NALTREXONE IN PRIVATE SUBSTANCE ABUSE TREATMENT CENTERS:
PREDICTORS OF ADOPTION AND
A CATEGORICAL TYPOLOGY OF ADOPTERS

by

CARRIE BETH OSER

(Under the Direction of Paul M. Roman)

ABSTRACT

Prominent on the nation's research agenda on drug abuse treatment is the development of effective behavioral and pharmacological treatment approaches. Likewise, there is concern about transferring this knowledge to practitioners to foster adoption within the service delivery system. This study addresses a facet of this mission using a diffusion of innovations theoretical framework outlined by Rogers (2003) to explore two objectives regarding the adoption of an innovative substance abuse treatment – naltrexone. First, using data from the National Treatment Center Study, a discrete time event history model examined the impact of culture, leadership characteristics, internal organizational structure, and external characteristics on the likelihood of adopting naltrexone across four points in time. Results suggested that organization's embracing a 12-step model and those employing more experienced administrators were significantly less likely to adopt naltrexone. Moreover, treatment centers that utilized prescription drugs, possessed an employee handbook, were accredited, and operated on a for-profit basis were significantly more likely to adopt naltrexone over time. Second, a categorical typology of treatment centers that had adopted naltrexone was created based on Rogers' (2003) adopter methodology. This typology includes the five adopter categories of innovators, early adopters, early majority, late majority, and laggards. I plotted the cumulative number of treatment centers adopting naltrexone over time, which resulted in a S-shaped curve, as well as diagramed the frequency distribution of the number of mean adopters per year, which approached a bell-shaped curve. Socioeconomic status, organizational personality, and communication behavior were used in an ordered logistic regression model to predict adopter categorization. The multivariate analysis revealed that organization's hosting 12-step meetings on site were significantly less likely to be in a more innovative category, whereas facilities that were already familiar with innovative treatment techniques were significantly more likely to be in a more innovative category. Additionally, treatment centers that learned about innovations from participation in professional development seminars and from informal conversations with treatment providers employed at other centers were significantly more likely to be in a less innovative category. Organizational-level implications for community treatment providers to further the adoption of evidenced-based treatments such as naltrexone are discussed.

INDEX WORDS: Diffusion of innovations, Naltrexone, Adoption, Adopter categorization, Substance abuse treatment centers

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DEDICATION

To the two most influential people in my life – my Dad and my Mom. In their own distinct way, they each taught me about the valuable things in life.

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CHAPTER 1

INTRODUCTION

The development of pharmacological approaches in conjunction with psychosocial therapy to aid in the treatment of substance abuse have shown varying degrees of success over the past decade (Garbutt, West, Casey, Lohr, and Crews, 1999; Kranzler, 2000; Moncrieff and Drummond, 1997). One promising pharmacological therapy is naltrexone, an opiate antagonist used in the treatment of both opiate and alcohol dependence. The development of naltrexone for the treatment of opiate addiction dates back to the 1960's (Stine and Kosten, 1997), with approval by the Food and Drug Administration (FDA) in 1984.

The best results with naltrexone treatment have been reported in patients whose careers depended on compliance with treatment, such as medical professionals or business executives (Ling and Wesson, 1984; Washton, Pottash, and Gold, 1984), or in patients under contingency contracting, such as prisoners or probationers (Brahen, Henderson, Capone, and Kondal, 1984). However, clinical trials have demonstrated a need to increase medication compliance for naltrexone treatment (Gonzalex, Oliveto, and Kosten, 2002; Preston, Silverman, Umbricht, DeJesus, Montoya, and Schuster, 1999; Rabinowtz, Cohen, and Atias, 1997), and several double-blind clinical trials have shown other limits in terms of naltrexone's effectiveness for the treatment of opioid dependence (Bradford, Hurley, Golondzoeske, and Dorrier, 1975; Gold, 1993; Meyer, Mirin, Altman, and McNamee, 1976; Rawson and Ling, 1991).

Subsequently, this pharmacological innovation was approved for the adjunctive treatment of alcohol dependence a decade later based on two well-designed randomized trials (O'Malley, Jaffe, Chang, Schottenfeld, Meyer, and Rounsaville, 1992; Volpicelli, Alterman, Hayashidia, and

O'Brien, 1992). The initial single-site studies reported that the use of naltrexone, when used in concert with psychosocial therapies, decreases cravings and reduces the risk of relapse (O'Malley et al., 1992; Volpicelli et al., 1992). However, subsequent studies have raised some questions about the efficacy of this application of naltrexone. For example, several studies have not been able to fully replicate the results of the two initial studies (Chick et al., 2000; Volpicelli, Rhines, Rhines, Volpicelli, Alterman, and O'Brien, 1997), and again further research emphasizes the need to increase compliance with naltrexone (Chick et al., 2000; O'Brien, Volpicelli, and Volpicelli, 1996; Oslin et al., 1999; Volpicelli et al., 1997). Moreover, naltrexone may only be an effective treatment approach for specific patient populations of motivated individuals with low to moderate levels of dependence (Anton, Moak, Waid, Latham, Malcolm, and Diaz, 1999). A recent multi-center, double blind, placebo-controlled study found that naltrexone was not effective for the treatment of Veterans Affairs patients with chronic, severe alcohol dependence (Krystal et al., 2001). While Krystal et al. (2001) raise concerns about the use of naltrexone for the treatment of long-term, severe alcohol dependence, they note that treatment matching may improve efficacy.

Though the use of medications when used in concert with psychological and behavioral therapies has shown promise in several clinical trials, substance abuse treatment centers have been slow to integrate these evidence-based practices into their respective treatment regimens. Historically, medications have not been a significant part of substance abuse treatment regimens. Issues surrounding the scope of this "research to practice gap" have been widely discussed in recent years (Backer, David, and Soucy, 1995; Brown, 2000; Greenlick, et al., 1999; Lamb, Greenlick, and McCarty, 1998; Read, Kahler, and Stevenson, 2001).

A major focus within the substance abuse treatment field is on conducting clinical trials in an effort to identify more effective treatment modalities. In addition to numerous clinical trials being conducted by individual PIs, in 1999 NIDA created the Clinical Trials Network (CTN) that is now comprised of 17 university-based "nodes" and over 100 affiliated community treatment programs. Despite the growth in the development of a number of evidence based treatment strategies, community treatment programs have been slow to adopt these new strategies (Backer, David, and Soucy, 1995; Brown, 2000; Greenlick et al., 1999; Lamb, Greenlick, and McCarty, 1998; Read, Kahler, and Stevenson, 2001), suggesting that innovation adoption is a complex organizational process. The existing "gap" challenges the common assumption that empirically-supported practices will automatically be transferred into practice.

During the previous three decades, technology transfer has also been referred to by other names, such as "bridging the gap," "diffusion of innovations," "science to practice," "research to application," and "bench to trench" (Rawson, Marinelli-Casey, and Ling, 2002). According to Backer (1991), technology transfer is generally defined as the dispersal of information to achieve application. Within the substance abuse treatment field, the ventures of NIDA and CSAT can be referred to as technology transfer – or lexically, the adoption of new, "evidence-based" technologies or procedures (Backer, David, and Soucy, 1995; Spear and Rawson, 2002; Tenkasi and Mohrman, 1995). NIDA's CTN has disposed of the "technology transfer" terminology, and replaced it with the term of "blending" to more accurately describe the idealized collaboration and communication between researchers and community service providers. While technology transfer is the dominant term in the field of addictions, it may be stigmatizing to community treatment providers by suggesting their lack of involvement in the creation and development of innovative techniques. The process of integrating science-based substance abuse treatment

practices into a clinical care environment is best conceptualized by the more politically correct term of "blending." However, throughout this dissertation, the terms used to describe the dissemination-focused activities produced by academic researchers, individual practitioners, service organizations, local communities, and federal agencies will be used interchangeably because the underlying premise is the same.

If treatment centers were "rational" entities and functioned in a manner similar to other organizations, Scott's (1995) institutional theory would suggest a gradual but increasingly rapid rate of adoption of these evidence-based practices given changes in the external environment in which treatment centers operate. Over the past 10 to 15 years, managed care has generated particularly intense scrutiny of substance abuse treatment practices in an effort to control costs while hopefully increasing treatment efficacy (Edmunds, Frank, Hogan, McCarty, Robinson-Beale, and Weisner, 1997; White, 1998). There is, however, an opposing cultural force that may have slowed the adoption of new treatment strategies, particularly pharmacological treatments. The overwhelming majority of substance abuse treatment facilities are based on the 12-step model (Roman, Johnson, and Blum 2000). As such, their approach to treatment is rooted in the 12-step traditions of AA, which may make them hesitant to accept alternative treatment approaches that might contradict that model. Thus, while managed care organizations call for more cost effective and efficient innovative therapies, many treatment providers remain entrenched in the 12-step doctrine. These two explanations are important in describing factors affecting the treatment field as a whole, but they fail to address why only certain organizations choose to adopt innovative treatment techniques.

This dissertation argues that much of the "gap" that exists between research and practice can be explained by structural variations between treatment organizations. Treatment facilities

have different levels of both monetary resources and human capital resources. Moreover, the organizational culture and environmental constraints vary from center to center. It is these organizational variations that may explain the differing rates of adoption of innovative practices across treatment centers. If the "gap" is to be reduced, understanding these variations and their effect on the use of innovations is essential.

