THE ADOPTION OF MEDICATIONS IN SUBSTANCE ABUSE TREATMENT:

ASSOCIATIONS WITH ORGANIZATIONAL CHARACTERISTICS

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INTRODUCTION

The delivery of effective treatment services is a critical means for addressing the high social, medical, and economic costs of substance abuse (Mark, Woody, Juday, & Kleber, 2001; Rosenheck & Kosten, 2001). Although effective and promising substance abuse treatment medications have been developed and are available (Anton, 2001), there is ample evidence that the rate of adoption of these medications has been slow (Institute of Medicine, 1998).

Addressing this "research to practice gap" requires an understanding of the organizational characteristics that facilitate and deter the adoption of substance abuse treatment medications (Fuller et al., 2005; Simpson, 2002). It is important to understand the adoption of medication as a general treatment approach as well as to identify characteristics that predict the adoption of individual medications. Using data drawn from nationally representative samples of 402 publicly funded and 362 privately funded specialty substance abuse treatment centers in the US, this research examines patterns of medication adoption and the organizational correlates of medication availability in community-based treatment settings.

Although psycho-social interventions are the predominant mode of substance abuse treatment delivered in the US (Mark et al., 2003b), there has been increasing attention paid to the development of effective treatment medications (McLellan & McKay, 1998). Agonist medications, such as methadone and buprenorphine, are a key group of pharmacotherapies for individuals who are dependent on opiates. This class of medications is strictly regulated, with clinics or prescribing physicians facing specific regulatory requirements (Jaffe & O'Keefe,

2003). A large literature has established methadone maintenance (MMT) as an evidence-based treatment for opiate dependence (Hubbard et al., 1997; Mattick et al., 2003; Ward et al., 1999; NIH, 1997). MMT is has tended to be concentrated within a treatment sector consisting of opioid treatment programs (OTPs) that exclusively dispense this medication. At the same time, about half of the providers of MMT in the US operate within mixed-modality settings (SAMHSA, 2002), which may or may not utilize other pharmacotherapies for their non-opiate dependent clients.

In 2002, the FDA approved buprenorphine, a partial agonist medication, for both opiate detoxification and maintenance. Buprenorphine reduces withdrawal symptoms and blocks the effects of opiates (Walsh & Eissenberg, 2003). Numerous clinical trials have evaluated the effectiveness of buprenorphine in comparison to placebo (Fudula et al., 2003), clonidine (Ling et al., 2005; Gowling, Ali, & White, 2004; Lintzeris, Bell, Bammer, Jolley, & Rushworth, 2002), and methadone (Johnson, Jaffe, & Fudula, 1992; Johnson et al., 2000; Pani, Maremmani, Piratsu, Tagliamonte, & Gessa, 2000; Schottenfeld, Pakes, Oliveto, Ziedonis, & Kosten, 1997; Strain, Stitzer, Liebson, & Bigelow, 1994). Although buprenorphine may not be more effective than methadone, it has three key advantages: it does not require daily dosing (Amass et al., 2001), its chemical composition renders it less likely to be diverted for illicit use (Amass et al., 2000), and federal regulations encouraging its prescription by primary care physicians may facilitate its integration into community-based treatment programs (Amass et al., 2004).

Other medications, such as naltrexone and disulfiram, address a wider range of substances, including alcohol, cocaine, and opiate dependence. They are less highly regulated than agonist mediations in that any physician can prescribe them. Naltrexone, an antagonist medication, is FDA approved for the treatment of alcohol and opiate dependence. It may have

particular utility in preventing relapse among opiate dependent clients who are motivated to achieve abstinence (Brahen et al., 1978; O'Brien et al., 1984; Greenstein et al., 1981). For alcohol-dependent clients, compliance with naltrexone results in a range of improved outcomes, such as reduced likelihood of relapse and lower consumption of alcohol; however, the major problem with this treatment is sustaining compliance (Kranzler & Van Kirk, 2001; Streeton & Whelan, 2001; O'Malley et al., 1992; Volpicelli, Alterman, Hayashida, & O'Brien, 1992).

Disulfiram may be useful in enhancing retention during treatment (Chandrasekaran, Sivaprakash, & Chitraleka, 2001) and in relapse prevention (Hunt, 2002). In recent studies it has shown promise in treating individuals with co-occurring cocaine and alcohol dependence (Carroll et al., 2000; Carroll et al., 1998; Kosten et al., 2002). As with naltrexone, the effectiveness of disulfiram is contingent on patients' compliance with the prescribed dose and schedule (Brewer, Meyers, & Johnsen, 2000; Kranzler, 2000; Litten & Allen, 1999).

