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Pharmacotherapy, resource needs, and physician recruitment practices in substance use disorder treatment programs

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Abstract

Objectives—Effective pharmacological treatments for opioid use disorder (OUD) continue to be underutilized, particularly within specialty substance use disorder (SUD) treatment organizations. Few studies have examined whether specific practices to recruit prescribers, financial needs, and human resource needs facilitate or impede the implementation of pharmacotherapy.

Methods—Surveys were completed by administrators from 160 treatment programs in Florida, Ohio, and Wisconsin. Respondents described availability of five pharmacotherapies for treating OUD, organizational resource needs, current use of physician recruitment practices, and buprenorphine treatment slots.

Results—The mostly commonly available medications were injectable naltrexone (65.4%; n=102), buprenorphine-naloxone (55.7%; n=88), and tablet naltrexone (50.0%; n=78). Adopters of each of the five pharmacotherapies reported significantly greater physician outreach than

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organizations that did not provide these medications. The mean number of buprenorphine slots was 94.1 (SD=205.9). There were unique correlates of adoption (i.e., any slots) and availability (number of slots) of buprenorphine. Physician outreach activities were correlated with the likelihood of non-adoption, while medical resource needs (i.e., needing more physicians to prescribe pharmacotherapy) and dedicated resources for physician recruitment were associated with the number of slots.

Conclusions—Physician recruitment activities differentiated those organizations that had existing pharmacotherapy treatment capacity (i.e., any slots) from those that had no capacity. Efforts to address the medical resource needs of treatment organizations as well as strategies that encourage organizations to devote resources to recruiting prescribers may hold promise for increasing access to these lifesaving treatments.

The United States is in the midst of an opioid epidemic, with 2–3 million Americans meeting criteria for opioid use disorder (OUD) (Han et al., 2017) and overdoses now a leading cause of accidental deaths (Rudd et al., 2016). Costs associated with heroin use disorder, including lost productivity, health care, and criminal justice costs, have been estimated at \$52 billion (Jiang et al., 2017), and costs for prescription OUD are even higher at \$79 billion (Florence et al., 2016).

Pharmacotherapies, including methadone, naltrexone, and buprenorphine, are effective treatments (Mattick et al., 2009; Mattick et al., 2014). Naltrexone is an antagonist that can be prescribed by any provider with prescribing authority. It is effective for relapse prevention, particularly in the extended release formulation (Krupitsky et al., 2011). Its uptake in specialty substance use disorder (SUD) treatment programs has been limited (Aletraris et al., 2015).

Agonist medications, such as methadone and buprenorphine, reduce opioid use and relapse (Thomas et al., 2014), mortality (Green et al., 2012), and the acquisition of hepatitis C (Tsui et al., 2014) and HIV (Gibson et al., 1999; MacArthur et al., 2012). Methadone can only be dispensed within federally approved opioid treatment programs (OTPs), restricting its potential for addressing the opioid epidemic. Buprenorphine can be prescribed in medical offices and specialty treatment programs, provided that prescribers meet federal requirements. Physicians, physician assistants, and nurse practitioners can apply for a waiver to prescribe buprenorphine (also known as an X-license) after attesting that they have met training requirements or hold professional credentials (e.g., board certification in addiction) (Department of Health and Human Services, 2016). Physicians initially can treat 30 patients at any given time. After one year, physicians can apply for an increase to 100 patients. Physicians holding the 100-patient waiver for at least a year can apply to treat up to 275 patients. Physician assistants and nurse practitioners are limited to 30 patients. Buprenorphine's partial agonist properties, combined with its availability in non-OTP settings, have made it an important treatment for combatting the opioid epidemic. However, the waiver system's limitation of the number of patients per provider constrains treatment capacity for those licensed to treat 100 patients or fewer.

There has been growth in the availability of buprenorphine, as measured by the number of registered providers (Knudsen et al., 2017), the amount prescribed in the US (Stein et al.,

2015), and Medicaid spending (Wen et al., 2017). However, buprenorphine treatment capacity remains an issue with not enough registered providers to fully address the OUD epidemic (Jones et al., 2015). Uptake of buprenorphine in treatment organizations has been notably slow (Andrews et al., 2014). Within specialty SUD organizations that offer medications, some have relatively few OUD patients on pharmacotherapy (Knudsen and Roman, 2012), while others have waiting lists (Molfenter et al., 2015).

