A Model of the Economic Impact of a Bipolar Disorder Screening Program in Primary Care

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Objective: Unrecognized bipolar disorder in patients presenting with a major depressive episode may lead to delayed diagnosis, inappropriate treatment, and excessive costs. This study models the cost effectiveness of screening for bipolar disorder among adults presenting for the first time with symptoms of major depressive disorder.

Method: A decision-analysis model was used to evaluate the outcomes and cost over 5 years of screening versus not screening for bipolar disorder. Screening was defined as a 1-time administration of the Mood Disorder Questionnaire at the initial visit followed by referral to a psychiatrist for patients screening positive for bipolar disorder. Health states included correctly diagnosed bipolar disorder, unrecognized bipolar disorder, and correctly diagnosed major depressive episodes. Model outcomes included rates of correct diagnosis of bipolar disorder and discounted costs (2006 US dollars) of screening and treating major depressive episodes. Literature was the primary source of data and was collected from September 2007 through March 2009.

Results: According to the model, 1,000 adults in a health plan with 1 million adult members annually present with symptoms of major depressive disorder. An additional 38 patients were correctly diagnosed with depression (unipolar or a major depressive episode) or bipolar disorder (440 with screening vs 402 without screening) through a 1-time screening for bipolar disorder. Estimated 5-year discounted costs per patient were $36,044 without screening and $34,107 with screening (savings of $1,937). Accordingly, total 5-year budgetary savings were estimated at $1.94 million. Results were most sensitive to difference in treatment costs for patients with recognized versus unrecognized bipolar disorder.

Conclusion: A 1-time screening program for bipolar disorder, when patients first present with a major depressive episode, can reduce health care costs to managed-care plans.

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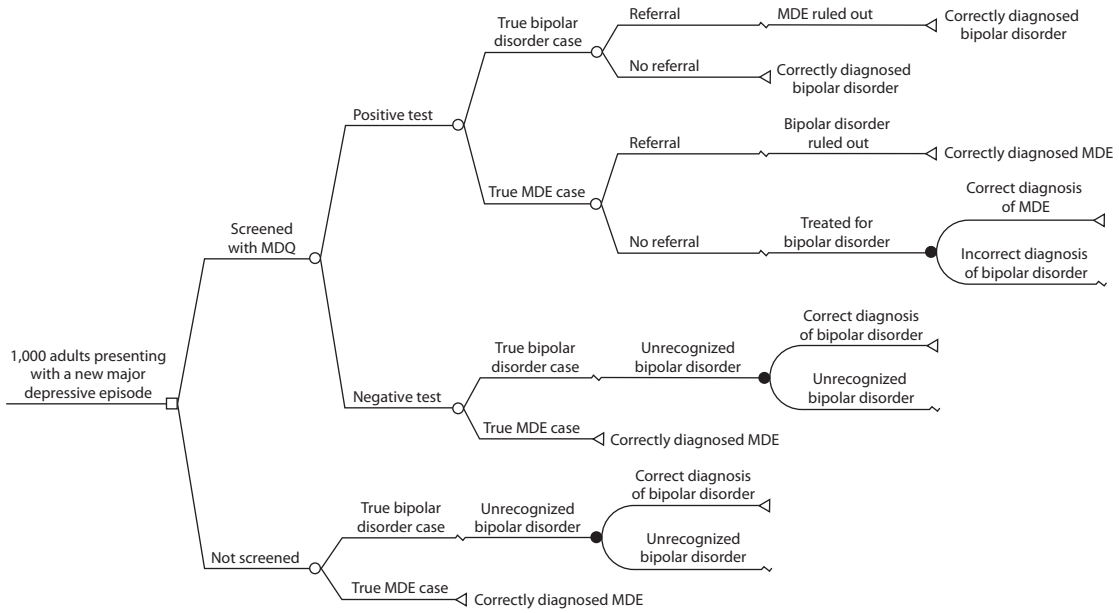
Bipolar disorders, including bipolar I disorder, bipolar II disorder, and cyclothymic disorder, are mood disorders characterized by a history of manic, mixed, or hypomanic episodes, usually with concurrent or previous history of 1 or more major depressive episodes.[1] Recent evidence suggests that the lifetime combined prevalence of bipolar disorder and subthreshold hypomania is 4.4% in the nonelderly adult US population.[2,3] In bipolar I disorder, the patient spends more time (47.3%) in the depressed phase than in the other symptomatic phases.[4] For this and other reasons, most patients with bipolar disorder present to their primary care provider in a depressed state, which may result in an incorrect diagnosis of unipolar depression. An estimated 22%–37% of patients who are diagnosed with unipolar depression actually have bipolar disorder.[5–8]

