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Facilitating Factors and Barriers to the Use of Medications in Publicly Funded Addiction Treatment Organizations

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Abstract

Objectives—Publicly funded addiction treatment organizations have been slow to adopt pharmacotherapies. Few studies have examined the organizational factors associated with adoption of different types of medication in this treatment sector. This study identifies organization-level facilitators and barriers to the use of medications in publicly funded addiction treatment organizations.

Methods—Face-to-face interviews with a sample of 318 administrators of a representative sample of publicly funded addiction treatment centers in the US.

Results—Only 23.4% of programs reported using any of the five FDA-approved pharmacotherapies for treating addiction. An additional 14.3% of programs only used medications approved for the treatment of psychiatric disorders. Multivariate multinomial logistic regression results revealed that the odds of adoption of addiction pharmacotherapies were significantly greater in government-owned programs and in programs with more medical personnel. Programs that relied more heavily on non-Medicaid public funding tended to be less likely to adopt addiction treatment medications. Greater contact with pharmaceutical representatives was positively associated with medication adoption.

Conclusions—Current public funding policies and lack of access to medical personnel are barriers to the adoption of medications by publicly funded addiction treatment organizations. Efforts to promote adoption may also benefit from greater detailing activities by pharmaceutical representatives. These findings suggest that the large research investment devoted to developing addiction treatment medications may have limited public health impact due to the characteristics of publicly funded service delivery system as well as the limited attention given to this system by commercial purveyors of medications.

Keywords

medication adoption; medication-assisted treatment; health services research

As in other medical specialties,[1–3] there have been repeated calls for greater delivery of evidence-based care in the American substance abuse treatment system in order to improve

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public health.[4] There is an emerging consensus that a sizeable gap exists between what has been shown to be effective through research and the services delivered as usual care in community-based addiction treatment organizations.[5–10] Pharmacotherapies have been particularly slow to diffuse, despite evidence that these medications may improve outcomes for some patients as an adjunct to psychosocial interventions.[11–15] While medications may not be clinically appropriate for every patient, organizational adoption of pharmacotherapies is necessary if any patients are to benefit from these medications.

The majority of clients in substance abuse treatment receive their care in publicly funded community-based organizations,[16–19] so understanding the facilitating factors and barriers to medication adoption in this sector is of high public health significance. Previous research has shown that publicly funded treatment organizations have lagged behind their privately funded counterparts in the adoption of FDA-approved medications for the treatment of addiction.[20, 21] They have also been slower to adopt psychiatric medications that may improve outcomes for clients with co-occurring mental health disorders and addiction.[22] Barriers to medication adoption in the publicly funded treatment sector have implications for the current quality of addiction treatment as well as for the future. Medication development is continuing on a variety of fronts, with considerable investment of federal research funds.[23] Understanding whether the current treatment system has the necessary infrastructure to facilitate the adoption of medications is critical to predicting whether newly developed medications are likely to yield improvements in public health.

To date, the literature on the adoption of medications in addiction treatment has largely focused on specific medications. Studies of the adoption of naltrexone,[12, 24–30] buprenorphine,[31, 32] acamprosate,[21] disulfiram,[21, 33] and SSRIs[22] have identified a variety of organizational characteristics associated with the adoption of these specific medications. Few studies have addressed medication adoption in more general terms. For example, a typology of adoption could be created to categorize programs based on whether they have adopted any of the five FDA-approved addiction treatment medications, have only adopted psychiatric medications, or have not adopted any medications.

Complicating the issue further is the lack of clarity in the relative importance of structural, cultural, and resource characteristics as barriers to medication adoption. Structural characteristics, such as ownership,[12, 20] organizational affiliation,[12, 21, 29] and accreditation,[12, 21, 27, 31, 34] have been shown to be positively associated with the quality of addiction treatment in general and with medication availability. Some evidence suggests that medication adoption may be hampered by the dominant treatment philosophy within organizations. Twelve-step and psychosocial treatment philosophies may be ambivalent or resistant to the use of medications.[15,27, 35–37]

Organizational resources in terms of staffing and funding may also facilitate or impede adoption. Across a range of studies, it has been shown that organizational size, as measured by an organization's the number of employees, is positively associated with innovation adoption.[38, 39] In addition, the availability of medical personnel, such as physicians and nurses, is necessary to support the implementation of medications,[20, 21, 40] yet access to these personnel is highly variable across treatment organizations.[35]

Funding resources may also be associated with medication adoption. Addiction treatment organizations are often funded through a mixture of public and private sources.[16] Even within the rubric of public funding, there is variability in whether that funding is directly allocated by governments to treatment organizations (e.g. state block grant funds and contracts) or is funneled through public insurance (e.g. Medicaid).[18] These funding mechanisms may vary in their reimbursement of medication-assisted treatment.

The diffusion of information about the use of medications in addiction treatment may be an important facilitator of adoption.[33, 41, 42] Federal and state agencies have devoted resources to disseminating information about evidence-based practices.[43, 44] Furthermore, detailing activities by pharmaceutical companies may be another mechanism through which information about medications is disseminated.[45] These different types of dissemination activities may be associated with greater adoption of medications.

Drawing on a large national sample of publicly funded addiction treatment organizations, this study models the associations between organizational characteristics and two types of medication adoption, namely the adoption of any of the five FDA-approved addiction treatment medications and adoption of only psychiatric medications. In addition, this study presents self-reported descriptive data from administrators of non-adopting centers on the relative importance of different types of barriers to medication adoption.

METHODS

Study Eligibility, Sampling, and Data Collection

Publicly funded addiction treatment organizations were defined based on three key criteria. First, these community-based organizations were required to be open to the public, which excluded Veterans Health Administration and correctional-based programs. Second, organizations were required to offer a minimum level of addiction treatment that was at least equivalent to structured outpatient programming.[46] This second criterion excluded counselors in private practice, detoxification-only facilities, halfway houses and transitional living facilities, DUI and driver education programs, and facilities exclusively offering methadone maintenance services. Finally, organizations were defined as publicly funded if at least half of their past-year revenues came from government block grants/contracts or at least half of their patients' expected source of primary payment was from public funds other than Medicaid/ Medicare.