This introduction has briefly touched upon the topics of the chapters to come in an effort to explain the diffusion of one innovation - naltrexone. Besides antabuse, naltrexone is the only pharmacological therapy available for the treatment of alcohol dependent clients. Relative to the pharmacological properties of the other medications available for the treatment of opiate dependence, naltrexone is the only pure antagonist, or non-addicting pharmacotherapy, available on the market. Naltrexone was chosen over more widely used medications, such as antabuse and methadone, since it is a more novel, less established alcohol and opiate treatment and because it possessed a good safety profile. Additionally, naltrexone was selected over the most current FDA approved opiate treatment, buprenorphine, because one of the primary objectives of this dissertation was to explore adoption over time. Buprenorphine's recent FDA approval in 2003 only permits for the investigation of adoption over the past year, which is an insufficient timeframe to look at trends in adoption.

Naltrexone is also a unique pharmacological therapy because it was reinvented, meaning that the use of naltrexone was changed and modified during the process of adoption and implementation. This transformation led to an alcohol indication for naltrexone, in addiction to its current opiate indication. Therefore, it is now currently used to aid in the treatment of both alcohol dependence indication and opiate dependence indication.

Naltrexone was not widely adopted by treatment facilities when it was only available to treat opiate dependence, despite DuPont Pharma's targeted marketing campaigns to methadone clinics; however, after FDA approval for the treatment of alcohol dependence, this was a pharmacological innovation that singularly enjoyed adoption in the mid-to-late 1990's because, notwithstanding antabuse, it was the only medication available for the treatment of alcohol dependence. However, sales of naltrexone have fallen far short of DuPont's original, modest expectations. The FDA gave naltrexone an orphan drug status, which granted DuPont seven years of post-approval market exclusivity and its reinvention provided an additional three years of market exclusivity for the alcoholism indication. The orphan drug status protects the manufacturer from the creation of generic versions of the medication thereby increasing DuPont's chances of gaining a return on their investment. As of 1998, naltrexone was completely off patent and DuPont has ceased all marketing efforts.

Despite a lack of market penetration, the attributes of naltrexone suggest that it is an effective treatment approach for certain demographic populations based on clinical trial evidence. Furthermore, communication between clinical researchers and community practitioners is presently a major focus of federal effort. Yet, while the characteristics of the innovation itself and the openness of communication channels are important factors in explaining adoption, they are not the focus of this dissertation. This dissertation project offers insight into addressing this "gap" by identifying the organizational-level predictors of the adoption of naltrexone, in addition to examining the factors effecting adopter categorization. Specifically, the research questions are "What organizational characteristics are significant in predicting whether or not an organization adopts naltrexone," and "Among adopting organizations, what organizational level factors are important in predicting adopter categorization (also known as

innovativeness)?" Information on how organizational characteristics affect the adoption process over time will help the field to better understand the dynamics of organizational adoption of pharmacological innovations.

This study is presented in the following manner. The reasons influencing naltrexone adoption in private treatment facilities could be three-fold. These include the attributes of the innovation, the communication channels between the innovation creators and the potential pool of adopters, and the characteristics of the adopters. Specifically, Chapter 2 is devoted to the addressing two of the explanations as to why the use of naltrexone has not widely diffused in the treatment field. Chapter 2 begins by summarizing the background and pharmacology of naltrexone. Next, this chapter addresses the traits of the innovation that may affect its rate of adoption including the innovation's relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003). The use of naltrexone as a pharmacotherapy treatment of both heroin addiction and alcohol dependence could have a slow rate of adoption because of some combination of these succinct attributes. An overview clinical literature on the use of naltrexone for both the treatment of opiate and alcohol dependence can be found in Appendix A and Appendix B, respectively. The second factor affecting adoption that has been addressed in the literature could be the underlying reasons for the lack of collaboration or communication between clinical researchers and community treatment providers. Therefore, this chapter will conclude with a brief history of technology transfer in the substance abuse treatment field.

Having considered the attributes of naltrexone as an aid to treatment as well as the history of bridging the gap between researchers and substance abuse treatment providers, Chapter 3 focuses on the third factor affecting adoption – characteristics of the organizations adopting the innovation. While attributes of the innovation and open channels of communication are

important in explaining adoption and innovativeness, the characteristics of adopters are often under-explored in the diffusion research. The diffusion of innovations theory guides the present analyses to provide insight into this issue. In particular, I utilize Everett Rogers' (2003) theoretical framework on the diffusion of innovations to address the adoption of naltrexone and to create a categorical typology of adopters using a national sample of private substance abuse treatment centers. Chapter 3 begins by outlining the diffusions of innovations theory and providing an overview of the brief literature on the adoption of this specific innovation in the treatment field. The existing literature on the diffusion of innovations is used to postulate specific hypotheses to be tested for both the adoption and innovativeness models.

Chapter 4 contains a detailed description of the methods used to collect data for the National Treatment Center Study (NTCS), a stratified random sample of private treatment centers spanning from 1994-2003. In addition, the measurement of the variables to be tested in the discrete time event history analysis and the ordered logit model, as well as the analytic strategy, is discussed.

Chapters 5 and 6 report the empirical findings of the two objectives of this dissertation research on the diffusion of naltrexone. The first aim of this study is to examine Rogers' theory of innovation adoption using longitudinal analyses of the NTCS to estimate the effects of the *Culture, Leadership, Internal Organizational Structure*, and *External Characteristics* at Wave I on the likelihood of adopting naltrexone during subsequent waves of on-site interviews. The results of the discrete-time event history analysis examining the adoption of naltrexone are addressed in Chapter 5.

After examining the organizational predictors of naltrexone adoption over time, the focus of attention turns to the predictors of a typology of adopters in Chapter 6. The cumulative

number of treatment facilities adopting naltrexone over time is displayed, as well as the graphed frequency distribution of the mean number of adopters of naltrexone per year. These graphic depictions will allow for the categorization of adopters on the basis of innovativeness using two parameters of the distribution, the mean and the standard deviation. Rogers' (2003) adoption categorization was utilized to divide treatment centers into five ideal types based on degree of innovativeness including the following: innovators, early adopters, early majority, late majority, and laggards. Moreover, this chapter is devoted to the *Socio-economic Characteristics, Organizational Personality (Climate),* and *Communication Behaviors* that influence a treatment center's decision to initiate the use of naltrexone into its treatment protocol relatively earlier in comparison to other organizations in its social system. Extant research on the relationship between these three components and adopter categorization use the individual as the unit of analysis. There are no known studies that examine the effects of *Socio-economic Characteristics, Organizational Personality (Climate),* and *Communication Behaviors* on the likelihood of being in a more innovative category at the organizational level. Thus, this study is the first to use an ordered logistic regression to predict innovation with the organization as the unit of analysis.

The final chapter begins by discussing the empirical findings of both the organizational-level predictors of adoption and the organizational-level predictors of innovativeness. While the empirical findings do contribute to the diffusion of innovations theory and to research on the adoption of naltrexone in private treatment facilities, several limitations are noted. Chapter 7 also suggests recommendations for future research and concludes by discussing the implications for technology transfer and bridging the gap between addiction researchers and community treatment practitioners.

CHAPTER 2

OTHER FACTORS INFLUENCING ADOPTION: ATTRIBUTES OF THE INNOVATION & COMMUNICATION CHANNELS BETWEEN INNOVATION CREATORS AND POTENTIAL ADOPTERS

The substance abuse treatment field has endorsed the use of naltrexone as an effective treatment choice for specific demographic populations. However, the adoption of naltrexone in the treatment arena is nowhere near universal. While some innovations diffuse immediately to widespread use in only a few years, others innovations have a relatively slow rate of adoption that can take decades (Golder and Tellis, 1997; Martinez, Polo and Flavian, 1998; Pae and Lehmann, 2003). There are three general areas that seem to influence the rate of adoption of an innovative technique, such as naltrexone. These areas include attributes of an innovation itself, knowledge dissemination via communication channels, and characteristics of the decision-making unit (Berwick, 2003; Damanpour, 1991; Groves, Flangan, and MacKinnon, 2002; O'Neill, Pouder, and Buchholtz, 1998; Rogers, 2003). The first two topics are the focal point of Chapter 2 while the latter topic is addressed in Chapter 3. Even though the attributes of an innovation and the issue of knowledge dissemination are not the focus of this dissertation, they are important factors that have been widely addressed in the literature. In fact, the majority of diffusion studies examine either the attributes of an innovation or the perceived attributes of an innovation, and Rogers (2003) suggests that this is the most important predictor of the rate of adoption of an innovation. Despite the fact that the majority of the variance in the rate of adoption (49% to 87%) can be explained by innovation attributes, it is also important to explore the other areas which influence adoption.

Therefore, the primary goals of this chapter are to provide a synopsis of the research on the attributes of the innovation, naltrexone, and the dissemination of knowledge in the substance abuse treatment field. Before I begin addressing these objectives, I will summarize the background and pharmacology of naltrexone. After this brief introduction to naltrexone, Chapter 2 will cover the standard classification scheme that is used to predict the rate of adoption for any type of innovation. In particular, Rogers (2003) scheme of five attributes of innovations will be used to discuss how the attributes of naltrexone may affect adoption behavior. The attributes of innovations to be explored include the innovation's relative advantage, compatibility, complexity, trialability, and observability. Next, this chapter discusses the literature on knowledge dissemination as it pertains to innovative treatments specific to the substance abuse treatment field. The presence of diffusion networks is necessary to convey innovation evaluation information to organizations in an effort to create a critical mass of adopters. Basically, there must be open channels of communication between substance abuse researchers and clinical practitioners. Chapter 2 concludes with summarizing the importance of both the attributes of an innovation and open communication channels in influencing the rate of adoption; thus, laying the groundwork for Chapter 3 to explore the third arena that influences adoption behavior – characteristics of the decision-making unit.

Background and Pharmacology

Naltrexone is a narcotic antagonist pharmacotherapy used in the treatment of both opiate and alcohol addictions. In the United States, FDA approval of naltrexone for opiate dependence occurred in 1984 and it is currently used in over 30 countries across the world (Tucker and Ritter, 2000). It was not until a decade later that naltrexone was approved by the FDA to aid in the treatment of alcohol dependence.

