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Organizational-Level Predictors of Adoption Across Time: Naltrexone in Private Substance-Use Disorders Treatment Centers*

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Abstract

Objective—Prominent on the nation's research agenda on substance-use disorders treatment is the dissemination of effective pharmacotherapies. Thus, the purpose of this article is to use a “diffusion of innovations” theoretical framework to examine the organizational-level predictors of the adoption of a pharmacotherapy, naltrexone (Revia), in private substance use-disorders treatment centers ($N = 165$).

Method—Data for these analyses were derived from the National Treatment Center Study, which contains four waves of data collected between 1994 and 2003. An event history model examined the impact of culture, leadership characteristics, internal structure, and external characteristics on the likelihood of adopting naltrexone between 1994 and 2003.

Results—The results suggest that organizations embracing a 12-step model and those employing more experienced administrators were significantly less likely to adopt naltrexone. Moreover, treatment centers that used prescription drugs, possessed an employee handbook, were accredited, and operated on a for-profit basis were significantly more likely to adopt naltrexone over time.

Conclusions—Structural characteristics do affect the innovation adoption behaviors of private substance-use disorders treatment centers. Organizational-level “research to practice” implications to further the adoption of innovative evidence-based treatments are discussed.

A Major Focus Within the substance-use disorders treatment field is on conducting clinical trials in an effort to identify more effective treatment modalities. Despite the development of a number of evidence-based treatment strategies, including pharmacotherapies, substance-use disorders treatment providers (Foreman et al., 2001; McGovern et al., 2004) and community treatment programs have been slow to adopt these new strategies (Backer et al., 1995; Lamb et al., 1998; Read et al., 2001) suggesting that the adoption of innovations is a more complex organizational process. We argue that much of the “gap” that exists between research and practice can be explained by the structural variations of treatment organizations. Therefore, the purpose of this article is to use a “diffusion of innovations”

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theoretical framework (Rogers, 2003) to examine the organizational predictors of innovation adoption in private substance-use disorders treatment centers using an event history analysis. Specifically, the adoption of naltrexone (Revia) between 1994 and 2003 will be explored. Naltrexone is an opiate antagonist used in the treatment of both opiate and alcohol dependence. The development of naltrexone for the treatment of opiate dependence was approved by the U.S. Food and Drug Administration (FDA) in 1984. Subsequently, naltrexone can be defined as an innovation (Rogers, 2003) since it was approved for the treatment of alcohol dependence a decade later based on two randomized trials (O'Malley et al., 1992; Volpicelli et al., 1992).

Theoretical concepts predicting naltrexone adoption

According to Rogers (2003), organizational innovativeness is determined by variation in three general areas: leadership, internal organizational structure, and external characteristics of the organization. However, it would be negligent to overshadow the cultural values of the expected innovation adopters, which, in the present study, are substance-use disorders treatment organizations. In fact, descriptive data from the National Treatment Center Study (NTCS) (2007) demonstrated that cultural ideological factors were listed as one of the most important motivations that influenced a center's decision to adopt naltrexone. Thus, organizational culture, although not in Roger's (2003) theoretical framework, is included in these analyses. Table 1 displays an overview of the four main theoretical concepts of the organizational model.

Organizational culture

Several researchers suggest that the fit of the innovation with the organization is crucial in the adoption decision-making process (Diamond, 1993; Glasner et al., 1983; Leonard-Baron and Sinha, 1993; Tornatzky and Klein, 1982). Organizations generally parallel the values of the dominant culture and the treatment field still adheres to traditional beliefs, ideologies, and philosophical practices that date back to the early 20th century (Ducharme et al., 2006; Roman et al., 2000; White, 1998). Specifically, there may be some resistance toward the use of pharmacotherapies among alcohol-dependent individuals (Rychtarik et al., 2000; Mark et al., 2003) and counselors (Knudsen et al., 2005) who adhere to a 12-step philosophy. However, it should be noted that self-help programs recommend that members follow their physician's medical advice and be medication compliant (Alcoholics Anonymous [AA], 1984).