To date, there are few data that examine rates of organizational adoption of these medications in the public and private specialty treatment systems, and even less attention has been paid to the organizational correlates associated with medication adoption. The emergent literature on medication adoption has been limited to regional samples (Fuller et al. 2005), private sector facilities (Knudsen et al., 2005; Roman & Johnson, 2002), and the practices of individual physicians (Mark et al., 2003a; Mark et al., 2003b). Understanding the role of treatment organizations is critical because recent research has revealed that the organizational context dramatically affects the prescribing behaviors of physicians and the likelihood that counselors will encourage and/or support the use of medications by their clients (Thomas et al., 2003).

Certain organizational characteristics are likely to be associated with medication

adoption. For example, the American substance abuse treatment system is comprised of a range of organizational forms, including government-owned facilities, non-profit organizations highly dependent on public funds, centers that are non-profit but reliant on private sources of funding, and for-profit organizations (White, 1998). These different types of organizations are subject to different environmental contingencies (Walmsley and Zald, 1973), which may result in differences in patterns of service delivery (Perry and Rainey, 1988). Furthermore, there has been a longstanding concern that disparities in access to high-quality services may exist for clients served by public systems (Rodgers and Barnett, 2000; Yahr, 1986).

Accreditation status may also be associated with medication adoption. Some have argued that accreditation is a proxy measure of program quality (Alexander and Wheeler, 1998), because accrediting organizations require centers to meet a variety of quality indicators. Thus, we might anticipate greater adoption of pharmacotherapies among accredited treatment programs.

Treatment organizations also vary in terms of the levels of care offered. For example, facilities may offer detoxification services on either an inpatient or outpatient basis. In addition, there are varying intensities of treatment, including short-term inpatient, residential, and outpatient programs. Medication adoption may be more likely for certain configurations of detoxification and treatment services.

For example, centers with detoxification services may have greater medical resources since their clients may have more urgent medical needs; those medical resources may also prove useful for the adoption of treatment medications. In addition, centers with inpatient programming may be better equipped to provide the medical monitoring that can increase medication compliance (Knudsen et al., 2005). However, levels of care may be proxy variables for

differential availability of medical resources, and therefore, less likely to be associated with the availability of pharmacotherapies when other measures of medical resources are taken into account.

Staffing may also be an important issue related to the adoption of treatment innovations such as medications (Saxon & McCarty 2005). Access to physicians is critical for medication adoption. Such access is neither universal nor uniform in substance abuse treatment settings. In addition, previous research suggests that workforce professionalism (Damanpour, 1991), such as greater employment of Master's-level counseling staff, may be association with greater innovation adoption (Knudsen et al., 2005; Knudsen & Roman, 2004; Johnson & Roman, 2002).

It is however less clear the extent to which these correlates generalize across a range of medications. Organizational analyses have tended to focus on the adoption of individual medications. Furthermore, single-medication analyses have rarely considered if and how the adoption of one medication may be associated with the likelihood that other medications have been adopted. Rogers (1995), in his classic work, *Diffusion of Innovations*, argued that organizations may adopt "technology clusters" of innovations that share certain characteristics. Thus the adoption of one medication may increase the likelihood that other medications are also used, although this hypothesis has rarely been tested in the treatment literature. An exception is recent work by Fuller et al. (2005) who found that the adoption of selective serotonin reuptake inhibitors (SSRIs), commonly used to treat mood disorders, tended to serve as a "gateway" to the adoption of naltrexone.

To summarize, corresponding to the recent growth in emphasis upon the use of medications in the treatment of substance abuse, relatively little is known about the extent to which public and private substance abuse treatment centers have adopted treatment medications,

such as agonist therapies, naltrexone, and disulfiram. Furthermore, it is unclear whether certain organizational characteristics are associated with medication adoption, and if the adoption of medications occurs as a "technology cluster." This research addresses these issues using large, nationally representative samples of treatment facilities.

METHODS

Sampling

Data for these analyses are drawn from the National Treatment Center Study, a family of NIDA-funded research projects that aim to measure change in the American specialty substance abuse treatment system, with an emphasis on the adoption of evidence-based treatment practices within these settings. The present study uses data collected via face-to-face interviews with administrators of nationally representative samples of 401 privately funded and 362 publicly funded substance abuse treatment centers. Interviews were conducted in 2002-2004. Similar sampling and data collection procedures were employed in both studies.

