, and monitored by the HealthPartners Institutional Review Board.

Measures

Patient self-report surveys were used to provide information on depression severity, work absence, productivity impairment, and health status (a single item asking patients to rate their overall health), as well as demographic characteristics including employment status. The PHQ-9, widely accepted as a valid measure of depression severity, was used to measure the severity of depression symptoms.[22,24-26] The PHQ-9 yields a continuous score from 0-27 with cut points representing mild (5), moderate (10), moderately severe (15), and severe (20) depression, respectively.

Questions about work function were obtained from the (WPA), a self-report measure of the amount of absence from work due to health problems, as well as productivity impairment while at work ("presenteeism") during the previous 7 days.[23,27,28] Percentage of work time missed due to health, a measure of absenteeism, was calculated as the hours missed during the previous 7 days divided by the hours missed plus the hours worked during this period. Percentage of impairment while working due to health, a measure of presenteeism, was calculated as a 10-point rating of degree of impairment while at work divided by 10. The number of hours of productivity impairment at work was calculated as the hours actually worked multiplied by the percent impairment while at work. The proportion of expected work time that was missed or affected by health problems over the previous 7 days (productivity loss) was calculated as the percent of work time missed plus the percent of time at work multiplied by impairment while there. Note that this value is not the sum of absenteeism plus presenteeism, because the latter only includes hours actually at work.

Statistical Analysis

Descriptive measures of central tendency and dispersion characterized participants included in the analytic data set. Within-person change from baseline to 6 months in productivity and depression symptoms was estimated by fitting 2 linear mixed models (PROC MIXED, SAS version 9.1.3, that used stabilized inverse probability weights to control for differences between characteristics of the study-eligible sample and the analytic dataset (details below). Each model predicted baseline and 6 month PHQ-9 (or WPAI) observations from each participant with the significance of an indicator variable for time denoting

whether depression symptoms (or productivity) were significantly different at 6 months relative to baseline.

The primary analyses for this study examined the relationship between change in depression symptoms and change in productivity loss from baseline to 6 months after treatment initiation for depression. A variance components model nested patients within clinics to estimate the clinic intraclass correlation (ICC) of WPAI change scores. The clinic ICC solved to zero, indicating no significant clustering of patients within clinics. The primary analysis was then carried out using a weighted general linear model (PROC GLM) in which WPAI change was predicted from PHQ-9 change, baseline WPAI and PHQ-9, self-reported functional health status and demographic characteristics (age, sex, racial or ethnic minority status, education, part-time employment status, and marital status). Omitting the functional health status and demographic covariates resulted in a pattern of results similar to those reported. Interaction terms between the productivity loss and depression symptom's main effects, and between main effects and covariates, were also estimated. None of these terms were found to be significant, and they were eliminated from the reported model.

To be included in the primary analysis, participants had to have completed both the baseline and 6-month survey, be employed at least part-time at baseline and 6 months, and have provided depression and employment data at both time points. Chi-square statistics revealed significant differences in the demographic characteristics of the study-eligible participants who met and failed to meet each of these criteria.

Three-nonparsimonious logistic regression models (propensity models) were estimated in order to derive each participant's likelihood of 6-month survey completion (n = 537 completed both surveys, n = 234 completed baseline only), of being employed at 6 months (n = 491 employed at baseline and 6 months, n = 46 employed at baseline only), and of providing complete depression and employment data at baseline and 6 months (n = 432 provided both, n = 59 had missing data), given demographic characteristics. The first propensity model revealed that participants who were older, in better health, had attained more education, and were currently married were more likely to complete the 6-months survey, while those who had never been married or were separated were less likely to complete the 6-month survey. The second propensity model found that participants with commercial insurance were more likely, and participants with 6-month PHQ-9 scores of 15 to 19 were less likely, to still be employed at 6 months. The third model found that participants with lower PHQ-9 scores at 6 months, no additional depression treatment in the past 6 months, and having less than a high school education or having a college education were more likely to provide complete data in both surveys.

One set of stabilized inverse probability weights (IPWs) was calculated based on the propensity scores derived from each of these models. The product of 3 IPWs was used as a weight in the primary analytic models so that the participants included in the analytic data set (n = 432) would be representative of those who were study-eligible (n = 771).

RESULTS

During a 36-month period, from February 2008 to January 2011, 161 patients were screened for study eligibility. The reasons for ineligibility were having a PHQ-9 score less than 7 (n = 723) self-reporting that the antidepressant fill was not for the treatment of depression (n = 481), inability to complete the screener (n = 420), being treated in a nonstudy clinic (n = 247), and not recalling an antidepressant fill (n = 110). The study enrollment data are shown in **Table 1**, indicating that 168 patients receiving usual care for their depression were contacted, assessed for eligibility, the patients were not consented, and enrolled.