Leadership

In the case of substance-use disorders treatment, leadership rests largely in the hands of administrators who possess the power, status, and oftentimes technical expertise to make authority-based innovation decisions (Rogers, 2003). Research demonstrates a positive relationship among innovation adoption and both a health care administrator's education and experience (Castle and Banaszak-Holl, 1997; Damanpour, 1991; Kimberly and Evanisko, 1981; Roman and Johnson, 2002).

Internal organizational structure

The third component of the model, internal organizational structure, is further subdivided into six interrelated dimensions of management and organizational characteristics: (1) centralization of power, (2) complexity, (3) formalization, (4) interconnectedness, (5) organizational resources, and (6) organizational size. First, centralization is the degree to which power is concentrated in an organization. For example, the presence of a board of directors may indicate a hierarchical system that could limit the learning and acceptability of both the counselors and clients who actually use the technology (Damanpour, 1991; Diamond, 1995; Kavanagh, 1995; Kimberly and Evanisko, 1981; Thomas, 1991).

Second, complexity can be conceptualized as the extent of professional knowledge and expertise within an occupational specialty. In the substance-use disorders treatment literature, having a high percentage of counselors with a master's degree suggests that these organizations will be more likely to adopt innovations such as naltrexone (Fennell, 1984; Roman and Johnson, 2002; Taleff and Swisher, 1997). In addition, the employment of an individual with formal training in the medical field who can prescribe pharmaceuticals, such as a psychiatrist, is needed and can reaffirm the credibility of both the substance-use disorders treatment center and the industry (Dewar and Dutton, 1986; McCallum, 1995). The current use of other prescription drugs suggests a technology cluster (or innovation package), which can be defined as the use of one or more elements of technology that are closely interrelated (Dewar and Dutton, 1986; Ettlie et al., 1984; Rogers, 2003) and could foster the adoption of naltrexone.

Third, formalization refers to the degree to which rules are emphasized when conducting organizational activities. Formalization is typically operationalized as the presence of rule manuals and job descriptions (Damanpour, 1991), such as an employee handbook. Among professionals, bureaucratic formalization limits the desire to learn about and subsequently adopt innovations because of limited autonomy (Aiken et al., 1980; Bailyn, 1985; Raelin, 1985).

The fourth dimension, interconnectedness, refers to the extent to which an organization is embedded within a social network of other organizations (Rogers, 2003). Substance-use disorders treatment facilities that have been accredited by endorsing institutions, such as the Commission on Accreditation of Rehabilitation Facilities (CARF) and the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), are more likely to be innovative because accreditation requires evidence of quality improvement practices (Griffith et al., 1995; Scott, 1995; Westphal et al., 1997). In addition, treatment facilities with memberships in professional associations have enhanced their capacity to successfully exchange information because they are tied into a larger interpersonal network of addiction-treatment practitioners (Damanpour, 1991).

Fifth, organizational resources are the degree to which relevant resources are available to an organization (Rogers, 2003). Hospital-based centers may be more likely to adopt pharmacotherapies because they possess the medical resources to administer and oversee medication dispensing (Roman and Johnson, 2002). In addition, organizations that

frequently use monetary resources to build an organizational base of knowledge, such as a budget for training and development, are expected to be more open to innovation adoption. Profit-oriented organizations are expected to have a greater receptivity to using medications because of the low labor costs associated with pharmacotherapies. The relatively low labor costs assists for-profit centers in the management of the intense pressure they face to increase the number of clients served while maintaining treatment costs (McGrath and Zell, 2001; Roman and Johnson, 2002). Each of these measures is consistent with the finding that the availability of both financial and human resource slack (Miller and Friesen, 1982) provides an environment conducive to innovation experimentation (Damanpour, 1991; Drazin and Schoonhoven, 1996).

Finally, organizational size has been positively related to innovation adoption (Damanpour, 1991; Kimberly and Evanisko, 1981; Moch and Morse, 1977; Roman and Johnson, 2002). Larger organizations typically have the necessary manpower as well as the capital available for investing in new products and techniques because of their greater volume of activity (Rogers, 2003).

