Effects of Concurrent Low Back Conditions on Depression Outcomes

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Context: Depression and low back problems are common issues in primary care.

Objective: To compare 6-month depression outcomes (specifically, clinical results and number of outpatient visits) in patients with or without comorbid low back conditions (LBCs). The authors hypothesized that the presence of an LBC within 3 months of the diagnosis of depression would negatively affect clinical outcomes of depression treatment after 6 months.

Design: Retrospective record review.

Setting: Collaborative care management program in a large primary care practice.

Participants: Patients with a diagnosis of depression enrolled in collaborative care management (N=1326), including 172 with and 1154 without evidence of an LBC within 3 months of enrollment.

Main Outcome Measures: Clinical depression outcomes (remission and persistent depressive symptoms) and number of outpatient visits at 6 months.

Results: Regression modeling for clinical remission and persistent depressive symptoms at 6 months demonstrated that LBCs were not an independent factor affecting clinical remission (*P*=.24) but were associated with persistent depressive symptoms (odds ratio, 1.559; 95% confidence interval, 1.065-2.282; *P*=.02); LBCs remained an independent predictor of outlier status for outpatient visits (≥8 clinical visits after 6 months of enrollment), with an odds ratio of 1.581 (95% confidence interval, 1.086-2.30; *P*=.02).

Conclusion: Increased odds of persistent depressive symptoms and increased number of outpatient visits were found in patients with depression and concomitant LBCs 6 months after enrollment into collaborative care management, compared with those in patients with depression and without LBCs. The data suggest that temporally related LBCs could lead to worse outcomes in primary care patients being treated for depression, encouraging closer observation and possible therapeutic changes in this cohort.

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Depression is one of the leading reasons for primary care visits in the United States.[1] Its prevalence is estimated to be 5.4% to 8.9% among the general population in the United States[2,3] and 5% to 13% among primary care patients.[4,5] Patients with depression tend to have somatic complaints, and for some these may be the only presenting symptoms[6,7]; common somatic complaints in depression include abdominal pain, back pain, fatigue, and headache.[3] A global ranking of disability life-years in 2010 demonstrated low back pain as the sixth most common cause of disability and major depression disorder as the 11th.[8] These are substantial increases since the prior evaluation performed in 1990, when low back pain and major depression disorder were ranked 11th and 15th, respectively.

Many patients with depression also have chronic illnesses, such as diabetes mellitus, hypertension, heart disease, and arthritis, and many studies[9-11] have examined the effects of depression on outcomes of chronic conditions. Outcomes are generally poorer when patients with chronic medical conditions also have depression.[5] Given the apparent bidirectional relationship between depression and comorbid medical conditions, improved outcomes have been demonstrated when management was targeted at both diseases.[12-15] Pain has also been shown to be common in primary care patients with depression,[16] and early management of pain is associated with improved depression outcomes.[17,18]

Low back pain is an extremely common clinical entity, estimated to be the fifth most common reason for all physician visits in the United States.[19] Acute low back pain usually lasts a few days to weeks, whereas chronic low back pain is defined as lasting longer than 3 months.[20] Depression is a known complicating factor for the latter. A 2011 study[7] from Japan found that of 1426 individuals with chronic low back pain, 371 (26%) had a history of depression; other factors associated with increased risk of depression included female sex, medical aid benefits, lower educational level, and lower family income. A recent study[21] analyzing 202 adult patients with chronic low back pain demonstrated a rate of current depressive symptoms as high as 22%, as well as a significant correlation between depression and somatic dysfunction scoring ($P<.01$).

Collaborative care management (CCM) was demonstrated to be effective for depression treatment by Unutzer et al[22] in 2002 with a randomized control study of 1801 patients in the Improving Mood-Promoting Access to Collaborative Treatment (IMPACT) study. Since then, 2 meta-analyses[23,24] have shown that CCM is more clinically effective than usual care only. Components of CCM include depression registry, care managers who interface with primary care and mental health professionals, therapeutic management based on clinical guidelines with evidence-based care, and oversight by a reviewing psychiatrist, usually weekly.