Failure to make prompt contact with a mental health professional is common in bipolar disorder. In 1 national sample, the median period from bipolar disorder onset to first treatment was 6 years.[9] During this period, bipolar patients with symptoms of depression may consult with several health care professionals before they receive the correct diagnosis. A survey of members of the National Depressive and Manic-Depressive Association, for example, found that 48% of respondents did not receive a diagnosis of bipolar disorder until they had consulted 3 or more health professionals, with 10% of respondents consulting 7 or more professionals before receiving a correct diagnosis.[10,11]

Unrecognized bipolar disorder often results in inappropriate treatment regimens involving overuse of antidepressants, which may exacerbate manic symptoms, and underuse of potentially effective medications, such as mood stabilizers.[7,12] In addition to risking preventable human suffering and clinical burden, failure to recognize bipolar disorder may result in substantial unnecessary costs. In several studies, patients with unrecognized bipolar disorder have been shown to incur higher medical costs than patients properly diagnosed with either bipolar disorder or unipolar depression.[6,13,14]

Given the burden of unrecognized bipolar disorder, effective screening is important, as it may play a role in facilitating an earlier diagnosis of this disorder. In particular, the Mood Disorder Questionnaire (MDQ) and the Bipolar Spectrum Diagnostic Scale (BSDS)—2 brief, self-reported questionnaires that can be easily scored by a physician or

Figure 1. Decision Analysis Model Schematic[a]



[a]Open circles represent a chance node, open squares represent a decision node, closed circles represent a Markov node, and open triangles represent an end node.
Abbreviations: MDE = major depressive disorder, MDQ = Mood Disorder Questionnaire.

other clinician—have been shown to be effective in detecting bipolar disorder among patients with symptoms of major depressive disorder.[15–17] In 1 study of particular relevance to primary care practice, Hirschfeld et al[18] found that, among patients in a family medicine clinic presenting with depression, two thirds of those who screened positive on the MDQ had not previously received a diagnosis of bipolar disorder.

While screening instruments have been shown to increase the rate of correct bipolar disorder diagnoses, the economic consequences of screening remain unknown. To our knowledge, there are no estimates of the potential economic impact of administering screening instruments to detect bipolar disorder in a primary care setting. The objective of this study, therefore, was to develop an economic model that assesses the outcomes and costs associated with screening adult primary care patients as the preliminary step in accurately diagnosing bipolar disorder in patients with a major depressive episode.

METHOD

Model Overview

We developed a decision-analysis model to assess the potential impact of screening versus not screening patients with a new major depressive episode for bipolar disorder. It was assumed that a 1-time screening would be performed and that patients would be followed for a period of 5 years. On the basis of the results of screening or not screening, patients were assigned to 1 of 3 health states—correctly diagnosed bipolar disorder, unrecognized (incorrectly diagnosed) bipolar disorder, or a correctly diagnosed major depressive episode. Model outcomes included rates of correct diagnoses of bipolar disorder and major depressive disorder and discounted costs for screening and treating these mental disorders. The perspective of the analysis was a third-party payer in the United States. Literature was the primary source of data and was collected from September 2007 through March 2009.

Model Structure

Figure 1 shows the structure of the decision-analysis model. The target population for this model consisted of patients 18 years of age and older who presented with a new major depressive episode. These patients were either screened or not screened for bipolar disorder. Under the screening scenario, we assumed that all patients received a 1-time screening with the MDQ. The MDQ is a self-administered questionnaire that has been validated in the psychiatric outpatient setting and in the general population. It consists of 13 questions, which inquire about behavioral characteristics (eg, mood, self-confidence, energy), the co-occurrence of symptoms, and the severity of functional impairment.[16,17]

Patients who screened positive on the MDQ were classified in the true-positive bipolar disorder or false-positive bipolar disorder branches, depending on the prevalence of bipolar disorder and the psychometric properties of the MDQ. We assumed that a proportion of those patients who screened positive on the MDQ would be referred to a psychiatrist to confirm correct diagnoses (ie, of bipolar disorder in the true-positive bipolar disorder branch and major depressive episode in the false-positive bipolar disorder branch).