External characteristics

External characteristics of the organization, such as competitive threats posed by neighboring treatment facilities, are also predicted to have an effect on the adoption of innovations over time. Market competition is related to the concept of bounded instability (Stacey, 1992). If there is market competition combined with an increasing number of nearby centers adopting naltrexone, then there is a powerful impetus to mimic those organizations and adopt the innovation (Glassman, 1995; McGrath and Zell, 2001). Research on the adoption of technical innovations in hospitals is positively influenced by competition with neighboring facilities (Kimberly and Evanisko, 1981).

Hypotheses and study overview

From the literature we derived several hypotheses to explore naltrexone adoption. Treatment centers basing their program on a 12-step model and holding on-site 12-step meetings will be less likely to adopt naltrexone. We also hypothesized that centers employing an administrator with a medical/doctoral degree and long-term managerial tenure in the health care field will be more likely to adopt naltrexone.

Centers with boards of directors will be less likely to adopt naltrexone, whereas organizations that use prescription drugs, employ a high percentage of counselors with master's degrees, and employ a physician will be more likely to adopt naltrexone. Organizations with employee handbooks are expected to be less open to naltrexone adoption; although, accredited organizations that belong to treatment associations will be more likely to adopt naltrexone therapy. Moreover, organizational resources (i.e., large, for-profit, hospital-based organizations with a training/development budget) will be positively related to naltrexone adoption. Finally, treatment centers faced with intense market competition will be more likely to adopt naltrexone to attract a larger clientele base.

This article is the first to examine Rogers' (2003) theory of innovation adoption using longitudinal data to estimate the effects of the culture, leadership, internal organizational structure, and external characteristics at Wave 1 on the likelihood of a treatment organization adopting naltrexone over the course of the study.

Method

Sample

Data for these analyses were derived from the NTCS (see Roman and Johnson, 2002). Organizations were included if they (1) received less than 50% of their funding from state or federal block grants and (2) offered a level of care at least consistent with the American Society of Addiction Medicine standards of an outpatient program (Roman and Johnson, 2002). To be representative of the private treatment sector in the United States, a two-stage stratified random sampling procedure was used. Four waves of data were collected between 1994 and 2003. The initial wave of data collection consisted of on-site interviews conducted in 1994-1996 with program administrators. A second and third wave of on-site interviews was conducted with the same panel of centers in 1997-1998 and 2000-2001, respectively. A split-panel design method was employed during each wave of the NTCS to augment the sample size. A fourth wave of on-site interviews for the NTCS began in 2002 with a completion date in 2004. The analyses were restricted to those treatment facilities followed across all four waves and with no missing information on the dependent variable or from the initial wave of data collection ($N = 165$).

Measures

The dependent variable in the discrete-time event history analysis is a dichotomous indicator of whether the adoption of naltrexone occurred in the interval between two waves. At the on-site interviews during Waves 3 and 4, centers were coded "1" if they began use of naltrexone during the time frame and "0" if they did not. This information was not included in Waves 1 and 2; therefore, data were imputed from Wave 3 interviews by asking "What year did you first start using naltrexone?" Centers responding that they had adopted naltrexone between 1994 and 1996 were coded as "yes" for the adoption of naltrexone during the Wave 1 time frame and centers reporting adoption after 1996 were coded as not adopting naltrexone during Wave 1 (1 = yes; 0 = no). Similarly, treatment facilities responding that they had adopted naltrexone between 1997 and 1998 were coded as "yes" for the adoption of naltrexone during the Wave 2 time frame and centers reporting adoption before 1997 or after 1998 were coded as not adopting naltrexone during Wave 2. The year of adoption as reported at Wave 3 is significantly correlated with the year of adoption as reported in Wave 4 ($r = .495, p < .01$).

Four theoretical concepts were measured including organizational culture, leadership, internal organizational structure, and external characteristics of the organization. First, organizational culture included two time-varying covariates. Centers were asked if they were based on a 12-step model (1 = yes; 0 = no) and if they held 12-step meetings on their premises (1 = yes; 0 = no). Second, two variables measured the concept of leadership: the administrator's level of education and the total number of years they had worked in the

behavioral healthcare field. The highest degree obtained by the administrator was an ordinal variable with the following categories: less than a bachelor's degree (coded "1"), bachelor's degree (coded "2"), master's degree (coded "3"), and Ph.D. or M.D. (coded "4"). The number of years employed in the behavioral healthcare field was a continuous self-reported measure ranging from 0 to 41 years. Given that administrative changes are a common occurrence within organizations, both measures were assessed at all four time points.

