

Financial Factors and the Implementation of Medications for Treating Opioid Use Disorders

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Objectives: Despite the established effectiveness of pharmacotherapies for treating opioid use disorders, implementation of medications for addiction treatment (MAT) by specialty treatment programs is limited. This research examined relationships between organizational factors and the program-level implementation of MAT, with attention paid to specific sources of funding, organizational structure, and workforce resources.

Methods: Face-to-face structured interviews were conducted in 2008 to 2009 with administrators of 154 community-based treatment programs affiliated with the National Institute on Drug Abuse's Clinical Trials Network; none of these programs exclusively dispensed methadone without offering other levels of care. Implementation of MAT was measured by summing the percentages of opioid patients receiving buprenorphine maintenance, methadone maintenance, and tablet naltrexone. Financial factors included the percentages of revenues received from Medicaid, private insurance, criminal justice, the Federal block grant, state government, and county government. Organizational structure and workforce characteristics were also measured.

Results: Implementation of MAT for opioid use disorders was low. Greater reliance on Medicaid was positively associated with implementation after controlling for organizational structure and workforce measures, whereas the association for reliance on criminal justice revenues was negative.

Conclusions: The implementation of MAT for opioid use disorders by specialty addiction treatment programs may be facilitated by Medicaid but may be impeded by reliance on funding from the criminal justice system. These findings point to the need for additional research that considers the impact of organizational dependence on different types of funding on patterns of addiction treatment practice.

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Opportunities to effectively treat opioid use disorders (OUDs) are enhanced by the availability of pharmacological treatments. Unlike substance use disorders (SUDs) associated with stimulants or cannabis where such treatments are not yet available, there are effective pharmacological treatments for OUDs, namely methadone, buprenorphine, tablet naltrexone, and, most recently, a depot formulation of naltrexone. The diffusion of buprenorphine and naltrexone has been remarkably slow, in part because of the financial resources required to implement pharmacotherapies.

For the past 40 years, specialized opioid treatment programs (OTPs) offering methadone have been the primary setting for treating opioid-dependent patients. Historically, the nation's OTPs have been inadequate in number to meet the demand for treatment. In 2000, before the Food and Drug Administration's (FDA's) approval of buprenorphine, OTPs constituted just 9% of US treatment facilities for SUDs, and methadone was included in the treatment plans of just 40% of all opioid treatment admissions (Substance Abuse and Mental Health Services Administration, 2002). The combination of the FDA's approval of newer medications (Ling and Smith, 2002; Saxon and McCarty, 2005) and regulatory changes allowing for the prescription of buprenorphine in non-OTP settings (Jaffe and O'Keefe, 2003) has increased the potential of expanding medications for addiction treatment (MAT) throughout the treatment system (Roman et al., 2011).

Although the number of medications for OUDs has expanded, studies on the "research-to-practice gap" (Lamb et al., 1998) have repeatedly shown that such medications have not been widely adopted by treatment programs outside of the OTP system (Knudsen et al., 2006; Koch et al., 2006; Ducharme et al., 2007; Knudsen et al., 2007; Heinrich and Hill, 2008; Thomas et al., 2008; Friedmann et al., 2010; Knudsen et al., 2010; Wallack et al., 2010; Knudsen et al., 2011a; Savage et al., 2012). Little is known about the implementation, or routine use, of MAT. To date, health services research has largely focused on medication adoption, measured by a dichotomous measure of availability, rather than implementation (Garner, 2009). A single study of MAT implementation for OUDs revealed limited implementation within adopting programs, with just 34.4% of patients with OUDs actually receiving MAT (Knudsen et al., 2011b). The study did not analyze variations in implementation across programs in the sample.

Financial factors are often described as barriers to the delivery of pharmacotherapies in addiction treatment (Rieckmann et al., 2010; Knudsen et al., 2011a). Resource dependence theory points to the relevance of funding sources for MAT implementation. This theoretical perspective contends that organizational strategy represents efforts to manage relationships with external entities that provide important resources (Pfeffer, 1987; Fennell and Warnecke, 1988). Treatment organizations must manage multiple external relationships because they typically receive funding from a mixture of sources, including Federal block grants, Medicaid, state and local government allocations, contracts with criminal justice, and private insurance reimbursement (Cartwright and Solano, 2003; Mark et al., 2005; Kubiak et al., 2009; Rieckmann et al., 2009; Stewart and Horgan, 2011; Thomas et al., 2011).