The standard usage of naltrexone for the treatment of opiate addiction is as a post-withdrawal relapse prevention intervention, however it can also be used during the process of rapid opiate detoxification. There are three target molecules for opiates including the mu, delta, and kappa opiod receptors and naltrexone works by attaching to the mu receptor. Specifically, as a non-specific competitive opioid antagonist, after the body systems are devoid of opiates, naltrexone works by binding to the mu receptor, thus hindering the activity of opiates (Kirchmayer, Davoli, Verster, Amato, Ferri, and Perucci, 1997). Essentially, it acts as a chastity belt, protecting the mu receptor and rendering opiates ineffective. Heroin self-administration is no long rewarding in the presence of naltrexone, thus ideally reducing or eliminating the behavior. Appendix A includes a clinical literature review of the use of naltrexone for the treatment of opiate addiction and discusses the advantages of disadvantages of this treatment technique.

Naltrexone is also effective as a treatment for alcoholism, because by blocking these specific portions of neurons in the brain that release dopamine, the positive outcomes of alcohol intake, including the "high" pleasurable feeling associated with consumption, is prevented (Volpicelli, Clay, Watson, and Volpicelli, 1994). This mechanism may work by reducing craving, thus, suppressing the desire to drink and ending the vicious cycle of excessive alcohol consumption (Volpicelli, Clay, Watson, and Volpicelli, 1994). However, it must be noted that naltrexone's mode of action for the treatment of alcoholism has not yet been clearly defined (Streeton and Whelan, 2001). Appendix B provides a clinical literature review of the use of naltrexone for the treatment of alcohol dependence.

The Affect of the Attributes of Naltrexone on the Rate of Adoption

As cited above, perceptions of an innovation are the most important predictor of the rate of adoption. In particular, there are five attributes of an innovation that have played a critical role in the diffusion of innovations literature. Based on the most commonly recognized scheme, devised by Rogers (1983, 1995, 2003), there are five attributes of innovations, or perceived characteristics, deemed valuable including relative advantage, compatibility, trialability, complexity, and observability. Each of these theoretical attributes is defined and addressed in relation to the innovation naltrexone.

According to Rogers (2003), relative advantage refers to the degree to which an innovation is perceived as being better than the idea it supersedes. Potential adopters evaluate an innovation based on a costs/benefits analysis. Rogers (2003) articulates relative advantage in both economic and social prestige stipulations but suggests additional ways of measuring relative advantage exist depending on the nature of the innovation. Other research has defined relative advantage in terms of economic advantage, effectiveness, and reliability (Dearing, Meyer, and Kazmierczak, 1994). Since individuals or organizations are more likely to adopt innovations that they think are advantageous, relative advantage of an innovation is the most powerful attribute affecting adoption (Berwick, 2003). The relative advantage of an innovation has a positive relationship with its rate of adoption (Rogers, 2003).

The relative advantage of naltrexone can be expressed in terms of economic profitability, social status, pharmacological properties and effectiveness. The course of naltrexone therapy generally lasts for 3-4 months with a wholesale cost of $3.75 per tablet and a retail price ranging between $5-6 per tablet. Overall, naltrexone treatment is expensive, about $150 per month (Mark, Kranzler, Poole, Hagen, McLeod, and Crosse, 2003; Ciraulo, Alpert, and Franko, 1997).

However, when compared to some other pharmacotherapy treatments, naltrexone does have an economic relative advantage. For example, naltrexone is more fiscally responsible than methadone maintenance for the treatment of opiate addiction and it eliminates the need for daily clinical visits (Farren, O'Malley, and Rounsaville, 1997; Rounsaville, 1995). It has also been shown to be economically advantageous to inpatient chemical dependence treatment for alcohol dependence (Rounsaville, 1995). While the cost of the innovation and the profit margin are important, even Rogers affirms in an interview that economic factors are not the sole explanation of the diffusion process (McGrath and Zell, 2001).

In terms of social status, using a pharmacotherapy such as naltrexone to treatment alcohol/drug dependence serves as a legitimacy tool for addiction treatment practitioners. Using medication management in the treatment of addictions will verify that drug dependence is a disease like any other. However currently, the public and many physicians view addiction as a social problem, rather than as a public health issue that requires prevention efforts and treatment (McLellan, Lewis, O'Brien, and Kleber, 2000). This dominant view is reinforced by the lack of addictions training in medical schools and residency curricula (McLellan, Lewis, O'Brien, and Kleber, 2000). The use of pharmacotherapies to aide in the treatment of addiction serves to establish that alcohol/drug dependence is a chronic medical illness. Treatment facilities adopting naltrexone have a relative advantage because they are importing new treatment techniques into the field in an effort to optimize the efficacy and efficiency of substance abuse treatment. As such, they are gaining social status by either being among the first to adopt an innovation or by imitating the innovation behavior of others (Rogers, 2003; Tarde, 1903).

The relative advantage of naltrexone can also be viewed in terms of its pharmacogentic properties in comparison to other pharmacogenic substances. First, the pharmacogenetic

properties of naltrexone, in comparison to other medications used for the treatment of opiate and alcohol dependence, are attractive to both treatment providers and patients. Naltrexone for the treatment of opiate dependence is more potent than other antagonists such as naloxone and nalorphine, and it is devoid of agonist activity unlike its newer cousin, buprenorphine. As a mixed agonist-antagonist, buprenorphine also binds to the mu opiate receptors, but it activates these receptors to a less degree than full opiate receptors (such as, heroin or morphine). As one of two pharmacotherapies used to treat alcohol addiction, the benefits of naltrexone outweigh the advantages of disulfiram (Antabuse®). Disulfiram is based on the principle of negative reinforcement because if a patient on disuliram consumes alcohol, the individual will experience a disulfiram ethanol reaction (DER), symptoms of which primarily include nausa, vomiting, and headache.

Second, the ease of induction via an oral administration route and the relatively long half-life make it appealing to patients and physicians alike. It is also available through an injectable sustained-release drug delivery system. Since naltrexone has no addictive potential, it is very easy to discontinue treatment due to the lack of withdrawal symptoms.

In terms of relative advantage in comparison to other pharmacological addiction treatments, naltrexone is generally well tolerated and has a good side effect profile (Farren, O'Malley, and Rounsaville, 1997). However, it must be noted that negative reactions do occur and may result in patient attrition from clinical studies or patient withdrawal from the prescribed treatment regimen in a community treatment setting. The most common side effects include dysphoria, nausea, headache, constipation, dizziness, nervousness, insomnia, drowsiness, and muscle pain in the arms or legs. Overall, it is extremely difficult to establish the causal ordering between depression and naltrexone treatment since comorbidity is a common phenomenon in

substance dependent individuals. Depression may be a pre-existing illness, or it may be a side effect of naltrexone. It is also feasible that depression may develop during the course of treatment, independent of naltrexone, as a result of lifestyle changes (Ritter, 2002). While the side effect profile does exist, it is generally benign with the vast majority of patients reporting few to no symptoms after the second week (Rounsaville, 1995). Hepatotoxity, or the condition of having a toxic liver, is the most serious side effect; however, this condition only occurs when the daily dosage levels are six times the average dose of 50 mg (Rounsaville, 1995).

Additionally, naltrexone's relative advantage can be assessed in terms of effectiveness. While controversy still surrounds the use of naltrexone for the treatment of opiate dependence, especially with regards to its involvement in rapid and ultra rapid opiate detox, naltrexone treatment for alcohol dependence is more of a mainstream practice. Even though the Krystal et al. study (2001), in additional to other research, has raised concerns about the effectiveness of naltrexone in the treatment of alcoholism, this negative study must be weighed against a preponderance of randomized, placebo-controlled clinical trails supporting the effectiveness of naltrexone. The majority of research supports the use of naltrexone as a pharmacological agent for reducing drinking behavior (Anton et al., 1999; Croop, Faulkner, and Labriola, 1997; O'Malley et al, 1992; Volpicelli et al., 1992; Volpicelli et al., 1997).

Compatibility is the second innovation attribute that affects the rate of innovation adoption. In order for naltrexone to diffuse, it must be compatible with the existing values, beliefs, past history, and current needs of adopters. According to Rogers (2003), the more compatible an innovation is, the more likely it is to be adopted. It can debated as to whether or not naltrexone is compatible with the existing norms of the treatment field. On the one hand, in the organizational context naltrexone is consistent with the dominant idealized treatment

outcome of abstinence, especially in comparison to opiate agonist treatments such as methadone. Because of naltrexone's nonaddicting properties, it can be used in a variety of settings from medical clinics to substance abuse treatment facilities and primary care centers, which increase its compatibility with a variety of treatment organizations in comparison to other pharmacotherapies. It can also be safely prescribed to individuals without the fear of diversion – being sold to patients or other opiate addicts (Bowersox, 1995; Farren, O'Malley, and Rounsaville, 1997; Rounsaville, 1995). Both methadone, and to a lesser degree buprenorphine, produce a slight sense of euphoria, which may increase its potential for abuse or diversion as compared to antagonistic treatments (Bowersox, 1995; Rounsaville, 1995). Since naltrexone is not scheduled under the Controlled Substance Act, it is one of the few pharmacological treatments for opiate dependence without special licensing or registration requirements (Preston, Silverman, Umbricht, DeJesus, Montoya, and Schuster, 1999). Moreover, alcohol dependent patients under disulfiram treatment, rather than naltrexone therapy, need close supervision in that the dilsulfiram ethanol reaction (DER) produced after the ingestion of alcohol while taking disulfiram can also be dangerous.

