The Journal of Mental Health Policy and Economics
J Ment Health Policy Econ **5**, 153-161 (2002)

Psychotherapy and Pharmacotherapy in Depression

Regina H. Powers,[1]* Thomas J. Kniesner[2] and Thomas W. Croghan[3]

[1]J.D., Ph.D., Office of Applied Statistics, The Substance Abuse and Mental Health Services Administration U.S. Department of Health and Human Services, Rockville, MD, USA
[2]Ph.D., Center for Policy Research and Department of Economics, Syracuse University, Syracuse, NY, USA
[3]M.D., The RAND Corporation, Arlington, VA, USA

Abstract

Background: Depression is a condition with various modes of treatment, including pharmacotherapy, psychotherapy, and some combination of each. The role of psychotherapy in the treatment of depression relative to the role of pharmacotherapy is not well understood, and guidelines for psychotherapy in the primary care setting differ from guidelines for specialty care. There is little evidence concerning circumstances in actual practice that affect the use of psychotherapy in conjunction with pharmacotherapy.
Aims of the Study: We retrospectively identify the most important factors associated with the use of psychotherapy in combination with pharmacotherapy in the treatment of depression. Specifically, we study provider choice, health plan characteristics, and patient characteristics.
Methods: We use a comprehensive medical and pharmacy claims data sample of 1,023 individuals during 1992–1994. We select persons prescribed with an antidepressant medication and diagnosed with a depressive disorder by a primary care physician, psychiatrist, or non-physician mental health specialist. Controlling for depression diagnosis, comorbidity, and demographics, we examine the role of provider type and insurance plan benefit characteristics. We study the intensity of psychotherapy using zero-inflated count regression, the intensity of pharmacotherapy using truncated count regression, and the likelihood of treatment failure using logistic regression.
Results: Patients initially seeing a psychiatrist receive more than double the amount of psychotherapy and slightly more pharmacotherapy than patients of other providers. An additional prescription for antidepressant medication reduces by five percent the likelihood of treatment failure, but the amount of psychotherapy does not affect treatment failure. Patients seeing a psychiatrist are half as likely to have failed treatment, independent of any effect of psychotherapy. Case management and coinsurance rates do not affect the amount of psychotherapy, but the presence of case management positively affects the amount of pharmacotherapy and the likelihood of treatment failure.
Discussion: Although the amount of psychotherapy provided in conjunction with medication does not lower the rate of treatment failure, psychotherapy may nonetheless provide beneficial outcomes not studied here. Choice of a psychiatrist reduces the likelihood of treatment failure, independent of the number of psychotherapy sessions and antidepressant prescriptions. The effect of provider choice on treatment failure could be an artefact of differences in provider follow-up practices or could represent a difference in provider skills. Managed care strategies do not appear to reduce the intensity of depression treatment, but case management does increase the likelihood of treatment failure.
Implications for Health Care Provision: Combined treatment with pharmacotherapy and psychotherapy appears to be individualized, as there is no pattern of more or less psychotherapy associated with antidepressant medication use. Choice of psychiatrist as the initial provider appears to reduce the likelihood of treatment failure, suggesting coordinated care may be beneficial. The link between psychiatrists and more psychotherapy is consistent with the hypothesis that patients resistant to treatment may nonetheless receive high quality care.
Implications for Health Policies: Managed care tools such as case management and coinsurance rates do not appear to restrict the use of either psychotherapy or pharmacotherapy. The association of case management with an increased likelihood of treatment failure suggests that plan characteristics can affect outcomes.
Implications for Further Research: Our study focuses on psychotherapy combined with medication and does not consider psychotherapy alone in the treatment of depression, which may be a preferred mode of treatment for some. Outcomes other than treatment failure, as well as costs, should also be considered. Our findings that psychiatrists are associated with a decreased likelihood of treatment failure and that case management is associated with an increased likelihood of treatment failure despite a correlation with greater pharmacotherapy intensity present avenues for additional study.

Received 1 October 2002; accepted 8 February 2003

***Correspondence to:** Regina H. Powers, Office of Applied Studies, Substance Abuse and Mental Health Services Administration, 5600 Fishers Lane, 16-105, Rockville, MD 20857, USA.
Tel.: +1-301-443 1596
Fax: +1-301-443 9847
E-mail: RPowers@samhsa.gov
Source of Funding: Eli Lilly and Company. The study was performed in partial fulfillment of the requirements for Dr. Powers' doctoral degree in Economics from Indiana University, Bloomington, funded by Eli Lilly and Company, and while Dr. Kniesner was a Visiting Research Fellow at Eli Lilly and Company. Dr. Croghan is a former employee and current stockholder of Eli Lilly and Company.

Introduction

The role of psychotherapy in the treatment of depression has been a subject of some uncertainty in recent years as pharmacotherapies have proliferated. The proportion of people treated with psychotherapy has declined even though

the rate of outpatient treatment for depression has increased.[1] Although psychotherapy alone is recognized as an efficacious treatment, it is often provided in combination with antidepressant medication in the treatment of depression. We examine how pharmacotherapy and psychotherapy are combined in practice across providers in the treatment of depression and the ultimate consequences of the mix of pharmacotherapy, psychotherapy, and provider for depression treatment failure.