The third component of internal organizational structure was subdivided into centralization, complexity, formalization, interconnectedness, organizational resources, and size. Centralization was a fixed covariate measured by the presence of a board of directors (1 = yes; 0 = no). Complexity was assessed by three time-varying covariates including the organization's use of prescription drugs (1 = yes; 0 = no), the percentage of counselors with at least a master's degree, and whether there was a physician on the payroll (1 = yes; 0 = no). The presence of an employee handbook within the treatment organization (1 = yes; 0 = no) was used as an indicator of formalization. Interconnectedness is measured by two dichotomous time-varying covariates including if the treatment organization was accredited (1 = yes; 0 = no) and if the organization was a member of a substance-use disorders treatment association (1 = yes; 0 = no).

The fifth component, organizational resources, contained three indicators. The physical location of a treatment center, hospital based or freestanding, was included in the model (1 = hospital based; 0 = freestanding). Centers were also distinguished by those that had a specific budget line item for training and development (1 = yes; 0 = no). Because budgetary issues are generally addressed and/or altered on a fiscal-year basis, the existence of a training and development budget line item may vary across data collections. Center profit status was coded "1" for profit centers and "0" for nonprofit centers. Organizational size was a time-varying covariate measured by the natural log of the number of full-time equivalent employees (FTEs). A log transformation is appropriate because the distribution of FTEs is positively skewed.

The external characteristics of the organization was a time-varying covariate assessed by the extent to which a treatment center faced competition from other treatment facilities in its market area ranging from 1 (no competition) to 10 (intense market competition).

Analytic strategy

An overview of the descriptive statistics across each of the four waves is provided. One-way analysis of variance and independent samples *t* test analyses were used to examine differences between adopting and nonadopting (resisting) organizations. The distribution of organizations adopting naltrexone by study wave was also examined to establish any group differences between the sample means of adopting organizations.

To study the occurrence and timing of events surrounding naltrexone adoption, a discrete-time event history analysis using Stata statistical software (Version 8; StataCorp LP, College Station, TX) was conducted. Event history analysis, also known as survival analysis, addresses several of the main problems associated with the use of more conventional statistical methods when analyzing longitudinal categorical data (Allison, 1995).

Specifically, this statistical technique includes the ability to manage both censored observations and time-varying explanatory variables. In the present study, the observation window is four waves of data. The center's history was segmented into a series of observations corresponding to four points in time, with approximately 2.5 years between each time wave of data. Thus, the unit of analysis is the center wave. The dependent variable is a binary variable denoting whether the treatment center adopted naltrexone between the beginning and end of each observation period. The values of the time-varying independent variables are recorded from the field interview at the beginning of each segment whereas the time-invariant variables are assessed at the initial wave. Discrete-time event history models produce regression-like estimates of the effects of these independent variables on the likelihood of the event of interest, naltrexone adoption. The analytical sample for the event history model had a total of 165 organizations contributing 398 center-wave observations. As a common occurrence in longitudinal analysis, missing data in the follow-up interviews were imputed from the previous interview year, but this occurred in less than 15% of the sample. This resulted in a conservative approach to deal with missing data in that some organizational inertia is assumed. None of the independent variables correlated so highly as to imply problems with multicollinearity.

Results

Descriptive statistics

Table 2 presents the descriptive statistics of all time-invariant and time-varying covariates included in the model across all four points in time. The majority of treatment facilities were based on a 12-step philosophy (93%) and held 12-step meetings on their premises (80%). Although the number of treatment centers hosting such on-site meetings as AA or Narcotics Anonymous remained relatively consistent across the time points, the proportion of treatment facilities rooted in 12-step culture dropped to 81% by the final wave.

Most administrators had at least a bachelor's degree and this remained relatively stable across all time points. Despite significant turnover at the administrator level within the substance-use disorders treatment industry, the number of years administrators worked in the behavioral health field grew consistently over time, suggesting an aging of the occupation.