This heterogeneity of funding, with each funder having its own priorities and goals, likely has implications for the implementation of MAT. Although states currently vary in the services covered by Medicaid (Garfield et al., 2010), previous research has demonstrated that greater reliance on Medicaid is positively associated with the adoption of SUD medications (Knudsen et al., 2010). Other research revealed that programs receiving any government funds were less likely to adopt buprenorphine, but that having at least 1 managed care contract was positively associated with adoption (Ducharme and Abraham, 2008). Historically, the criminal justice system has not embraced the use of medications to treat addiction. Correctional institutions have been slow to adopt medications for treating OUDs (Smith-Rohrberg et al., 2004; Rich et al., 2005), and less than one third of administrators of Departments of Corrections indicate that medications are an ancillary service provided to offenders receiving community-based services (Kubiak et al., 2009).

This research examines the implementation of MAT for OUDs in a subsample of treatment programs within the National Drug Abuse Treatment Clinical Trials Network (CTN). The CTN partners university-based researchers with specialty addiction treatment programs across the United States to conduct multisite clinical trials of treatment interventions in heterogeneous settings and to disseminate evidence-based treatment practices (Hanson et al., 2002). It includes the full range of drug treatment modalities: outpatient “drug free” programs, therapeutic communities, OTPs, inpatient hospital-based programs, and complex organizations delivering varying levels of care at multiple sites (Ducharme et al., 2007; McCarty et al., 2008).

Drawing on data from 152 treatment centers within the CTN, this research addresses 2 questions. First, is greater reliance on certain types of financial resources associated with MAT implementation? Second, are financial factors associated with the implementation of MAT after controlling for organizational structure and workforce characteristics?

METHODS

Sample and Data Collection

Data are drawn from the ongoing National Treatment Center Study, which includes research on the community-

based addiction treatment organizations affiliated with the CTN (Roman et al., 2010). To be eligible for this study, organizations were required to offer either methadone maintenance as an OTP or a level of treatment at least equivalent to the American Society of Addiction Medicine (ASAM) definition of *outpatient services* (Mee-Lee et al., 1996). Some organizations were housed in a single facility, whereas others consisted of multiple treatment centers, defined as organizational units with autonomous administrators who held discretionary control over their units' budget. When multiple treatment centers were embedded within a single organization, data were collected from the administrator and/or clinical director at each center. In 2008 to 2009, we identified 238 eligible treatment centers. Administrators and/or clinical directors of 198 treatment centers participated in face-to-face interviews (response rate = 84.7%). The research design was approved by the institutional review boards of the University of Georgia and University of Kentucky.

For this analysis, 42 OTPs that did not offer other ASAM-defined levels of care were excluded because their implementation of MAT is essentially 100% (ie, universal implementation is accomplished because MAT is their raison d'être). Treatment centers offering methadone and other ASAM-defined levels of care ($n = 11$) were included because MAT was not the only treatment option for patients with OUDs, as evidenced by an average rate of MAT less than 50% in these 11 centers. These criteria restricted the analytic sample to 156 treatment centers.

Measures

The measure of implementation of MAT for OUDs was constructed by summing the percentages of patients with OUDs receiving buprenorphine for maintenance, tablet naltrexone, and methadone maintenance. At the time of the study, the depot injectable formulation of naltrexone had not received FDA approval for OUD treatment. Implementation for each medication was first measured, with programs not offering a particular medication being coded as zero. Then, the 3 indicators were summed to yield an aggregate measure of MAT implementation.

For sources of revenues, administrators were asked what percentage of past-fiscal year revenues came from Medicaid, private insurance, the criminal justice system, the Federal block grant, state government (excluding block grant funding), and county government. To maximize accuracy, administrators were sent these questions before the interview so that they could consult financial records.