Psychotherapy in conjunction with medication may be beneficial not only as a direct treatment of the depressive disorder and its symptoms but also as an aid both to medication compliance[2] and family support of treatment.[3] Although combined treatment has been shown to be more efficacious than unimodal treatment in specific contexts,[4] generally the indications for combination treatment are unclear, and guidelines for treatment in the primary care setting differ from guidelines for psychiatric specialty care.[5]

The most recent treatment guidelines for depression treatment state that combined pharmacotherapy and psychotherapy "may be a useful initial treatment choice" for patients with moderate to severe major depression who experience psychosocial or interpersonal problems or a comorbid psychiatric disorder, as well as for patients with less severe depression if they prefer combined treatment, have a history of partial response to psychotherapy or medication alone, or exhibit poor adherence to treatment.[6] However, there is no model for combined treatment, and the optimal frequency of psychotherapy as part of a treatment plan has not been determined. Several individual-specific factors are relevant in determining the frequency of psychotherapy visits, including the goals of the individual treatment plan, the maintenance of successful therapeutic relationship, the patient's adherence to treatment, and suicidality.[6]

The circumstances in actual practice under which psychotherapy is best combined with antidepressant medication are not well understood. Aside from provider and patient preferences, additional factors can affect the use of psychotherapy, such as availability and cost.[7] Previous work has identified a need for examination of the practice of psychotherapy, including psychotherapy with concurrent pharmacotherapy, as well as characterization of patients in terms of diagnosis, severity, comorbidity, and demographics.[8]

Other work has suggested that characteristics of the health care system can affect the use of psychotherapy in treating depression. Data from the Medical Outcomes Study showed that depressed patients of general medical clinicians receive less counseling than patients of mental health specialists and that health plan prepayment is associated with lower counseling rates.[9] Although the cost-containment incentives of managed care organizations have been cited as a potential reason for reductions in the use of psychotherapy, some observers have suggested that psychotherapy, if shown to be cost-effective, might be more compatible with managed care than with traditional health insurance arrangements.[10] Indeed, in the context of severe mental illness, psychotherapy has been associated with reduced costs.[11] Thus, the relationship between the use of psychotherapy and managed care strategies is not clear.

Recent evidence suggests that psychotherapy and pharmacotherapy are productive complements in treating depression, meaning that they have similar therapeutic effects, ceteris paribus.[12] However, in clinical practice they need not be used in isolation (as therapeutic substitutes in depression treatment), but rather together (as complementary treatments). Using a claims data sample of persons diagnosed with depression and receiving a prescription for an antidepressant medication we attempt to identify retrospectively the most important factors associated with the use of psychotherapy in combination with medication in the treatment of depression.

Our results suggest that patients initially seeing psychiatrists get substantially more psychotherapy and slightly more pharmacotherapy than patients initially seeing other non-psychiatrist providers of anti-depression care. We find no evidence that the two types of therapies are used in conjunction systematically or that more of one is used in place of less of the other therapy in depression treatment involving some pharmacotherapy. Concerning the downstream benefits of pharmacotherapy and psychotherapy, our results indicate that pharmacotherapy lessens the likelihood of failed depression treatment and that psychotherapy does not have an independent effect on treatment failure; however patients seeing a psychiatrist are less likely to have a failed treatment, net of any effect of the amount of psychotherapy.

Methods

Our objective is to disentangle the relative quantitative importance of factors influencing the intensity of psychotherapy in individuals treated for depression with antidepressant medication. We use a retrospective claims database of persons diagnosed with depression and treated with antidepressant medication with or without psychotherapy. Using multivariate statistical models that are appropriate for dependent variables that take on non-negative integer values and that may also be truncated, we assess whether the factors influencing psychotherapy are jointly determined with the intensity of medication use. Finally, we examine the relationship among psychotherapy, pharmacotherapy, and a downstream outcome of interest in the treatment of depression, the likelihood of treatment failure.

Data and Variable Definitions

Our data, which come from the MarketScan™ database, contain comprehensive medical and pharmacy claims data for about 700,000 employed persons and their families who worked in 20 different self-insured Fortune 500 companies (The MEDSTAT Group, Ann Arbor, MI). Health insurance benefits offered by employers include indemnity and managed care plans that were dominated by preferred provider organizations. The particular MarketScan™ information we use centers on claims data for continuously enrolled individuals and their plan benefit information during 1992-1994.

Available claims information covers eight quarters post-

Table 1. Descriptive statistics stratified by provider - Mean (standard deviation)

Variable	Total	Psychiatrist (n = 272)	Non-Physician Mental Health Specialist (n = 163)	Primary Care Physician (n = 588)
Psychotherapy Visits	5.727 (10.262)	10.882 (12.726)	5.098 (8.630)	3.517 (8.409)
Antidepressant Prescriptions	11.413 (9.255)	12.456 (9.815)	11.123 (9.459)	11.010 (8.903)
Anxiolytic Prescriptions	2.895 (7.658)	4.272 (9.905)	3.160 (9.953)	2.185 (5.299)
Treatment Failure	0.223 (0.416)	0.154 (0.362)	0.233 (0.424)	0.252 (0.434)
4+ Antidepressant Prescriptions	0.765 (0.424)	0.739 (0.440)	0.785 (0.412)	0.772 (0.420)
Log Medical Costs	8.031 (1.341)	8.035 (1.545)	8.260 (1.171)	7.966 (1.277)
Age	42.642 (9.335)	42.188 (10.087)	41.865 (8.336)	43.068 (9.227)
Female	0.738 (0.440)	0.665 (0.473)	0.724 (0.448)	0.776 (0.418)
Major Depression, Single Episode	0.179 (0.383)	0.313 (0.464)	0.135 (0.343)	0.129 (0.336)
Major Depression, Recurrent	0.109 (0.312)	0.265 (0.442)	0.141 (0.349)	0.029 (0.168)
Dysthymia	0.264 (0.441)	0.313 (0.464)	0.460 (0.500)	0.187 (0.390)
Reactive Depression	0.077 (0.267)	0.066 (0.249)	0.239 (0.428)	0.037 (0.190)
Depression NOS	0.370 (0.483)	0.044 (0.206)	0.025 (0.155)	0.617 (0.486)
Log Pre-Diagnosis Costs	4.568 (2.622)	4.301 (2.836)	4.892 (2.686)	4.602 (2.490)
Comorbidities	6.829 (2.992)	6.688 (3.182)	7.190 (2.856)	6.794 (2.934)
Mental Health Coinsurance Rate	0.126 (0.095)	0.140 (0.121)	0.120 (.087)	0.121 (.083)
Case Management	0.362 (0.481)	0.379 (0.486)	0.288 (0.454)	0.374 (0.484)