About 80% of the facilities reported to a board of directors. Consistent with the medicalization movement in the substance-use disorders treatment field, the proportions of centers using prescription drugs within their treatment protocols increased from 84% at Wave 1 to 93% at Wave 4. This may also suggest the professionalization of the field. Both the proportion of counselors with a graduate degree and the presence of a physician on the payroll increased in 1997-1998 and 1999-2001 but began to level off by the fourth on-site interview. Additionally, only 75% of centers possessed a budget for training and development at the initial time point, yet this escalated to more than 95% by 2002-2003. The proportion of accredited treatment organizations decreased by approximately 5% between Wave 1 and Wave 4. The majority of treatment centers possessed an employee handbook (95%), was hospital based (72%), and operated on a nonprofit basis (71%). The average

center was small and employed approximately 22 people at the initial interview in 1994-1996 ($e^{3.10}$).

The administrators' responses to the level of competition from other treatment centers in the market area drastically decreased over time. On a scale ranging from 1 (no competition) to 10 (intense competition), the average score reported was 6.40 in 1994-1996 whereas in 2002-2003 it was 2.76.

Table 3 displays the significant differences between the naltrexone adopters ($n = 117$) and naltrexone resisters ($n = 48$). Centers holding on-site 12-step meetings were overrepresented among naltrexone adopters. Moreover, treatment facilities that had adopted naltrexone employed administrators with more education and with fewer years in the behavioral health care field. Centers incorporating prescription drugs into their treatment regimen represented 94% of naltrexone adopters but only 80% of naltrexone resisters. As expected, treatment facilities that adopted naltrexone were significantly more likely to employ a physician, use an employee handbook, be accredited, be a hospital-based facility, and operate on a for-profit basis.

The distribution of treatment centers adopting naltrexone by study wave is displayed in Table 4. During the time frame of the study, 117 of the 165 treatment facilities adopted naltrexone. However, the rate of adoption was not constant over time and there was an overall decline throughout the research window in the estimated hazard rate (i.e., the probability that a case would experience the event). The hazard rate was calculated as the number of centers that experienced adoption divided by the remaining number of centers "at risk." For the duration of the initial on-site interview, 55 (33%) of the 165 treatment facilities began using naltrexone. By 1997-1998, the hazard rate had increased to .383, with 42 of the remaining facilities beginning to use naltrexone. At the time of the third contact, only 12 centers had adopted naltrexone, yielding a hazard rate of .176. By the end of the observation period in 2002-2003, an additional 8 of the 56 treatment centers had begun using naltrexone resulting in a hazard rate of .143. Chi-square tests indicated that the changes in the hazard rate were statistically significant between each of the four waves.

Discrete-time event history analysis results

In the event-history analysis, one of the two time-varying covariates measuring organizational culture was predictive of naltrexone adoption (Table 5). Specifically, the estimated net hazard of naltrexone adoption decreased by about half among centers that were based on a 12-step model of treatment (odds ratio [OR] = 0.442, $p < .05$). Among the variables measuring leadership, the number of years that the administrator had been employed within the behavioral healthcare field was a significant time-varying covariate but not in the hypothesized direction. Each additional year that the leader of the treatment organization was employed in the behavioral health care field produced a 3% decrease in the likelihood of the adoption of naltrexone, even when controlling for the effects of the other independent variables in the model.

As mentioned earlier, internal organizational structure contained six separate but interrelated components, including centralization, complexity, formalization, interconnectedness,

organizational resources, and size. One of the three measures of complexity, the use of prescription drugs, was positively associated with the adoption of naltrexone. This association was quite dramatic with use of prescription drugs increasing the odds of adopting naltrexone threefold ($OR = 3.001, p < .05$). The fixed-time indicator of formalization, the use of an employee handbook, also increased the likelihood of naltrexone adoption. Specifically, organizations with employee handbooks were greater than three times more likely to adopt naltrexone ($OR = 3.258, p < .05$). One of the two variables assessing interconnectedness was predictive of naltrexone adoption. Treatment facilities accredited by agencies such as JCAHO or CARF were 5.4 times more likely to adopt naltrexone than nonaccredited treatment centers. The organizational resources measure, profit status, was a significant predictor of the adoption of naltrexone. For-profit centers were 2.4 times more likely to use naltrexone than nonprofit organizations.