Organizational variables consisted of both structural and workforce measures. Three structural variables were measured: location within a hospital setting (1 = hospital-based, 0 = nonhospital), profit status (1 = for-profit, 0 = nonprofit), and delivery of outpatient-only services (1 = outpatient-only, 0 = offers inpatient/residential services). Workforce characteristics included measures of both physicians and counselors. We constructed a measure of physicians on staff by summing the numbers of psychiatrists and other physicians who were employed by the center (ie, on the payroll). Workforce professionalism was measured by the percentage of counselors

who held at least a master’s level degree and the percentage of counselors who were personally in recovery.

Statistical Analysis

To address missing data on the covariates, we used multiple imputation by chained equations. If we had used listwise deletion, 13.9% of treatment centers would have been excluded from the analysis. Consistent with the recommendation of Allison (2009), we excluded 4 centers with missing data for the dependent variable. Imputation was performed using the “ice” command in Stata 12.0 (Royston, 2005a,b), which generated 20 imputed data sets.

Our models of MAT implementation relied upon negative binomial regression (Long and Freese, 2006). The decision to use negative binomial regression rather than ordinary least squares (OLS) regression was informed by 3 factors. First, respondents reported the percentage of patients receiving medications as a whole number; although OLS regression assumes truly continuous variables (ie, not whole numbers), negative binomial regression is an appropriate method for dependent variables represented by counts. Second, negative values for MAT implementation were impossible, which violated another assumption of OLS regression. Finally, negative binomial regression can handle substantially skewed data where a sizeable proportion of cases are zero on the dependent variable (Beck and Tolnay, 1995; Long, 1997).

An additional analytic challenge was that the measures of financial factors were not truly independent from each other. For example, a higher percentage of revenues from Medicaid meant that the other sources of revenues could only be lower. Therefore, we estimated a set of bivariate negative binomial regression models for each of the 6 financial factors. Then, we estimated multivariate models for each financial factor that was significant at the bivariate level ($P < 0.05$, 2-tailed test) with the organizational and workforce variables. For all models, we used the “mi estimate” command, which pooled the estimates from the 20 imputed data sets into a single set of results (Barnard and Rubin, 1999; Royston, 2004). We included the “cluster” option (Long and Freese, 2006), which yields robust standard errors to account for data nesting (ie, multiple treatment centers nested within a single organization).

RESULTS

In these treatment centers, 17.0% had adopted buprenorphine, 9.3% had adopted naltrexone, and 7.2% offered methadone for the treatment of OUDs. Overall, the average level of implementation of MAT was low, reaching only an average of 9.6% of patients with OUDs. This low level of implementation was driven by the sizeable percentage (76.3%; $n = 116$) of treatment centers that had not implemented MAT for any OUD patients. Implementation was considerably greater in the 36 programs that offered at least one of the medications for OUDs, with an average of 40.4% of OUD patients receiving MAT ($SD = 34.9$).

Other descriptive statistics appear in Table 1. In the average treatment center, the 2 largest sources of revenues were state governments (meaning, allocations apart from the Federal block grant) and Medicaid. All of these measures had large standard deviations, indicating the heterogeneity

of treatment center funding. The vast majority were located outside of hospital settings and operated on a nonprofit basis. About half of these centers offered only outpatient treatment. The average number of physicians was slightly less than 1, reflecting the fact that about half (53.0%; $n = 79$) did not have any physicians on staff.

Table 2 presents bivariate negative binomial regression models for each of the 6 financial factors. Three of the financial factors were significantly associated with MAT implementation. First, there was a positive association between the percentage of past-fiscal year revenues from Medicaid and MAT implementation. Greater reliance on revenues from the criminal justice system was negatively associated with MAT implementation. There was a negative association between

TABLE 1. Descriptive Statistics of Organizational Characteristics of Treatment Programs Within the Clinical Trials Network