depression diagnosis and two quarters pre-depression diagnosis. We select antidepressant recipients diagnosed with a depressive disorder by a primary care physician, a psychiatrist, or a non-physician mental health specialist. To identify new treatment episodes we exclude persons with any claims for psychotherapy or antidepressants in the six-month period prior to the diagnosis of depression. We include only people with information about their plan. The final sample size we use in estimation is 1,023.

Table 1 lists the variables of interest in the study sample. In addition to demographic information about the patient's age, sex, and the number of comorbid physical conditions, we examine effects of the specific depression diagnosis and the type of provider associated with the initial depression diagnosis. We also attempt to account for propensity to use health care and overall health by including non-psychiatric costs in the quarter prior to the diagnosis. We account for the intervening influence of the number of anxiolytic prescriptions filled after the depression diagnosis.* To examine the effect of characteristics of the health plan and to purify the estimated effects of provider on outcomes of interest in a multivariate setting, we include as control variables the outpatient

* Anxiolytic medication is intended to reduce anxiety and could correspond to the level of psychiatric distress, be an indicator of the patient's propensity or willingness to fill prescribed medication, be used by the patient as a hypnotic (perhaps to counteract a side effect of antidepressant pharmacotherapy), or indicate inappropriate treatment of depressive symptoms.

psychiatric coinsurance rate and whether the health plan employed case management practices.* We consider there to be treatment failure when the claims data include any of the following: a new episode of drug therapy follows a gap of six or more months in medication claims, a suicide attempt, a psychiatric hospitalization, a mental health related emergency department visit, or electroconvulsive therapy.†

Data Analytic Procedures

To study the use of psychotherapy and pharmacotherapy in some quantitative detail we expand on simple univariate comparisons in by employing multivariate models of the number of psychotherapy visits and antidepressant prescriptions that account for the substantial number of nonusers of psychotherapy and the fact that all patients had at least one antidepressant prescription. Our list of categorical explanatory variables includes depression diagnosis indicators, with Depression Not Otherwise Specified as the reference category, and diagnosing provider indicators, with Primary Care Physicians as the reference category. The amount of psychotherapy is the number of psychotherapy visits after the depression diagnosis, and the amount of pharmacotherapy is the number of antidepressant prescriptions. Because the dependent variables we study are each a non-negative integer we use count data models rather than standard regression models in which the dependent variable is a continuous variable.*

The Poisson regression model is the most basic count model, but it invokes the restriction of equality between mean and variance, termed equi-dispersion. Because preliminary results show that the conditional mean and variance are unequal for each of the two therapies we study in our sample, we employ the more general Negative Binomial multivariate model, which is a generalization of the Poisson model that allows for overdispersion (the conditional variance exceeds the conditional mean) and has been productively applied to models of health care utilization.[15-18]

Expressed algebraically, the conditional mean value of a therapy level in a sample where *i* indexes a case of depression is

$$E(y_i \mid x_i) = \lambda_i = \exp(b'x_i), \qquad (1)$$

where *b* is the vector of parameters to estimate that determine the marginal effect of an independent variable, *x*, on the discrete value of therapy incidence, *y*. The negative binomial count model also includes an overdispersion parameter, δ, that parameterizes the prevalent form of heteroskedasticity where the conditional variance exceeds the conditional mean, λ, which is prevalent in count data

$$\text{var}(y_i \mid x_i) = \lambda_i(1+\lambda_i\delta). \qquad (2)$$

Equation (2) illustrates how the negative binomial specification nests inside it the Poisson model, and that if $\hat{\delta} = 0$ then the Poisson count model appears.

An additional complexity common in models of counts is a large number of zero values. In our case, about 47 percent of the sample had no claim for psychotherapy, and we attempt to account for the high proportion of patients not receiving psychotherapy in the statistical model. Although the Negative Binomial model accommodates a large number of zeros, we also estimate variations of the Negative Binomial model that further adjust for so-called excess zeros in the sample termed the zero-inflated Negative Binomial model. The ZINB model adds what is termed a splitting parameter, *q*, that is the proportion of zero use that will occur no matter what the values of the independent variables might be (some people will never submit to psychotherapy)

$$E(y_i \mid x_i) = \lambda_i(1-q_i(x)) \qquad (3)$$

and

$$\text{var}(y_i \mid x_i) = \lambda_i(1-q_i)[1+\lambda_i(q_i+\delta)]. \qquad (4)$$

Using the same list of explanatory variables we also examine models of the intensity of pharmacotherapy for depression where the dependent variable is the number of antidepressant medication prescriptions filled. To expand on a simple comparison of means we again use a multivariate count regression model. However, because our sample of depressed persons is constructed by locating patients with at least one antidepressant prescription, we must employ a model that accounts for truncation at zero.* We use a truncated negative binomial model to examine the marginal effect of provider type on anti-depressant medication use.