Organizational theories on innovation diffusion suggest that financial and human resources, specifically slack resources, professionalism, and technical capacity, may be associated with measures of buprenorphine capacity (Rogers, 2003; Greenhalgh et al., 2004; Damschroder et al., 2009). Slack resources refer to the availability of funding and personnel beyond those needed to maintain the organization's basic operations. Organizations reporting high needs for additional funding and personnel have limited slack, which constrains their ability to implement innovative services. Cost has long been noted as a barrier to the adoption of pharmacotherapies (Sharma et al., 2017). Research on financial barriers has largely focused on reliance on different types of funding streams (Knudsen and Roman, 2012; Quest et al., 2012) rather than specifically inquiring about the financial and human resource needs of the organization. In SUD treatment, organizational theory suggests that limited slack (i.e., high resource needs) may restrict managerial willingness to expand treatment capacity in terms of increasing the number of buprenorphine slots to treat new patients.

Organizational theory also points to the importance of professionalism and technical capacity for the implementation of innovations (Greenhalgh et al., 2004). Access to medical professionals is necessary to have the technical capacity to implement this treatment. Lack of access to prescribers has been a key barrier (Friedmann et al., 2010; Abraham et al., 2013; Molfenter et al., 2015). Historically, relatively few specialty SUD treatment programs have employed physicians (Knudsen et al., 2012), so SUD organizations must make concerted efforts to attract, hire, integrate, and retain physicians to build and sustain this technical capacity. Few studies have measured whether organizations undertake specific practices to recruit prescribers. Theory regarding professionalism and technical capacity suggests that SUD organizations that engage in physician outreach and dedicate resources to recruiting physicians may have greater overall treatment capacity.

The current study sought to explore treatment organizations' efforts to use pharmacotherapy to address the opioid epidemic as part of a larger trial on expanding access to pharmacotherapy in publicly funded specialty treatment settings. First, we describe the organizational resource needs and current practices for recruiting physicians in a convenience sample of SUD treatment programs in three states. Second, we examine the associations between organizational resource needs, physician recruitment practices, and buprenorphine treatment capacity.

METHODS

Sample

As part of cluster randomized trial on improving access to pharmacotherapy for OUD (NCT02926482), a survey was distributed to SUD organizations in Florida, Ohio, and

Wisconsin with at least 100 annual treatment admissions that receive Substance Abuse and Prevention (SAPT) block grant funding. These states, although not randomly sampled, were selected for pragmatic and substantive reasons. Because of the resources required to field a trial of more than 70 organizations, the team focused on three states that varied in key characteristics. These states varied with regard to the magnitude of the opioid epidemic, as measured by past-year rates of opioid use disorder (Jones et al., 2015), opioid overdose death rates (Centers for Disease Control and Prevention, 2016) and per capita prescribing of opioid pain relievers (Paulozzi et al., 2014). All three states have both rural and urban areas, which could provide important information about whether rurality impacts efforts to expand pharmacotherapy. In addition, the states differed in their approaches to implementing the Affordable Care Act (ACA). Florida declined to expand Medicaid, Ohio adopted the expansion, and Wisconsin did not adopt Medicaid expansion but allows adults up to 100% of the federal poverty line to enroll in Medicaid (Henry J. Kaiser Family Foundation, 2018). In addition, state stakeholders indicated interest in the study and agreed to serve on an advisory board.

The goal of the survey was to collect information regarding interest in participating in the cluster randomized trial as well as basic information about these SUD organizations. Eligible organizations were identified by the state's SUD agency, which has responsibility for routing federal SAPT block grant funding to treatment programs. Stakeholders used administrative data submitted by programs to identify all eligible organizations within their states. State stakeholders sent a REDCap link to the online survey to 448 programs that met these criteria. This email invitation noted that organizations may be invited to participate in a study that included technical assistance to expand buprenorphine treatment capacity. Data were collected from October 2016 to May 2017 from 160 organizations (35.7% response rate). Study procedures were approved by the University of Wisconsin-Madison's institutional review board.