The sample draws on publicly funded organizations sampled during an earlier study in 2002[20, 22, 31] and a sample of replacement facilities drawn between 2004 and 2006. In 2002, a two-stage random sampling strategy was used to identify a random sample of US counties that proportionately represented the US population, and then a random sample of treatment organizations were drawn from those sampled counties. Organizations were identified using the Substance Abuse and Mental Health Services Administration's (2001) national directory, directories provided by Single State Agencies, yellow pages listings, and EAP referral directories. Organizations were randomly selected from sampled counties and screened via telephone interview for eligibility. This previous round of data collection involved 363 administrators of publicly funded addiction organizations, who represented 80% of the programs that were screened as eligible for the study.

The present study draws upon this previous cohort of publicly funded programs and a sample of replacement centers. Beginning in 2004, programs from the previous wave were re-contacted to ascertain whether they were still open, eligible, and willing to participate; of the original sample, 245 organizations were open, eligible, and agreed to participate. To increase the sample size, 73 centers were randomly selected from the sampled counties and screened for eligibility. The combined samples yielded 318 participating organizations, which represented 79.9% of the programs that were open and eligible for the study. Prior to combining the two samples for analysis, we compared the original sample (n = 245) to the replacement sample (n = 73) on the measures used in this study, using chi-square or t-tests depending on the level of measurement. No significant difference in medication adoption was found between the two samples. The only detected difference in organizational characteristics was for levels of care. Newly sampled

programs were less likely to be inpatient/residential-only and more likely to offer outpatient-only or a combination of inpatient/residential and outpatient services.

Data were collected between November 2004 and December 2006 during face-to-face interviews with administrators of each participating treatment organization. The design of the study was approved by the University of Georgia's Institutional Review Board, and informed consent was attained from each administrator prior to beginning the interview. On average, these interviews lasted about 90 minutes and covered a wide range of organizational and clinical topics. Participating treatment organizations received an honorarium of US$100.

Measures

The primary dependent variable was a typology of medication adoption that categorized programs into those 1) using no medications, 2) using only psychiatric medications, or 3) using addiction treatment medications. Information elicited during several questions was used to code this variable. First, program administrators were asked whether the treatment center currently used any medications for the treatment of addiction, psychiatric conditions, or pain management; negative responses to this dichotomous measure were used to create the "no medications" category. Administrators who answered in the affirmative were asked a series of follow-up questions about current use of specific medications, including the five FDA-approved addiction treatment medications (naltrexone, disulfiram, methadone, buprenorphine, and acamprosate) and three classes of psychiatric medications (selective serotonin reuptake inhibitors (SSRIs), other antidepressants, and antipsychotic medications). Programs who reported using any of the three classes of psychiatric medications but none of the addiction treatment medications were categorized into the "only psychiatric medications" group. Those programs who reported using at least one of the five addiction treatment medications were categorized into the "addiction treatment medications" group. Most programs in this last group also used psychiatric medications; there were not a sufficient number of cases to create a separate category for programs that used addiction treatment medications but not psychiatric medications.

Six basic organizational characteristics were measured. Organizations were categorized as government-owned (coded 1) or privately-owned (coded 0). Additionally, organizations were coded as being located within a hospital setting (1 = hospital-based; 0 = non-hospital). Center administrators were asked if their center was accredited (1 = accredited, 0 = not accredited) by an outside organization such as the Joint Commission, the Commission on Accreditation of Rehabilitation Facilities, or the Council on Accreditation. Program administrators were asked to identify the predominant treatment model used by their organization; programs were categorized as those relying on a 12-step model (reference category), a cognitive behavioral therapy-based model, or an eclectic treatment model. Organizations were coded into those offering detoxification services (1 = offers detoxification, 0 = no detoxification services) and categorized based on the available levels of treatment services within the organization. Organizations were coded into those that only offered outpatient treatment (reference category), only offered inpatient (<30 days) or residential (>30 days) services, or offered a combination of outpatient as well as inpatient/residential services.

Three staffing characteristics were measured. The number of counselors was included as a proxy of organizational size; this measure was natural-log transformed to correct for skew. The measure of physicians combined administrators' reports of the number of psychiatrists and other physicians who were employed by the center (i.e. on its payroll). The number of registered nurses, licensed practical nurses, and nurse practitioners employed by the center were included in the measure of nursing staff.

Two measures of funding were included in the analyses. Administrators were asked about the percentage of clients for whom Medicaid was their expected primary source of payment and the percentage of clients for whom other public (non-Medicaid/Medicare) funds were the expected source of primary payment. Patients covered by "other public funds" include those whose treatment was reimbursed through federal block grants administered by states, criminal justice contracts, state contracts, and county/local government funding. For the eight cases with missing data on these funding variables, mean substitution was used to impute the missing values.

The extent to which centers received information about treatment innovations from pharmaceutical companies, federal agencies, and state substance abuse authorities was also measured. Administrators were asked to rate the extent to which the center received information about treatment innovations from pharmaceutical companies using a six-point Likert response format (0 = no extent, 5 = very great extent). Using this same response format, administrators reported the center's reliance on materials from federal agencies, such as NIDA and SAMHSA, for information about treatment innovations; these four items were averaged into a mean scale ($\alpha = .70$). Finally, administrators indicated whether they had received any information from the state substance abuse authority about eight domains of evidence-based practices; these dichotomous indicators were summed ($\alpha = .81$).

Finally, for centers that reported no use of addiction or psychiatric medications, a series of questions were asked about the relative importance of eight factors in explaining why the center does not use medications; the wording of these items appears in Table 4. Responses about the importance of each reason ranged from 0 (not at all important) to 5 (very important).