Variable	Mean (SD) or % (N)
Implementation of medications for treating opioid use disorders	9.56 (24.06)
Financial factors	
% past-fiscal year revenues from Medicaid	18.99 (25.17)
% past-fiscal year revenues from private insurance	12.81 (22.26)
% past-fiscal year revenues from criminal justice system	4.12 (13.95)
% past-fiscal year revenues from Federal block grant	11.18 (22.00)
% past-fiscal year revenues from state government (nonblock grant)	23.06 (31.97)
% past-fiscal year revenues from county government	9.06 (17.69)
Structural characteristics	
Hospital-based	12.0% (18)
For-profit	8.6% (13)
Outpatient-only	51.0% (76)
Workforce characteristics	
Number of physicians on staff	0.96 (1.42)
% counselors with master’s-level degree or higher	46.90 (36.04)
% counselors personally in recovery	39.05 (34.04)

Descriptive statistics reflect available data before imputation; sample sizes ranged from 137 to 152 treatment centers.

TABLE 2. Unadjusted Negative Binomial Regression Models of Financial Factors and Implementation of Medications for Treating Opioid Use Disorders*

	Unadjusted <i>b</i> (Robust SE)
% past-fiscal year revenues from Medicaid	0.024 (0.011)*
% past-fiscal year revenues from private insurance	0.024 (0.014)†
% past-fiscal year revenues from criminal justice system	−0.061 (0.024)*
% past-fiscal year revenues from Federal block grant	−0.007 (0.011)
% past-fiscal year revenues from state government (ie, not the Federal block grant)	−0.015 (0.012)
% past-fiscal year revenues from county government	−0.023 (0.011)*

Models adjust for the nesting of treatment programs within 70 organizations. * $P < 0.05$; † $P < 0.10$ (2-tailed tests). *b*, unstandardized coefficient; SE, standard error.

MAT implementation and reliance on funding from county governments.

Next, organizational and workforce variables were added to the models for these 3 significant financial factors (Table 3). Controlling for organizational structure and workforce characteristics, reliance on Medicaid continued to be positively associated with MAT implementation (model 1). Although the unstandardized coefficient may seem small, the magnitude of this association became clearer when the change in the expected count of MAT implementation was calculated for a standard deviation increase in reliance on Medicaid. The expected count of MAT implementation increased by about 96.1% for a standard deviation (SD = 24.06) change in the percentage of revenues from Medicaid [$96.1 = (100)(e^{0.028 \times 24.06} - 1)$]. Consistent with the bivariate model, there was a negative association between reliance on funding from the criminal justice system and MAT implementation (model 2). A standard deviation (SD = 13.95) increase in the percentage of revenues from the criminal justice system reduced the expected count of MAT implementation by nearly half [$-48.1 = (100)(e^{-0.047 \times 13.95} - 1)$]. As seen in model 3, reliance on revenues from county governments trended toward, but did not achieve, statistical significance once structural and workforce variables were added to the model.

Although our main goal was to examine sources of revenues in relation to MAT implementation, we also examined the associations for organizational and workforce characteristics because of the paucity of prior MAT implementation studies. Across the 3 models, location in a hospital setting was associated with MAT implementation. Using model 1 as an example, the difference in the expected count of MAT implementation between hospital-based and non-hospital-based programs was about 375.9% [$375.9 = (100)(e^{1.560} - 1)$]. For-profit programs reported significantly lower MAT implementation than nonprofit programs in 2 of the 3 models; in the model of criminal justice funding, the *P* value for profit status was 0.051. Based on model 1, the expected count for MAT implementation was about 90.2% lower in for-profit centers than in nonprofit centers [$90.2 = (100)(e^{-2.321} - 1)$]. The number of physicians was positively associated with MAT implementation in 2 of the 3 models; the association in model 1

trended toward, but did not achieve, significance (*P* = 0.087). Similarly, workforce professionalism, as measured by the percentage of master's-level counselors, was positively associated with implementation in 2 of the 3 models. In model 3, workforce professionalism was not statistically significant, although the direction of the association was consistent with the other 2 models (*P* = 0.091).