Table 1. Clinical Model Parameter Estimates[a]

Parameter	Base Case	Low Value	High Value	Reference
Bipolar disorder screening with MDQ				
Likelihood of receiving a positive result	21	11[b]	31[b]	Hirschfeld et al 2005[18]
Likelihood of receiving a negative result	79	89[b]	69[b]	Calculated
MDQ test characteristics				
Sensitivity of MDQ screening tool	58	45[b]	71[b]	Hirschfeld et al 2005[18]
Specificity of MDQ screening tool	93	88[b]	98[b]	Hirschfeld et al 2005[18]
Pretest prevalence of bipolar disorder	26	21[b]	31[b]	Manning et al 1997[21]
Positive predictive value	74	50	94	Calculated
1 – Positive predictive value	26	50	6	Calculated
Negative predictive value	86	86	88	Calculated
1 – Negative predictive value	14	14	12	Calculated
Obtaining a correct diagnosis				
Annual probability of a patient with FP bipolar disorder obtaining a correct MDE diagnosis	10	5	15	Expert opinion
Annual probability of a patient with FN bipolar disorder obtaining a correct bipolar disorder diagnosis	10	5	15	Expert opinion
Probability that an unscreened patient with MDE does not have bipolar disorder	74	79[b]	69[b]	Calculated
Probability that an unscreened patient with MDE has bipolar disorder (pretest prevalence)	26	21[b]	31[b]	Manning et al 1997[21]
Annual probability that an unscreened patient with MDE obtains a correct bipolar disorder diagnosis	10	5	15	Expert opinion
Rate of attrition from the population (eg, all-cause mortality and health plan disenrollment)	17	7[b]	27[b]	Cunningham and Kohn 2000[20]
Probability of a psychiatric referral/workup to confirm MDQ or a new diagnosis	75	50[b]	100[b]	Assumption

[a]All values presented as %.
[b]Varied in the Monte Carlo simulation but not in the 1-way sensitivity analyses.
Abbreviations: FN = false negative, FP = false positive, MDE = major depressive episode, MDQ = Mood Disorder Questionnaire.

Patients who screened positive on the MDQ but were not referred to a psychiatrist obtained diagnoses and treatment from their primary care physicians. Patients who obtained correct diagnoses of bipolar disorder or major depressive episodes remained in their respective health states for the duration of follow-up.

Alternatively, patients who screened negative on the MDQ were classified in the true-negative bipolar disorder or false-negative bipolar disorder branches. We assumed that patients who screened negative would not be referred to a psychiatrist for a complete workup. Instead, patients in the true-negative bipolar disorder branch were assumed to have a correct diagnosis of major depressive disorder, while those in the false-negative bipolar disorder branch had unrecognized bipolar disorder. For those patients with unrecognized bipolar disorder, we assumed that each year a proportion of them would obtain a correct diagnosis of bipolar disorder and thus would transition to the correctly diagnosed bipolar disorder state for the duration of follow-up. Those patients who did not obtain a correct diagnosis remained in the unrecognized bipolar disorder state and were assumed to receive inappropriate treatment.

Under the no screening scenario, we assumed that patients would not be referred to a psychiatrist for a complete workup. Similar to the scenario under the negative screening, patients who were not screened were either correctly diagnosed with major depressive disorder or incorrectly diagnosed with major depressive disorder and thus had unrecognized bipolar disorder. As with the false-negative branch under the screening scenario, a proportion of patients would be correctly diagnosed in each year.

Patients accrued annual total treatment costs—including costs for inpatient, outpatient, and prescription drugs—that varied on the basis of their health state during each year. Other costs included the 1-time cost of screening patients for bipolar disorder and the 1-time cost of a psychiatric workup. Patients may have also left the health plan for any reason, after which time they stopped accruing costs.