Statistical Analysis

This study used cross-sectional multinomial logistic regression to estimate associations between organization-level characteristics and the typology of medication adoption.[47, 48] We estimated a series of bivariate models; significant correlates were then entered into a multivariate multinomial logistic regression model. Each model produced three comparisons: the likelihood of any addiction treatment medication adoption relative to no medications, the likelihood of adoption of only psychiatric medications relative to no medications, and the likelihood of addiction treatment medication adoption relative to adoption of only psychiatric medications.

Data were available from 308 of the 318 treatment organizations. Item non-response was examined by comparing these complete cases with those excluded due to missing data; chi-square tests and t-tests were used for these comparisons depending on the level of measurement for each organizational characteristic. There were no significant differences between included and excluded cases ($p<.05$, two-tailed tests). All analyses were performed using Stata 10.0 (Stata Corp, College Station, Tex).

RESULTS

Descriptive statistics for this sample of 308 publicly funded addiction treatment centers are presented in Table 1. Most treatment organizations were privately owned, but the average center reported that about two-thirds of patients' care was reimbursed by non-Medicaid public funding. These organizations were fairly small in size; about 33.1% had 5 or fewer counselors, 28.3% had between 6 and 10 counselors, and 38.6% had more than 10 counselors. The presence of medical personnel in these facilities was very low. About 70.8% of programs did not have any physicians on staff, 16.2% had one physician, and 13.0% had more than one physician on staff. About 63.0% did not employ any nurses, while 17.5% had one nurse and 19.5% had more than one nurse on staff.

The majority of programs (62.3%) had not adopted any medications. About 14.3% of programs had only adopted psychiatric medications, and 23.4% reported using at least one of the FDA-approved addiction treatment medications.

Additional analyses revealed that rates of adoption of specific addiction treatment medications were even more modest. About 11.4% (n = 35) of programs reported using buprenorphine and 7.8% (n = 24) reported using methadone. Naltrexone was used in 8.8% (n = 27) programs, while 10.7% used disulfiram (n = 33) and 7.8% (n = 24) had adopted acamprosate.

Bivariate Associations between the Typology of Medication Adoption and Organizational Characteristics

Table 2 presents the results from a series of bivariate multinomial logistic regression models that estimated associations between each organizational characteristic and the typology of medication adoption. At the bivariate level, nearly all of these organizational characteristics were associated with the likelihood of adopting at least one of the FDA-approved addiction treatment medications relative to the likelihood of adopting no medications (Column 1). The likelihood of adoption of any addiction treatment medications was greater in government-owned programs (odds ratio, OR = 3.44), hospital-based programs (OR = 3.28), and accredited programs (OR = 2.15). Programs endorsing a CBT-based treatment model were more likely than 12-step programs to have adopted any addiction treatment medications (OR = 1.81). Organizations offering detoxification services were more likely to offer these medications (OR = 4.18). Adoption was positively associated with the measures of organizational size (OR = 3.64), the number of physicians (OR = 3.36), and the number of nurses (OR = 2.01). Reliance on Medicaid reimbursement was positively associated with adoption of addiction treatment medications (OR = 1.02), while the association for non-Medicaid/Medicare public funding was negative (OR = .99). Reliance on information from pharmaceutical representatives (OR = 2.12), the federal agencies of NIDA and SAMHSA (OR = 1.57), and state substance abuse authorities (OR = 1.23) were all positively associated with the odds of addiction treatment medication adoption.

Organizational characteristics were slightly less predictive of adoption of only psychiatric medications relative to the adoption of no medications (Table 2, Column 2). At the bivariate-level, adoption was positively associated with government ownership (OR = 2.26), offering a combination of outpatient and inpatient/residential services (OR = 2.39), and only offering inpatient/residential services (OR = 2.81). The number of staff physicians (OR = 1.73) and number of nurses (OR = 1.76) were also positively associated with adoption of psychiatric medications. Greater reliance on Medicaid funding was positively associated with the likelihood of adopting only psychiatric medications (OR = 1.02), while the association for reliance on other non-Medicaid/Medicare public funding was negative (OR = .99). Of the informational resources, only the measure of contact with pharmaceutical representatives was associated with the adoption of psychiatric medications (OR = 1.40).

Some of the organizational characteristics differentiated programs using addiction treatment medications from the group of programs that only used psychiatric mediations. The likelihood of addiction treatment medication adoption (relative to the likelihood of adoption of only psychiatric medications) was greater in programs endorsing CBT than in 12-step programs (OR = 2.75) and in organizations offering detoxification (OR = 2.78). Adoption of addiction treatment medications, relative to adoption of psychiatric medications, was positively associated with organizational size (OR = 3.04), the number of physicians (OR = 1.94), and the number of nurses (OR = 1.14). Greater reliance on pharmaceutical representatives for information (OR = 1.51), and greater reliance on NIDA and SAMHSA for information (OR = 1.84) were also positively associated with adoption of addiction pharmacotherapies. However, programs offering only inpatient/residential services were less likely than outpatient-only

programs to have adopted addiction treatment medications, relative to the odds of adopting only psychiatric medications (OR = .24).

Multivariate Model of Medication Adoption on Organizational Characteristics

Table 3 presents the multivariate model of medication adoption, which was estimated using multinomial logistic regression. The first column includes the comparison of any addiction treatment medication adoption to non-adoption. Seven organizational characteristics were statistically significant in the multivariate model. After controlling for the other organizational characteristics, government-owned treatment organizations were more likely than privately owned facilities to have adopted at least one addiction pharmacotherapy (OR = 2.82). Organizations offering detoxification were more likely than facilities that do not offer detoxification to have adopted addiction treatment medications (OR = 3.22). Larger programs, as indicated by a greater number of counselors, were more likely to have adopted addiction treatment pharmacotherapies (OR = 1.89). Both measures of medical resources were statistically significant. Each additional staff physician was associated with a 74.8% increase in the likelihood of addiction treatment medication adoption, while each additional staff nurse was associated with a 51.6% increase in the likelihood of adoption. Greater reliance on non-Medicaid public funding was a significant barrier to the adoption of addiction treatment medications (OR = .98), such that a standard deviation increase in this funding source was associated with a 39.9% decrease in the odds of adoption. Greater contact with pharmaceutical representatives was also positively associated with adoption, after controlling for the other organizational characteristics in the model (OR = 1.81).