We analyzed data on the relationship between depression and work impairment for all 432 participants (37% of the consented and enrolled patients) who reported that they were working for wages either full- or part-time both at the baseline interview and at 6 months, and who provided 6-month data on the PHQ-9 and WPAI measures, and were receiving usual care in their clinic setting prior to DIAMOND program implementation. Demographic characteristics and treatment received at baseline and 6 months for these patients are described in **Table 2**. Table 2 shows that the majority of patients were female, middle-aged, white, married, with at least some college education, and reporting good, very good, or excellent health status. At baseline, 65% of patients reported being treated for depression 1 or more times in the past (40% reported 2 or more times). Patients reported receiving relatively few treatment modalities other than antidepressants during the 6-month study period. These included individual counseling (27%), psychiatrist visit (4%), group therapy (2%), and other depression treatment (2%).

Table 3 shows weighted baseline and 6-month data on productivity loss and depression symptoms. At baseline, productivity loss represented an average of 38.2% of employees' usual work hours, or 14.4 hours of work missed or work time impaired due to health in the last 7 days.

At 6 months, productivity loss decreased to 26.9%, or 10.0 hours (P <.001). At both points in time, productivity loss was more attributable to employees' underperformance while at work, or presenteeism, than to missing work, or absenteeism. Patients with more productivity loss (e.g., higher WPAI scores) at baseline tended to report more improvement (reduction in WPAI scores) in productivity from baseline to 6 months (reduction = –.61, P <.001), and this improvement was greater for those who achieved response (n = 51, M = – 14.1, SD = 30.8) or remission (n = 182, N = –19.0, SD = 32.7) as measured by PHQ-9 scores at 6 months (neither response nor remission, n = 199, M = – 3.4, SD = 29.6).

Table 1. Patient Enrollment

	N	% of Total	% of Remaining
Eligibility assessed	5161		
Study eligible	1180	22.9	22.9
Baseline survey complete	1168	22.6	99.0
Working for pay at baseline	771	14.9	66.0
6-month survey complete	537	10.4	69.6
Working for pay at 6 months	491	9.5	91.4
Complete data at 6 months	432	8.4	88.0

Mean PHQ-9 scores also decreased from 12.0 at baseline to 7.1 at 6 months, (P <.001). At baseline, 64.7% of patients had PHQ-9 scores in the moderate to severe range, whereas at 6 months, this percentage had decreased to 26.9%.

Similar to the finding for productivity loss, patients with more severe depression symptoms (higher PHQ-9 scores) at baseline tended to report greater reduction in PHQ-9 scores from baseline to 6 months (reduction = –0.41, P <.001).

The model that was of most interest was the weighted general linear model that predicted change from baseline to 6 months in productivity from change in depression symptoms, baseline productivity loss, and depression symptoms, adjusting for self-reported health status and several demographic variables (see **Table 4**).

The overall model containing all covariates was significant, F = 38.57, P <.0001 (model R^2 = .48).

Specifically, we found that for every 1-point decrease in PHQ-9 scores from baseline to 6 months, there was a 1.87 point increase in productivity. Patients' PHQ-9 scores decreased an average of 5 points over 6 months of usual care for depression, and this symptom improvement was associated with an average improvement of 9.35 points (11%) in productivity during the same period, translating into an approximate gain of 4.4 hours per week in productivity. The productivity gain observed corresponds to an effect size of 0.34 (WPAI change score divided by SD of WPAI at baseline, or 9.35/27.8). Individual variables significantly associated with productivity change were baseline productivity loss (P <.0001), baseline depression symptoms (P <.0001), and change in depression symptoms from baseline to 6 months (P <.0001). Lower productivity and greater depression symptoms at baseline, as well as greater depression symptom reduction from baseline to 6 months, were all associated with greater improvements in productivity (P <.0001) from baseline to 6 months.

DISCUSSION

The results from this study suggest that improvement in depression symptoms is associated with improvement in productivity for primary care patients receiving usual care for depression. Patients' average PHQ-9 score decrease of 5 points is clinically significant and was associated with a productivity gain of approximatelf 4.4 hours per week, after adjusting for loss to follow-up at 6 months, baseline scores, demographic variables, and self-reported health status.