Model Parameters

We estimated various population, clinical, and economic parameters in the model. An estimate of population size was based on the general age distribution within health plans, the 1-year incidence of a major depressive episode in a community setting (estimated at 0.2%),[19] and the likelihood of visiting a physician's office with depressive symptoms (assumed to be 50%). The base case of the model was thus populated with a hypothetical cohort of 1,000 patients from a health plan with approximately 1 million adult members aged 18 years or older. Each year, it was assumed that 17% of plan members would disenroll.[20]

Clinical Parameter Inputs

Clinical model parameters included the pretest prevalence of bipolar disorder, MDQ test characteristics, and transition probabilities for the relevant health states (Table 1). The pretest prevalence of bipolar disorder was derived from a prospective analysis of anxious or depressed patients

Table 2. Economic Model Parameter Estimates

Parameter	Base Case	Low Value	High Value	Reference
Cost of screening per patient, $[a]	10	5	20	Valenstein et al 2001[22]
Cost of psychiatric referral to confirm diagnosis, $[a]	155	78	310	Based on Current Procedural Terminology codes
Per-patient annual cost of treatment, mean, $[a,b]				
Correctly diagnosed bipolar disorder	11,842	5,921	17,763	Birnbaum et al 2003[13]
Incorrectly diagnosed (or unrecognized) bipolar disorder	17,430	8,715	26,145	Birnbaum et al 2003[13]
Correctly diagnosed major depressive episode	8,649	4,325	12,974	Birnbaum et al 2003[13]

[a]Year 1 costs are expressed in 2006 US dollars.
[b]Includes inpatient, outpatient (primary care physician and psychiatrist), institutional/long-term care, and pharmacy.

in a family practice setting, in which family physicians in the practice conducted semistructured interviews to determine diagnoses of nonbipolar depression and bipolar disorder. Their findings suggest that 26% of presenting patients had bipolar I or II disorder or cyclothymia.[21]

Test characteristics of the MDQ were obtained from studies of adult patients with symptoms of depression treated in a general outpatient family medicine clinic.[18] It was found that 21.3% of primary care patients who had been treated with an antidepressant screened positive for bipolar disorder. Sensitivity and specificity of the instrument in this population were found to be 0.58 (with a 95% CI = 0.45 to 0.71) and 0.93 (with a 95% CI = 0.88 to 0.98), respectively, after adjusting for sampling. These estimates, along with the pretest prevalence, were used to calculate positive and negative predictive values, which in turn determined the number of patients in the true-positive, false-positive, true-negative, and false-negative branches.

We assigned an annual probability of 10% to patients transitioning from a false-negative bipolar disorder diagnosis (ie, unrecognized bipolar disorder) to a state of correct bipolar disorder diagnosis, which roughly corresponds to a median delay in correct diagnosis of 6 years.[9] For consistency, an annual probability of 10% was subsequently assigned to unscreened patients with major depressive episodes who transitioned to a state of correct bipolar disorder diagnosis. The probability that unscreened patients with major depressive episodes had bipolar disorder was assumed to be equal to the pretest prevalence of bipolar disorder (ie, 26%).

Economic Parameter Inputs

The economic parameters of interest included direct medical costs comprising the 1-time cost of screening patients for bipolar disorder, the 1-time cost of a psychiatric workup among those who screened positive on the MDQ, and the annual costs of treatment for each of the 3 health states (Table 2). Costs were expressed in 2006 US dollars and discounted at an annual rate of 3%.

The costs of screening patients for bipolar disorder using the MDQ were based on estimates from the costs of screening patients for major depressive disorder in a primary care practice using similar, brief, self-administered questionnaires.[22] Costs, which consisted of nurse and physician time for scoring the screening examination and for consulting with the patient, were estimated to be $10 per patient. The cost of psychiatric referral to confirm a positive MDQ result was based on an analysis of Current Procedural Terminology codes 90885 and 90807.

We assumed that the psychiatric examination would last approximately 30 minutes, for a total cost of $155 per patient. Mean per-patient annual costs of treatment for correctly diagnosed bipolar disorder, incorrectly diagnosed (or unrecognized) bipolar disorder, and a correctly diagnosed major depressive episode were derived from a claims-based analysis of the economic burden of unrecognized bipolar disorder.[13] Within this claims-based analysis, the author estimated monthly total costs—consisting of inpatient, outpatient, and prescription drugs—for patients with bipolar I or II disorder. The author found that patients with unrecognized bipolar disorder had 3 times higher inpatient costs, 2 times greater outpatient costs, and higher pharmacy costs when compared to the component costs of patients with major depressive episodes.[13] Using these estimates, we calculated total annual costs of $11,842; $17,430; and $8,649 for recognized bipolar disorder, unrecognized bipolar disorder, and nonbipolar depression, respectively.