Private Center Sample

Beginning in 1995, the National Treatment Center Study initially focused on service delivery changes occurring within the private substance abuse treatment system (Johnson & Roman, 2002; Milne, Blum, & Roman, 2000). Using a two-stage sampling design, an initial panel of 450 treatment facilities was selected. The first stage of sampling involved the random selection of counties based on population. This procedure resulted in counties being selected from 35 states. Within the sampled counties, all substance abuse treatment facilities were enumerated using published directories, federal and state provider listings, and other resources such as EAP directories and the yellow pages. From these lists, treatment centers were randomly

selected proportionate to the total number of centers in the sampled counties. This use of multiple sources to compile the sampling frame ensured broad representation of private sector facilities, many of which do not appear in federal or state listings. In fact, 26% of all private centers in this sample are not listed on the SAMHSA's *National Facilities Register*, from which national samples of treatment organizations are usually drawn.

Sampled centers were contacted by telephone for a brief screening interview to establish eligibility for the study. Ineligible centers and refusals were replaced with centers randomly selected from the same geographic stratum. Three key criteria determined eligibility. First, centers were required to be located in the community, meaning that services were available to the general public; this requirement excluded Veteran's Administration (VA) and correctional facilities. Second, the organization had to provide a level of substance abuse treatment at least equivalent to structured outpatient as defined by the American Society of Addiction Medicine (Mee-Lee et al., 1996). This requirement excluded settings such as facilities that only offer detoxification services, halfway houses, counselors in private practice, and programs exclusively offering methadone maintenance services. Treatment centers offering methadone maintenance along with other modalities were eligible for inclusion. Finally, in order to be considered a "private center," treatment organizations were required to receive less than 50% of their annual operating revenues from government block grants and other federal, state or local grants or contracts. On average, centers received less than 20% of their operating revenues from these sources.

Four waves of face-to-face interviews have been completed with treatment facilities in this study sample. At each wave, the sample has been refreshed with randomly selected centers in order to replace centers that have closed or refused to participate in subsequent interviews.

The following analyses use data from the most recent set of interviews, collected over an 18 month period from late 2002 to early 2004. During this wave of data collection, a participation rate of 88% was achieved among private centers that remained open and eligible.

Public Center Sample

In 2002, a companion sample of publicly funded substance abuse treatment centers was added to the National Treatment Center Study so that comparisons could be made between the public and private sectors. The overall design of the public center study was similar to that of the private center study. Again, a two-stage sampling strategy was utilized, and facilities were required to be community-based and offer a minimum of structured outpatient treatment. The critical difference is that treatment centers in the public center sample were required to receive at least 50% of their annual operating revenues from government block grants and/or government contracts. The public center sample includes both government-owned facilities and privately-owned nonprofit centers that are heavily dependent on government funding sources. The average center in this sample received more than 84% of its annual operating revenues from such public sources. A participation rate of 80% was achieved among eligible publicly funded centers, with interviews conducted between late 2002 and early 2004.

Measures

Three dichotomous dependent variables are measured. First, centers are categorized according to whether they had adopted one of three agonist medications: buprenorphine, methadone, and/or levo-alpha-acetyl-methadol (LAAM). Although manufacture of LAAM was discontinued in early 2005, it was available throughout the data collection period for this study,

and was included among the pharmacotherapies reported by the treatment program administrators.

The other two dependent variables measure the adoption of two other medications: naltrexone and disulfiram. In order to control for "technology clusters," each analysis estimates the associations between these three medication variables.

The independent variables encompass the broad categories of center type, basic organizational characteristics, levels of care, staffing, caseload characteristics, and region. *Center type* was categorized into four groups: government-owned, publicly funded non-profit (reference category), privately funded non-profit, and for-profit. Other basic organizational characteristics include *center age* in years, *center size* based on the number of full-time equivalent employees, *accreditation* by either JCAHO or CARF (1 = accredited, 0 = non-accredited), and whether the center is based on a *12-step model of recovery* (1 = 12-step, 0 = not 12-step).

The measures of levels of care focused on both detoxification and treatment services. Administrators indicated if their facility offered *inpatient detoxification* (1 = yes, 0 = no) and/or *outpatient detoxification* (1 = yes, 0 = no). In addition, centers were categorized as offering any *inpatient treatment* services for adults and/or adolescents (1 = yes, 0 = no) or *residential care* (1 = yes, 0 = no); these two levels of care are differentiated by the degree to which the services are medically monitored, with inpatient services having a measurable degree of medical staff, equipment, and similar resources. The final level of care variable was the availability of *outpatient programming* (1 = yes, 0 = no).