Along with the count regressions for psychotherapy, our regression for pharmacotherapy reveals whether intensity of pharmacotherapy seems to complement, substitute for, or is largely independent of the amount of psychotherapy. If psychotherapy complements pharmacotherapy, then the number of psychotherapy visits should increase with the number of antidepressant prescriptions. If they are substitutes, then the number of psychotherapy visits should decline as the number of prescriptions increases. If neither a positive nor a negative relationship occurs between the two therapies, then we consider decisions to use psychotherapy and pharmacotherapy as largely independent.

---

* In the MarketScan™ data we use the term case management describes a form of utilization review and not clinical case management often applied to the care of persons with severe mental illnesses such as schizophrenia. The goal of the case management practices as examined here is most likely to be reduction or limitation of unnecessary treatment.

† For another example of a similar claims-based method of identifying treatment failure (relapse) see (13), who find that about three-fourths of treatment failures were due to starting a new episode of anti-depressant treatment.

* OLS is clearly a misspecified functional form as the dependent variable is both bounded and bunched at zero. Alternatives to count models include ordered probit, Tobit, or an exponential functional form estimated with non-linear least squares. For empirical examples see[14] and for discussion of the relative strengths and weakens of alternative models see.[15]

* Adjusting for truncation involves rescaling the likelihood that the pharmacotherapy dependent variable takes on any particular value by the inverse of the probability of $y > 0$.[19]

Table 2. Psychotherapy visits - Zero inflated negative binomial regression

	Coefficient	Std. Error	t-ratio	P-value	Marginal Effect	Std. Error	t-ratio	P-value
Constant	1.671	0.281	5.951	0.000	11.745	3.294	3.565	0.000
Age	-0.013	0.005	-2.732	0.006	-0.094	0.065	-1.456	0.146
Female	0.104	0.118	0.879	0.380	0.731	1.389	0.527	0.599
Major Depression, Single Episode	0.090	0.159	0.564	0.573	0.629	1.862	0.338	0.736
Major Depression, Recurrent	0.657	0.210	3.135	0.002	4.620	2.458	1.880	0.060
Dysthymia	0.253	0.115	2.193	0.028	1.775	1.350	1.314	0.189
Reactive Depression	0.125	0.242	0.519	0.604	0.881	2.834	0.311	0.756
Log Pre-Diagnosis Costs	0.007	0.018	0.400	0.689	0.052	0.217	0.237	0.812
Anxiolytic Prescriptions	0.030	0.008	3.678	0.000	0.214	0.102	2.102	0.036
Comorbidities	0.010	0.018	0.562	0.574	0.072	0.217	0.333	0.739
Psychiatrist	0.950	0.201	4.737	0.000	6.676	2.353	2.838	0.005
Non-MD Mental Health Specialist	0.225	0.154	1.459	0.145	1.580	1.808	0.874	0.382
Plan Coinsurance Rate	-0.444	0.621	-0.715	0.475	-3.122	7.282	-0.429	0.668
Case Management	-0.069	0.099	-0.702	0.482	-0.487	1.157	-0.421	0.674
Overdispersion Parameter	2.316	0.389	5.950	0.000				
Zero Inflation Parameter	-0.895	0.329	-2.723	0.006				

Lastly we examine the relative importance of the components of anti-depression treatment on treatment success measured by the likelihood of a failed treatment. For ease of interpretation we use the familiar binary (y = 0, 1) logit specification with

$$\text{Prob(Failure)} = \text{Prob}(y = 1) = e^{\beta' x} / (1 + e^{\beta' x}), \qquad (5)$$

where we are concerned with the estimates of β to use in constructing case-mix adjusted effects of the regressors related to the specialty of treatment provider and amounts of pharmacotherapy versus psychotherapy. In our data failure means that the person subsequently experienced a new episode of anti-depressant therapy, a suicide attempt, psychiatric hospitalization, a mental health related emergency department visit, or electroconvulsive therapy, which is a measure previously shown responsive to changes in the quality of care.[20,13]

Before discussing our results it is important to note that the regression coefficients, b in Equation (1) and β in Equation(5) are not the objects of interest, because they are not themselves the estimated effects of a unit change in an independent variable, the so-called marginal effects. All of the models we estimate are non-linear index transformations of the regressors with general form $y = G(f(x))$ so that marginal effects (ME) of interest must be evaluated at a particular set of values for x, which we generally set equal to $\bar{x}$. For a continuous regressor ME = $\hat{G}'\hat{f}'$, so that for the negative binomial models of pharmacotherapy and psychotherapy ME= $\hat{\lambda}(\bar{x})\hat{b}$ and for the treatment failure logit the marginal effect is ME = $\hat{P}(\bar{x})(1-\hat{P}(\bar{x})\hat{\beta}$ where P = Prob(y = 1). For a discrete regressor (provider type),

$$\text{ME} = \hat{y}(x=1) - \hat{y}(x=0) = \hat{G}(\hat{f}(x=1)) - \hat{G}(\hat{f}(x=0)) \cong \hat{P}(\bar{x})(1-\hat{P}(\bar{x})\hat{\beta}$$

In the empirical results we focus the discussion on the estimated marginal effects of provider type on the numbers of psychotherapy visits and anti-depressant prescriptions and on the marginal effects of the intensity of pharmacotherapy, psychotherapy, and provider type on treatment effectiveness measured by the probability of a treatment failure.