Measures

Measures of organizational resource needs consisted of 9 items with Likert response categories ranging from 1=not true to 5=true. Six items measured physician recruitment practices using the same response options. Five types of OUD pharmacotherapy were measured (1=currently available, 0=not available). Buprenorphine treatment slots were measured as assigned slots, meaning the number of buprenorphine treatment slots accessible within their organization and via relationships with external providers. Second, organizations were asked how many of these assigned slots were currently open for new patients. The former measures treatment capacity, while the latter is a measure of treatment availability. Missing values on these two measures were replaced with zero for organizations that reported providing neither buprenorphine-naloxone nor buprenorphine (without naloxone).

Statistical Analysis

Descriptive statistics were calculated. The factor structure of the items measuring organizational resource needs and physician recruitment practices was examined using principal components factor analysis with a varimax rotation. Mean scales were constructed. Organizations in the three states were compared using chi-square tests or analysis of

variance (with Bonferonni correction) depending on the level of measurement. Independent samples t-tests compared scale scores by the five types of OUD pharmacotherapy. Because a substantial number of organizations had no buprenorphine slots, a zero-inflated negative binomial regression model (Long, 1997) was used to estimate the associations between assigned slots, organizational resource needs, and physician recruitment practices while controlling for state; the “margins” command estimated predicted means at varying values of significant covariates while adjusting for all other variables in the model (Mitchell, 2012). A negative binomial regression model estimated treatment availability, as measured by open buprenorphine slots, for the subset of organizations with any assigned slots. All analyses were conducted using *Stata 15.0* (StataCorp, College Station, TX).

RESULTS

Table 1 presents descriptive statistics for the items measuring organizational resource needs and physician recruitment practices as well as the percentage of organizations responding at the maximum (i.e., “true”) for each item. Overall, the sample reported needing more resources to address the opioid epidemic, with more than half the sample choosing the maximum value for eight of the nine resources. Over one-third of organizations reported that they were currently seeking additional physicians. Current efforts and resources dedicated to recruiting physicians were modest, as indicated by the relatively few organizations that selected the maximum for these items.

Based on the factor analysis results, four scales were constructed: general resource needs for funding, counseling staff, and training (Cronbach’s $\alpha=.81$), medical resource needs for physicians who can prescribe pharmacotherapy ($\alpha=.84$), physician outreach activities ($\alpha=.73$), and dedicated resources for physician recruitment ($\alpha=.94$; see Table 2). Overall, treatment organizations reported a high need for more general resources (i.e., funding, counselors, and training). The mean for medical resource needs indicated that the average organization noted it was “mostly true” that they needed more physicians who can prescribe pharmacotherapy. Physician outreach activities was limited, with a mean between “slightly true” and “somewhat true.” The mean for dedicated resources was the lowest, with a mean below “slightly true.” Two scales varied by state. Specifically, the means for organizations in Wisconsin were significantly greater than those in Florida for medical resource needs and dedicated resources for physician recruitment.

In this sample, there was variability in the provision of pharmacotherapies (Table 2). The most common medications were injectable naltrexone, buprenorphine-naloxone, and tablet naltrexone. Availability of injectable naltrexone, buprenorphine-naloxone, buprenorphine without naloxone, and methadone varied by state, with greatest availability in Florida. The average organization provided 2.2 of the 5 medications ($SD=1.7$), but 23.8% ($n=36$) did not provide any of the 5 medications. About 27.5% ($n=40$) provided 4 medications and 6.0% ($n=9$) provided all five medications. The average organization had 94.1 assigned buprenorphine slots ($SD=205.9$; median=85.0). Among the 83 organizations with any assigned slots, the mean for open buprenorphine slots was 71.3 ($SD=140.8$), but the median was just 25 (IQR: 2–95). About 19.3% ($n=16$) of these organizations reported being

completely full (i.e., having zero open slots), while 21.7% (n=18) had 100 or more open buprenorphine treatment slots. Buprenorphine slots did not vary by state.

Comparisons were made between adopters and non-adopters for each of the five pharmacotherapies for the organizational resource scales and physician recruitment scales (Table 3). Adopters and non-adopters did not differ on general resource needs or medical resource needs. Adopters of each of the five pharmacotherapies reported significantly greater physician outreach than organizations that did not provide these medications. Organizations providing buprenorphine-naloxone and generic buprenorphine reported significantly greater resources dedicated to physician recruitment than organizations not offering these medications.