Staffing is measured in terms of physician resources and counselor characteristics. *Access to physicians* used three categories, measuring centers that employed any staff physicians, those retaining any physicians via contractual relationships, and those with no access to physicians

(reference category). The two counselor characteristics included in these analyses were the *percentage of counselors with a Master's-level degree or higher* and the *percentage of counselors that were certified in addiction treatment*.

Two measures of caseload characteristics are included in the analyses. Administrators reported the percentage of clients with a *primary diagnosis of alcohol abuse/dependence*. They also indicated the percentage of clients with a *primary diagnosis of opiate abuse/dependence*.

Finally, the analyses control for potential regional variations in medication adoption. Centers were categorized into four *US Census-defined regions*: Northeast, Midwest, South (reference category), and West.

Analysis

Given the dichotomous nature of the dependent variables, logistic regression was used to examine the adoption of the three types of medications. For each medication, analyses were conducted in three stages. First, medication adoption was estimated by center type. In the second model, organizational characteristics (except other medication adoption) were added to the equation in order to see if organizational differences accounted for the bivariate center type associations. The third and final model included the other measures of medication adoption in order to examine whether the adoption of treatment medications are consistent with Rogers' (1995) concept of "technology clusters." Listwise deletion was utilized in the analyses; complete data were available from 664 centers.

RESULTS

The rates of medication adoption were 18.4% for agonist medications, 21.1% for

naltrexone, and 24.2% for disulfiram. Descriptive statistics for all variables appear in Table 1.

< Table 1 about here >

Availability of Agonist Medications

As seen in the first column of Table 2, there were two significant differences in availability of agonist medications based on center type. Compared to publicly funded nonprofit centers (PBNP), privately funded non-profit organizations (PRNP) were four times more likely to offer agonist medications (O.R. = 4.281, p<.001). For-profit facilities (FP) were about three times more likely than PBNP centers to have adopted agonist medications (O.R. = 3.132, p<.01).

< Table 2 about here >

In the second column, organizational characteristics were added to the model of agonist medication availability. Controlling for these variables rendered the center type differences non-significant. However, six organizational variables were associated with the availability of agonist medications. Accredited centers were nearly five times more likely than non-accredited facilities to have adopted agonist medications (O.R. = 4.876, p<.001). Of the levels of care measures, centers with outpatient detoxification services were significantly more likely to have adopted agonist medications (O.R. = 2.448, p<.05). Centers with inpatient treatment services were also more likely to use agonist medications (O.R. = 1.959, p<.05), while centers with residential programs were less likely to use this class of medications (O.R. = .500, p<.05). As anticipated, access to physicians was also associated with the availability of agonist medications. Centers

with at least one physician on staff were over four times more likely than centers without physicians to have adopted these medications (O.R. = 4.432, p<.001); there was a trend for centers with contract physicians to be more likely to have adopted agonist medications, but it did not achieve statistical significance (O.R. = 2.624, p = .052). Finally, centers with a greater percentage of opiate dependent clients were significantly more likely to have adopted these medications (O.R. = 1.038, p<.001), such that the odds of adoption increased by 2.017 times with a standard deviation increase in opiate clients (S.D. = 18.76).

As seen in the third model of Table 2, three medications—SSRIs, naltrexone, and disulfiram—were added to the model of agonist adoption. Centers that had adopted disulfiram were nearly twice as likely to have also adopted one or more agonist medications (O.R = 1.981, p<.05). The association for naltrexone was not significant, while the association between SSRI and agonist availability approached, but did not achieve, significance (O.R. = 1.788, p = .071). Organizational characteristics associated with agonist medication adoption, net of center type and other medication availability, included accreditation status (O.R. = 4.495, p<.001), outpatient detoxification (O.R. = 2.038, p<.05), residential treatment (O.R = .508, p<.05), the presence of staff physicians (O.R. = 4.251, p<.01), and the percentage of opiate dependent clients (O.R. = 1.038, p<.001).

Availability of Naltrexone

The models of naltrexone availability appear in Table 3. As seen in the first column, two of the three comparisons based on center type were statistically significant. Relative to publicly funded non-profit organizations (PBNP), privately funded non-profits (PRNP) were about six times more likely to have adopted naltrexone (O.R. = 6.077, p<.001). For-profit centers (FP)

were also nearly six times more likely to have adopted naltrexone than PBNP centers (O.R. = 5.896, p<.001).