Results

Table 1 presents the descriptive statistics for the entire sample and stratified by the type of provider making the initial diagnosis of depression. The specialty of the first provider is significantly associated with the mix of treatment patients subsequently receive. Patients diagnosed by psychiatrists average about 11 claims for psychotherapy, while patients of non-physician mental health specialists average about 5 psychotherapy claims, and patients diagnosed by primary care physicians average 3-4 psychotherapy claims.

As another point of comparison, 90 percent of patients diagnosed by psychiatrists have at least one psychotherapy claim following the depression diagnosis, 54 percent of patients diagnosed by non-physician mental health specialist have at least one psychotherapy claim, and 35 percent of primary care patients have at least one psychotherapy claim.

Inter-provider differences in case mix, which could reflect diagnostic patterns or real differences in the types of patients who seek care from specific providers, are such that psychiatrists are the main provider of treatment for cases of single episode and recurrent major depression while non-

Table 3. Antidepressant prescriptions - Truncated negative binomial

	Coefficient	Std. Error	t-ratio	P-value	Marginal Effect	Std. Error	t-ratio	P-value
Constant	1.716	0.196	8.773	0.000	18.194	5.993	3.036	0.002
Age	0.004	0.004	0.951	0.341	0.043	0.049	0.877	0.381
Female	-0.016	0.084	-0.196	0.845	-0.175	0.932	-0.187	0.851
Major Depression, Single Episode	0.121	0.109	1.114	0.265	1.285	1.265	1.016	0.310
Major Depression, Recurrent	0.137	0.152	0.901	0.368	1.452	1.746	0.832	0.406
Dysthymia	-0.136	0.100	-1.359	0.174	-1.438	1.216	-1.182	0.237
Reactive Depression	0.048	0.159	0.300	0.764	0.505	1.761	0.286	0.775
Log Pre-Diagnosis Costs	0.003	0.014	0.202	0.840	0.031	0.160	0.193	0.847
Anxiolytic Prescriptions	0.035	0.014	2.552	0.011	0.369	0.194	1.906	0.057
Comorbidities	0.015	0.006	2.474	0.013	0.158	0.089	1.780	0.075
Psychiatrist	0.038	0.097	0.391	0.696	0.401	1.081	0.371	0.711
Non-MD Mental Health Specialist	0.049	0.108	0.456	0.648	0.521	1.207	0.432	0.666
Plan Coinsurance Rate	0.193	0.378	0.510	0.610	2.047	4.239	0.483	0.629
Case Management	0.326	0.079	4.136	0.000	3.452	1.446	2.387	0.017
Overdispersion parameter	0.836	0.062	13.395	0.000				

physician mental health specialists are the main provider of treatment for cases of dysthymia and reactive depression.

Overall, about three fourths of the sample received at least four prescriptions in the first six months of treatment, and there were no differences across providers. (Psychiatrist patients, however, receive more prescriptions for anxiolytics and are less likely to have a failed treatment than persons seeing other providers.)

Because univariate comparisons do not reveal fully differences in case-mix among various providers, we proceed to control for case-mix details in order to identify better the role of provider type in the use of psychotherapy, pharmacotherapy and treatment failure.

Psychotherapy Visits

Table 2 presents the zero-inflated negative binomial (ZINB) count model of the number of psychotherapy visits. We include both model coefficients and marginal effects computed at the means of the independent variables. Both the estimated overdispersion parameter $\hat{\delta}$ and the estimated zero-inflation parameter (which is a function of $\hat{q}_i$) are significant statistically, which means that the data reject both the simpler Poisson specification and the basic negative binomial specification in favor of the ZINB count model form.*

Concerning the variables controlling for case mix across providers, a diagnosis of recurrent major depressive disorder is significantly and positively related to the number of psychotherapy visits, resulting in about 4-5 additional psychotherapy visits; the number of visits for a major depressive disorder is about twice the mean. The effects of all other types of depression are small and insignificant statistically as are the influences of age and gender on psychotherapy. Neither the psychiatric coinsurance rate nor the presence of case management in the health insurance plan are statistically significant predictors of the amount of psychotherapy.*

Because provider type appears related to the subsequent mix of treatments, a focal point of our research effort is whether there is a statistically significant differential effect of provider, *ceteris paribus*, on the use of psychotherapy. If the amount of psychotherapy is a substitute for pharmacotherapy, then it follows that providers who use more psychotherapy should use less pharmacotherapy.

Adjusting for case mix, diagnosis by a psychiatrist is associated with approximately six more psychotherapy visits than if the diagnosis is by a primary care physician.† The

* We modeled the zero generating process as a logistic function of all *x*'s. Changing the list of regressors or functional form of the zero generating process proved uninformative. The estimated zero inflation statistic in **Table 2** is the statistic[21] that one uses to check the non-nested hypothesis whether the zero-inflated negative binomial model detects excess zeros after controlling for overdispersion.[22] When the data support a ZINB model the absolute value of the computed Vuong statistic is at least 2.0. As a point of reference, the estimated marginal effect of a psychiatrist is about 15 percent smaller in a model where we purposely incorrectly ignore zero inflation.

* We note that lack of a coinsurance rate effect is driven by the fact that the rate varies little across the patients of primary care physicians and other mental health specialists. A separate count regression for only the patients of psychiatrists shows a significantly negative coinsurance rate effect on psychotherapy visits such that a doubling of the coinsurance rate leads to 25 percent fewer visits. The possibility of heterogeneity in the effect of health care plan characteristics across providers remains an interesting issue for future research.