Nonetheless, it must be noted that naltrexone is a pharmacotherapy and as such is it inconsistent with the past experiences of most treatment organizations. The majority of treatment programs are based on a 12-step model of treatment, which is not compatible with the use of pharmacotherapies because it promotes abstinence from all substances. As such, the prospect of changing organizational behavior to adopt naltrexone introduces a great deal of uncertainty for treatment organizations (Meyer, Johnson, and Ethington, 1997).

Complexity, or the degree to which an innovation is viewed as relatively difficult to understand and to use, is the third innovation attribute of interest (Rogers, 2003). The

relationship between complexity and innovation adoption can be reduced to the statement that the more complex an innovation, the more slowly it tends to be adopted (Meyer, Johnson, and Ethington, 1997). Simply put, naltrexone is a complex innovation because it requires a medical supervision and there is an issue with patient compliance. As a pharmacotherapy it necessitates a prescription from a physician. But prior to the administration of naltrexone therapy, several tests need to be performed. To be precise, liver testing needs to be conducted before beginning a naltrexone program because this agent is broken down by the liver and can affect its functioning. In addition, a Narcan challenge test needs to be administered to all opiate dependent individuals prior to instituting naltrexone maintenance therapy, yet this is recommended for all patients receiving naltrexone (including those with only a diagnosis of alcohol dependence or abuse because they might not acknowledge their use of opiates). If an individual is treated with naltrexone while opiates are present in his/her system, opiate withdrawal symptoms will occur (Weinrieb and O'Brien, 1997).

In addition, naltrexone is complex in that in case of a medical emergency to control pain, the legal administration of an opiate derivative will be ineffective if the individual is currently on naltrexone (Rounsaville, 1995). Therefore, it is important that all individuals prescribed naltrexone be instructed to care a card or wear a medical bracelet or tag explaining that they are currently on naltrexone and that treatment with an opiate derivative during a medical emergency will be ineffective (Seivewright and Iqbal, 2002). Moreover, in relation to the use of naltrexone for the treatment of opiate dependence, the chance of death via overdose is greater if these patients relapse.

Naltrexone is also a complex innovation because the primary obstacle to receiving the therapeutic benefit of oral naltrexone treatment is medication non-compliance, or problems

associated with its daily dosing regimen. The fact that naltrexone treatment is easy to start and is discontinued trouble-free is both an advantage and a shortcoming. Essentially, there is no pharmacological negative reinforcement for premature dropout (Farren, O'Malley, and Rounsaville, 1997; Rounsaville, 1995). Several approaches have been examined to manage poor patient compliance, most of which add some element of psychosocial intervention to the treatment plan, in an effort to improve treatment outcomes and reduce complexity. Most importantly, establishing a therapeutic link is critical to continuing naltrexone treatment. Vigilant supervision of naltrexone dosing by a salient other (such as a family member, significant other, or family member) in a supportive environment in conjunction with family therapy has been shown to improve naltrexone compliance (Fals-Stewart and O'Farrell, 2003; Hulse and Basso, 2000; Rothenberg, Sullivan, Church, Seracini, Collins, Kleber, and Nunes, 2002). Hulse and Basso (2000) found that the patient's daily medication ingestion being witnessed and verbally enforced in the initial weeks resulted in significantly better patient outcomes at the six-month point. In a second study, Fals-Stewart and O'Farrell (2003) found that at the one-year follow-up, patients receiving behavioral family counseling and taking naltrexone in the presence of a family member ingested more doses of naltrexone, attended more therapy sessions, had more drug-free days, and experienced fewer drug-related, legal, and family problems.

A second adjunct therapy used to increase naltrexone treatment compliance is a voucher-based contingency management approach. Recent randomized trials evaluated the use of vouchers (exchangeable for goods or services) to increase and sustain the use of naltrexone in opiate dependent subjects. As compared to the standard naltrexone control group, the contingency management groups had significantly longer treatment retention and ingested

significantly more does of naltrexone (Carroll, Ball, Nich, O'Connor, Eagan, Frankforter, Triffleman, Shi and Rounsaville, 2001; Preston, Silverman, Umbricht, DeJesus, Montoya, and Schuster, 1999).

In addition to the initial efforts to bolster the efficacy of naltrexone treatment with the addition of viable behavioral therapies (Carroll et al., 2001; Preston et al., 1999), Rounsaville's (1995) call for this effort has resulted in the development of Behavioral Naltrexone Therapy (BNT). BNT situates naltrexone in a psychotherapeutic context, combining aspects of Network Therapy (Galanter, 1993) and tenets of the Community Reinforcement Approach (Meyers and Smith, 1995) in an attempt to address the difficulties of transitioning to naltrexone maintenance, the issue of poor compliance, and the possibility of dysphoric side effects (Rothenberg, Sullivan, Church, Seracini, Collins, Kleber, and Nunes, 2002). The pilot trial demonstrated that participants previously using methadone had poorer outcomes suggesting the apparent physiological difficulties with transitioning from a long-acting opiate, such as methadone, to naltrexone therapy (Rothenberg et al., 2002). However, promising results from the participants using only heroin (no methadone) were found. Specifically, among the heroin addicts not previously using methadone, a positive correlation between treatment retention and both the percentage of opiate-free urine samples and adherence to naltrexone therapy was found (Rothenberg et al., 2002).

Since the oral dose form can be easily discontinued, the addictions research community has also proposed an injectable sustained-release formulation of naltrexone in an effort to surmount this predicament. Depotrex® is an injectable sustained-release drug delivery system of naltrexone that could somewhat alleviate the problem of medication compliance, thereby reducing the complexity level. Depotrex® requires substantially less naltrexone than the total

monthly oral dose and meets the goals of improving patient compliance and reducing the adverse effect associated with peaks/low levels of oral dosage formulas in both alcohol and opiate dependent patients (Alim, Tai, Chiang, Green, Rosse, Lindquist, and Deutsch, 1995; Comer, Collins, Kleber, Nuwayser, Kerrigan, and Fischman, 2002; Heishman, Francis-Wood, Keenan, Chiang, Terrill, Tai, and Henningfield, 1994; Kranzler, Modesto-Lowe, and Nuwayser, 1998).

Several studies, two of which were funded by NIDA, examine the safety, pharmacokinetics, pharmacodynamics, and effectiveness of Depotrex® for the treatment of drug dependence. First, Alim and colleagues (1995) reported that as hypothesized, the physiological and subjective effects of 10mg of intravenous morphine in cocaine dependent participants receiving 206mg of depot naltrexone were blocked. Second, using a sample of heroin dependent individuals during an 8-week inpatient study, Comer and colleagues (2002) found that both low and high doses of depot naltrexone produced a long lasting antagonism of the effects of heroin. Despite the initial discomfort associated with the actual injection of deport naltrexone and the mild soreness reported at the injection site for 2-3 days after injection, minimal side effects were reported in both studies (Alim et al., 1995; Comer et al., 2002).

Third, in a similar study of 101 opiate addicts in Great Britain, Foster, Brewer, and Steele (2003) found that naltrexone implants provide a good deal of protection against early relapse after rapid opiate detoxification under general anesthesia or sedation and were a cost effective alternative (at about $71 week) when compared to inpatient residential treatment. Fourth, Kranzler, Modesto-Lowe, and Nuwayser (1998) conducted a placebo-controlled study of the safety and tolerability of Depotex® in alcohol dependent participants. Patients receiving 206mg depot naltrexone had significantly reduced the percentage of heavy drinking days compared to the placebo-treated participants (Kranzler, Modesto-Lowe, and Nuwayser, 1998). Again,

adverse effects were minimal and analogous to those reported after oral naltrexone administration (Kranzler, Modesto-Lowe, and Nuwayser, 1998).

Overall, the use of depot naltrexone or naltrexone implants is an important and exciting alternative to the oral administration route. Treatment implications include additional protection against medication noncompliance without the complication of rigorous supervision by family or friends or the threat of contingency contracting. Moreover, these advances in the drug delivery system protect against early relapse, a phenomenon that is quite common during the most vulnerable period after detoxification. Therefore, the use of depot naltrexone could increase naltrexone's relative advantage while simultaneously decreasing its complexity.

A fourth factor affecting the rate of diffusion is the trialability of an innovation. Trialability can be defined as the degree to which an innovation can be experimented with on a temporary basis and is thought to have a positive impact on innovation adoption (Rogers, 2003). The dominant mode of administration and the lack of negative reinforcements for discontinuance make naltrexone an ideal candidate for addicted individuals to sample naltrexone. On the other hand, the use of naltrexone may not be tried on the installment plan in certain treatment organizations. Organizational barriers to trialability exist for treatment facilities that do not employ a physician or for those organizations that are not currently using any pharmacotherapies.

The final innovation attribute is observability, or the extent to which the results of an innovation are visible (Rogers, 2003). This attribute is also considered to have a positive relationship with innovation adoption (Rogers, 2003). Clinical trials have promoted the efficacy of naltrexone for opiate dependence for specific demographic populations, such as professionals and prisoners/probationers (Ling and Wesson, 1984; Washton, Pottash, and Golde, 1984). In

1994, naltrexone was reinvented to serve as an aid in the treatment of alcohol dependence based on the publication of two seminal articles (O'Malley et al., 1992; Volpicelli et al., 1992). The results of naltrexone are available to treatment practitioners as treatment follows the detoxification process, it increases the chance of both long-term opiate abstinence and/or sobriety (Farren, O'Malley, and Rounsaville, 1997; Rounsaville, 1995). Lengthy periods of detoxification and an abundance of withdrawal symptoms, make this an extremely vulnerable period during which many opiate- or alcohol-dependent individuals relapse. From a behavioral perspective, the chances for abstinence are great because the client has already experienced the protracted withdrawal phase. Additionally, patients can now de-condition the association between environmental cues and use behavior, thus further reducing the likelihood of relapse after the discontinuation of naltrexone treatment (Rounsaville, 1995).