Table 4 presents the zero-inflated negative binomial regression model for assigned buprenorphine slots, which has two parts. First, the zero-inflated part of the model estimates associations between the independent variables and the likelihood of having zero assigned buprenorphine treatment slots. The negative association for physician outreach activities indicates that organizations reporting greater physician outreach were significantly less likely to have zero assigned slots. In addition, organizations located in Florida and Ohio were significantly less likely than organizations in Wisconsin to report having zero treatment slots. Second, for the negative binomial part of the model estimating the number of assigned buprenorphine slots, two variables were significant. Organizations reporting greater medical resource needs (i.e., needing more physicians to prescribe pharmacotherapy) had significantly fewer assigned slots. There was a positive association between dedicated resources for physician recruitment and the number of assigned buprenorphine slots.

These associations were further examined through the estimation of predicted means by varying values of each significant independent variable in the zero-inflated negative binomial regression model. These predicted means were estimated while adjusting for the other variables in the model. Using the medical resource needs as an example, the predicted mean of assigned slots, when this scale was at its mean (3.94), was 66.7 slots (95% CI=45.4–88.1). A one-unit decrease in the medical resource needs scale from its mean (from 3.94 to 2.94) resulted in a predicted mean of 116.9 (95% CI=66.7–167.1), which was a near doubling of assigned slots. Physician outreach activities had a somewhat smaller impact. When physician outreach was set at its mean (2.24), the predicted mean of assigned slots was 89.2 (95% CI: 48.4–130.0); increasing the physician outreach scale by one unit (to 3.24) resulted in a predicted mean of 123.9 (95% CI=65.1–182.7) which was about 40% greater than when physician outreach is set at its mean. When dedicated resources was set at its mean (1.83), the predicted mean of assigned slots was 77.9 (95% CI=46.6–109.2); increasing dedicated resources by one unit (to 2.83) raised the predicted mean of assigned slots to 113.3 (95% CI=47.6–168.9), an increase of about 45%.

A negative binomial regression model estimated the relationships between open buprenorphine slots available for new patients and the independent variables (Table 5). This model was restricted to organizations that had any assigned buprenorphine slots. The only significant variable was medical resource needs, which was negatively associated with open buprenorphine slots. Organizations indicating lower medical resource needs reported having

significantly greater open buprenorphine slots that were available for new patients; put another way, organizations with greater medical resource needs had fewer open slots (i.e., they were more full and had less capacity for new patients). Predicted means provided more detail regarding this association. The predicted mean of open slots, when medical resource needs was set at its mean (3.94), was 54.6 (95% CI=33.0–76.2). A one-unit reduction in medical resource needs (to 2.94) resulted in predicted mean of 108.2 open slots (95% CI=44.3–172.0), which was a near doubling of open slots. There were no differences in open buprenorphine slots by state.

DISCUSSION

In this non-random sample of publicly funded treatment centers in three US states, organizations providing treatment for OUD report substantial needs for additional resources to address the opioid epidemic. The majority of organizations in this sample indicated needing more financial resources, more counseling staff, and more physicians who prescribe buprenorphine. Nearly half reported needing more prescribers of extended-release naltrexone. Current efforts to recruit physicians to provide pharmacotherapy were somewhat limited.

Notably, organizations differed in the pharmacotherapies that they offered, and their capacity for providing buprenorphine, as measured by treatment slots, was highly variable. About a quarter of the sample did not provide any medications to treat OUD, while others offered multiple types of pharmacotherapy. Capacity for providing buprenorphine varied, with some having no buprenorphine treatment slots, some having assigned slots but no open slots for new patients, and others having a considerable number of open slots.

These varying patterns of capacity, such that some organizations did not offer buprenorphine while others were already implementing this pharmacotherapy, were differentially associated with the measures of physician recruitment practices. Physician outreach activities, such as having a plan for recruiting physicians, engaging in forums with physicians, and actively seeking additional physicians, differentiated those organizations that had existing buprenorphine treatment capacity (i.e., any assigned slots) from those that had no capacity. While these activities have some costs associated with them, those costs are likely smaller than employment of a recruiter or having a budget dedicated to supporting physician recruitment costs. The zero-inflated model revealed that the association for dedicated resources was actually significant for implementation in terms of the amount of total capacity, but not for the adoption part of the model. There may be value in implementation strategies that help organizations offering pharmacotherapy to engage in developing increased technical capacity through greater prescriber outreach and the dedication of resources to recruitment.