† As a basic robustness check we estimated the psychotherapy model in **Table 2** using Tobit regression. The results were similar in that the estimated marginal effect of having a psychiatrist provider was a statistically significant 6.2 additional visits with no significant difference for non-physician mental health specialist.

Table 4. Treatment failure - Logit regression

	Coefficient	Std. Error	t-ratio	P-value	Marginal Effect	Std. Error	t-ratio	P-value
Constant	-0.322	0.449	-0.717	0.473	0.052	0.072	-0.719	0.472
Age	-0.013	0.009	-1.443	0.149	-0.002	0.001	-1.445	0.149
Female	-0.338	0.189	-1.790	0.074	-0.054	0.030	-1.794	0.073
Major Depression, Single Episode	-0.103	0.258	-0.399	0.690	-0.017	0.041	-0.399	0.690
Major Depression, Recurrent	-0.133	0.338	-0.392	0.695	-0.021	0.054	-0.392	0.695
Dysthymia	0.076	0.221	0.343	0.732	0.012	0.035	0.343	0.732
Reactive Depression	0.176	0.335	0.524	0.600	0.028	0.054	0.524	0.600
Log Pre-Diagnosis Costs	-0.015	0.032	-0.466	0.641	-0.002	0.005	-0.466	0.641
Anxiolytic Prescriptions	0.036	0.011	3.261	0.001	0.006	0.002	3.267	0.001
Comorbidities	0.077	0.029	2.617	0.009	0.012	0.005	2.625	0.009
Psychiatrist	-0.682	0.241	-2.829	0.005	-0.109	0.038	-2.851	0.004
Non-MD Mental Health Specialist	-0.216	0.253	-0.853	0.393	-0.035	0.040	-0.854	0.393
Plan Coinsurance Rate	-0.986	1.013	-0.974	0.330	-0.158	0.162	-0.976	0.329
Case Management	0.565	0.165	3.420	0.001	0.091	0.026	3.450	0.001
Antidepressant Prescriptions	-0.063	0.011	-5.945	0.000	-0.010	0.002	-6.229	0.000
Psychotherapy Visits	0.004	0.009	0.510	0.610	0.001	0.001	0.510	0.610

relative therapy mix outcome is quite different for diagnosis by non-physician mental health specialists. In contrast to the results for psychiatrists, there is a quantitatively small but insignificant increase in the use of psychotherapy subsequent to an initial diagnosis by a non-physician mental health specialist. After adjusting for case-mix, diagnosis by a non-physician mental health specialist does not result in any additional psychotherapy visits than does diagnosis by a primary care physician.

The case-mix adjusted differential in the amount of psychotherapy in **Table 2** between psychiatrists and other providers is about the same as the unadjusted difference in **Table 1**; patients whose initial providers were psychiatrists got about twice the psychotherapy as patients whose initial providers of anti-depression therapy were general medical practitioners or non-physician mental health specialists. Even when faced with patients of the same age, gender, depression type and general health, psychiatrists' patients receive substantially more psychotherapy than the patients of other types of initial providers of anti-depression therapy. An interesting question that we attempt to address shortly is whether greater amounts of psychotherapy also reduce the likelihood that the anti-depression treatment fails.

Anti-depressant Medication

The results for the truncated count model of anti-depressant prescriptions appear in **Table 3**. The most striking result is that the presence of case management in the health plan is significantly associated with the number of antidepressant prescriptions, increasing the number of prescriptions by more than three. Using the mean as a point of reference, case management increases the intensity of pharmacotherapy by about 30 percent. No other covariates had a large statistically significant estimated marginal effect as case management. The most important result to emerge from our truncated negative binomial count model of anti-depression pharmacotherapy is that the case-mix adjusted results for inter-provider differences mimic the unadjusted results of **Table 1**. We find no differences across the initial provider in the amounts of anti-depressant prescriptions that patients fill.*****

Treatment Failure

One way to assess the quality of anti-depression treatment is by examining whether a person receives any therapy at all or discontinues therapy early, failing to complete an adequate amount of therapy according to recommended guidelines.[23, 24] Another way to meter success is to examine the downstream consequences of therapy by noting whether a patient suffers a treatment failure. In our data about 22 percent of patients have a failed treatment. **Table 4** presents logit coefficient estimates for how intensity of treatment and provider type influence the probability of treatment failure, *ceteris paribus.*

The most notable results concerning treatment success as indicated by a reduced likelihood of treatment failure relate to having a psychiatrist provider. In **Table 4** we capture

* As a basic robustness check we also estimated the pharmacotherapy model in **Table 3** using truncated normal regression.[22] The results were similar in that there were also no statistically significant differences across providers in the number of anti-depressant prescriptions filled.

treatment in three dimensions: the amount of psychotherapy, the amount of pharmacotherapy, and the type of treatment provider. Recall that the count regression results in earlier tables had patients of psychiatrists receiving significantly more psychotherapy so that one way a psychiatrist could reduce the likelihood of a failed treatment for depression is by greater amounts of psychotherapy. The results in **Table 4** reveal that, after controlling for diagnosing provider type, the number of psychotherapy visits does not affect the likelihood of treatment failure.

Although the amount of psychotherapy does not affect treatment failure, the amount of pharmacotherapy does affect treatment failure in our data. Using the mean as a reference point, an extra anti-depressant prescription lowers the probability of treatment failure by about 4-5 percent (-0.01/ 0.22). Because our results in **Table 3** indicated no differences in the amount of pharmacotherapy across providers, however, there is no direct effect on treatment failure of a psychiatrist provider through any differential amount of anti-depression medication.