The external characteristics indicator, level of competition, was not significant, suggesting that the varying intensities of market competition for treatment services neither increased nor decreased the likelihood of naltrexone adoption.

Discussion

Summary of findings

The purpose of this article was to examine the impact of culture, leadership, internal organizational structure, and external characteristics on the likelihood of adopting naltrexone between 1994 and 2003 using data from the NTCS. The estimated hazard rate, or the probability of naltrexone adoption, fluctuated over time with the majority of the organizations adopting its use within the first 5 years after FDA approval for the treatment of alcohol dependence.

In the multivariate model predicting adoption over time, it was revealed that one of the two measures of an organization's culture impacted its risk of naltrexone adoption despite it not being an original component of Rogers' (2003) theoretical framework. However, the finding that an organization's embrace of a 12-step ideology may be more likely to promote abstinence from all drugs should be cautiously interpreted. Additional studies are needed to confirm or refute this hypothesis, especially as AA (1984) advises all members to follow medical advice. In addition, one of two measures assessing leadership was predictive of naltrexone adoption over time. Contrary to expectations but consistent with other adoption studies (Peay and Peay, 1994; Weiss et al., 1990), managerial tenure was negatively related to innovation adoption. More experienced administrators may be reluctant to engage in risk-taking behaviors (i.e., naltrexone adoption) because greater tenure has resulted in an experiential knowledge base of "what works."

The event history model supported four of the six components (complexity, formalization, interconnectedness, and organizational resources) under the domain of internal organizational structure. As expected, treatment centers already using pharmacological treatments (i.e., more complex centers) experienced a contagion effect because they possess the knowledge, expertise, and infrastructure to adopt other innovative treatments, such as naltrexone. Formalization had a negative impact on the adoption of naltrexone during the

course of the study. Previous research has demonstrated that bureaucratic formalization stifles job autonomy and thus serves as an impediment to learning about and adopting innovations (Aiken et al., 1980; Bailyn, 1985; Raelin, 1985). Interconnected treatment organizations (i.e., accredited centers) are significantly more likely to adopt naltrexone over time because they may be established within a social network of other substance-use disorders treatment organizations. In addition, accreditation creates normative pressures to be like others in their social system (DiMaggio and Powell, 1983) as well as requires accountability for the use of best practices and evidence of quality of care. For-profit agencies were more likely to adopt naltrexone across the four time periods than nonprofit agencies, possibly because of the low labor costs associated with pharmacotherapies. This strategy could be the result of an impetus faced by for-profit centers to increase patient capacity while maintaining treatment costs (McGrath and Zell, 2001; Roman and Johnson, 2002). Also, for-profit centers possess both the financial slack to assume the start-up costs of pharmacological adoption and the human resource slack necessary to engage in innovation experimentation (Damanpour, 1991; Miller and Friesen, 1982).

Limitations

Several limitations needed to be noted. In the NTCS data the administrator is the proxy for the organization. Reducing the organization to the equivalent of an individual may be an oversimplification (Rogers, 2003); however, this is a common practice when collecting organizational-level data (Lehman et al., 2002; Oser et al., 2007; Roman and Johnson, 2002). Observational studies of organizations, ethnographic research, or multilevel modeling could be used in future research to augment the current approach. In addition, generalizability is limited because this study only examined private treatment centers. Future research could explore innovation adoption behaviors in other types of substance-use disorders treatment settings such as public facilities, therapeutic communities, and general practitioner offices. Other limitations include the lack of variables to measure physician specialty, type of clientele, type of program, and the degree of pharmaceutical marketing of naltrexone. These measures could theoretically impact naltrexone adoption. Finally, the present study had a singular focus on naltrexone and the NTCS database does not contain information on whether the organization adopted naltrexone for the treatment of alcohol and/or drug dependence. Although many innovation studies are designed to examine one innovation (Damanpour, 1991; Kimberly and Evanisko, 1981), it is not known whether the study of the adoption of a single drug therapy can generalize to other pharmacotherapies in the private treatment field.