Underscoring the need to build physician capacity within these organizations was the need for additional medical resources, specifically more prescribers of pharmacotherapies. Consistent with the literature on slack resources, medical resource needs for more prescribers were correlated with both the number of assigned slots (i.e., overall capacity) and open slots. Organizations with smaller overall capacity as well as those with fewer open

slots reported greater needs in terms of access to more prescribers of pharmacotherapy. Given that the majority of organizations reported needing more medical resources, these findings suggest that some treatment agencies may be able to develop initial nominal capacity to provide OUD pharmacotherapies, but have difficulty scaling-up this service due to prescriber availability.

These findings provide initial support for the importance of some of the elements that will be tested in the larger cluster randomized trial. Central to the RCT is the deployment of a prescriber recruitment bundle (PRB), which contains information on how to identify providers who may be interested in prescribing OUD pharmacotherapies, educational information to inform providers of models of OUD pharmacotherapy that incorporate other clinical team members to assist in patient management, academic detailing strategies, information on telemedicine in the context of OUD pharmacotherapy, and interventions to build leadership support for expanding OUD treatment capacity (Molfenter et al., 2017). In the intervention arm of the RCT, the PRB will be accompanied by coaching and a learning collaborative using the NIATx Organizational Change model, while the control arm will only have online access to the PRB materials.

Several limitations should be acknowledged. First, the data collected were from a cross-sectional survey, so causal inferences cannot be made. Second, data were obtained from a single person within the organization, usually a director who may be less knowledgeable about capacity than medical providers who are actually prescribing these medications. Third, although we used statistical approaches that are appropriate for count data, our sample size is somewhat small for these techniques, which may increase the risk of Type II error. Fourth, the response rate to the survey was low, which may limit generalizability. Because we relied on state agencies to send the invitations, we were unable to follow-up with non-respondents to encourage participation. The absence of an incentive for survey completion may also have limited the response rate.

Other aspects of the design limit generalizability. Notably, the sample was recruited from only 3 US states and only organizations receiving SAPT block grant funding with more than 100 annual admissions were eligible. It is unknown if these findings would generalize to SUD organizations in other states, to smaller providers, or to those that rely on private insurance funding. Furthermore, because the survey was linked to recruitment efforts for the RCT, responses may reflect organizations that had greater interest in expanding their capacity to deliver pharmacotherapy. Indeed, adoption of buprenorphine and extended-release naltrexone was considerably higher than national rates in the most recent National Survey of Substance Abuse Treatment Services (N-SSATS). In 2016, about 27% of specialty SUD facilities offered buprenorphine and 21% offered extended-release naltrexone (Substance Abuse and Mental Health Services Administration, 2017). Methadone adoption in this sample was closer to national data, where about 9% of specialty programs are licensed opioid treatment programs. Elevated rates of adoption may reflect recent state and federal efforts that have expanded funding for buprenorphine and extended-release naltrexone (Dissell, 2017; Swisher, 2017). Caution should be exercised in generalizing these findings to the broader field.

In addition, the survey included a limited number of measures and did not obtain detailed data regarding organizational structure and funding streams, so it is unknown whether such variables would affect our findings. Funding streams may be directly associated with capacity for delivering pharmacotherapy, may mediate the associations in the models, or may moderate these relationships. Future research should attempt to replicate these findings in a random sample of treatment organizations.

To address the ongoing opioid epidemic, the expansion of pharmacotherapy is critically important. The specialty SUD treatment sector, health systems, and county public health departments have the potential to increase access to effective treatment. Specialty programs, in particular, may be important for patients who need more structure and wraparound services (Substance Abuse and Mental Health Services Administration, 2018). This exploratory study suggests that efforts to address the medical resource needs as well as strategies that encourage organizations to engage in outreach and devote resources to recruiting physicians may hold promise for increasing access to this lifesaving evidence-based treatment.