Prior studies of patients enrolled into CCM for treatment of their depression have shown that clinical outcomes, such as remission and persistent depressive symptoms after 6 months, are correlated with baseline depression severity, anxiety, clinical diagnosis, and abnormal results of screening for bipolar disorder.[25-27] No studies to date, to our knowledge, have specifically looked at the effects of comorbid low back conditions (LBCs) on the outcomes of depression. Our aim was to compare 6-month depression outcomes (specifically, clinical results and number of outpatient visits) in patients with or without comorbid LBCs. We hypothesized that the presence of an LBC at diagnosis of depression would negatively affect clinical outcomes of depression treatment after 6 months.

Methods

In a retrospective review, we analyzed records of patients in a large multisite primary care practice who were enrolled into CCM for depression treatment from March, 1, 2008, through June 30, 2011. The CCM program was originally started at a single clinical site and by 2010 was implemented at all 5 sites within our practice of

approximately 100,000 adult patients. Approximately 50% of patients were covered by the institutional health insurance plan as employees or dependents. Details on the CCM process and its implementation have been published elsewhere.[27,28] To be enrolled in the CCM program, patients had to have a clinical diagnosis of major depression or dysthymia and a Patient Health Questionnaire (PHQ-9)[29] score of at least 10; patients were excluded if they had a psychiatric diagnosis of bipolar disorder. A total of 1326 patients were enrolled during the time frame of the study and had complete intake data sets, with 6-month PHQ-9 follow-up data. These patients made up our study group.

The dependent variables in our analysis were clinical remission (defined as a PHQ-9 score of <5 at 6 months) or evidence of persistent depressive symptoms (PHQ-9 score of ⩾10 at 6 months) and number of outpatient visits. The demographic predictor variables included age, sex, race, and marital status, and the independent clinical variables included diagnosis (first or recurrent episode of major depression or dysthymia), intake PHQ-9 score (range, 0-27), Alcohol Use Disorders Identification Test (AUDIT)[30] score (range, 0-40), Generalized Anxiety Disorder 7 screen[31] score (range, 0-21), Mood Disorder Questionnaire (MDQ)[32] score for bipolar disorder, presence of an LBC (yes or no), and number of outpatient visits. (A "negative" MDQ screen result was defined as fewer than 7 items checked on question 1 and negative responses to questions 2 and 3; all other results were recorded as "abnormal MDQ.") The presence of LBCs was determined by review of the electronic medical record (EMR) for a low back–related diagnosis (eg, acute, mechanical, or chronic low back pain; sciatica), evidence of lumbar radiographic testing (of any type), or physical therapy for an LBC. The review for LBCs extended from 3 months before enrollment into CCM through 3 months after enrollment.

The number of outpatient visits was determined by reviewing the EMR for outpatient clinical visits during the 6 months after enrollment into CCM; these included all provider visits within the outpatient clinic (primary, secondary, and tertiary care) and retail medicine sites and excluded any emergency room visits or hospitalizations. Patients were enrolled into our CCM program from a large multisite primary care practice sharing an EMR. To control for individual patient characteristics, we determined the total number of outpatient clinical visits for the 6 months before enrollment, as we have done for other studies in our primary care population.[32-38] We also controlled for the potential for clinical site-to-site variability in outcomes by including a site location variable in the regression modeling.

Statistical analysis was performed with MedCalc software (version 12.3.0.0). We used Mann-Whitney tests for independent variables to evaluate continuous variables (because of not-normal distributions), and χ^2 analysis for categorical variables. We performed regression modeling with independent variables while controlling for site-to-site differences in clinical outcomes. Outlier status for outpatient visits was defined as being in the 80th percentile or higher for outpatient visits during the 6 months after enrollment in CCM. Statistical significance was defined as $P<.05$. The study was reviewed and approved by Mayo Clinic's institutional review board.