Analyses

We estimated the total numbers of correctly diagnosed patients, incorrectly diagnosed patients, and patients leaving the population before and after implementation of a screening program. The number of correctly diagnosed patients, defined as the sum of the number of correctly diagnosed bipolar disorder patients and the number of patients correctly diagnosed with major depressive episodes, was compared with the number of incorrectly diagnosed (unrecognized) bipolar disorder patients. The total number of patients leaving the population was assumed to be independent of screening strategy (ie, excess mortality from undiagnosed bipolar disorder). Costs were computed overall and by component, including the costs of screening, psychiatric workup, and treatment, and were expressed on an aggregate and per-patient basis.

We also conducted 1-way and probabilistic sensitivity analyses to determine the impact of varying clinical and economic parameters on model outcomes. One-way sensitivity analyses were conducted by independently modifying

selected clinical and cost inputs (input values can be found in Tables 1 and 2). The probabilistic sensitivity analyses consisted of Monte Carlo simulations in which all clinical and economic input parameters were varied simultaneously. Assuming a uniform distribution, we ran 10,000 iterations of the model to estimate the cost impact associated with implementing a screening program.

The model was programmed in Microsoft Excel (Microsoft Corporation, Redmond, Washington), and calculations were verified using TreeAge Pro 2008 Suite (TreeAge Software Inc, Williamstown, Massachusetts). All model outputs were successfully verified to within 0.5%.

RESULTS

Base Case Results

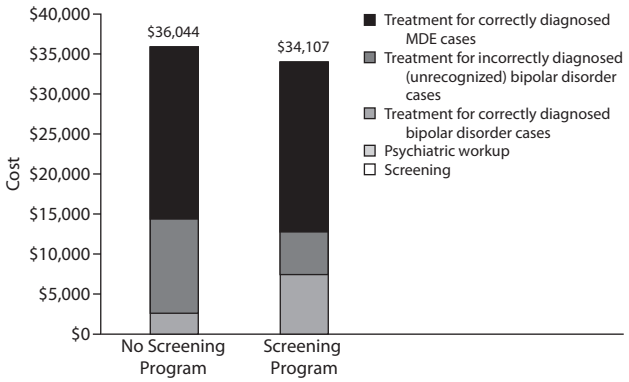
In a health plan with approximately 1 million members aged 18 years or older, we estimate that 1,000 US adults would present annually to a primary care physician with a new major depressive episode. In this base-case scenario, 38 additional patients would be correctly diagnosed with depression (unipolar or a major depressive episode) or bipolar disorder (440 with screening vs 402 without screening) through a 1-time screening for bipolar disorder. Moreover, screening would lead to 5-year per-patient discounted-cost savings of $1,937 ($34,107 with screening vs $36,044 without screening; Figure 2), which is substantially higher than the screening-associated costs, resulting in a total budgetary savings of approximately $1.94 million.

Sensitivity Analyses

We undertook a number of 1-way sensitivity analyses with results shown in Table 3. Due to the uncertainty of clinical input data applied in the model, we first assessed variations in results on the basis of the pretest prevalence of bipolar disorder and the psychometric properties of the MDQ. When applying a low value (50% of the base case) to the pretest prevalence, we found that screening results in savings of $1,345, while a high value (150% of the base case) yields savings of $2,508. Additionally, we varied the MDQ's sensitivity and specificity in a low-high, high-low manner by using the lower and upper bounds of the confidence intervals reported by Hirschfeld et al.[18] Using low sensitivity and high specificity values, we found that screening results in savings of $1,173, while high sensitivity and low specificity values yield savings of $2,687.

Other sensitivity analyses included adjusting the time horizon, the annual probability of a psychiatric referral/workup, and the annual rate of attrition from the health plan. In addition to the base-case time horizon of 5 years, we undertook analyses of 1-year, 2-year, and 10-year time horizons and found cost savings of $647; $1,137; and $2,330, respectively. Additionally, adjustment of the annual rate of psychiatric referral results in savings of $1,747 when applying a low probability and $2,123 when applying a high probability.