Nonetheless, availability of information supporting treatment effectiveness does not ensure observability among potential adopters. In fact, a lack of knowledge was cited by both patients and physicians as the primary barrier to naltrexone adoption (Mark, Kranzler, Poole, Hagen, McLeond, and Crosse, 2003). Physicians also suggested that the observability of naltrexone is limited in that the pharmaceutical companies have not adequately promoted naltrexone. The failure of the pharmaceutical company's naltrexone marketing campaign has led to a lack of promotional materials such as free samples (Mark et al., 2003).

Synopsis of Naltrexone's Attributes

Overall, the general consensus of the addiction research community is that additional studies are needed to further examine naltrexone, but its initial support has established naltrexone as a valid treatment choice within the field. Despite being a theoretically ideal drug, naltrexone treatment has not been optimized in clinical treatment settings. This may, in part, be the result of

the perceived attributes of naltrexone. The inspection of naltrexone's attributes on its rate of adoption are mixed in terms of it's relative advantage, compatibility, complexity, trialability, and observability. Moreover, some of these attributes are contingent upon the organizational context in which the pharmacotherapy may or may not be used. However, it must be noted that naltrexone does have a relative advantage in comparison to other pharmacotherapies in that it is has been shown to be effective, especially for specific demographic populations. An ideal naltrexone program patient would fit the demographic characteristics of being young, married, employed, and having minimal involvement in the criminal justice system (Farren, O'Malley, and Rounsaville, 1997). Additionally, the patient would be motivated, under pressure from their employer or involved in contingency contracting (Ling and Wesson, 1984; Washton, Pottash, and Gold, 1984, Brahen et al., 1984), have family involvement, and be early in his/her substance abuse career (Farren, O'Malley, and Rounsaville, 1997). Moreover, naltrexone adoption may increase an organization's social status and has advantageous pharmacological properties.

Overall, naltrexone does not have an ideal set of perceived attributes, which is one reason for this innovation's slow rate of adoption. In particular, naltrexone is compatible in comparison to opiate agonists, it is not compatible with the dominant view of the treatment field, which is based on a 12-step philosophy. Additionally, this innovation is deemed complex by both users and practitioners. Naltrexone requires medical supervision and it possess intensive problems with non-compliance. Moreover, while naltrexone can be easily tried on a limited basis through tablet form, it may be difficult for treatment facilities to test naltrexone that are not already using pharmacotherapies or do not have a physician on the payroll. Finally, the use of naltrexone is limited in terms of visibility to both patients and clinicians. This innovation attribute,

observability, leads us to the next topic of communication between the innovation creators and the potential innovation adopters.

The Affect of Communication Channels on the Rate of Adoption

While the attributes of an innovation are the primary inhibitors of the rate of adoption, the level of communication between inventors and adopters is also a barrier that must be considered. According to Rogers (2003; 18) "Diffusion is a particular type of communication in which the message content that is exchanged is concerned with a new idea." The diffusion process involves: (1) an innovation, (2) an individual or group that has knowledge and experience with an innovation, (3) another individual or group that does not have knowledge or experience with the innovation, and (4) a communication channel between these two individuals or groups (Rogers, 2003). In the present study, the inventors with the knowledge or experience with an innovation are the addiction researchers and the potential adopters are the community treatment providers. It is necessary to have open communication channels, or the means by which messages get from one individual or group to another, in order for adoption to occur. The presence and nature of information exchange significantly impacts the conditions under which an adoption decision will be made.

The remainder of this chapter will discuss the following issues related to the communication flow between researchers and practitioners in the substance abuse treatment field. I will begin by describing the current state of affairs between addiction researchers and practitioners as well as address the reasons behind the schisms between clinical researchers and service delivery organizations to set the stage for the later discussion of organizational studies of innovativeness in Chapter 3. Grasping knowledge of the factors that impact technology transfer, or the lack thereof, will lay the groundwork for future attempts to increase the communication

flow. In order to understand this phenomenon, the following barriers to bridging the gap will be addressed in the remainder of this chapter: diverse perspectives, primary modes of information exchange, and structure of the federal support system.

Current State of Affairs: Limited Communication Between Researchers and Treatment Practitioners

Addiction is a unique phenomenon. Some addiction researchers acknowledge that it is a chronic medical illness, hence the need for high quality evidenced-based treatments (McLellan, Lewis, O'Brien, and Kleber, 2000). Although addiction is theoretically deemed a disease like any other, neither the public nor treatment providers view it as such, thus the need for federal involvement in the technology transfer process to increase communication flow. Society addresses alcohol and drug dependence as a social problem requiring punitive repercussions rather than a treating it as a health problem needing prevention and treatment (McLellan, Lewis, O'Brien, and Kleber, 2000). In other fields of medicine, there is far less resistance to new technology. The federal government funds clinical trials, and it is commonplace for health care providers to automatically adopt these treatments to improve patient outcomes.

However, as alluded to above, the substance abuse treatment is an oddity within the field of medicine in that addiction is not taught as part of the medical school curricula nor do primary care physicians adequately screen for alcohol or drug dependence (McLellan, Lewis, O'Brien, and Kleber, 2000). In recent decades, there has been an increase in the development of effective medications to treat alcohol and drug addictions in an effort to validate the drug dependence as a chronic medical illness. This lack of training and sharing information may in part explain why there has historically been a slow rate of adoption of "evidence-based" practices for the treatment of addictions, thus producing the social context for a congressional mandate.

In order to disseminate effective, research-based interventions and treatment service protocols, the field of substance abuse treatment needs to understand the barriers of this process. The impediments to building the bridge, or opening the flow of communication, between the professions of scientific researchers and service providers are three-fold. First, the diverse perspectives of these two communities impede the dissemination of knowledge and the technology transfer initiative. Second, in order for technology transfer to occur, the knowledge surrounding scientifically validated treatment techniques must be disseminated in an appropriate manner. The field of substance abuse research has developed a network of journals and conferences to transfer this knowledge to practitioners. However, the underlying reasons explaining why this is not an effective medium of exchange will be discussed. In order for this mode of communication to be effective, it needs to be augmented. Third, the structure of the federal support of the drug abuse treatment field has not historically facilitated nor has it been conducive to technology transfer, or communication between researchers and practitioners. The barriers to opening the floodgates for communication flow include confusion of responsibility, the lack of incentives to participate in collaborative relationships, and the absence of an effort to produce the behavioral or cognitive processes of organizations.

Diverse Perspectives as Barriers to Open Communication Channels

It is imperative that discourse and interaction between clinical researchers and treatment practitioners occur in an effort to reduce both the direct societal costs of drug dependence and the indirect costs brought about by co-occurring social problems. As alluded to above, these two factions have the same goal of increasing treatment efficiency and efficacy, however, there is no innate attraction between researchers and practitioners. Moreover, while both researchers and clinicians acknowledge the importance of collaboration, there are a plethora of barriers that

impede the communication processes necessary to meet the challenge of successful technology transfer. This professional separatism and lack of communication is not limited specifically to the field of substance abuse treatment, it also has roots in psychology (Jensen, Hoagwood, and Trickett, 1999), the sociology of the community (Nyden et al., 1997), higher education (Benishek, 1998; Lazar, 2002; Potapchuk, 1998; Stanton, 1990) and organizational management (Bennis and Biederman, 1997; Hargrove, 1998; Sherman and Torbert, 2000).

Specifically, several barriers to opening the communication channels between academic researchers and clinicians will be addressed. To begin, academic researchers and community practitioners are familiar with different aspects of substance abuse treatment. Researchers and treatment providers come from training backgrounds and possess a variety of education experiences; therefore, they need to be able to gauge each other's credibility. Although the researchers' areas of expertise overlap with those of practitioners, they are not parallel and they speak different languages. Technology transfer can only be fostered if there are open lines of communication between researchers and practitioners. These two parties must be able to relate to one another with language that is clear, concise, and user-friendly. In extremist terms, academics are stereotyped as being scholars housed in an "ivory tower" unconnected and immune to social reality; whereas, in contrast, treatment providers are "warriors" on the front lines who are living in the "trenches" in the war against substance abuse (Jensen, Hoagwood, and Trickett, 1999; Lazar, 2002; Sherman and Torbert, 2000). A major reason cited by treatment providers for their lack of participation in research activities, is distrust of academic researchers (Brown, 1998). Conversing and collaborating will allow practitioners and researchers to become less skeptical of the other's credibility and more familiar with the others' organizational culture and goals.

In addition, while researchers are focusing on gathering scientific data to provide a rationale for the use of a particular pharmacological innovation or behavioral therapy, they may not assess the effort needed to encourage the implementation of an innovation strategy into a specific treatment program. If a community treatment program does not occupy both the material and human institutional resources necessary to adopt and implement an initiative, it is unlikely that adoption of that innovative treatment component will occur (Backer, 1991; Brown, 1998; Glaser, Abelson, and Garrison, 1983; Simpson, 2002). The center may be inclined to stay with the traditional, cost efficient, treatment techniques. When researchers and service providers communicate, they may agree to go beyond communication and engage in a collaborative partnership. This enables these two factions to work together to address the issue of the feasibility, or replicability, of the innovative treatment in a real-world community setting (Brown, 1995; Brown, 1998). Moreover, both parties can be listed as co-investigators on any grants or publications, ensuring equal partnership in the collaborative process (Reback et al., 2002).

Impact of the Primary Modes of Exchange on Communication Flow

A disconnect between the academic scientist and their community partners is apparent despite the attempts to disseminate knowledge. This could be in part due to the fact that the primary mode of sharing research information regarding treatment technology is via the print media – specifically, peer-reviewed academic journals. While this is the predominant medium of exchange, and on the surface may be a good vehicle for sharing research knowledge because theoretically it is available to everyone, it is not the most effective strategy for linking research and practice. McLellan and McKay (1998) assert that research findings on pharmacological

therapies and psychosocial treatments are specifically underutilized in community based-treatment settings.