< Table 3 about here >

Organizational characteristics were then added to the model of naltrexone adoption, as seen in the second column of Table 3. The center type differences remained significant, although they were slightly attenuated by the addition of these variables (O.R. for PRNP = 2.402, p<.01 O.R. for FP = 3.324, p<.01). Four other variables were also significantly associated with naltrexone availability. Of the levels of care, centers with inpatient detoxification (O.R. = 3.399, p<.001) and outpatient detoxification (O.R. = 2.525, p<.01) were significantly more likely to use naltrexone. As with the agonist medication models, having one or more physicians on staff doubled the likelihood of naltrexone adoption in these centers (O.R. = 2.012, p<.05). Likewise, centers with a greater percentage of Master's-level counselors (O.R. = 1.009, p<.01) were also more likely to have adopted naltrexone; a standard deviation increase in the percentage of Master's-level counselors (S.D. = 34.00) was associated with a 35.4% increase in the odds of naltrexone adoption.

The third model of Table 3 adds the variables measuring the other medications. SSRI adoption was strongly associated with naltrexone availability (O.R. = 4.213, p<.001). Centers that currently used disulfiram were also significantly more likely to have adopted naltrexone (O.R. = 5.389, p<.001), but, as in the first set of analyses, the measure of agonist medication adoption was not associated with the availability of naltrexone. Controlling for the other medications reduced the number of significant associations between the organizational

characteristics and naltrexone availability. For-profit centers continued to be more likely to offer naltrexone than publicly funded non-profit centers (O.R. = 3.036, p<.05); however, the difference between private non-profits and public non-profits was completely mediated by the inclusion of the other medication measures. Of the remaining organizational characteristics, only inpatient detoxification availability was significantly associated with naltrexone adoption once the other medication adoption variables were controlled (O.R. = 2.701, p<.01).

Availability of Disulfiram

Table 4 presents the logistic regression analysis of the availability of disulfiram. The first model included the center type variables. All three center type comparisons, relative to the reference category of publicly funded non-profit centers (PBNP), were statistically significant. Government-owned facilities (O.R. = 3.081, p<.001), privately funded non-profits (O.R. = 3.450, p<.001) and for-profit (FP) organizations (O.R. = 3.378, p<.001) were each at least three times more likely than PBNP facilities to have adopted disulfiram.

< Table 4 about here >

These associations were somewhat mediated when organizational characteristics were added in Model 2, although the differences remained statistically significant. When organizational characteristics were controlled, government-owned centers were still 2.738 times more likely than PBNP facilities to use disulfiram (p<.01); the odds ratios for PRNP and FP organizations were 1.839 and 2.237, respectively (both p<.05), indicating a substantially greater likelihood of disulfiram adoption. Six other organizational variables were also significant. The

availability of inpatient detoxification (O.R. = 2.107, p<.05) and outpatient detoxification (O.R. = 2.619, p<.01) were positively associated with disulfiram adoption. Centers offering residential care were about 39.6% less likely to currently use disulfiram (O.R. = .604, p<.05). Of the staffing measures, centers with at least one physician on staff were more likely than centers without physicians to have adopted disulfiram (O.R. = 2.160, p<.01); the difference between centers with contract physicians and those without physicians approached statistical significance (O.R. = 1.786, p = .054). There was also a positive association between the percentage of Master's-level counselors and disulfiram adoption (O.R. = 1.009, p<.01); a standard deviation increase in Master's level counselors (S.D. = 34.00) was associated with a 36.4% increase in the odds of disulfiram availability. Finally, centers located in the West were significantly more likely than centers located in the South to have adopted disulfiram (O.R. = 2.767, p<.001), while other regional differences were non-significant.

Finally, in Model 3 of Table 4, the other medications were added to the regression equation. As expected based on the results of the other analyses, each of these measures was positively associated with the likelihood that the center had adopted disulfiram. Centers using naltrexone were more than five times more likely to have adopted disulfiram, while the use of agonist medications doubled the odds of disulfiram adoption (O.R. for naltrexone = 5.236, p<.001; O.R. for agonists = 2.072, p<.05). Centers that had adopted SSRIs were 2.755 times more likely to offer disulfiram (p<.001). Inclusion of these medications in the model rendered two of the three center type comparisons non-significant. Only the difference between government-owned facilities and PBNP centers remained significant (O.R. 2.544, p<.01). Two other variables were also significantly associated with a center's use of disulfiram: availability of outpatient detoxification (O.R. = 1.938 p<.05) and location in the West relative to the South

(O.R. = 2.565, p<.01).