Figure 2. Base-Case Results for Overall and Component Costs per Patient Presenting With a Major Depressive Episode (MDE)[a]



[a]The expected per-patient costs of screening and psychiatric workup (< $25 under the screening and no screening programs) are included but are too small to visualize.

Using low and high values of the annual rate of attrition, we found cost savings of $2,218 and $1,697, respectively.

Results from the 1-way sensitivity analyses were also sensitive to the difference in treatment costs for patients with recognized bipolar disorder versus unrecognized bipolar disorder. For instance, we found that screening results in savings of $1,208 and $2,666 when treatment costs for correctly diagnosed bipolar disorder and unrecognized bipolar disorder are 50% and 150% of the base case, respectively.

From a Monte Carlo simulation that varied all key model parameters simultaneously, we found an expected savings of $1,826 per patient (95% CI = $7,080 to −$3,186, which indicates an increase in costs). The point estimate is quite similar to results found in the base-case scenario. We also found that the majority of simulations (76%) showed that the screening program would be cost saving.

DISCUSSION

In our model assessing the impact of screening for bipolar disorder, we found that a strategy of 1-time screening among patients newly presenting with symptoms of a major depressive episode reduces costs over 5 years compared with a strategy of not screening. Using the MDQ, administration of a 1-time screening in a population of 1 million patients in a typical US health plan resulted in a correct diagnosis of a major depressive episode or bipolar disorder in 38 additional patients. Furthermore, early recognition of bipolar disorder in this model would be expected to reduce direct medical costs by $1,937 per person over a 5-year time span, for a savings of $1.94 million in a health plan with 1 million members.

To our knowledge, this is the first published decision-analysis model to assess the economic impact of bipolar disorder screening among adults presenting for the first time with a major depressive episode. In a study of a screening

Table 3. Sensitivity Analyses Results[a]

Input Parameter	Discounted Cost per Patient Presenting With MDE[b]		
	No Screening Program	Screening Program	Difference Due to Screening Program
Pretest prevalence of bipolar disorder			
Low value	34,768	33,423	−1,345
High value	37,321	34,812	−2,508
Sensitivity and specificity of MDQ			
Low sensitivity, high specificity	36,044	34,871	−1,173
High sensitivity, low specificity	36,044	33,358	−2,687
Annual probability of a patient with false-positive bipolar disorder obtaining a correct MDE diagnosis			
Low value	36,044	34,140	−1,904
High value	36,044	34,079	−1,966
Annual probability of a patient with false-negative bipolar disorder obtaining a correct bipolar disorder diagnosis			
Low value	36,044	34,327	−1,717
High value	36,044	33,912	−2,132
Annual probability of an unscreened patient with MDE obtaining a correct bipolar disorder diagnosis			
Low value	36,575	34,107	−2,467
High value	35,573	34,107	−1,465
Annual rate of attrition			
Low value	43,560	41,342	−2,218
High value	29,964	28,267	−1,697
Annual probability of a psychiatric referral/workup to confirm MDQ or a new diagnosis			
Low value	36,041	34,294	−1,747
High value	36,048	33,924	−2,123
Timeframe for analysis (base case is 5 y), y			
1	10,790	10,143	−647
2	19,379	18,242	−1,137
10	47,761	45,431	−2,330
Cost of correctly diagnosed bipolar disorder relative to cost of correctly diagnosed MDE			
Bipolar disorder equals MDE	35,395	32,117	−3,278
Cost of correctly diagnosed bipolar disorder relative to cost of unrecognized bipolar disorder			
Low values (50%)	28,908	27,700	−1,208
High values (150%)	43,181	40,515	−2,666
Cost of unrecognized bipolar disorder relative to cost of correctly diagnosed MDE			
Low values (50%)	19,232	20,762	1,530
High values (150%)	52,859	47,455	−5,404

[a]All values are presented as US dollars.
[b]Results are expressed over a period of 5 years, with the exception of the timeframe for analysis estimates.
Abbreviations: MDE = major depressive episode, MDQ = Mood Disorder Questionnaire.