There are several practical explanations why academic journals currently cause the divorce, rather than the marriage, of research and practice. First and foremost, while research findings are intended to improve the treatment field and provide a scientific foundational base for practice, many community practitioners are not aware, or do not read, research findings reported in scholarly journals (Brown, 2000; Froehle and Rominger, 1993; Simpson, 2002). This thwarts the process of informing an audience of potential adopters about the existence and efficacy of an innovation such as naltrexone. The underlying reasons for the behaviors of practitioners vary. To begin, journals are often not available to the treatment community for economic reasons. While researchers housed in university settings have complete access to libraries or computer technology to retrieve or download journal articles on substance use, treatment programs rarely have library budgets or the computer technology, nor do they have the staff time, available to review the research findings (Brown, 2000). Moreover, there are over 17 national journals that address drug abuse treatment and preventions, sometimes with institutional subscriptions costing over $1,500 annually for a single journal subscription (Brown, 2000).

A related issue in relying on research journals as a medium of exchange is the employment of specific research methodologies and the selective reporting of findings (Brown, 2000; Froehle and Rominger, 1993). The competitive nature of peer-referred journals often demands the use of complex statistical analyses, technical clinical trials, and the use of complicated research vocabulary. The implication of this type of journal format is that it requires higher-levels of education. Peer-reviewed journals often do not precisely report their research methods, thus it is challenging to apply it to real life. Moreover, the rigorous standards

of journals are selective in their reporting of findings and the common practice of behavioral social science journals discourage replication studies, as well as studies with incompatible findings (Bardon, 1987; Froehle and Rominger, 1993). This continues to facilitate that the strongly scholarly base for practice will not be read, and therefore has a slim chance of directly influencing the practice of community treatment providers.

In addition, the demographic composition of the treatment community is a factor in relying on the research journals to disseminate information. As such, treatment staff is composed of a dichotomy, the majority of which are workers who possess a vast experiential background (in both substance abuse and human relations) rather than educational credentials (Brown, 2000). Traditionally, the substance abuse field places a great degree of value on the background experiences of its' paraprofessional staff, which ultimately shapes the delivery of treatment services (Backer, Brown, and Howard, 1994; Brown, 2000). The majority of counselors possess a bachelor's degree or less, which may be a population without significant experience in the use of journals as a knowledge base on technology transfer (Brown, 2000). However, it must be noted that the occupation is attempting to professionalize itself with graduate degrees. Data from the National Treatment Center Study in 2004 show that the percentage of counselor's with a Master's degree ranges from 31% in therapeutic communities to 47% in private treatment facilities. Yet, the field of study of is unknown in the NTCS, and thus may be a function of obtaining a Master's degree in more applied field (e.g. Social Work) than in traditionally academic majors. Moreover, this data suggests a significant negative relationship between the percentage of counselors with a Master's degree and both the percentage of either counselors in recovery and the percentage of certified counselors. It is plausible that counselors have either academic credentials or have experiential knowledge legitimated by certification in

addictions counseling. Either way, the academic journals are often littered with specialized jargon that is unintelligible to the layperson (Nyden, Figert, Shibley, and Burrows, 1997).

There is also the matter of research relevance, which serves to impede the efforts to promote technology transfer because application is not be effectively communicated. Many mental and behavioral health professionals view the findings presented in research journals as irrelevant to their everyday practice of service delivery (Froehle and Rominger, 1993; Sorensen and Guydish, 1991). Clinical trials oftentimes possess strict protocols that are not applicable to the real world. For example, they may only include patients addicted to heroin, while excluding the poly-drug users that compose the majority of the substance dependent population. Community treatment providers may be hesitant to replicate this treatment protocol with their clientele base. Additionally, the adoption of innovative research findings lag far behind the production of this research information because they must compete with the normative dogmatic practices that are deeply entrenched within the vested interests of treatment providing organizations (Froehle and Rominger, 1993; Lamb, Greenlick, and McCarty, 1998; Reback, Cohen, Freese, and Shoptaw, 2002).

The traditional method of academic publications for the dissemination of scientific information is primarily designed to serve researchers (Brown, 2000; Simpson, 2002). It has not historically created awareness-knowledge among an audience of potential adopters. These are incentives for scientific researchers to publish in credible academic journals including professional recognition, tenure, promotion, and access to research grant monies; moreover, there appears to be an inverse relationship between journal prestige and accessibility to the service delivery population (Brown, 2000). Such incentives are nonexistent for treatment providers and as a result of their very demanding jobs feel their time is better spent treating

clients and completing the overwhelming amounts of paperwork. These mechanisms promote the transmission of information to the research, rather than the treatment, community. However, it is necessary for both the addiction researchers and the community practitioners have awareness knowledge of an innovation such as naltrexone.

Fostering the community's ownership of research endeavors increases the relevance of findings for the adopting organization (Backer, 1998; Brown, 1996, Brown, 1998; Simpson, 2002), which can be achieved by allowing innovation consumers to partake in the planning, data collection, and analyzing portions of the research process (Backer, 1991; Brown, 1998). Besides involvement in the research process, partnerships between researchers and clinicians in publishing ventures increase the relevance of the treatment initiative (Reback et al., 2002). On the other hand, since research journals as a medium of information exchange are often difficult to interpret even for the academically trained clinician (Brown, 1998), it has been suggested that interpersonal contacts between researchers and practitioners is a better avenue to take when attempting to adopt new service delivery initiatives (Backer, 1991; Brown, 1998; Sorenen and Guydish, 1991).

Structure of Federal Support as Impeding Communication Flow

The evidence documenting a gap between research and practice can best be illustrated by the Public Broadcastings Service's five-part documentary Bill Moyers on addiction and substance abuse treatment in the United States during the late 1990's. This report begins by commenting on the bio-behavioral basis of addictive disorders and diseases, as well as discusses the numerous advances of scientifically validated treatment practices during the 1980's and 1990's (Public Broadcasting Service, 1998). The discrepancy between the worlds of substance abuse research and treatment are illustrated when the focus turns to the description of current

treatments utilized in the field. In particular, the treatment service delivery system in the late 1990's is practically indistinguishable from the system found twenty years prior (Rawson, Marinelli-Casey, and Ling, 2002). A preponderance of treatment programs continue to embrace the "traditional" approaches used to treat substance abuse despite the fact that the majority of practitioners acknowledge that most of their clients will relapse, yet they continue to conduct treatment outcome assessments (Rawson, Marinelli-Casey, and Ling, 2002; White, 1998).

During the previous decade, the budgets of U.S. federal agencies responsible for substance abuse treatment and research have increased, with NIDA's budget doubling during the past five years (Rawson, Marinelli-Casey, and Ling, 2002), but this trend has not rolled over into the future. A substantial proportion of federal funds have been used to conduct clinical trials of pharmacological treatment techniques resulting in several scientifically derived medications (Cornish, Metzger, Woody, Wilson, McLellan, Vandergrift, and O'Brien, 1997; Ling, Huber, and Rawson, 2001; O'Brien, Volpicelli, and Volpicelli, 1996). However, it must be noted that pharmaceutical companies have hesitated to become involved in the behavioral health field of substance abuse, in part due to stigmatization, but also because of the high degree of government regulation and the reluctance of the substance abuse service delivery system to adopt pharmacological treatments to aid in the treatment of substance abuse (Kranzler, 2000; Rawson, Marinelli-Casey, and Ling, 2002). Despite the emphasis on pharmacological therapies in treatment research, these new medication treatments are either unknown or have been largely ignored by service providers. Eventually, this discrepancy may lead to the public questioning the use of billions of dollars to fund research that only produces academic articles, which are overlooked by practitioners who continue to employ their normative treatment approaches,

ultimately resulting in little to no improvements in the quality of care (Rawson, Marinelli-Casey, and Ling, 2002).

The new knowledge produced by researchers does not guarantee that new practices will be utilized in the real world setting. This conundrum may be in part due to the significant degree of confusions surrounding the ownership of blending substance abuse research and practicing treatment organizations (Brown, 1998). It is difficult to assess who is responsible for commanding the technology transfer initiative to produce changes. Researchers may feel they have held up their end of their end of the bargain by producing quality journal publications and it is beyond their monetary and experiential resources to extend the findings beyond publication (Brown, 1998). Additionally, they have no incentives to produce anything beyond journal publications, a process which is entrenched in achieving academic notoriety and future grant support. Any contact with treatment providers is likely to be viewed as a pro bono effort.

In contrast, service providers lack the time and monetary resources necessary to review, and subsequently adopt and implement, innovative treatment techniques due to a turbulent environment created by managed care organizations. Furthermore, if practitioners are even aware of innovative techniques, then they are likely to question the relevance of research findings, the credibility of the research and research design strategy, the feasibility of implementing a specific novel service component into their specific treatment environment (Brown, 1998). In addition, despite the goal of improved treatment outcomes, the incentives for practitioners to communicate and participate in the technology transfer process are few and far between. In fact, they may be hesitant to adopt innovative treatments because of policies, governmental regulations, and funding issues (Rawson, Marinelli-Casey, and Ling, 2002). The structure of the federal agencies that support substance abuse treatment and prevention research

allows, but does not demand or facilitate, the use of research findings to trigger changes in either policy or treatment programs (Brown, 1998).

Despite the previous discussion of obstacles to technology transfer, impediments to communication and collaboration are being to dissolve. There have been several recent federal efforts that have encouraged the adoption of empirically proven treatments. In particular, publicizing the Institute of Medicine's (IOM) Report: *Bridging the Gap Between Practice and Research: Forging Partnerships with Community-Based Drug and Alcohol Treatment* (Lamb, Greenlick, and McCarty, 1998) outlined the rationale for the current federal research-practice initiatives. Substantial investments have resulted in multiple research-practice integration programs including initiatives by two federal agencies – the National Institute on Drug Abuse (NIDA) and the Center for Substance Abuse Treatment (CSAT) (Rawson and Branch, 2002).