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Table 1
Descriptive statistics and factor analysis of organizational resource needs and physician recruitment practices

<i>Our organization needs...</i>	Available N	Mean (SD)	% (N) Responding "True"	Factor 1	Factor 2	Factor 3	Factor 4	Uniqueness
More treatment dollars in order to address the opioid epidemic	159	4.39 (0.97)	63.5% (101)	.73	.17	-.14	.11	.40
More counselors in order to address the opioid epidemic	160	4.29 (0.98)	56.3% (90)	.70	.07	.16	.03	.48
More physicians in order to address the opioid epidemic	158	4.13 (1.26)	56.3% (89)	.22	.82	-.12	.26	.19
More physicians who can prescribe buprenorphine in order to address the opioid epidemic	159	3.89 (1.40)	59.7% (79)	.03	.87	.12	.03	.23
More physicians who prescribe naltrexone or injectable naltrexone in order to address the opioid epidemic.	159	3.76 (1.44)	45.9% (73)	.22	.84	.03	-.09	.24
More funds to pay for medication-assisted treatment in order to address the opioid epidemic	157	4.39 (1.11)	69.4% (109)	.72	.26	-.02	.11	.40
More funds to pay for recovery supports such as housing and employment in order to address the opioid epidemic	157	4.60 (0.84)	75.8% (119)	.63	.20	-.25	.06	.50
More funds to pay for primary prevention services in order to address the opioid epidemic	156	4.29 (1.09)	60.3% (94)	.77	.02	-.08	.10	.39
More clinician training in evidence-based approaches to address the opioid epidemic	160	4.33 (1.02)	61.3% (98)	.63	.35	.21	-.22	.38
<i>How true are the following statements for your organization?</i>								
We are currently seeking additional physician capacity	158	3.12 (1.74)	38.0% (60)	.05	.42	.04	.74	.27
We have a formal plan to identify physician candidates for recruitment.	158	2.30 (1.39)	7.0% (11)	.09	-.01	.44	.70	.30
We conduct recruitment outreach to physician candidates weekly	159	1.68 (1.09)	3.1% (5)	-.00	.01	.37	.74	.32
We have conducted a public physician forum over the past year to inform physicians about addiction disorders	159	1.87 (1.46)	14.5% (23)	.17	-.24	.18	.57	.56
We have a dedicated physician recruiter.	158	1.83 (1.44)	12.7% (20)	-.03	-.00	.93	.16	.10
We have a dedicated budget for physician recruiting	157	1.85 (1.44)	12.1% (19)	-.03	.05	.91	.18	.13

Notes: Response options were 1=not true, 2=slightly true, 3=somewhat true, 4=mostly true, and 5=true. Factors loadings from the rotated component matrix are presented for the four factors. Items included in each of the four scales are identified by factor loadings in bold.

Organizational resource needs, physician recruitment practices, and pharmacotherapy overall and by state

Table 2

	Available N	Mean (SD) or % (N)	IQR	Florida Mean (SD) or % (N)	Ohio Mean (SD) or % (N)	Wisconsin Mean (SD) or % (N)
General Resource Needs	150	4.4 (0.7)	4.2, 5.0	4.6 (0.4)	4.3 (0.7)	4.3 (0.8)
Medical Resource Needs ^{**}	158	3.9 (1.2)	3.7, 5.0	3.3 (1.5)	3.8 (1.2)	4.2 (1.0)
Physician Outreach Activities	157	2.2 (1.1)	1.0, 3.0	2.5 (1.0)	2.2 (0.9)	2.2 (1.2)
Dedicated Resources for Recruitment ^{**}	156	1.3 (1.4)	1.0, 2.5	1.3 (0.9)	1.6 (1.1)	2.1 (1.6)
Provides buprenorphine-naloxone [*]	158	55.7% (88)		75.0% (18)	62.8% (32)	45.8% (38)
Provides buprenorphine (without naloxone) [*]	157	37.6% (59)		58.3% (21)	42.9% (21)	28.6% (24)
Provides oral naltrexone	156	50.0% (78)		45.8% (11)	54.9% (27)	48.9% (40)
Provides extended-release naltrexone ^{**}	156	65.4% (102)		91.3% (21)	68.0% (34)	56.6% (47)
Provides methadone ^{**}	155	14.2% (22)		45.8% (11)	12.2% (6)	6.1% (5)
Assigned buprenorphine slots	151	84.5 (198.0)	0.0, 100.0	92.1 (99.5)	122.9 (292.6)	61.3 (142.3)
Open buprenorphine slots (among the subset of organizations with any slots)	83	71.3 (140.8)	2.0, 95.0	93.6 (72.3)	86.5 (215.5)	47.9 (76.1)

Notes. IQR=inter-quartile range. Significant F-statistic or chi-square test.