In the comparison of the adoption of only psychiatric medications relative to no medications, five variables were statistically significant. Compared to outpatient-only facilities, those offering a combination of inpatient/residential and outpatient treatment (OR = 2.86) and inpatient/residential-only programs (OR = 2.92) were more likely to only offer psychiatric medications. The likelihood of adoption was positively associated with the number of nurses (OR = 1.47). Adoption of psychiatric medications was positively associated with contact with pharmaceutical representatives (OR = 1.37). Also, greater reliance on information from federal sources (e.g. NIDA, SAMHSA) was negatively associated with the likelihood of psychiatric medication adoption relative to non-adoption (OR = .67).

The final comparison in the multivariate model was between the likelihood of adoption of any addiction treatment medications relative to the adoption of only psychiatric medications. Five variables were statistically significant. Adoption of addiction treatment medications, relative to psychiatric medications, was more likely in programs offering detoxification services (OR = 3.59). However, the odds of adoption of addiction medications, when compared to the odds of adopting only psychiatric medications, were lower in organizations offering a combination of outpatient and inpatient/residential treatment (OR = .26) and in organizations only offering inpatient/residential treatment (OR = .18). There was a positive association between the number of counselors and the likelihood of addiction treatment medication adoption (OR = 2.00), relative to only adopting psychiatric medications. Reliance on information from federal sources (e.g. NIDA, SAMHSA) was positively associated with the likelihood of any addiction treatment medication adoption (OR = 1.70) relative to the likelihood of only adopting psychiatric medications.

Self-Reported Barriers to Medication Adoption

Table 4 presents additional information gathered from non-adopting centers about the relative importance of eight reasons for not adopting medications in their treatment programs. The most strongly endorsed reasons were a lack of physicians, that state regulations prohibit the center from prescribing medications, and a lack of nurses and other medical staff. Reasons related to

a lack of information about medications, the program's treatment philosophy, and staff resistance to the use of medications received much weaker endorsement.

DISCUSSION

The aim of this study was to examine the organizational factors that facilitate or impede the adoption of medications by publicly funded addiction treatment organizations, which are the predominant site of substance abuse treatment in the US.[16] In our prior work on medication adoption within treatment settings, we largely focused on the adoption of specific medications.[22, 29, 31, 33, 49] The current study extended that work by considering a typology of medication adoption in which organizations were categorized into those that had adopted at least one FDA-approved addiction treatment medication, those that had only adopted psychiatric medications (e.g. SSRIs, other antidepressants, and anti-psychotic medications), and those that had adopted neither addiction treatment nor psychiatric medications.

Findings from this study of publicly funded treatment organizations replicated some of our previous results while expanding the range of organizational characteristics included in our analysis. The multivariate model pointed to the importance of organizational resources, such as medical personnel and organizational size, in understanding the adoption of addiction treatment medications. These findings were consistent with our prior work on the adoption of buprenorphine[31] and SSRIs.[22, 49] As with our previous research on medication adoption,[20, 22] government-owned centers were more likely than non-governmental organizations to adopt addiction treatment medications. We had not previously considered different types of public funding, so our finding that non-Medicaid public funding (e.g. federal block grant, state contracts, and criminal justice contracts) was a barrier to the adoption of addiction treatment medications was novel. Another innovative aspect of the current study was the consideration of different types of informational sources, which we had examined in a broader study of treatment innovations[50] but had not included in our previous research on medication adoption. We found that contact with pharmaceutical representatives was positively associated with the adoption of addiction pharmacotherapies, even after controlling for a variety of other organizational characteristics.

Notably, these findings from the statistical model were consistent with self-reported data from administrators of organizations that had not adopted medications. In ranking the importance of different reasons for non-adoption, the most strongly endorsed reasons were related to the lack of medical staff and state regulations (which would prohibit the use of medications in centers that do not have access to medical personnel). Consistent with the finding that treatment philosophy was not associated with medication adoption, the ranking of organizational culture as a barrier (e.g. treatment philosophy and staff resistance) was considerably lower.

Our findings suggest that there are substantial barriers to further adoption of addiction treatment medications by substance abuse treatment organizations, particularly in terms of limited access to physicians and other medical personnel who can support the implementation of medication-assisted treatments. We found that the presence of staff physicians and nurses was quite low, which is consistent with other studies of addiction treatment organizations.[51–53] Without increases in the employment of physicians, nurses, and other medical personnel, there are likely to be ceiling effects on the percentage of organizations that can offer medication-assisted treatments. The absence of medical personnel in these organizations also has broader implications in terms of the likelihood that programs can offer on-site primary medical care, which generally improves client outcomes.[54, 55]

Given the importance of medical staff for the adoption of medications, there is a need for research on why some treatment programs employ medical staff while others do not. To some

extent, it may be a function of financial resources and treatment culture within organizations. The financial resource issue may reflect a lack of reimbursement for physician services by certain funding mechanisms as well as an overarching lack of available dollars to pay physician salaries.[56] In addition, the absence of medical employees within these programs may also reflect shortages in physicians and nurses in the local labor market. Given projections that these shortages are likely to worsen,[57, 58] addressing this barrier may be particularly challenging. Some organizations may opt to contract with physicians rather than employ them directly. It remains an empirical question as to whether contractual arrangements attain the same degree of adoption and implementation of medications when compared to direct employment of medical personnel.