DISCUSSION

These data from nationally representative samples of publicly funded and privately funded substance abuse treatment centers revealed a moderate degree of medication adoption. However, there were significant bivariate differences in the adoption of medications by treatment sector, particularly between publicly funded non-profits and the two types of private centers. For agonist medications, these differences were entirely accounted for by organizational characteristics, including measures of accreditation, levels of care, access to physicians, and the percentage of opiate dependent clients. In contrast, the differences in naltrexone availability between public non-profits and the two types of private centers remained significant even after controlling for other organizational characteristics. The public-private differences for disulfiram availability were also significant, net of organizational variables. However, for naltrexone and disulfiram, the addition of other medication use mediated some of the center type differences.

Organizational characteristics were associated with medication adoption. Programs offering detoxification services were more likely to have adopted pharmacotherapies; this is notable despite the fact that, except for buprenorphine, the medications included in these analyses are generally not prescribed for detoxification purposes. Thus, it may be that providing treatment services in a medically managed setting enhances the medicalization of addiction, and thereby facilitates the introduction of pharmacotherapies at the organizational level. By contrast, the provision of residential services (which are substantially less “medical” in their structure and content) significantly decreased the likelihood of adoption of disulfiram or agonist medications. The availability of inpatient treatment services was positively associated with agonist medication

adoption, while outpatient care was not associated with any of the medications.

The results for the associations between center staffing and medication adoption were also mixed. As expected, employing at least one physician on the center's staff increased the odds of medication availability, although for disulfiram this association was completely mediated by the availability of the other two medications. There were trends suggesting greater adoption of agonists and disulfiram in centers in which a physician was available on a contractual basis, but these relationships only approached statistical significance. Thus, these findings raise questions about whether contractual relationships with physicians are sufficient for adoption of pharmacotherapies. For naltrexone and disulfiram, a more highly educated counseling workforce was associated with greater odds of availability. However, the percentage of certified counselors was not associated with any of the dependent variables.

Accreditation status was only associated with agonist medication availability. This finding may be explained by recent regulatory changes that require programs offering methadone maintenance to be accredited. It was expected that accreditation may be associated with the other medications since it is often viewed as a proxy measure for program quality; however, accreditation was not associated with disulfiram or naltrexone availability.

Of note, the twelve-step orientation of the center was not associated with medication adoption. It is commonly perceived that centers based on a 12-step model of recovery may be less inclined to offer pharmacotherapies, but these data suggest that, controlling for other organizational characteristics, this approach is not a significant barrier to medication use.

These data also provided some support for Rogers' (1995) concept of "technology clusters." The adoption of SSRIs appeared to be part of an overall cluster of medication adoption; it was associated with the adoption of naltrexone and disulfiram, while trending

towards significance for agonist medications. The positive association between SSRIs and naltrexone availability was consistent with recent work by Fuller et al. (2005) who found a similar relationship using longitudinal data. In addition, disulfiram availability was associated with both of the other medications, suggesting that it may serve as a possible "gateway" for the adoption of other treatment medications.

Of note, the association between naltrexone and agonist medications was not significant, suggesting that these medications neither facilitate nor impede the adoption of the other type of pharmacotherapy. This finding is intriguing in that both naltrexone and the agonist medications share a common "market" – i.e., opiate-dependent patients. However, the adoption of any of the agonist medications measured here (buprenorphine, methadone, and then-available LAAM) is predicated upon the treatment center successfully clearing a number of regulatory requirements. Naltrexone may be viewed as advantageous for treatment providers serving opiate-dependent clients but unwilling or unable to meet the demands imposed on physicians and clinics prescribing or dispensing other agonist medications. By the same token, naltrexone's utility in treating alcohol dependence positions it to serve a potentially greater number of clients within any given treatment center relative to other medications considered in these analyses.

There are several limitations in these analyses. First, the data are cross-sectional, which limits the ability to test causal relationships. In addition, while the samples are representative of the majority of specialty substance abuse treatment facilities operating in the US, it is unknown whether and to what extent these findings may generalize to VA settings, correctional facilities, opioid treatment programs, and clinicians in private practice, who were excluded from the research design. Finally, these analyses were only concerned with *adoption* of medications, and therefore, cannot speak to the issue of implementation. Consideration of how routinely these

medications are prescribed and the proportion of eligible clients receiving them are important directions for future research.