Results

Of the 1326 patients studied, 172 (13.0%) met the criteria for a concomitant LBC (LBC group). Patients with LBCs were more likely to be older than those without LBCs (mean age, 45.4 vs 42.0 years; $P=.03$), have higher anxiety scores (mean Generalized Anxiety Disorder 7 screen score, 12.1 vs 11.1; $P=.02$), and have more outpatient visits before (mean, 5.5 vs 2.5 visits; $P<.001$) and after (7.7 vs 5.1 visits; $P<.001$) enrollment. For all other variables, differences were not statistically significant at univariate analysis (*Table 1*).

Regression modeling for clinical remission or persistent depressive symptoms 6 months after enrollment (with controlling for age, sex, marital status, race, and clinical site) demonstrated that LBCs were not an independent factor for clinical remission at 6 months ($P=.24$) but were associated with persistent depressive symptoms (odds ratio, 1.559; 95% confidence interval

Table 1.
Comparison by Variable in 1326 Primary Care Patients With Depression Enrolled in Collaborative Care Management, With or Without Concomitant Low Back Conditions

Variable, No. (%)[a]	Concomitant Low Back Condition (n=172)	No Recent Back Conditions (n=1154)	*P* Value
Age, mean (range), y	45.4 (18.1-92.3)	42.0 (18.0-91.0)	.03
Sex, female	128 (74.4)	823 (71.3)	.45
Marital Status, married	94 (54.7)	659 (57.1)	.60
Race, white	158 (91.9)	1093 (94.7)	.18
Depression Diagnosis			.17
First episode	92 (53.5)	587 (50.9)	
Recurrent	75 (43.6)	491 (42.5)	
Dysthymia	5 (2.9)	76 (6.6)	
Initial Scores, mean			
PHQ-9	15.8	15.5	.39
GAD-7	12.1	11.1	.02
AUDIT	3.3	3.0	.60
Abnormal MDQ Score	20 (11.6)	103 (8.9)	.32
Remission[b]	83 (48.3)	631 (54.7)	.14
Persistent Depressive Symptoms[c]	51 (29.7)	245 (21.2)	.02
Outpatient Visits, mean (range)			
6 mo before enrollment	5.5 (0-22)	2.5 (0-28)	<.001
6 mo after enrollment	7.7 (1-24)	5.1 (0-35)	<.001

[a] Data presented as No. (%) unless otherwise indicated.
[b] Remission was defined as a Patient Health Questionnaire (PHQ-9) score of <5 at 6 months after enrollment.
[c] Persistent depressive symptoms were defined as a PHQ-9 score of ⩾10 at 6 months after enrollment.

Abbreviations: AUDIT, Alcohol Use Disorders Identification Test; GAD-7, Generalized Anxiety Disorder 7 screen; MDQ, Mood Disorder Questionnaire.

[CI], 1.065-2.282; *P*=.02) (*Table 2*). Prior studies have demonstrated the effects of depression severity, anxiety, and abnormal MDQ scores on clinical outcomes of depression.[25-27]

Outlier status for outpatient clinical visits for the 6 months after enrollment into CCM was defined as 8 visits or more (80th percentile or higher). In regression modeling, increased initial PHQ-9 score and increased number of outpatient visits before enrollment were predictive of outlier status (odds ratio, 1.051 [95% CI, 1.013-1.090; *P*=.008] and 1.188 [95% CI, 1.139-1.239; *P*<.001], respectively). The presence of LBCs remained an independent predictor of outlier status for outpatient visits, with an odds ratio of 1.581 (95% CI, 1.086-2.301; *P*=.02). The model was not affected by patient age, sex, marital status, race, clinical diagnosis, AUDIT, GAD-7, MDQ score at intake, or 6-month PHQ-9 score (*Table 3*).