What we find is more subtle, holding psychotherapy visits and anti-depressant prescriptions constant, having a psychiatrist initial provider lowers the probability of a failed treatment by almost 50 percent using the mean likelihood of treatment failure as a reference point

$$(ME / \overline{P} = -0.109 / 0.223 = 0.49)$$

In our data there appears to be a benefit of having a psychiatrist provider in terms of reducing the chance of having a failed treatment for depression that is over and above the measured amounts of psychotherapy and pharmacotherapy psychiatrists provide relative to other providers.

Discussion

Our research objectives have centered on understanding any connections among the intensity of psychotherapy received by depressed patients who also receive an antidepressant with an eye for several questions of medical interest. Do there appear to be significantly different amounts of psychotherapy across providers, and how large are the inter-provider differences in psychotherapy? Is there a relationship between intensity of psychotherapy and intensity of pharmacotherapy? Finally, are there quantitatively important inter-provider differences in anti-depression treatment success as measured by the likelihood of treatment failure and how is any difference related to inter-provider differences in the intensity of pharmacotherapy versus the intensity of psychotherapy?

We find that after adjusting for case mix psychiatrists' patients receive almost twice the number of psychotherapy visits but fill no more prescriptions for anti-depressant medication than the patients of general medical providers or non-physician mental health specialists. In the sense that psychiatrist's patients get more psychotherapy than other providers' patients but no more or less pharmacotherapy, there is no obvious pattern across providers for combining pharmacotherapy and psychotherapy. It appears that decisions regarding use of psychotherapy and pharmacotherapy are largely independent.

Although the research presented here generally agrees with prior research there are patterns of treatment we observe that are also somewhat surprising. For example, although the first treatment for depression appears to depend largely on the specialty of the provider at the point of entry,[24] among patients receiving medication the number of visits and the number of prescriptions appears independent of who first diagnosed a patient's depression. The only exception to the diagnoser-treatment pattern is the finding that psychiatrists use more psychotherapy than other providers; whether a patient first entered care through a general medical doctor or through a non-physician specialist makes no difference in the relative amount of psychotherapy and pharmacotherapy received.

We note some limitations to our study that require careful interpretation of the results. First is the difficulty of identifying clinical events in claims data. We acknowledge that unmeasured patient characteristics and diagnostic patterns could differ systematically across providers. For example, psychiatrists might be more likely to diagnose a patient with recurrent major depressive disorder while a primary care provider might be more likely to diagnose a patient with depression NOS. **Table 1** demonstrates differences in the frequencies of diagnostic codes by provider type although our claims data do not allow us to explore more rigorously whether **Table 1** captures case-mix differences or differences in provider habits. If there are differences in provider diagnosing habits then our results pertaining to diagnosis categories actually reflect differences attributable to provider type.

Another limitation of our study is that our data identify only the provider that initiates the patient's treatment by diagnosing the depressive disorder. Our data do not identify the provider type associated with each subsequent encounter. Clearly, some patients in our sample are subsequently treated by a different provider type than the one making the initial diagnosis, whether or not they continue to see the diagnosing provider. The most obvious case is that of a person diagnosed by a non-physician mental health specialist, who generally does not have the ability to prescribe medication. Persons initially seeing a non-physician mental health provider must be referred to other providers to receive a prescription for antidepressant medication. Our conclusions regarding provider type are then limited to implications about the effect of the type of provider initiating the treatment. We believe that our results, even as just qualified, are informative because they suggest the importance of the provider's role as treatment gatekeeper.

Our research has several implications for research, clinical practice, and mental health policy. The notion that receiving treatment from psychiatrists may be associated with reductions in the incidence of treatment failure is provocative, but we must acknowledge a possible confound imposed by how treatment failure is identified here. Specifically, treatment failure here means that a new "clean" period with no evidence of pharmaco- or psychotherapy occurs between episodes of medication treatment, but we could fail to observe a gap in treatment because of the increase in the number of

psychotherapy visits associated with psychiatrists. Suppose psychiatrists are more likely to see patients intermittently in follow up for a prior episode. If the frequency of follow-up visits is every three months or more, then we do not observe a "clean" period and have no opportunity to observe a treatment failure even if one occurs clinically. Our results regarding psychiatrists should be interpreted with caution but provide an opportunity to investigate further the relationship between provider type and treatment failure.

As is true for other studies that rely on MarketScan data, we report relatively high levels of quality of pharmacotherapy. Nearly three in four patients in our study received care consistent with clinical practice guidelines.* The relatively high baseline in mind, it appears that psychiatrists are more likely to offer additional psychotherapy to their patients. Our findings of a link between initial provider and psychotherapy are consistent with the hypothesis that the additional psychotherapy may be used for patients whose symptoms are resistant to treatment but who nonetheless may receive high quality treatment, which is another line of research to pursue.

About a third of the plans we study used case management, which is associated with more prescriptions. Because the case management identified in MarketScan represents a form of utilization review designed to limit care to persons most in need, we hypothesize that plans who make use of the case-management cost-containment tool may also use quality improvement strategies that improve care. Because we cannot explicitly control for depression severity in our study, our finding of a positive correlation between case management and the probability of treatment failure might suggest that plans target case management toward patients who are more severely depressed and likely to have a failed treatment. Our finding of a positive link between case management and pharmacotherapy intensity represents both an opportunity for research and an example for clinical practice.