Our findings of reduced productivity loss following usual care for depression are consistent with findings from randomized trials of enhanced depression care interventions as well as some cross-sectional and modeling studies.[16,17] The approximate gain of 4 hours per week in productivity among patients we observed at 6 months compares favorably to the estimate of an annualized gain of 2 hours of work per week in the randomized trial of a telephonic depression-care program for employed individuals (Wang et al).[8] Notably, participants in the latter trial were more likely to have minor depression and were recruited from their work sites, not from primary care clinics where patients in the current study may have been seeking care specifically for depression. A randomized trial evaluating enhanced depression care for primary care patients conducted by Rost et al found 8% increases in productivity among consistently employed workers over a 2-year period.[10] The study by Woo et al of Korean workers with major depression showed that after 8 weeks of treatment, absenteeism and clinical symptoms of depression were significantly reduced and associated with

Table 2. Demographic Characteristics of Enrolled Patients Working for Pay

N	432
Female	75.9*
Age (Mean, SD)	43.4 (12.3)
Hispanic	2.3
Race	
American Indian	0.7
Asian	0.2
Black, African American	3.0
Native Hawaiian, Alaska Native	0.2
White	92.1
Other	1.4
Multiracial	2.1
Unknown	0.2
Non-Hispanic White	91.0
Education	
High school or less	22.7
Some college	38.9
College graduate	26.9
Graduate degree	11.6
Employment	
Employed for wages	92.4
Self-employed	6.9
Student	0.7
Marital status	
Married	56.5
Unmarried couple	9.0
Divorced	14.6
Separated	2.8
Widowed	1.6
Never married	15.5
Functional health status	
Excellent, very good, or good	78.0
Fair or poor	22.0
Previous depression treatment	
0 times	35.0
1 time	24.4
2+ times	40.6
Depression treatments used in 6 months post baseline	
Individual counseling	26.6
Psychiatrist visit	4.2
Group therapy	2.1
Other	2.3

*All figures in this table refer to percentages of the sample of 432, except for age.

significant improvement in self-rated job performance.[19]

Although our study combined the outcomes of absenteeism and presenteeism, trajectories of improvement following treatment may differ for each, as shown in Table 3. Birnbaum et al linked employee health survey data to medical and drug claims data and found that increased compliance with antidepressants was associated with reduced absenteeism but not presenteeism, noting that the process of recovery from depression may continue at work, hindering productivity.[15] The findings of Buist-Bouwman et al underscore this phenomenon, suggesting that concentration and attention problems are significant mediators of the association between depression and role functioning, and therefore should be a focus of treatment.[29] Other studies have shown that even minor depression symptom severity is associated with work impairment, and although work performance improves in proportion to depression symptom remission following treatment, it remains consistently lower among individuals showing clinical improvement in depression compared with non-depressed controls, suggesting the importance of treating patients to full remission in order to restore psychosocial function.[7,30,31] Our findings support this assertion. After 6 months of antidepressant treatment, productivity loss decreased to 26.9%, a level associated with minor depression (PHQ-9 scores in the 5-9 range), but still well above the 8% reported as normative data from the WPAI for-nondepressed individuals with no other chronic medical condition. Steve Schwartz, director of research, (Health Media, e-mail, August 25, 2010).

Several studies also have measured or estimated reductions in indirect costs following depression treatment using different costing methods and yielding varying but mostly favorable results.[9,11,32-34] These include findings of annualized absenteeism cost reductions of $50 for depressed employees who were compliant with anti-

Table 3. Baseline and 6-month Weighted Descriptive Statistics for Productivity Loss and Depression Symptoms Among 432 Analysis-Eligible Participants

	Baseline	6 Months
WPAI productivity loss, mean (SD)	38.2[a] (27.8)	26.9 (26.9)
Hours of productivity loss, mean (SD)	14.4 (13.3)	10.0 (11.3)
WPAI absenteeism, mean (SD)	5.3 (14.1)	3.5 (11.1)
WPAI presenteeism, mean (SD)	35.9 (27.0)	25.2 (25.6)
PHQ-9 depression, mean (SD)	12.0 (4.2)	7.1 (5.5)
PHQ-9 <7 (%)	0	54.0
PHQ-9 7-9 (%)	35.3	19.1
PHQ-9 10-14 (%)	37.7	15.2
PHQ-9 15-19 (%)	21.4	8.3
PHQ-9 20+ (%)	5.6	3.4

PHQ-9 indicates Patient Health Questionnaire 9-item screen; WPAI, Work Productivity and Activity Impairment Questionnaire.