It also remains unclear how federal and state-level policies may influence the adoption of evidence-based practices, such as addiction treatment medications. Some have argued that federal regulations regarding methadone have limited its spread.[14] Buprenorphine, a more recently approved medication to treat opioid dependence, has less burdensome federal regulatory requirements than methadone, but still has regulations that differentiate it from medications such as naltrexone or SSRIs.[10, 32] However, even if regulations are perceived by providers as a barrier to the adoption of buprenorphine, it is less clear why the adoption of medications without these requirements, such as naltrexone and acamprosate, remains low.

The statistical results point to current public funding policies as a barrier to medication adoption, while regulatory barriers were a strongly endorsed reason for non-adoption. Others have argued that state funding, regulations, and policies may influence the services offered by treatment organizations.[5] A recent study found that an array of state-level regulatory and funding policies explained about 16% of facility-level variation in the adoption of naltrexone.[12] Research also suggests that state policy requirements can increase the likelihood of facility-level adoption of services,[17] although such policies do not achieve universal adoption. It appears that state policies of funding and regulations may need to be aligned if greater adoption of medications is to be accomplished.

These data also point to the potential role that pharmaceutical companies might play in supporting the process of medication adoption. Consistent with other reports of the low levels of marketing of addiction treatment medications,[41] the average treatment center had little contact with pharmaceutical company representatives. However, this type of contact was positively associated with the adoption of medications, even after controlling for other structural, cultural, and resource characteristics. This finding was not altogether unexpected given research documenting that such detailing can result in better return on investment than direct to consumer marketing.[59]

The design of this study has several limitations. First, this study relies on cross-sectional data, which restricts our ability to identify causal relationships. Future research should continue to examine medication adoption through a longitudinal research design, particularly one in which data on all variables are collected at multiple time-points. Second, these data are only representative of one sector of the substance abuse treatment system. It is not known if these findings would generalize to other systems, such as the privately financed treatment sector, the Veterans Health Administration system, or programs based within correctional settings. However, these findings yield important information about the publicly funded sector of care, which serves the largest segment of treatment-seeking individuals in the US.[16] Another limitation is the reliance on self-report data for all measures. While self-reports are consistent with both federal surveys (e.g. N-SSATS) and other studies of service delivery,[17, 32, 60, 61] there is no way to fully eliminate the possibility that administrators may err in their descriptions of their organizations. An additional limitation is that our measures of medical personnel were restricted to those who were employed by the organization and on its payroll. We did not have

a measure of the numbers of psychiatrists, other physicians, and nurses who had contracts with the organization to provide services.

Finally, it must be noted that this analysis cannot address the issue of implementation of medications, since the dependent variable is only focused on adoption. Implementation research on how routinely medications are used by treatment organizations suggests that the percentage of clients receiving these medications is very low.[29, 30, 41] Understanding the factors associated with implementation within adopting centers is an important area for future research.

CONCLUSIONS

Researchers continue to work on multiple fronts to identify and develop pharmacological approaches to treat substance abuse.[23] Such research may yield pharmacotherapies that would improve outcomes for treatment-seeking individuals, but those gains will only be achieved if such medications are adopted and implemented in routine practice. These data from this large sample of community-based publicly funded treatment organizations, representing the predominant sector of care in the US, suggest that this sector has thus far been unable to adopt medications that are currently available, making it difficult to envision adoption of newly available medications by these programs. The employment of medical personnel within treatment organizations is a major factor in facilitating adoption, but programs that employ medical staff are the minority within this treatment sector. Reliance on non-Medicaid public funding was an additional barrier to adoption. Interestingly, program philosophy was not associated with adoption. Taken together, these findings point to problems in the capacity to adopt medications based on current resources rather than a lack of willingness or cultural opposition to adoption. Infrastructure development, particularly in terms of medical staffing, and the alignment of funding policies may yield important gains in medication adoption.

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References

1. Carroll KM, Rounsaville BJ. Bridging the gap: a hybrid model to link efficacy and effectiveness research in substance abuse treatment. Psychiatr Serv 2003;54:333–339. [PubMed: 12610240]
2. L'Enfant C. Clinical research to clinical practice lost in translation? New Engl J Med 2003;349:868–874. [PubMed: 12944573]
3. Institute of Medicine. Crossing the quality chasm: A new health system for the 21st century. Washington, DC: National Academy Press; 2001.
4. Institute of Medicine. Improving the quality of health care for mental and substance-use disorders: Quality chasm series. Washington, DC: National Academy Press; 2006.
5. Lamb, S.; Greenlick, MR.; McCarty, D. Bridging the Gap between Practice and Research: Forging Partnerships with Community-Based Drug and Alcohol Treatment. Washington, D.C: National Academy Press; 1998.
6. Ginexi EM, Hilton TF. What's next for translation research? Eval Health Prof 2006;29:334–347. [PubMed: 16868341]
7. Read JP, Kahler CW, Stevenson JF. Bridging the gap between alcoholism treatment research and practice: Identifying what works and why. Prof Psychol-Res Pr 2001;32:227–238.
8. Simpson DD. A conceptual framework for transferring research to practice. J Subst Abuse Treat 2002;22:171–182. [PubMed: 12072162]