Implications

The research-to-practice gap discussed in the treatment literature has real world applications that can increase patient access to evidence-based treatments. To avoid a pro-innovation bias, it must be noted that naltrexone may not be appropriate for all clients within a treatment center. However, if privately funded treatment organizations wish to adopt naltrexone, the variables that were significant in both Tables 3 and 5 provide several recommendations. Pharmaceutical representatives, treatment administrators, counselors, and researchers need to communicate and collaborate to reduce cultural divergences on treatment philosophies. In a related fashion, increasing awareness among administrators

with experiential knowledge could help increase innovation adoption because they may intuitively seek to maintain the status quo. The use of company newsletters, videos, or magazines may be a cost-efficient strategy to help to create an innovation-friendly environment (Meyer et al., 1997). Moreover, substance-use disorders treatment facilities using prescription drugs could be targeted as potential naltrexone adopters because they possess the knowledge and technical expertise for innovation experimentation. Finally, accreditation provides a staff education tool, evaluates performance, and stimulates quality improvement efforts (Berwick, 2003).

In conclusion, this study shed light on organizational-level characteristics impacting innovation adoption, which is often an underexplored area in the diffusion, substance-use disorders, and health services literature. The identification of significant organizational predictors of innovation adoption in private substance-use disorders treatment centers is needed to reduce the gap between the discovery and adoption of evidence-based treatment practices.

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Table 1
Overview of the theoretical concepts of the organizational model

Theoretical concepts in the organizational model	Definition of theoretical concepts	Operationalization of theoretical concepts
1. Culture	The systems of knowledge, experience, values, beliefs, and attitudes shared by the substance-use disorders treatment center.	<ul style="list-style-type: none"> Based on 12-step model 12-step meetings on premises
2. Leadership	<p>The characteristics of the individual who is located at the top of the substance-use disorders treatment center's organizational hierarchy and who is responsible for decision making.</p> <p>The manner in which a substance-use disorders treatment center is organized. The organization includes six interrelated dimensions including the following:</p> <ol style="list-style-type: none"> 1 Centralization of power, 2 Complexity, 3 Formalization, 4 Interconnectedness, 5 Organizational resources, and 6 Organizational size, 	<ul style="list-style-type: none"> Administrator's education No. of years in behavioral health field <ol style="list-style-type: none"> 1 Centralization of power <ul style="list-style-type: none"> Board of directors 2 Complexity <ul style="list-style-type: none"> Use prescription drugs Percent of MA counselors Physician on payroll 3 Formalization <ul style="list-style-type: none"> Employee handbook 4 Interconnectedness <ul style="list-style-type: none"> Accredited Belong to treatment association 5 Organizational resources <ul style="list-style-type: none"> Hospital based Budget for training/development Profit status 6 Organizational size <ul style="list-style-type: none"> Log of full-time equivalent employees Competition
3. Internal organizational structure		
4. External characteristics	The outside factors that impact and/or influence the operations of a substance-use disorders treatment center.	

Note: MA = master of arts.

Table 2
Descriptive statistics of private treatment centers included in the discrete time event history analysis

Variable	Wave 1 (1994-1996) Mean (SD) or %	Wave 2 (1997-1998) Mean (SD) or %	Wave 3 (1999-2001) Mean (SD) or %	Wave 4 (2002-2003) Mean (SD) or %
Culture				
Based on 12-step model	93.33%	88.48%	93.33%	81.82%
12-step meetings on premises	80.00%	78.79%	78.79%	78.79%
Leadership				
Administrator's education	2.61 (0.76)	2.61 (0.75)	2.64 (0.78)	2.60 (0.70)
No. of years in behavioral health field	14.55 (8.03)	15.90 (8.23)	18.46 (7.78)	19.88 (7.32)
Internal organizational structure				
Board of directors	80.00%	—	—	—
Use prescription drugs	84.24%	91.52%	92.12%	93.33%
Percentage of MA counselors	46.08 (32.52)	51.92 (32.43)	53.43 (31.83)	49.41 (30.52)
Physician on payroll	39.39%	58.18%	56.36%	52.12%
Employee handbook	95.15%	—	—	—
Accredited	87.88%	87.88%	85.45%	82.42%
Belong to treatment association	51.52%	—	—	—
Hospital based	72.12%	—	—	—
Budget for training/development	75.15%	88.48%	95.15%	95.15%
For-profit status	29.09%	—	—	—
Log of full time equivalent employees	3.10 (1.05)	2.96 (1.08)	2.99 (1.16)	3.22 (1.16)
External characteristics Competition	6.40 (2.48)	5.40 (2.40)	3.61 (1.79)	2.76 (1.22)

Notes: *N* = 165. MA = master of arts.