program for depression in primary care, Valenstein et al[22] developed a nonstationary Markov model to evaluate cost-effectiveness. They assumed that all patients, regardless of mental health status, were screened during a routine health evaluation, whereas our model screened a population at high risk for bipolar disorder. Despite a lower-risk population, Valenstein et al estimated that a 1-time screening program was cost effective in terms of conventional thresholds for economic value (ie, a cost of $45,298 per quality-adjusted life-year from the payer perspective).[22]

Our analyses focused on cost savings from a medical perspective only. Thus, our analyses understate both the cost savings from a societal perspective, which would include indirect costs due to reduced absenteeism and presenteeism, and the potential clinical benefits of earlier recognition of bipolar disorder (eg, improved quality of life, reduced number of suicides). Furthermore, since our model draws exclusively on cost data available in the current literature, it was not feasible to incorporate clinical outcome variables such as psychiatric symptoms or episodes of mania into the model. Future research should investigate clinical outcomes in addition to economic outcomes in order to assess the potential impact of a bipolar disorder screening program on improving treatment practices.

Our study was not without limitations. First, our model relied exclusively on currently published literature for clinical and economic parameter inputs that may not have adequately distinguished between the types of bipolar disorder (bipolar I, II, or not otherwise specified or cyclothymia) or the severity of disease. For instance, the pretest prevalence of bipolar disorder applied in the model was obtained from a prospective analysis of anxious or depressed patients that reported a prevalence rate for bipolar disorder I or II or cyclothymia. Similarly, cost input data were obtained from a claims-based analysis of the economic burden of unrecognized bipolar disorder, which presented economic data for patients with bipolar disorder I or II only.

Second, this study considered only the MDQ and did not assess the psychometric properties of other instruments (eg, Bipolar Spectrum Diagnostic Scale[15]). The merits of the MDQ are extensive—it is a validated instrument that is brief and practical and may be self-administered in the primary

care setting. In addition to these merits, we chose the MDQ for screening purposes because of its relevance to our study population, namely that it is intended for use among patients who newly present with depressive symptoms (ie, those who are about to be prescribed an antidepressant). Despite the benefits and relevance of the MDQ, future studies based on alternative instruments would be of great interest.

Third, clinical diagnoses may not be perfectly accurate, especially among unscreened patients or those patients who screen negative with the MDQ. The MDQ, and specifically estimates concerning the sensitivity and specificity of the instrument, allowed us to identify true bipolar disorder cases (ie, true positives). For those patients who screened positive using the MDQ, a proportion were referred to a psychiatrist to confirm diagnoses. We assumed that all patients who were referred to a psychiatrist would obtain a correct diagnosis. However, in instances in which patients do not see a psychiatrist, clinical diagnoses may be less reliable. Also, this model used the perspective of a managed care plan, considering only typical health plan members for model entry (ie, the working adult population). This model should not be extrapolated to a national scale, as it disregarded a large portion of the bipolar disorder population—those incarcerated, homeless, uninsured, or older than 65 years—thus resulting in an underestimated economic burden of the disorder.

Other limitations dealt with the economic inputs in the model. As previously mentioned, model results were sensitive to the difference in treatment costs for patients with recognized bipolar disorder versus unrecognized bipolar disorder. In fact, direct medical cost data of treating patients with major depressive disorder or bipolar disorder vary widely across current literature and specifically across payer type (ie, commercial insurers versus Medicaid).[6,13,14] It may, therefore, not be appropriate to extrapolate our results to other payer types. In addition, cost input data were based on mean monthly costs and were annualized for the purposes of this model. Assuming that patients with deteriorating health conditions accrue higher costs over time, we may have underestimated the economic burden of the disorder.

In conclusion, our findings suggest that implementation of a 1-time screening program for bipolar disorder at the time a patient presents with a new major depressive episode may improve the clinical diagnosis of bipolar disorder and might also contribute to direct cost savings to managed care plans.