Comment

We examined the impact of temporally related LBCs (occurring within 3 months of diagnosis of depression

Table 2.
Odds Ratio for Clinical Outcomes of Depression at 6 Months After Enrollment in Collaborative Care Management, by Variable (N=1326)

	Depression Outcome at 6 mo[a]			
	Remission		Persistent Depressive Symptoms	
Variable	Odds Ratio (CI)	*P* Value	Odds Ratio (CI)	*P* Value
Depression Diagnosis				
First Episode	Referent	…	Referent	…
Recurrent	0.667 (0.525-0.847)	.001	1.227 (0.918-1.640)	.17
Dysthymia	0.992 (0.602-1.636)	.98	1.355 (0.764-2.403)	.30
Initial Test Score				
PHQ-9	0.940 (0.911-0.970)	<.001	1.101 (1.062-1.142)	<.001
GAD-7	0.967 (0.944-0.990)	.006	1.028 (0.998-1.059)	.06
AUDIT	0.985 (0.959-1.011)	.26	1.001 (0.973-1.030)	.95
Abnormal MDQ Score	0.573 (0.376-0.874)	.01	1.954 (1.286-2.970)	.002
Presence of Low Back Condition	0.815 (0.581-1.145)	.24	1.559 (1.065-2.282)	.02

[a] Remission and persistent depressive symptoms were defined as Patient Health Questionnaire (PHQ-9) scores of <5 or ≥10, respectively, at 6 months after enrollment. We controlled for patient age, sex, marital status, and race, along with clinical site location, to control for site-to-site variability in outcomes.

Abbreviations: AUDIT, Alcohol Use Disorders Identification Test; CI, confidence interval; GAD-7, Generalized Anxiety Disorder 7 screen; MDQ, Mood Disorder Questionnaire.

and a PHQ-9 score of ≥10) on depression outcomes at 6 months. The clinical outcomes studied were remission (PHQ-9 score <5), persistent depressive symptoms (PHQ-9 score ≥10), and number of outpatient visits (outlier status, ≥80th percentile). Our hypothesis was correct for 2 of the 3 outcomes. The presence of an LBC did not affect remission negatively, but it was associated with both persistent depressive symptoms at 6 months and increased number of outpatient visits, even when we controlled for clinical outcomes, prior outpatient visit patterns, and baseline demographics.

Our findings may encourage clinicians to identify patients with depression who have LBCs and consider more aggressive management of both conditions. We recommend future research to determine whether effective management of LBCs affects depression outcomes, as well as research on specific, directed therapy for both diagnoses. Unfortunately, the small size of our LBC group did not allow for the analysis of subgroups. We also did not examine the effects of depression outcomes on LBC outcomes, but that would be an intriguing future area of study.

Our study did not differentiate between acute and chronic LBCs, but it is possible that many of the 172 individuals with evidence of LBCs had chronic low back pain. Chronic low back pain responds best to multimodal therapy, but pharmacologic treatment is common, whether alone or in combination with other modalities.[39] In 1 study,[40] approximately 80% of patients with chronic low back pain were prescribed at least 1 medication and 34% were prescribed at least 2. Some of these medications are also used to treat patients with depression. A 2010 study[41] demonstrated central sensitization as the common pathophysiologic mechanism for both chronic low back pain and depression. Duloxetine, with its unique indications for chronic pain and depression therapy, has

Table 3.
Odds Ratio for Outpatient Visit Outlier Status (⩾8 Visits) at 6 Months After Enrollment in Collaborative Care Management (N=1326)[a]

Variable	Odds Ratio (CI)	*P* Value
Age	1.008 (0.998-1.017)	.12
Sex, Female	1.000 (0.730-1.370)	>.99
Marital Status	0.948 (0.712-1.261)	.71
Race, White	0.715 (0.404-1.267)	.25
Depression Diagnosis		
First episode	Referent	…
Recurrent	1.047 (0.786-1.395	.75
Dysthymia	0.766 (0.415-1.416)	.40
Initial Test Score		
PHQ-9	1.051 (1.013-1.090)	.008
GAD-7	1.018 (0.989-1.048)	.22
AUDIT	0.994 (0.965-1.023)	.67
Abnormal MDQ Score	0.804 (0.496-1.302)	.38
Persistent Depressive Symptoms[b]	1.313 (0.952-1.811)	.10
Outpatient Visits During 6 mo Before Enrollment	1.188 (1.139-1.239)	<.001
Presence of Low Back Condition	1.581 (1.086-2.301)	.02

[a] We controlled for clinical site location to adjust for site-to-site variability in outcomes.
[b] Persistent depressive symptoms were defined as a Patient Health Questionnaire (PHQ-9) score of ⩾10 at 6 months after enrollment.