* $p < .05$,

** $p < .01$,

*** $p < .001$.

Organizational resource needs and physician recruitment practices by pharmacotherapy adoption

Table 3

	General Resource Needs Mean (SD)	Medical Resource Needs Mean (SD)	Physician Outreach Activities Mean (SD)	Dedicated Resources for Recruitment Mean (SD)
Provides buprenorphine-naloxone	4.47 (0.58)	3.97 (1.17)	2.61 *** (1.05)	2.19 *** (1.57)
Does not provide buprenorphine-naloxone	4.24 (0.88)	3.88 (1.22)	1.77 (0.93)	1.39 (0.99)
Provides buprenorphine (without naloxone)	4.51 (0.62)	4.04 (1.07)	2.63 *** (1.02)	2.16* (1.57)
Does not provide buprenorphine	4.28 (0.78)	3.89 (1.25)	1.98 (1.03)	1.65 (1.26)
Provides oral naltrexone	4.40 (0.80)	4.04 (1.17)	2.60 *** (1.03)	2.03(1.45)
Does not provide oral naltrexone	4.32 (0.67)	3.84 (1.20)	1.92 (1.02)	1.66 (1.35)
Provides extended-release naltrexone	4.43 (0.64)	3.97 (1.17)	2.49 *** (1.06)	1.98 (1.21)
Does not provide extended-release naltrexone	4.26 (0.87)	3.88 (1.22)	1.76 (0.95)	1.59 (1.49)
Provides methadone	4.63 (0.53)	4.01 (1.15)	2.83 ** (1.02)	1.52 (1.21)
Does not provide methadone	4.31 (0.76)	3.85 (1.23)	2.15 (1.05)	1.91 (1.44)

Notes. Difference between adopters and non-adopters.

* p<.05,

** p<.01,

*** p<.001, using independent samples t-tests (two-tailed).

Table 4

Zero-inflated negative binomial regression model of assigned buprenorphine treatment slots (n=137)

	Likelihood of having no assigned slots Coefficient (95% CI)	<i>p</i> -value	Count of assigned slots Coefficient (95% CI)	<i>p</i> -value
<i>Count of assigned slots</i>				
General resource needs	-0.074 (-0.688, 0.540)	.814	-0.201 (-0.642, 0.239)	.370
Medical resource needs	-0.012 (-0.402, 0.378)	.952	-0.563 (-0.834, -0.293)	<.001
Physician outreach activities	-0.696 (-1.173, -0.219)	.004	0.141 (-0.147, 0.429)	.337
Dedicated resources for physician recruitment	-0.281 (-0.653, 0.091)	.138	0.285 (0.478)	.019
State				
Florida	-1.471 (-2.852, -0.089)	.037	-0.102 (-0.987, 0.783)	.821
Ohio	-0.958 (-1.878, -0.387)	.041	0.611 (-0.082, 1.304)	.084
Wisconsin	Reference		Reference	

Note. Model uses complete case analysis, so the sample size reflects the loss of 23 organizations that had missing data.

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Table 5

Negative binomial regression model of open buprenorphine treatment slots among organizations with any assigned slots (n=75)

	Coefficient	(95% CI)	p-value
General resource needs	-0.096	(-0.774, 0.582)	.781
Medical resource needs	-0.684	(-1.116, -0.252)	.002
Physician outreach activities	0.175	(-0.251, 0.601)	.422
Dedicated resources for physician recruitment	0.151	(-0.180, 0.482)	.370
State			
Wisconsin	Reference		
Florida	-0.085	(-1.460, 1.290)	.903
Ohio	0.119	(-0.978, 1.215)	.832

Note. Model uses complete case analysis. Of the subset of 83 organizations that had any assigned buprenorphine slots and provided data on open slots, 8 organizations were excluded due to missing data on the independent variables.