9. Sloboda Z, Schildhaus S. A discussion of the concept of technology transfer of research-based drug "abuse" prevention and treatment interventions. Subst Use Misuse 2002;37:1079–1087. [PubMed: 12180556]
10. Saxon AJ, McCarty D. Challenges in the adoption of new pharmacotherapeutics for addiction to alcohol and other drugs. Pharmacol Ther 2005;108:119–128. [PubMed: 16055196]
11. Garbutt JC, West SL, Carey TS, Lohr KN, Crews FT. Pharmacological treatment of alcohol dependence: a review of the evidence. JAMA 1999;281:1318–1325. [PubMed: 10208148]
12. Heinrich CJ, Hill CJ. Role of state policies in the adoption of naltrexone for substance abuse treatment. Health Serv Res 2008;43:951–970. [PubMed: 18454775]
13. Kranzler HR. Pharmacotherapy of alcoholism: gaps in knowledge and opportunities for research. Alcohol Alcohol 2000;35:537–547. [PubMed: 11093959]
14. Ling W, Compton P. Recent advances in the treatment of opiate addiction. Clin Neurosci Res 2005;5:161–167.
15. McGovern MP, Fox TS, Xie HY, Drake RE. A survey of clinical practices and readiness to adopt evidence-based practices: Dissemination research in an addiction treatment system. J Subst Abuse Treat 2004;26:305–312. [PubMed: 15182895]
16. Cartwright WS, Solano PL. The economics of public health: financing drug abuse treatment services. Health Policy 2003;66:247–260. [PubMed: 14637010]
17. Chriqui JF, Terry-McElrath Y, McBride DC, Eidson SS. State policies matter: the case of outpatient drug treatment program practices. J Subst Abuse Treat 2008;35:13–21. [PubMed: 17936550]
18. Heinrich CJ, Fournier E. Dimensions of publicness and performance in substance abuse treatment organizations. J Policy Anal Manage 2004;23:49–70. [PubMed: 14976993]
19. Mark, TL.; Coffey, RM.; McKusick, D.; Harwood, H.; King, E.; Bouchery, E. National Estimates of Expenditures for Mental Health Services and Substance Abuse Treatment, 1991–2001. Rockville, MD: SAMHSA; 2005.
20. Knudsen HK, Ducharme LJ, Roman PM. The adoption of medications in substance abuse treatment: Associations with organizational characteristics and technology clusters. Drug Alcohol Depend 2007;87:164–174. [PubMed: 16971059]
21. Ducharme LJ, Knudsen HK, Roman PM. Trends in the adoption of medications for alcohol dependence. J Clin Psychopharmacol 2006;26 (Suppl 1):S13–19. [PubMed: 17114950]
22. Knudsen HK, Ducharme LJ, Roman PM. The use of antidepressant medications in substance abuse treatment: The public-private distinction, organizational compatibility, and the environment. J Health Soc Behav 2007;48:195–210. [PubMed: 17583274]
23. Vocci F, Ling W. Medications development: successes and challenges. Pharmacol Ther 2005;108:94–108. [PubMed: 16083966]
24. Fuller BE, Rieckmann T, McCarty D, Smith KW, Levine H. Adoption of naltrexone to treat alcohol dependence. J Subst Abuse Treat 2005;28:273–280. [PubMed: 15857728]
25. Mark TL, Kranzler HR, Poole VH, Hagen CA, McLeod C, Crosse S. Barriers to the use of medications to treat alcoholism. Am J Addict 2003;12:281–294. [PubMed: 14504021]
26. Mark TL, Kranzler HR, Song X. Understanding US addiction physicians' low rate of naltrexone prescription. Drug Alcohol Depend 2003;71:219–228. [PubMed: 12957340]
27. Oser CB, Roman PM. Organizational-level predictors of adoption across time: Naltrexone in private substance-use disorders treatment centers. J Stud Alcohol Drugs 2007;68:852–861. [PubMed: 17960303]
28. Oser CB, Roman PM. A categorical typology of naltrexone-adopting private substance abuse treatment centers. J Subst Abuse Treat 2008;34:433–442. [PubMed: 17997266]
29. Roman PM, Johnson JA. Adoption and implementation of new technologies in substance abuse treatment. J Subst Abuse Treat 2002;22:211–218. [PubMed: 12072165]
30. Thomas CP, Wallack SS, Lee S, McCarty D, Swift R. Research to practice: adoption of naltrexone in alcoholism treatment. J Subst Abuse Treat 2003;24:1–11. [PubMed: 12646325]
31. Knudsen HK, Ducharme LJ, Roman PM. Early adoption of buprenorphine in substance abuse treatment centers: data from the private and public sectors. J Subst Abuse Treat 2006;30:363–373. [PubMed: 16716852]