Specifically, the IOM report recommended two strategies for linking research and practice. First, the committee recommended that "NIDA and CSAT should support the development of an infrastructure to facilitate research within a network of community-based treatment programs, similar to the National Cancer Institute's Community Clinical Oncology Program (CCOP) networks" (Lamb, Greenlick, and McCarty, 1998;113). The second recommendation suggested that "NIDA and NIAAA should develop research initiatives to foster studies that include community-based treatment programs as full partners" (Lamb, Greenlick, and McCarty, 1998;114). The extensive efforts of these two major enterprises to close the research-practice gap will briefly be discussed.

The largest research to practice collaboration that was inspired by the IOM's report is NIDA's Clinical Trials Network (CTN). The CTN's mission is as follows:

> To conduct studies of behavioral, pharmacological, and integrated behavioral and pharmacological treatment interventions of therapeutic effect in rigorous, multi-site clinical trials to determine effectiveness across a broad range of community-based treatment settings and diversified patients populations; and (to) transfer the research results to physicians, providers, and their patients to improve the quality of drug abuse treatment throughout the country using science as the vehicle (NIDA, 2002).

To complete this mission, NIDA's initial step was to award $55 million in grant funds to create the CTN in 1999 (Reback et al., 2002). Specifically, NIDA began by funding six regional research and training centers (RRTC's) during the first year, eight nodes in the second year, and three nodes in the third year (NIDA, 2002). The CTN is designed to meet the IOM's recommendations in creating opportunities for collaboration between university-based research centers and community treatment programs within a specific geographic area. Participation in the network entails that within each geographically dispersed research node, communication between researchers and practitioners is necessary to determine all aspects of the research process (Rawson et al., 2002).

NIDA has joined the Substance Abuse and Mental Health Services Administration's (SAMHSA) Center for Substance Abuse Treatment (CSAT) to develop a landmark initiative. This interagency covenant, called the NIDA/SAMHSA ATTC Blending Initiative, drives towards the goal of moving scientific findings into mainstream addiction treatment practice. Blending teams are comprised of NIDA researchers and staff from CSAT's ATTC network and collaboratively work to develop a strategic dissemination plan. While NIDA has established several evidenced-based treatment interventions that are ready for widespread use in the treatment field, CSAT is responsible for supporting a system of 14 training centers, or Addiction Technology Transfer Centers (ATTCs). These establishments are the core of the CSAT effort to disseminate empirically supported treatment techniques into the community setting. Moreover, the ATTC has created manuscripts to promote organizational change, designed an online training

course, developed video training programs, and established objective certification standards for counselors (Rawson et al., 2002). Two blending teams are currently in place to disseminate recent scientific findings on buprenorphine and the Addiction Severity Index (ASI) into mainstream addiction treatment practice.

Overall, the IOM report served to meld together U.S. federal agencies as well as to prompt these agencies to release program announcements encouraging researchers and practitioners to collaborate building the bridge to better link substance abuse treatment and research in the United States. This integrative challenge with the goal of cultivating communication channels is the forefront consideration on today's substance abuse treatment research agenda. NIDA and CSAT's development of funding initiatives in accordance with IOM's recommendations have reduced the research-practice gap and have produced substantial published documents (Rawson et al., 2002). It must be noted that dividing the responsibility for conducting research and transferring that knowledge into practice between two independent and competing agencies (NIDA and CSAT) may not be the best strategy (Brown, 1998). Perhaps, concentrating all efforts to one organization would be more beneficial and the director of NIDA at the time, Alan Leshner, had stated interest in such a venture. However, both NIDA's CTN and NIDA/SAMHSA ATTC Blending Initiative are in an embryonic stage, but the treatment field is cautiously optimistic about the division of labor, as well as the communication and collaboration, between these two federal agencies. The federal government is creating evidenced-based treatment interventions and calculating a dissemination strategy in an effort to construct the bridge the gap.

Synopsis of Communication Channels in the Field of Addictions

To conclude, the diffusion of an innovation is a very social process that involves an information exchange between the inventors and potential adopters. Several issues have impeded communication relationships between addictions researchers and community treatment practitioners and this may have an impact of the rate of diffusion of innovative treatment techniques. First, these two groups possess diverse perspectives of addiction treatment and it is obvious that the transfer of knowledge occurs most often between to individuals or groups who are similar, or homophilous (Rogers, 2003). The factors impeding the mutually productive relationship between substance abuse practice and research organizations is that these groups do not share a common language, they have different types of educational training, and they conducted their everyday work in different milieus.

Second, the primary mode of information exchange affects communication channels between academic researchers and community practitioners. Academic journals are the primary mode of sharing information, but this medium is limited for a variety of reasons. Community practitioners may not be aware of or have the time to read scholarly journal articles. They may lack the economic resources necessary to purchase journal subscriptions. In addition, peer-reviewed journals have a slim chance of directly influencing community treatment practices because they often employ statistically complex analyses or may not be applicable to a real world setting.

The final factor that may affect the communication flow, thereby impacting adoption, is the structure of the federal system. Currently, the federal government is making an effort to ensure that the best practices will be utilized in community treatment providers. As a result of the Institute of Medicine's report, several community-university research cooperation initiatives

were created to demonstrate the efforts made by the federal government to build the bridge of effective communication. A brief overview of the mission statements and logistics of both NIDA's Clinical Trials Network and NIDA/SAMHSA ATTC Blending Initiative was provided. Both of these initiatives encompass the objective of ensuring the communication and collaboration among addiction researchers and community practitioners to encourage the dissemination of evidenced-based treatments.

Communication and collaboration are beneficial because they increase the efficiency of treatment, but they are also advantageous to both researchers and practitioners. First, limited resources produced by current economic conditions and budget cuts in both environments can be used more efficiently when blending clinical research and community practice (Nyden et al., 1997). This period of austerity has produced a decrease in government funding of social science programs within the university milieu causing the downsizing of administrative workers and departmental faculty; and, more specifically, it has forced academic researchers to seek support from competitive private sector foundations (Nyden et al., 1997). In a similar fashion, substance abuse treatment centers are faced with limited resources as a result of the impact of managed care on service delivery aspects. The turbulent environment created by managed care has decreased flexibility in both the state-regulated public sector and the market-driven private sector. As a result of this social movement towards less costly treatment alternatives, substance abuse treatment centers have had drastic increases in outpatient levels of care and have consistently employed non-medical 12-step treatment approaches to achieve cost containment (Schmidt and Weisner, 1993).

In addition to the rationale of limited resources to increase collaboration in producing technology transfer, Brown and Flynn (2002) posit three positive outcomes of collaboration. In

relation to the planning process, the primary consumer group has for the most part been disregarded. Therefore, when the treatment community is involved in the planning process, the proposed study has greater promise of actually addressing a meaningful clinical issue within a real-life treatment setting. The rate of adoption of effective treatments may increase in community treatment facilities. Second, if treatment providers are involved in creating the agenda, they will be more inclined to assist in conducting the study and possess the financial resources to participate. Subsequently, they will be more invested in the research findings of the study, and thus, more willing to implement the treatment protocol (Brown and Flynn, 2002). When these two entities are communicating effectively, long-term planning can occur. Due to the long gestation period surrounding the procurement of research grant monies, the grant process typically begins a year before funding; therefore, for research findings to achieve maximum benefit, timing is imperative (Brown, 1998; Sorensen and Clark, 1994). Despite the slow pace of adoption and implementation of empirically based research findings, there are a plethora of reasons for academic researchers and community treatment providers to communicate and collaborate. Both interpersonal and formal communication is the key to increasing the adoption of evidenced-based practices.

This chapter paves the way for the next chapter, which discusses one facet of innovation-process studies - the distinctive features of organizations that promote the adoption of naltrexone. While it remains important for addiction researchers to continue to address both the attributes of innovations and the social communication processes involved in the diffusion of innovations, the primary focus of this dissertation is on the relationship between managerial and structural characteristics within treatment organizations that affect both their adoption behavior and degree

of organizational innovativeness. Chapter 3 provides an overview of the theoretical framework and formulates the hypotheses guiding the present study.

CHAPTER 3

DIFFUSION OF INNOVATIONS THEORY & HYPOTHESES

As alluded to in the previous chapters, there have been significant advances in the scientific knowledge of best health care practices; yet to no avail, the vast majority of this knowledge remains unused. This trend is more pronounced in the health care field than in other service sectors (Berwick, 2003). The tools to improve service delivery in the United States are readily available, but this country fails to deliver the best possible care to its citizens, leading to the use of both expensive and harmful practices (Berwick, 2003; Chassin, Galvin, and et al., 1998; Institute of Medicine, 2001). In terms of addiction treatment, failing to use available science to treatment chronic illnesses leads to the overuse of unhelpful or ineffective care. Ignorance or neglect of best treatment practices could be a consequence of the attributes of the innovation, the lack of open communication channels between the innovation creators and the potential pool of adopters, and/or the characteristics of the adopters. This chapter addresses the latter factor by exploring the wider literature on the diffusion of innovations to shed light onto the organizational predictors of adoption. In particular to the substance abuse treatment field, the foci of this dissertation are attempting to answer the questions of "What organizational characteristics are significant in predicting whether or not an organization adopts naltrexone," and "Among adopting organizations, what organizational level factors are important in predicting innovativeness?"

First, this chapter will begin by providing a brief overview of the various models of technology transfer. More in-depth insight into the model guiding these the two primary research questions, Everett Rogers' (2003) diffusion of innovations theory, will be given.