Table 3
Culture, leadership, international organizational structure, and external characteristics,
by naltrexone adoption status

Variable	Naltrexone adopters (<i>n</i> = 117)	Naltrexone resisters (<i>n</i> = 48)
Culture		
Based on 12-step model, %	.90	.92
12-step meetings on premises, %	.83	.74 [*]
Leadership		
Administrator's education ^{a,b}	2.66	2.58 [*]
No. of years in behavioral health field ^a	14.50	16.70 [†]
Internal organizational structure		
Board of directors, %	.79	.80
Use prescription drugs, %	.94	.80 [†]
MA counselors, % ^a	50.52	45.85
Physician on payroll, %	.56	.47 [*]
Employee handbook, %	.97	.92 [*]
Accredited, %	.96	.77 [†]
Belong to treatment association, %	.50	.54
Hospital based, %	.76	.67 [*]
Budget for training/development, %	.85	.83
For-profit status, %	.32	.23 [*]
Log of full-time equivalent employees ^a	3.10	2.96
External characteristics Competition ^{a,c}	5.59	4.83

Notes: MA = master of arts.

^aIndependent samples *t* tests were used for continuous variables;

^bwhere 1 = less than a bachelor's degree, 2 = bachelor's degree, 3 = master's degree, 4 = Ph.D. or M.D.;

^crange from 1 = no competition to 10 = intense market competition.

^{*}*p* < .05;

[†]*p* < .01 (one-tailed significance test).

Table 4
Estimated hazard rate of naltrexone adoption, by study wave

Study wave	No. of centers adopting naltrexone	No. at risk	Estimated hazard rate
Wave 1 (1994-1996)	55	165	.333 [‡]
Wave 2 (1997-1998)	42	110	.382 [‡]
Wave 3 (1999-2001)	12	68	.176 [‡]
Wave 4 (2002-2003)	8	56	.143 [‡]

[‡] Statistically significant change in the hazard rate ($p < .001$).

Table 5
Logistic regression of naltrexone adoption behavior on organizational culture, leadership characteristics, internal organizational structure, and external characteristics

Variable	Coefficient (SE)	Odds ratio (90% CI)
Culture		
Based on 12-step model	-0.817* (0.470)	0.442 (-1.585–0.049)
12-step meetings on premises	0.442 (0.363)	1.556 (-0.154–1.039)
Leadership		
Administrator's education	-0.008 (0.180)	0.992 (-0.305–0.288)
No. of years in behavioral health field	-0.035* (0.015)	0.966 (-0.061–0.010)
Internal organizational structure		
Board of directors	-0.057 (0.308)	0.945 (-0.563–0.450)
Use prescription drugs	1.099* (0.485)	3.001 (0.301–1.897)
Percentage of MA counselor	0.001 (0.004)	1.001 (-0.005–0.008)
Physician on payroll	0.254 (0.248)	1.289 (-0.155–0.663)
Employee handbook	1.181* (0.660)	3.258 (0.094–2.267)
Accredited	1.681 [†] (0.546)	5.371 (0.783–2.579)
Belong to treatment association	0.032 (0.250)	1.033 (-0.380–0.444)
Hospital based	0.184 (0.348)	1.202 (-0.383–0.751)
Budget for training/development	0.239 (0.358)	1.270 (-0.349–0.827)
For-profit status	0.866 [†] (0.306)	2.377 (0.363–1.368)
Log of full-time equivalent employees	-0.105 (0.138)	0.900 (-0.332–0.121)
External characteristics Competition	0.050 (0.047)	1.051 (-0.028–0.128)

Notes: MA = master of arts; CI = confidence interval.

*
 $p < .05$;

[†]
 $p < .01$ (one-tailed significance test).