Abbreviations: AUDIT, Alcohol Use Disorders Identification Test; CI, confidence interval; GAD-7, Generalized Anxiety Disorder 7 screen; MDQ, Mood Disorder Questionnaire.

demonstrated statistically significantly reduced Brief Pain Inventory scores in randomized double-blind trials ($P<.01$), making duloxetine suitable for patients with chronic low back pain and depression.[42,43]

The present study supports the major osteopathic principle that a person is an integrated unit of body, mind, and spirit, demonstrating the persistent association of a common psychiatric illness (depression) with a common physical condition (LBC). Reinforcing this association, a 2012 study[21] correlated depression scores with low back pain severity, back-specific disability, and the number of key osteopathic lesions. A multimodal approach to osteopathic treatment of patients with depression and LBCs should strongly be considered by osteopathic physicians who are adequately trained.

Our study had several limitations. First, our patients were from a single clinical group practice with little diversity in insurance coverage and other demographic variables, such as race; this may limit the generalizability of the results to other clinical sites. Second, because our study included patients who entered the CCM database after receiving a diagnosis of depression, there was no control group of patients with depression and LBCs receiving usual care. In addition, our EMR search did not

include patients who chose to use only chiropractic or other therapies (eg, massage, acupuncture) for low back pain. Third, because the study was retrospective, there may be confounding variables that were not studied. For example, *catastrophizing*, defined as distorted thought magnification of the pain and a common target in the management of many psychological disorders, would be an important variable to assess as an independent predictor of treatment outcome because of its association with persistence of pain.[44,45] Finally, we did not look at other comorbid conditions that may also increase the number of outpatient visits and negatively affect depression outcome, such as heart disease, diabetes mellitus, and chronic obstructive pulmonary disease.[46]

The current study was a baseline investigation that supports the importance of additional inquiry into the effects of LBCs on CCM outcomes. For more specific results, future studies might analyze group differences by comparing, for example, chronic vs acute back pain, different levels of severity of back pain, the presence vs absence of radiographic abnormalities or obesity, personality traits such as introversion vs extraversion, and somatic distress vs minimizing-type behavioral expression. Because many components of CCM are not yet used in regular outpatient practice, future care systems, such as accountable care organizations, may incorporate new models such as CCM. Management of complex, multiple comorbid disease processes, as seen in our study, may help with the transformation.

Conclusion

In comparing patients with or without concomitant LBCs, we demonstrated increased odds of persistent depressive symptoms and increased number of outpatient visits 6 months after enrollment into CCM for those with LBCs. Future work is recommended, including directed therapy for patients with both depression and LBCs.