In summary, these data from the NTCS suggest that there are substantial differences in medication adoption between the public and private treatment sectors. To some extent, these differences may be partly a function of differences in organizational characteristics. These data also suggest that the presence of staff physicians is a key resource for medication adoption, and that contractual relationships with physicians may not be sufficient for the expansion of pharmacotherapy use in the specialty treatment system in the US. While centers offering detoxification services were significantly more likely to use these medications, their technology is predisposed to embrace the adoption of pharmacotherapies, and, moreover, such centers represent a minority in the treatment system. Finally, there is some evidence that medication adoption can be conceptualized as a technology cluster, such that use of one medication increases the likelihood that the center has adopted other relevant medications.

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Table 1: Descriptive Statistics for Independent Variables (n = 664)

Variable	Mean (SD) or %
Center Type	
Government-Owned	12.95%
Publicly Funded Non-Profit	34.64%
Privately Funded Non-Profit	37.35%
For-Profit	15.06%
Center Age in Years	23.57 (16.82)
Center Size (in FTEs)	32.70 (48.19)
Accredited Center	48.04%
Based on the 12-Step Model	67.77%
Offers Inpatient Detoxification	28.92%
Offers Outpatient Detoxification	10.84%
Offers Inpatient Treatment	33.43%
Offers Residential Program	30.27%
Offers Outpatient Care	82.98%
Physician Resources	
Staff Physician(s)	41.11%
Contract Physician(s)	30.57%
No Access to Physicians	28.31%
% Master's-Level Counselors	44.52 (34.00)
% Certified Counselors	58.22 (34.58)
% Primary Alcohol Clients	45.07 (23.94)

% Primary Opiate Clients	16.41 (18.76)
Region	
Northeast	22.29%
Midwest	26.96%
South	27.86%
West	22.89%
Medication Adoption	
SSRIs	49.25%
Agonist Medications	18.37%
Naltrexone	21.08%
Disulfiram	24.25%

Table 2: Logistic Regression of Agonist Medication Availability (n = 664)

	Model 1 **b (S.E.)**	**Model 2** **b (S.E.)**	**Model 3** **b (S.E.)**
Center Type			
Government-Owned	.588 (.393)	.320 (.499)	.208 (.507)
Public Non-Profit	Reference	Reference	Reference
Private Non-Profit	1.454 (.278)***	.528 (.401)	.372 (.414)
For-Profit	1.142 (.340)**	.259 (.470)	.141 (.482)
Center Age in Years	---	-.008 (.008)	-.007 (.008)
Center Size in FTEs	---	.001 (.002)	.002 (.002)
Accredited Center	---	1.584 (.348)***	1.503 (.355)***
12-Step Model	---	-.458 (.307)	-.388 (.319)
Inpatient Detoxification	---	.311 (.340)	.109 (.356)
Outpatient Detoxification	---	.895 (.350)*	.712 (.358)*
Inpatient Treatment	---	.672 (.331)*	.637 (.340)$^{+}$
Residential Program	---	-.693 (.325)*	-.678 (.333)*
Outpatient Care	---	-.256 (.384)	-.261 (.402)
Physician Resources			
Staff Physician(s)	---	1.489 (.462)**	1.447 (.483)**
Contract Physician(s)	---	.965 (.497)$^{+}$	.991 (.519)$^{+}$
No Physicians	---	Reference	Reference
% Master's-Level Counselors	---	-.002 (.004)	-.005 (.004)

% Certified Counselors	---	-.001 (.004)	-.001 (.004)
% Primary Alcohol Clients	---	-.006 (.006)	-.008 (.007)
% Primary Opiate Clients	---	.037 (.007)***	.037 (.007)***
Region			
Northeast	---	-.262 (.369)	-.229 (.375)
Midwest	---	-.658 (.391)$^{+}$	-.737 (.398)
South	---	Reference	Reference
West	---	.014 (.370)	-.137 (.382)
Medication Adoption			
SSRIs	---	---	.581 (.322)$^{+}$
Naltrexone	---	---	.274 (.307)
Disulfiram	---	---	.683 (.298)*
Constant	-2.407 (.240)	-3.822 (.792)	-4.012 (.833)
McKelvey & Zavoina's R^2	.110	.537	.570

$^{+}$p<.10, *p<.05, **p<.01, ***p<.001 (two-tailed)

Table 3: Logistic Regression of Naltrexone Availability (n = 664)