32. Koch AL, Arfken C, Schuster CR. Characteristics of US substance abuse treatment facilities adopting buprenorphine in its initial stage of availability. Drug and Alcohol Dependence 2005:83.
33. Knudsen HK, Roman PM, Ducharme LD, Johnson JA. Organizational predictors of pharmacological innovation adoption: The case of disulfiram. J Drug Issues 2005:35.
34. Griffith, JR.; Sahney, VK.; Mohr, RA. Re-engineering health care: Building on CQU. Ann Arbor, MI: Health Administration Press; 1995.
35. Miller WR, Sorensen JL, Selzer JA, Brigham GS. Disseminating evidence-based practices in substance abuse treatment: A review with suggestions. J Subst Abuse Treat 2006;31:25–39. [PubMed: 16814008]
36. Rieckmann T, Daley M, Fuller BE, Thomas CP, McCarty D. Client and counselor attitudes toward the use of medications for treatment of opioid dependence. J Subst Abuse Treat 2007;32:207–215. [PubMed: 17306729]
37. McCarty D, Fuller BE, Arfken C, et al. Direct care workers in the national drug abuse treatment clinical trials network: Characteristics, opinions, and beliefs. Psychiatr Serv 2007;58:181–190. [PubMed: 17287373]
38. Rogers, EM. Diffusion of innovations. 5. New York: Free Press; 1995.
39. Damanpour F. Organizational innovation: a meta-analysis of effects of determinants and moderators. Acad Manage J 1991;34:555–590.
40. Ducharme LJ, Knudsen HK, Roman PM, Johnson JA. Innovation adoption in substance abuse treatment: Exposure, trialability, and the Clinical Trials Network. J Subst Abuse Treat 2007;32:321–329. [PubMed: 17481455]
41. Mark TL, Kranzler HR, Song X, Bransberger P, Poole VH, Crosse S. Physicians' opinions about medications to treat alcoholism. Addiction 2003;98:617–626. [PubMed: 12751979]
42. Corrigan PW, Steiner L, McCracken SG, Blaser B, Barr M. Strategies for disseminating evidence-based practices to staff who treat people with serious mental illness. Psychiatr Serv 2001;52:1598–1606. [PubMed: 11726749]
43. Kellogg S, Melia D, Khuri E, Lin A, Ho A, Kreek MJ. Adolescent and young adult heroin patients: Drug use and success in methadone maintenance treatment. J Addict Dis 2006;25:15–25. [PubMed: 16956865]
44. Brown BS, Flynn PM. The federal role in drug abuse technology transfer: a history and perspective. J Subst Abuse Treat 2002;22:245–257. [PubMed: 12072168]
45. Mizik N, Jacobson R. Are physicians “easy marks”? Quantifying the effects of detailing and sampling on new prescriptions. Manage Sci 2004;50:1704–1715.
46. Mee-Lee, D.; Gartner, L.; Miller, MM.; Shulman, GR.; Wilford, BB. Patient placement criteria for the treatment of substance-related disorders. 2. Chevy Chase, MD: American Society of Addiction Medicine; 1996.
47. Long, JS. Regression models for categorical and limited dependent variables. Thousand Oaks, CA: Sage; 1997.
48. Long, JS.; Freese, J. Regression models for categorical dependent variables using Stata. College Station, TX: StataCorp; 2003.
49. Knudsen HK, Ducharme LJ, Roman PM. Racial and ethnic disparities in SSRI availability in substance abuse treatment. Psychiatr Serv 2007;58:55–62. [PubMed: 17215413]
50. Knudsen HK, Roman PM. Modeling the use of innovations in private treatment organizations: the role of absorptive capacity. J Subst Abuse Treat 2004;26:353–361. [PubMed: 14698799]
51. Vassilev ZP, Strauss SM, Astone JM, Friedmann PD, Des Jarlais DC. Provision of on-site medical care to patients with hepatitis C in drug treatment units. J Health Care Poor Underserved 2004;15:663–671. [PubMed: 15531822]
52. Friedmann PD, Alexander JA, D'Aunno TA. Organizational correlates of access to primary care and mental health services in drug abuse treatment units. J Subst Abuse Treat 1999;16:71–80. [PubMed: 9888124]
53. McLellan AT, Carise D, Kleber HD. Can the national addiction treatment infrastructure support the public's demand for quality care? J Subst Abuse Treat 2003;25:117–121. [PubMed: 14680015]

54. Friedmann PD, Zhang Z, Hendrickson J, Stein MD, Gerstein DR. Effect of primary medical care on addiction and medical severity in substance abuse treatment programs. J Gen Intern Med 2003;18:1–8. [PubMed: 12534757]

55. Samet JH, Friedmann P, Saitz R. Benefits of linking primary medical care and substance abuse services: patient, provider, and societal perspectives. Arch Intern Med 2001;161:85–91. [PubMed: 11146702]

56. Marinelli-Casey P, Domier CP, Rawson RA. The gap between research and practice in substance abuse treatment. Psychiatr Serv 2002;53:984–987. [PubMed: 12161673]

57. Cooper RA, Getzen TE, McKee HJ, Laud P. Economic and demographic trends signal an impending physician shortage. Health Aff (Millwood) 2002;21:140–154. [PubMed: 11900066]

58. Spetz J, Given R. The future of the nurse shortage: will wage increases close the gap? Health Aff (Millwood) 2003;22:199–206. [PubMed: 14649447]

59. Narayanan S, Desiraju R, Chintagunta PK. Return on investment implications for pharmaceutical promotional expenditures: The role of marketing-mix interactions. J Marketing 2004;68:90–105.

60. Friedmann PD, Lemon SC, Durkin EM, D'Aunno TA. Trends in comprehensive service availability in outpatient drug abuse treatment. J Subst Abuse Treat 2003;24:81–88. [PubMed: 12646334]

61. Richter KP, Choi WS, McCool RM, Harris KJ, Ahluwalia JS. Smoking cessation services in U.S. methadone maintenance facilities. Psychiatr Serv 2004;55:1258–1264. [PubMed: 15534014]

TABLE 1

Characteristics of Publicly Funded Addiction Treatment Organizations (N = 308)

Measure	Mean (SD) or N (%)
Typology of medication adoption	
Program uses no medications	192 (62.3)
Program only uses psychiatric medications	44 (14.3)
Program uses at least one FDA-approved addiction treatment medication	72 (23.4)
Ownership	
Organization is government-owned	71 (23.1)
Organization is privately-owned	237 (77.0)
Organizational affiliation	
Organization is located in a hospital	24 (7.8)
Treatment is not located in a hospital	284 (92.2)
Accreditation status	
Organization is accredited	145 (47.1)
Organization is not accredited	163 (52.9)
Organization's treatment model	
12-step treatment model	152 (49.4)
Cognitive behavioral therapy-based model	54 (17.5)
Eclectic treatment model	102 (33.1)
Detoxification services	
Organization offers detoxification	67 (21.8)
Organization does not offer detoxification	241 (78.3)
Levels of care	
Outpatient-only treatment services	138 (44.8)
Combination of outpatient and inpatient/residential treatment services	108 (35.1)
Inpatient/residential-only treatment services	62 (20.1)
Number of counselors	13.09 (22.20)
Number of physicians	0.53 (1.13)
Number of nursing staff	1.53 (3.84)
% Patients covered by Medicaid	12.49 (21.29)
% Patients covered by non-Medicaid/Medicare public funding	65.46 (33.34)
Reliance on pharmaceutical representatives for information about innovations	1.31 (1.40)
Reliance on NIDA/SAMHSA materials for information about innovations	2.23 (1.17)
Types of information on evidence-based practice received from the state authority	3.53 (2.47)