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References

1. Dejesus RS, Vickers KS, Melin GJ, Williams MD. A system-based approach to depression management in primary care using the Patient Health Questionnaire-9. *Mayo Clin Proc.* 2007;82(11):1395-1402.
2. Narrow WE, Rae DS, Robins LN, Regier DA. Revised prevalence estimates of mental disorders in the United States: using a clinical significance criterion to reconcile 2 surveys' estimates. *Arch Gen Psychiatry.* 2002;59(2):115-123.
3. Maurer DM. Screening for depression. *Am Fam Physician.* 2012;85(2):139-144.
4. Whooley MA. Diagnosis and treatment of depression in adults with comorbid medical conditions: a 52-year-old man with depression. *JAMA.* 2012;307(17):1848-1857.
5. Coyne JC, Fechner-Bates S, Schwenk TL. Prevalence, nature, and comorbidity of depressive disorders in primary care. *Gen Hosp Psychiatry.* 1994;16(4):267-276.
6. Simon GE, VonKorff M, Piccinelli M, Fullerton C, Ormel J. An international study of the relation between somatic symptoms and depression. *N Engl J Med.* 1999;341(18):1329-1335.
7. Ha JY, Kim ES, Kim HJ, Park SJ. Factors associated with depressive symptoms in patients with chronic low back pain. *Ann Rehabil Med.* 2011;35(5):710-718.
8. Murray CJ, Vos T, Lozano R, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet.* 2012;380(9859):2197-2223.
9. Robinson RG, Bolduc PL, Price TR. Two-year longitudinal study of poststroke mood disorders: diagnosis and outcome at one and two years. *Stroke.* 1987;18(5):837-843.
10. Ford DE, Mead LA, Chang PP, Cooper-Patrick L, Wang NY, Klag MJ. Depression is a risk factor for coronary artery disease in men—the precursors study. *Arch Intern Med.* 1998; 158(13):1422-1426.
11. Ciechanowski PS, Katon WJ, Russo JE. Depression and diabetes: impact of depressive symptoms on adherence, function, and costs. *Arch Intern Med.* 2000;160(21):3278-3285.
12. Rosenthal MH. The challenge of comorbid disorders in patients with depression. *J Am Osteopath Assoc.* 2003; 103(8 suppl 4):S10-S15.
13. McGregor M, Lin EH, Katon WJ. TEAMcare: an integrated multicondition collaborative care program for chronic illnesses and depression. *J Ambul Care Manage.* 2011;34(2):152-162.
14. Katon WJ, Lin EH, Von Korff M, et al. Collaborative care for patients with depression and chronic illnesses. *N Engl J Med.* 2010;363(27):2611-2620.
15. Dolnak DR. Treating patients for comorbid depression, anxiety disorders, and somatic illnesses. *J Am Osteopath Assoc.* 2006;106(5 suppl 2):S1-S8.

16. Janosky JE, South-Paul JE, Lin CJ. Pain and depression in a cohort of underserved, community-dwelling primary care patients. *J Am Board Fam Med.* 2012;25(3):300-307.

17. Fava M, Mallinckrodt CH, Detke MJ, Watkin JG, Wohlreich MM. The effect of duloxetine on painful physical symptoms in depressed patients: do improvements in these symptoms result in higher remission rates? *J Clin Psychiatry.* 2004;65(4):521-530.

18. Schneider E, Linden M, Weigmann H, et al. Early reduction in painful physical symptoms is associated with improvements in long-term depression outcomes in patients treated with duloxetine. *BMC Psychiatry.* 2011;11:150.

19. Chou R, Huffman LH. Medications for acute and chronic low back pain: a review of the evidence for an American Pain Society/ American College of Physicians clinical practice guideline. *Ann Intern Med.* 2007;147(7):505-514.

20. Borenstein DG. Chronic low back pain. *Rheum Dis Clin North Am.* 1996;22(3):439-456.

21. Licciardone JC, Gatchel RJ, Kearns CM, Minotti DE. Depression, somatization, and somatic dysfunction in patients with nonspecific chronic low back pain: results from the OSTEOPATHIC Trial. *J Am Osteopath Assoc.* 2012;112(12):783-791.

22. Unutzer J, Katon W, Callahan CM, et al. Collaborative care management of late-life depression in the primary care setting: a randomized controlled trial. *JAMA.* 2002;288(22):2836-2845.

23. Gilbody S, Bower P, Fletcher J, Richards D, Sutton AJ. Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. *Arch Intern Med.* 2006;166(21):2314-2321.

24. Thota AB, Sipe TA, Byard GJ, et al. Collaborative care to improve the management of depressive disorders: a community guide systematic review and meta-analysis. *Am J Prev Med.* 2012;42(5):525-538.

25. Angstman KB, Dejesus RS, Rohrer JE. Correlation between mental health co-morbidity screening scores and clinical response in collaborative care treatment for depression. *Ment Health Fam Med.* 2010;7(3):129-133.

26. Angstman KB, Maclaughlin KL, Rasmussen NH, DeJesus RS, Katzelnick DJ. Age of depressed patient does not affect clinical outcome in collaborative care management. *Postgrad Med.* 2011;123(5):123-145.