	Model 1 **b (S.E.)**	**Model 2** **b (S.E.)**	**Model 3** **b (S.E.)**
Center Type			
Government-Owned	.499 (.420)	.379 (.452)	-.022 (.484)
Public Non-Profit	Reference	Reference	Reference
Private Non-Profit	1.805 (.286)***	.876 (.338)*	.598 (.372)
For-Profit	1.774 (.331)***	1.201 (.379)**	1.110 (.417)**
Center Age in Years	---	.002 (.006)	.006 (.007)
Center Size in FTEs	---	-.001 (.002)	-.000 (.002)
Accredited Center	---	.407 (.281)	.293 (.316)
12-Step Model	---	.277 (.267)	.537 (.298)$^{+}$
Inpatient Detoxification	---	1.223 (.310)***	.993 (.347)**
Outpatient Detoxification	---	.926 (.321)**	.557 (.356)
Inpatient Treatment	---	-.026 (.296)	-.154 (.330)
Residential Program	---	-.180 (.277)	-.102 (.308)
Outpatient Care	---	.691 (.402)	.761 (.441)$^{+}$
Physician Resources			
Staff Physician(s)	---	.699 (.333)*	.382 (.373)
Contract Physician(s)	---	.538 (.348)	.316 (.394)
No Physicians	---	Reference	Reference
% Master's-Level Counselors	---	.009 (.004)*	.002 (.004)

% Certified Counselors	---	-.005 (.003)	-.006 (.004)
% Primary Alcohol Clients	---	.003 (.005)	.003 (.006)
% Primary Opiate Clients	---	-.002 (.007)	-.010 (.008)
Region			
Northeast	---	.101 (.349)	.064 (.376)
Midwest	---	.609 (.316)$^{+}$	.549 (.349)
South	---	Reference	Reference
West	---	.641 (.333)$^{+}$	.291 (.370)
Medication Adoption			
SSRIs	---	---	1.438 (.312)***
Agonists	---	---	.211 (.307)
Disulfiram	---	---	1.684 (.257)***
Constant	-2.528 (.252)	-4.759 (.701)	-5.381 (.813)
McKelvey & Zavoina's R^2	.178	.364	.513

$^{+}$p<.10, *p<.05, **p<.01, ***p<.001 (two-tailed)

Table 4: Logistic Regression of Disulfiram Availability (n = 664)

	Model 1 **b (S.E.)**	**Model 2** **b (S.E.)**	**Model 3** **b (S.E.)**
Center Type			
Government-Owned	1.125 (.314)***	1.007 (.340)**	.934 (.364)*
Public Non-Profit	Reference	Reference	Reference
Private Non-Profit	1.238 (.246)***	.604 (.301)*	.267 (.335)
For-Profit	1.217 (.298)***	.805 (.342)*	.546 (.378)
Center Age in Years	---	-.001 (.006)	.000 (.007)
Center Size in FTEs	---	-.002 (.002)	-.002 (.003)
Accredited Center	---	.155 (.253)	-.166 (.285)
12-Step Model	---	-.361 (.230)	-.404 (.253)
Inpatient Detoxification	---	.745 (.297)*	.283 (.334)
Outpatient Detoxification	---	.963 (.299)**	.662 (.330)*
Inpatient Treatment	---	-.075 (.277)	-.218 (.309)
Residential Program	---	-.504 (.260)*	-.483 (.286)
Outpatient Care	---	.399 (.352)	.284 (.374)
Physician Resources			
Staff Physician(s)	---	.770 (.297)*	.409 (.327)
Contract Physician(s)	---	.580 (.302)$^{+}$	.324 (.332)
No Physicians	---	Reference	Reference
% Master's-Level Counselors	---	.009 (.003)**	.004 (.004)

% Certified Counselors	---	.003 (.003)	.005 (.004)
% Primary Alcohol Clients	---	.005 (.005)	.006 (.005)
% Primary Opiate Clients	---	.009 (.006)	.005 (.007)
Region			
Northeast	---	-.238 (.327)	-.325 (.353)
Midwest	---	.462 (.292)	.442 (.322)
South	---	Reference	Reference
West	---	1.018 (.292)***	.942 (.316)***
Medication Adoption			
SSRIs	---	---	1.014 (.270)***
Agonists	---	---	.729 (.296)*
Naltrexone	---	---	1.656 (.259)***
Constant	-2.017 (.205)	-3.845 (.611)	-3.983 (.663)
McKelvey & Zavoina's R^2	.092	.284	.405

$^{+}$p<.10, *p<.05, **p<.01, ***p<.001 (two-tailed)