Finally, we point to the finding that pharmacotherapy and psychotherapy appear to be used independently and not as substitutes or complements among patients with some pharmacotherapy. Because the two treatments have similar efficacy rates, economists have tended to view them as perfect substitutes. We suggest that physicians appear to apply the two therapies on an individual basis, perhaps attempting to individualize treatment based on need and patient preferences, a worthy if difficult goal.

Disclaimer

This paper does not represent policy or the position of the Office of Applied Studies, the Substance Abuse and Mental Health Services Administration, the U.S. Department Health and Human Services, Syracuse University, Indiana University, the RAND Corporation, or Eli Lilly and Company, and no official endorsement by any of these organizations is intended or should be inferred.

Acknowledgements

The authors acknowledge the helpful comments of Peter Sun and the expert manuscript preparation help of Mindy Tanner and Laura Sauta.

References

1. Olfson M, Marcus S, Druss B, Elinson L, Tanielian T, Pincus H. National trends in the outpatient treatment of depression. *J Am Med Assoc* 2002; **287**: 203-209.
2. Paykel E. Psychotherapy, medication combinations, and compliance. *J Clin Psychiatry* 1995; **56**: 24-30.
3. Miller VW, Keitner GI. Combined medication and psychotherapy in the treatment of chronic mood disorders. *Psychiatr Clin North Am* 1996; **19**: 151-171.
4. Keller MB, McCullough JP, Klein DN, Arnow B, Dunner DL, Gelenberg AJ, Markowitz JC, Nemeroff CB, Russell JM, Thase ME, Trivedi MH, Zajecka J. A comparison of nefazodone, the cognitive behavioral-analysis system of psychoterapy, and their combination for the treatment of chronic depression. *N Engl J Med* 2000; **342**: 1462-1470.
5. Persons J, Thase M, Crits-Christoph P. The role of psychotherapy in the treatment of depression: Review of two practice guidelines. *Arch Gen Psychiatry* 1996; **53**: 283-290.
6. American Psychiatric Association. Practice guideline for the treatment of patients with major depressive disorder (revision). *Am J Psychiatry* 2000; **157** (Supplement).
7. Thase ME. Integrating psychotherapy and pharmacotherapy for treatment of major depressive disorder: Current status and future considerations. *J Psychother Pract Res* 1997; **6:** 300-306.
8. Clarkin JF, Pilkonis PA, Magruder KM. Psychotherapy of depression: Implications for reform of the health care system. *Arch Gen Psychiatry* 1996; **53**: 717-723.
9. Meredith LS, Wells KB, Kaplan SH, Mazel RM. Counseling typically provided for depression: Role of clinician specialty and payment system. *Arch Gen Psychiatry* 1996; **53**: 905-912.
10. Sharfstein S. 1999. Psychotherapy and managed care: Compatible or incompatible? In *Psychotherapy: Indications and Outcomes*. Washington, DC: American Psychiatric Press, Inc.
11. Gabbard GO, Lazar SG, Hornberger J, Spiegel D. The economic impact of psychotherapy: A review. *Am J Psychiatry* 1997; **154**: 147-155.
12. DeRubeis RJ, Gelfand LA, Tang TZ, Simons A. Medications versus cognitive behavioral therapy for severely depressed outpatients: Mega-analysis of four randomized comparisons. *Am J Psychiatry* 1999; **156**: 1007-1013.
13. Sood N, Treglia M, Obenchain RL, Dulisse B, Melfi CA, Croghan TW. Determinants of antidepressant treatment outcome. *Am J Manag Care* 2000; **6**: 1327-1336.
14. Delgado MS, Kniesner TJ. Count data models with variance of unknown form: An application to a hedonic model of worker absenteeism. *Rev Econ Stat* 1997; **79:** 41-49.
15. Cameron AC, Trivedi PK. *Regression Analysis of Count Data* New York: Cambridge University Press, 1998.
16. Freund DA, Kniesner TJ, LoSasso AT. Dealing with the common econometric problems of count data with excess zeros, endogenous treatment effects, and attrition bias. *Econ Lett* 1999; **62**: 7-12.
17. Jones AM. 2000. Health Econometrics. In *Handbook of Health Economics, Volume 1A.* Amsterdam: Elsevier Science B.V., chapter 6.
18. Winkelmann R. *Econometric Analysis of Count Data: Third, Revised and Enlarged Edition* Berlin: Springer-Verlag, 2000.
19. Greene WH. *LIMDEP, Version 7.0 User's Manual Revised Edition* Plainview, NY: Econometric Software, Inc., 1998.
20. Melfi CA, Chawla AJ, Croghan TW, Hanna MP, Kennedy S, Sredl K. The effects of adherence to antidepressant treatment guidelines on relapse and recurrence of depression. *Arch Gen Psychiatry* 1998; **55**: 1128-1132.
21. Vuong QH. Likelihood ratio tests for model selection and non-nested hyphotheses. *Econometrica* 1989; **57**: 307-333.
22. Greene WH. *Econometric Analysis, Fifth Edition* Upper Saddle River, NJ: Prentice-Hall, Inc., 2003.
23. Dobrez DG, Melfi CA, Croghan TW, Kniesner TJ, Obenchain RL. Antidepressant treatment for depression: Total charges and therapy duration. *J Ment Health Policy Econ* 2000; **3**: 187-198.
24. Kniesner TJ, Powers RH, Croghan TW. *Provider type and depression treatment adequacy.* CPR Working Paper No. 43. Syracuse, NY: Center for Policy Research, 2003.

* To assess whether treatment is consistent with clinical practice guidelines, we measure whether a patients received five or more antidepressant prescriptions or two or more psychotherapy visits. For discussion see.[24]