DISCUSSION

This study pioneers the examination of the relationships between financial factors and the implementation of MAT for OUDs. The scope of implementation varies by the perspective taken on the data. Implementation of MAT, defined as the percentage of OUD patients receiving pharmacotherapy, was particularly low when addiction treatment centers that had adopted no medications were included in the analysis. Restricting the data set to only those centers that had adopted at least 1 OUD medication yielded a rate of implementation (40%) that was slightly higher than a prior study of privately funded addiction treatment programs (34%) (Knudsen et al., 2011b).

Multivariate models indicated that greater reliance on Medicaid for funding was positively associated with MAT implementation. It is important to note that Medicaid itself has historically been implemented differently across states in terms of which treatment services are covered (Garfield et al., 2010; Terry-McElrath et al., 2011). There has been a tendency within the SUD treatment field to regard Medicaid policies as a hindrance to innovation adoption, a perspective not supported by these data. A vital direction for future research is to link state-level data regarding Medicaid policy with program-level data on MAT implementation. Collection of Medicaid policy data was beyond the scope of this study, so we were unable to control for whether programs were located in states where Medicaid provided coverage for MAT and included these medications on its formulary. Resource dependence theory suggests that supportive state policies would likely result in greater implementation of MAT (Kubiak et al., 2009; Thomas et al., 2011), although the presence of a supportive state policy is no guarantee that programs will accept Medicaid payment (Terry-McElrath et al., 2011).

TABLE 3. Multivariate Negative Binomial Regression Models of Implementation of Medications for Treating Opioid Use Disorders

	Model 1 <i>b</i> (Robust SE)	Model 2 <i>b</i> (Robust SE)	Model 3 <i>b</i> (Robust SE)
% past-fiscal year revenues from Medicaid	0.028 (0.014)*	—	—
% past-fiscal year revenues from criminal justice system	—	-0.047 (0.023)*	—
% past-fiscal year revenues from county government	—	—	-0.025 (0.145)†
Hospital-based (vs nonhospital)	1.600 (0.620)*	1.975 (0.757)‡	2.615 (0.973)‡
For-profit (vs nonprofit)	-2.321 (0.911)*	-1.730 (0.889)†	-2.290 (1.095)*
Outpatient-only (vs not outpatient-only)	-1.225 (0.940)	-0.559 (0.700)	-0.260 (0.817)
Number of physicians on staff	0.404 (0.235)†	0.437 (0.205)*	0.518 (0.244)*
% counselors with master's-level degree or higher	0.028 (0.012)*	0.028 (0.011)*	0.021 (0.013)†
% counselors personally in recovery	-0.000 (0.009)	0.001 (0.009)	0.001 (0.009)
Constant	-0.158 (0.957)	0.131 (0.863)	0.226 (0.869)
Alpha	13.992 (3.658)	14.410 (3.810)	14.403 (3.808)

Models adjust for the nesting of treatment programs within 70 organizations.

**P* < 0.05; †*P* < 0.10; ‡*P* < 0.01.

b, unstandardized coefficient; SE, standard error.

The positive association between Medicaid funding and MAT implementation may suggest that the impending roll-out of key provisions in the Patient Protection and Affordable Care Act of 2010 (ACA; ie, health reform) could be beneficial for OUD patients. Under ACA, the number of people covered by Medicaid is poised to expand considerably (Holahan and Headen, 2010) and will likely include significant numbers of individuals with SUDs (Buck, 2011; Stewart and Horgan, 2011). Notably, the ACA requires parity such that Medicaid will offer the essential benefits that are available via the state insurance exchanges. It is expected that these changes will increase funding for SUD treatment via Medicaid (Buck, 2011), which may increase access and implementation of MAT, given our current findings regarding Medicaid. Future research should examine whether the ACA has these intended consequences and whether there are unanticipated consequences for the implementation of MAT and other services.