Table 4. Model-Estimated Relationship Between Change in Depression Symptoms (PHQ-9) and Change in Productivity Loss Adjusting for Baseline Scores, Health Status, and Demographics[a]

Effect	Parameter Estimate	Standard Error	*t*	*P*
Intercept	–1.44	2.23	–0.65	.52
PHQ-9 change	1.87	0.22	8.49	<.0001
Baseline WPAI (productivity loss)[b]	–0.76	0.04	–17.37	<.0001
Baseline PHQ-9	1.91	0.31	6.09	<.0001
Self-reported health status as fair or poor	–1.05	2.69	–0.39	.70
Age	–0.10	0.09	–1.06	.29
Male gender	3.04	2.68	1.13	.26
Racial or ethnic minority	5.51	3.82	1.44	.15
Educational level of high school or less	–0.32	2.63	–0.12	.90
Employment part-time	–0.42	3.05	–0.14	.89
Marital status not coupled	–3.10	2.37	–1.31	.19

PHQ-9 indicates Patient Health Questionnaire 9-item screen; WPAI, Work Productivity and Activity Impairment Questionnaire.
[a]The weighted mixed model shows the relationship between change in PHQ-9 scores and change in productivity loss adjusted for all other variables listed in the table.
[b]Productivity loss is defined as the combination of absenteeism (percent of time missed in the past 7 days due to health) and presenteeism (percent impairment at work in the past 7 days due to health). These measures were obtained from the WPAI.

depressant medications, $1800 annualized value of higher mean hours worked among depression intervention participants, $1982 savings per depressed full-time employee over 2 years for patients receiving collaborative care for depression, and cost savings of $7508 per employee per year resulting from improvements in self-rated job performance following treatment. Moreover, a cost-benefit modeling study by Lo Sasso et al suggested that every 1 dollar invested in enhanced depression care yields approximately 3 dollars to employers in the form of productivity gains by employees.[35]

The reductions in productivity loss we found in this study would potentially yield cost savings to employers, especially in light of the fact that the participating primary care clinics did not increase treatment costs that might have occurred in trials of enhanced depression care. On the other hand, the incremental benefit of enhanced depression care on labor outcomes may exceed the additional costs associated with these enhanced-care management programs, whether they focused on pharmacotherapy, psychotherapy, or both.[36] In either case, findings from this and other studies underscore the benefit to employers of investing in treatment for depression.

The results reported in this paper have both strengths and limitations. Unlike typical clinical trials of depression care, usual primary care for depression prior to implementation of the DIAMOND initiative involved minimal pa-

tient exclusion criteria, no implementation or monitoring of treatment protocols, the allowance for variation in how depression care was implemented at the numerous participating clinics, and no special training provision to participating primary care providers. The relatively large sample of primary care patients participating in DIAMOND was obtained from members of a majority of health plans (including individuals utilizing Medicaid products) across the state of Minnesota who received usual care for depression. Because the data were collected before these clinics participated in enhanced depression care as part of the DIAMOND Initiative, the results reflect real-world care patterns in the absence of additional depression care management support. Therefore, the results should be generalizable to primary care patients receiving usual care for depression, notwithstanding the limited racial and ethnic diversity of individuals in this geographic region. In addition, we examined depression symptoms and productivity loss longitudinally, enabling us to model predictors of improvement in productivity loss over 6 months following initiation of antidepressants.

One limitation of this study is the loss to follow-up of patients and therefore missing data at 6 months. We addressed this potential bias by using sets of stabilized inverse probability weights to adjust for variables known to differ between patients with complete and missing 6-month data. Results from our multivariate analysis did not change significantly when weighted or unweighted data were used, indicating that the relationship between depression symptom reduction and reduction in productivity loss was robust to the measured characteristics that differentiated the study-eligible sample from the analytic sample. Another study limitation is the lack of detailed data on other medical or psychiatric conditions that might be associated with work loss and productivity impairment, because we did not have access to comorbidity data across all health plans participating in the study. The inclusion of self-reported health status was used as a less precise proxy measure of disease burden.

In addition, this study examined the relationship between improvements in depression symptoms and work performance among employed patients to whom antidepressants were prescribed. The nature of this relationship may vary by the type of depression treatment received (psychotherapy vs antidepressants, or a combination), the treating clinician, and the type of job held by the patient (high vs low stress, physical demands, etc). Our data were not available or of sufficient detail to explore the impact of these factors on the relationship between depression and work performance, but they are important questions for further research.

Finally, the analyses for this study were restricted to those reporting at least some employment at baseline and at 6 months, and we excluded those either not in the labor force at either time period (e.g., retirees, etc) and those who lost employment, because our focus was on work function.

CONCLUSIONS

This study demonstrated the strong relationship between reductions in depression symptoms and increases in productivity over 6 months for patients initiated on antidepressant treatment across multiple primary care clinics. Findings from this study highlight the benefit to employers of investing in detection and effective treatment of depression to response or remission in order to maximize improvement in work outcomes for their employees.

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