27. Angstman KB, Pietruszewski P, Rasmussen NH, Wilkinson JM, Katzelnick DJ. Depression remission after six months of collaborative care management: role of initial severity of depression in outcome. *Ment Health Fam Med.* 2012;9(2):99-106.

28. Williams M, Angstman K, Johnson I, Katzelnick D. Implementation of a care management model for depression at two primary care clinics. *J Ambul Care Manage.* 2011;34(2):163-173.

29. Spitzer RL, Kroenke K, Williams JB. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary Care Evaluation of Mental Disorders. Patient Health Questionnaire. *JAMA.* 1999;282(18):1737-1744.

30. Reinert DF, Allen JP. The alcohol use disorders identification test: an update of research findings. *Alcohol Clin Exp Res.* 2007;31(2):185-199.

31. Spitzer RL, Kroenke K, Williams JB, Lowe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med.* 2006;166(10):1092-1097.

32. Hirschfeld RM, Calabrese JR, Weissman MM, et al. Screening for bipolar disorder in the community. *J Clin Psychiatry.* 2003;64(1):53-59.

33. Angstman KB, DeJesus RS, Williams MD. Collaborative care management for depression: comparison of cost metrics, clinical response to usual care. *J Prim Care Community Health.* 2010;1(2):73-77.

34. Angstman KB, Garrison GM, Rohrer JE, Dupras DM, O'Grady JS. Retail clinic visits: are resident paneled patients more likely to make multiple visits? *Fam Med.* 2012;44(4):235-239.

35. Rohrer JE, Angstman KB, Bartel GA. Impact of retail medicine on standard costs in primary care: a semiparametric analysis. *Popul Health Manag.* 2009;12(6):333-335.

36. Rohrer JE, Angstman KB, Furst JW. Impact of retail walk-in care on early return visits by adult primary care patients: evaluation via triangulation. *Qual Manag Health Care.* 2009;18(1):19-24.

37. Rohrer JE, Angstman KB, Garrison G. Early return visits by primary care patients: a retail nurse practitioner clinic versus standard medical office care. *Popul Health Manag.* 2012;15(4):216-219.

38. Rohrer JE, Yapuncich KM, Adamson SC, Angstman KB. Do retail clinics increase early return visits for pediatric patients? *J Am Board Fam Med.* 2008;21(5):475-476.

39. Weiner SS, Nordin M. Prevention and management of chronic back pain. *Best Pract Res Clin Rheumatol.* 2010;24(2):267-279.

40. Cherkin DC, Wheeler KJ, Barlow W, Deyo RA. Medication use for low back pain in primary care. *Spine (Phila Pa 1976).* 1998;23(5):607-614.

41. Edmond SL, Werneke MW, Hart DL. Association between centralization, depression, somatization, and disability among patients with nonspecific low back pain. *J Orthop Sports Phys Ther.* 2010;40(12):801-810.

42. Skljarevski V, Zhang S, Desaiah D, et al. Duloxetine versus placebo in patients with chronic low back pain: a 12-week, fixed-dose, randomized, double-blind trial. *J Pain.* 2010;11(12):1282-1290.

43. Skljarevski V, Desaiah D, Liu-Seifert H, et al. Efficacy and safety of duloxetine in patients with chronic low back pain. *Spine (Phila Pa 1976).* 2010;35(13):E578-E585. doi:10.1097 /BRS.0b013e3181d3cef6.

44. Haythornthwaite JA, Clark MR, Pappagallo M, Raja SN. Pain coping strategies play a role in the persistence of pain in post-herpetic neuralgia. *Pain.* 2003;106(3):453-460.

45. Edwards RR, Smith MT, Stonerock G, Haythornthwaite JA. Pain-related catastrophizing in healthy women is associated with greater temporal summation of and reduced habituation to thermal pain. *Clin J Pain.* 2006;22(8):730-737.

46. Rotella F, Mannucci E. Diabetes mellitus as a risk factor for depression: a meta-analysis of longitudinal studies [published online ahead of print December 23, 2012]. *Diabetes Res Clin Pract.* 2013;113(2):98-104.