In contrast to the positive association for Medicaid, greater reliance on criminal justice funding was negatively associated with MAT implementation. This finding was not unexpected, given the work of Kubiak et al. (2009), who surveyed state Department of Corrections leaders and found that medications were generally not a highly prioritized treatment service for these purchasers of treatment services. Historically, the criminal justice system has been slow to view MAT as an acceptable part of the treatment process (Chandler et al., 2009; Marlowe, 2011), and few correctional institutions have actively attempted to refer opioid-dependent offenders to MAT in the community (Rich et al., 2005; Nunn et al., 2009). Despite the consistency between our findings and these prior studies, more data are needed to develop an in-depth understanding of the reasons behind the limited adoption and implementation of medications for individuals involved with the criminal justice system. Diversion programs, drug courts, and the delivery of treatment under correctional auspices involve an intermingling of medical and justice paradigms that may suggest conflicts between key assumptions of these 2 systems. Addressing the complexities of increasing implementation of MAT for individuals under community corrections supervision (ie, probation or parole) is a focus of the Criminal Justice Drug Abuse Treatment Studies 2 initiative, which may yield additional insights regarding how to improve access to MAT for drug-involved offenders (Friedmann et al., 2012).

The trend of county funding being negatively associated with MAT implementation seems a somewhat unique finding. It may suggest a lower level of exposure to newer treatment modalities at this level of decision making. It may also represent greater influence at the county level of local persons from the recovery community, perhaps with a stronger orientation toward traditional 12-step and drug-free treatment modalities.

Our analysis focused on treatment organizations, but factors beyond financing are likely to explain additional variance in MAT implementation. Studies are needed about how physicians make prescribing decisions. Data from pharmacies have shown increases in the numbers of MAT prescriptions over time (Mark et al., 2009), but little is known about the factors that physicians consider when deciding whether to prescribe MAT to their patients. For example, what is the impact of a patient's primary source of payment for treatment on prescribing

decisions? Previous work examining barriers to prescribing naltrexone for patients with alcohol use disorders found that patients' inability to afford medication was a prevalent barrier (Mark et al., 2003). It is less clear whether physicians are more likely to prescribe MAT for insured patients, such as those with Medicaid.

In addition, research is needed regarding the preferences of patients. There is little reason to assume readiness for public acceptance of MAT, except for the possibility of positive attitudes generated from knowing individuals who have benefited from methadone treatment. To date, diffusion of information about the technology of MAT into public media has been minimal in that it has not been the target of any organized educational campaign. Receiving treatment outside the OTP system may be a signal that some patients with OUDs prefer not to include pharmacotherapy in their treatment plan. However, where patients receive treatment is constrained by availability of treatment in the local context. Furthermore, patients cannot exert their preferences when programs do not offer MAT. Nonetheless, the dearth of available data means that we cannot untangle the complexities of how much of the variance in MAT implementation can be traced back to prescribers' behaviors and patients' preferences for treatment.

Several limitations of the research design should be noted. First, these data are cross-sectional, which limits our ability to determine causal relationships between financial factors and the implementation of MAT for OUDs. We are currently collecting another round of data from CTPs in the CTN, so we plan to conduct longitudinal analyses once data collection is complete. While diverse in the types of treatment centers (eg, outpatient, hospital inpatient, residential) that are affiliated with it (McCarty et al., 2008), the CTN does not constitute a random sample, which may limit the extent to which these findings may generalize to the rest of the US addiction treatment system. An additional limitation is that our measures were self-reported by administrators, which may increase the risk of recall or social desirability bias. We attempted to mitigate recall bias for the financial measures by sending administrators a worksheet containing these questions before the interview. The relatively low rate of MAT implementation seems to suggest that administrators were not exaggerating their center's use of MAT.

CONCLUSIONS

The limited implementation of medications for the treatment of OUDs in specialty programs points to the continued significance of the research-to-practice gap. This research demonstrated that financial factors, specifically reliance on Medicaid and criminal justice funding, are associated with medication implementation even after controlling for key resources, such as access to physicians. The impending changes in the US health care system under the ACA, particularly with regard to the anticipated expansion of Medicaid, may have a positive impact on implementation. However, additional longitudinal research is needed to empirically demonstrate whether Medicaid expansion actually has this effect. Furthermore, longitudinal data would allow for consideration of whether criminal justice funding remains a persistent barrier to the implementation of medications for OUDs. Given the evolving policy

and funding environment, additional studies are needed about how financial factors are related to the use of pharmacotherapy in the treatment of patients with OUDs.

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