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REFERENCES

1. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders,* Fourth Edition. Washington, DC: American Psychiatric Association; 1994.
2. Merikangas KR, Akiskal HS, Angst J, et al. Lifetime and 12-month prevalence of bipolar spectrum disorder in the National Comorbidity Survey replication. *Arch Gen Psychiatry.* 2007;64(5):543–552.
3. Akiskal HS, Bourgeois ML, Angst J, et al. Re-evaluating the prevalence of and diagnostic composition within the broad clinical spectrum of bipolar disorders. *J Affect Disord.* 2000;59(suppl 1):S5–S30.
4. Judd LL, Akiskal HS, Schettler PJ, et al. The long-term natural history of the weekly symptomatic status of bipolar I disorder. *Arch Gen Psychiatry.* 2002;59(6):530–537.
5. Hirschfeld RM. Bipolar spectrum disorder: improving its recognition and diagnosis. *J Clin Psychiatry*. 2001;62(suppl 14):5–9.
6. McCombs JS, Ahn J, Tencer T, et al. The impact of unrecognized bipolar disorders among patients treated for depression with antidepressants in the fee-for-services California Medicaid (Medi-Cal) program: a 6-year retrospective analysis. *J Affect Disord.* 2007;97(1-3):171–179.
7. Ghaemi SN, Boiman EE, Goodwin FK. Diagnosing bipolar disorder and the effect of antidepressants: a naturalistic study. *J Clin Psychiatry.* 2000;61(10):804–808.
8. Angst J, Gamma A, Lewinsohn P. The evolving epidemiology of bipolar disorder. *World Psychiatry.* 2002;1(3):146–148.
9. Wang PS, Berglund P, Olfson M, et al. Failure and delay in initial treatment contact after first onset of mental disorders in the National Comorbidity Survey replication. *Arch Gen Psychiatry.* 2005;62(6):603–613.
10. Lish JD, me-Meenan S, Whybrow PC, et al. The National Depressive and Manic-Depressive Association (DMDA) survey of bipolar members. *J Affect Disord.* 1994;31(4):281–294.
11. Hirschfeld RM, Lewis L, Vornik LA. Perceptions and impact of bipolar disorder: how far have we really come? results of the National Depressive and Manic-Depressive Association 2000 survey of individuals with bipolar disorder. *J Clin Psychiatry.* 2003;64(2):161–174.
12. Matza LS, Rajagopalan KS, Thompson CL, et al. Misdiagnosed patients with bipolar disorder: comorbidities, treatment patterns, and direct treatment costs. *J Clin Psychiatry.* 2005;66(11):1432–1440.
13. Birnbaum HG, Shi L, Dial E, et al. Economic consequences of not recognizing bipolar disorder patients: a cross-sectional descriptive analysis. *J Clin Psychiatry.* 2003;64(10):1201–1209.
14. Shi L, Thiebaud P, McCombs JS. The impact of unrecognized bipolar disorders for patients treated for depression with antidepressants in the fee-for-services California Medicaid (Medi-Cal) program. *J Affect Disord.* 2004;82(3):373–383.
15. Nassir Ghaemi S, Miller CJ, Berv DA, et al. Sensitivity and specificity of a new bipolar spectrum diagnostic scale. *J Affect Disord.* 2005; 84(2-3):273–277.
16. Hirschfeld RM, Williams JB, Spitzer RL, et al. Development and validation of a screening instrument for bipolar spectrum disorder: the Mood Disorder Questionnaire. *Am J Psychiatry.* 2000;157(11):1873–1875.
17. Hirschfeld RM, Holzer C, Calabrese JR, et al. Validity of the Mood Disorder Questionnaire: a general population study. *Am J Psychiatry.* 2003;160(1):178–180.
18. Hirschfeld RM, Cass AR, Holt DC, et al. Screening for bipolar disorder in patients treated for depression in a family medicine clinic. *J Am Board Fam Pract.* 2005;18(4):233–239.
19. Eaton WW, Kalaydjian A, Scharfstein DO, et al. Prevalence and incidence of depressive disorder: the Baltimore ECA follow-up, 1981–2004. *Acta Psychiatr Scand.* 2007;116(3):182–188.
20. Cunningham PJ, Kohn L. Health plan switching: choice or circumstance? *Health Aff (Millwood).* 2000;19(3):158–164.
21. Manning JS, Haykal RF, Connor PD, et al. On the nature of depressive and anxious states in a family practice setting: the high prevalence of bipolar II and related disorders in a cohort followed longitudinally. *Compr Psychiatry.* 1997;38(2):102–108.
22. Valenstein M, Vijan S, Zeber JE, et al. The cost-utility of screening for depression in primary care. *Ann Intern Med.* 2001;134(5):345–360.