TABLE 2

Bivariate Multinomial Logistic Regression Models of Medication Adoption in Publicly Funded Addiction Treatment Organizations (N = 308)

Measure	Addiction Medications vs. No Medications b (SE)	*P*-value	Psychiatric Medications vs. No Medications b (SE)	*P*-value	Addiction Medications vs. Psychiatric Medications b (SE)	*P*-value
Center is government-owned	1.234 (.313)	<0.001	.817 (.386)	0.034	.417 (.409)	0.308
Center is located in a hospital	1.188 (.482)	0.014	.958 (.585)	0.101	.230 (.585)	0.695
Center is accredited	.767 (.282)	0.007	.133 (.336)	0.693	.634 (.387)	0.102
Treatment model						
12-step treatment model	Reference		Reference		Reference	
CBT-model	.592 (.301)	0.049	−.419 (.409)	0.305	1.011 (.451)	0.025
Eclectic model	−.213 (.427)	0.618	−.030 (.435)	0.994	−.182 (.544)	0.737
Center offers detoxification	1.431 (.315)	<0.001	.410 (.426)	0.336	1.022 (.444)	0.021
Levels of care						
Outpatient-only	Reference		Reference		Reference	
Combination of OP and inpatient/residential	.434 (.301)	0.150	.871 (.408)	0.033	−.437 (.450)	0.331
Inpatient/residential-only	−.389 (.423)	0.358	1.034 (.437)	0.018	−1.423 (.545)	0.009
Number of counselors (natural log)	1.292 (.205)	<0.001	.181 (.214)	0.397	1.111 (.260)	<0.001
Number of physicians	1.212 (.195)	<0.001	.547 (.239)	0.022	.665 (.225)	0.003
Number of nursing staff	.698 (.122)	<0.001	.567 (.125)	<0.001	.131 (.056)	0.019
% Patients covered by Medicaid	.016 (.006)	0.010	.015 (.007)	0.035	.001 (.008)	0.919
% Patients covered by public funding	−.014 (.004)	0.001	−.010 (.005)	0.034	−.003 (.005)	0.523
Reliance on pharmaceutical representatives for information about treatment innovations	.749 (.111)	<0.001	.338 (.128)	0.008	.411 (.137)	0.003
Reliance on NIDA/SAMHSA materials for information about treatment innovations	.452 (.124)	<0.001	−.158 (.152)	0.300	.610 (.176)	0.001
Receipt of information related to evidence-based practice from the state authority	.203 (.058)	<0.001	.117 (.069)	0.089	.086 (.078)	0.269

TABLE 3

Multivariate Multinomial Logistic Regression Model of Medication Adoption in Publicly Funded Addiction Treatment Organizations (N = 308)

Measure	Addiction Medications vs. No Medications b (SE)	*P*-value	Psychiatric Medications vs. No Medications b (SE)	*P*-value	Addiction Medications vs. Psychiatric Medications b (SE)	*P*-value
Center is government-owned	1.037 (.449)	0.021	.507 (.470)	0.280	.530 (.527)	0.314
Center is located in a hospital	.320 (.719)	0.657	.435 (.691)	0.529	−.116 (.748)	0.877
Center is accredited	.544 (.411)	0.185	.095 (.380)	0.802	.448 (.473)	0.343
Center offers detoxification	1.169 (.512)	0.023	−.109 (.516)	0.833	1.277 (.583)	0.029
Levels of care						
Outpatient-only	Reference		Reference		Reference	
Combination of OP and inpatient/residential	−.283 (.502)	0.573	1.050 (.486)	0.031	−1.333 (.592)	0.024
Inpatient/residential-only	−.660 (.664)	0.320	1.071 (.516)	0.038	−1.731 (.705)	0.014
Treatment model						
12-step treatment model	Reference		Reference		Reference	
CBT-model	−.449 (.623)	0.471	.374 (.518)	0.470	−.823 (.705)	0.243
Eclectic model	.355 (.463)	0.443	−.272 (.454)	0.549	.627 (.550)	0.254
Number of counselors (natural log)	.636 (.286)	0.026	−.056 (.260)	0.830	.692 (.335)	0.039
Number of physicians	.558 (.235)	0.018	.207 (.281)	0.463	.352 (.266)	0.186
Number of nursing staff	.416 (.118)	<0.001	.383 (.121)	0.002	.033 (.065)	0.611
% Patients covered by Medicaid	−.006 (.012)	0.637	.004 (.010)	0.715	−.009 (.012)	0.446
% Patients covered by public funding	−.015 (.007)	0.039	−.010 (.007)	0.158	−.006 (.008)	0.492
Reliance on pharmaceutical representatives for information about treatment innovations	.591 (.160)	<0.001	.314 (.151)	0.037	.277 (.181)	0.126
Reliance on NIDA/SAMHSA materials for information about treatment innovations	.128 (.190)	0.501	−.403 (.184)	0.029	.531 (.229)	0.021
Receipt of information related to evidence-based practice from the state authority	.124 (.086)	0.147	.110 (.081)	0.175	.014 (.099)	0.887
Constant	−4.703 (1.087)	<0.001	−1.898 (.875)	<0.001	−2.805 (1.192)	0.019

TABLE 4

Relative Importance of Reasons for Non-Adoption of Medications

Measure	Mean (SD)
State regulations prohibit us from prescribing medications	3.88 (1.99)
Lack of physicians who can prescribe medications	3.96 (1.83)
Lack of nursing or other medical staff	3.83 (1.89)
Inconsistent with center's treatment philosophy	2.04 (2.18)
Lack of evidence of clinical effectiveness	1.20 (1.80)
Better alternatives are available	1.88 (2.05)
Inadequate information at this center about the use of medications	1.35 (1.78)
Clinical staff resistance to use of medications	1.34 (1.79)

Note: Response categories for each item ranged from 0, which indicated "not at all important" to 5, which indicated "very important."