Second, I will turn to focus on the brief literature that addresses the diffusion of naltrexone as well as address the manners in which the present study improves upon extant research.

Third, I will discuss the four general organizational-level predictors of naltrexone adoption including *Culture, Individual Leadership Characteristics, Internal Organizational Structure*, and *External Characteristics of the Organization*. These four theoretical components will be used in an event history analysis to differentiate adopting organizations from non-adopters over time. Previous literature on the relationship between the measures assessing the four components and innovation adoption will steer the construction of hypotheses. Fourth, the theoretical foundations of Rogers' (2003) continuum of innovativeness, which is composed of five ideal adopter types, will be addressed in an effort to begin attending to the second research question of interest. This section will discuss the theoretical foundations fueling the hypotheses for the ordered logistic regression. Variables measuring the concepts of *Socioeconomic Status*, *Organizational Personality (Climate),* and *Communication Behavior* will be used to identify the significant predictors of more innovative organizations. This examination will significantly add to the extant research on the theoretical predictors of adopter categorization because it is the first empirical analysis to do so at the organizational, rather than individual, level. Chapter 3 will conclude by summarizing Rogers' (2003) theory and foreshadowing the future the contents of Chapter 4.

Theoretical Models – The Diffusion of Innovations

Several models of technology transfer can be found in the extant literature including the appropriability model, the knowledge utilization model, the communication model, and the dissemination model. According to the appropriability model, purposive technology transfer mechanisms are unnecessary because empirically-validated technologies will automatically be

adopted by consumers (Devine, James, and Adams, 1987; Tenkasi and Mohrman, 1995). However, this model is inappropriate for technology transfer in the field of addictions because researchers have repeatedly stressed the fact that treatment organizations have been slow to adopt evidenced-based treatment strategies (Backer, David and Soucy, 1995; Brown, 2000; Greenlick et al., 1999; Lamb, Greenlick, and McCarty, 1998; Read, Kahler, and Stevenson, 2001).

The knowledge utilization model emphasizes the communication between researchers and practitioners/clients. The major criticism of this model is that it accentuates the transfer process as uni-directional, moving from the originating researcher to the receiving client, rather than as an interactive process (Dimancesu and Botkin, 1986; Tenkasi and Mohrman, 1995; Williams and Gibson, 1990). A third model of technology transfer, coined the communication model, denotes the cognitive changes necessary to have a two-way line of communication between researchers and adopters; yet, it is characterized by methodological difficulties (Doheny-Farina, 1992; Williams and Gibson, 1990).

This dissertation is based on Rogers' (1962, 1971, 1983, 1995, 2003) theoretical model of innovation diffusion. Rogers' model is the bedrock for the majority of innovations studies (Glassman, 1995) with Rogers being deemed the "father of diffusion of innovation research" (McGrath and Zell, 2001; 386). In the highly acclaimed book, *Diffusion of Innovations*, Rogers (2003) reports on all stages of the innovation-decision process, as well as covers the attributes of innovations and type of communication channels, which produce adoption and subsequent implementation. Furthermore, this seminal book has evolved to a fifth edition, with the expansion of latter editions to offer theoretical predictors of both individual as well as organizational adoption (Rogers, 1995, 2003). Thus, the present study attempts to address a

particularly understudied facet of the technology transfer mission by exploring the organizational characteristics that are theoretically predictive of innovation adoption and innovativeness. Adoption is defined as "A decision to make full use of an innovation as the best course of action available," where innovativeness refers to "the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a system" (Rogers, 2003; p. 21-22).

But before exploring the literature of adoption and innovativeness, I must precisely define the characteristics of an innovation. The lexical definition of an innovation is "An idea, practice or object that is perceived as new by an individual or other unit of adoption" (Rogers, 2003; p.12). The innovation may not be new in a traditional sense, but other scholars have also asserted if is perceived as new and involves the risks associated with adoption, then it is an innovation (Backer, 1991; Daft, 1982; Hage and Dewar, 1972; Zaltman, Duncan, and Holbek, 1973). Innovations may be created internally or may be adopted from external sources. In the management literature, innovations are further compartmentalized into technical and administrative innovations because the two types of innovations involve different decision-making processes and ultimately serve different functions (Daft, 1978; Downs and Mohr, 1976; Kimberly and Evanisko, 1981; Damanpour, 1987, 1991). Technical innovations refer to the adoption of novel products or services whereas administrative organization constitutes the adoption of a change in the basic work processes and are related to managerial issues (Kimberly and Evankiso, 1981). The present study explores the adoption of a technical innovation used to increase the effectiveness of the delivery of substance abuse treatment services in private organizations.

The intellectual origin of diffusion theory is from two European sources. First, Gabriel Tarde (1903) was the first to assert that proximity led to imitation, or the mimicking of other individuals' adoption behavior. As a French sociological pioneer in the diffusion field, Tarde (1903) acknowledged that the rate of imitation, currently termed adoption, generally followed the S-shaped curve over time. In addition he documented the role that opinion leaders play in the practice of "imitation," as well as recognized the social processes involved in imitation behavior (Tarde, 1903). The second root of diffusion theory is from two schools of anthropological theory, termed the "British diffusionists" and the "German-Austrian diffusionists" (Rogers, 2003). The traditional diffusionism viewpoint claims that innovations disseminate from only one source and that all social change is the product of diffusion (Rogers, 2003). While these European diffusionists popularized the concept of diffusion theory within other social sciences, the dominant viewpoint today is that social change is the product of both invention and diffusion (Rogers, 2003).

Diffusion empirical research is historically derived from rural sociological studies examining the expansion of new agricultural techniques among farmers (Rogers, 2003). During an interview with McGrath and Zell (2001), Everett Rogers asserted that the hybrid seed corn diffusion study in Iowa by Ryan and Gross (1943) is the most influential study in the diffusion field, in that it set off a tremendous number of future studies. This influential study resulted in the creation of a "revolutionary paradigm" on the diffusion of innovations (Rogers, 1976).

The Iowa hybrid corn study investigated a variety of items during a face-to-face interview with farmers, such as the year of adoption, the communication channels used at each stage in the innovation-decision making process, the total percentage of the farmer's corn acreage that was planted in hybrid, and the demographic characteristics of the farmers. Results

revealed that the hybrid corn study's rate of adoption followed the S-shaped curve. Categorizing adopters on the basis of innovativeness discovered that innovators had larger-sized farms, higher incomes, more education, and were more cosmopolite (as measured by the number of trips made to the Iowa's largest city, Des Moines) (Ryan and Gross, 1943). This research also demonstrated the importance of different types of communication during the various stages of the diffusion process, with salespersons influencing innovators and informal communication with neighboring farmers influencing later adopters (Ryan and Gross, 1943). Overall, the tactics used by Ryan and Gross (1943) have benefited the diffusion field because not only did they popularize the term "diffusion" but they also establish the now customary research methodology, which is the use of retrospective survey data.

However, diffusion theory is a multidisciplinary perspective because it has spread to explore a variety of topic ranging from research on marketing consumer projects to health promotion studies (Rogers, 2003). The second most influential study to the diffusion paradigm was carried out by a team of sociologists in the late 1950's and is known as the Columbia University Drug Study (Coleman, Katz, and Menzel, 1957; Coleman, Katz, and Menzel, 1966; Menzel and Katz, 1955). This study analyzing the diffusion of tetracycline, a new antibiotic, highlighted the social process of diffusion, the nature of diffusion networks, and suggested that the role of opinion leaders (doctors) is crucial in the S-shape diffusion curve (Coleman, Katz, and Menzel, 1957).

Innovation research has evolved dramatically over the previous three decades. Innovation studies during the 1960s and 1970s demonstrated that awareness and access to novel ideas is not usually sufficient to produce and sustain change within either individuals or organizations (Backer, David, and Soucy, 1995). During the following decade, research

attempted to establish the most effective methods to promote utilization. Recent innovation diffusion studies have primarily focused on transferring these approaches into a formalized strategy, examining the realistic roles of adopting individuals or organizations, and adapting the studies from the previous era to mesh with current resource-poor times (Backer, David, and Soucy, 1995).

Additionally, the unit of analysis has changed over time. The earliest studies of innovation diffusion were limited to individual decision makers as the unit of analysis. However, many innovations are adopted by organizational entities and the examination of this unit of analysis is a much more complex process (Rogers, 2003). An organization can be defined as a "stable system of individuals who work together to achieve common goals through a hierarchy of ranks and a division of labor" (Rogers and Agarwala-Rogers, 1976; 26). While organizations are relatively stable, they do experience a fair degree of instability as a consequence of the social process of innovation adoption.

The initial research studies on the diffusion process in organizations were often oversimplifications, in that investigators continued to use the same methodologies to examine organizational innovativeness as they had previously used to explore the individual decision makers (Rogers, 2003). Current innovation research has progressed to not only examine the predictive characteristics of innovative organizations, but also focuses on the process of innovation within organizations over time (Rogers, 2003). While Rogers (2003) acknowledges that certain characteristics of innovative individuals can be translated to their organizational counterparts, there are also organizational characteristics that are not equivalent. For example, structural characteristics such as formalization, or the degree to which an organization emphasizes following rules or procedures, doesn't have an individual counterpart.

Rogers (2003) suggests two vexing problems regarding organizational innovativeness studies. First, organizational innovativeness investigations typically have found empirically weak relationships between predictor variables and dependent variable of innovation adoption. This, in part, may be the result of cross-sectional data. This type of analysis translates into the loss of time as a variable. Second, organizational innovativeness studies generally collect data from a single individual, usually the chief executive within the organization, thus reducing the organization to the equivalent of an individual.

The present study overcomes the first problematic issue by examining adoption behavior from a discrete time event history perspective rather than taking a cross-sectional approach to data analysis. While this dissertation research analyzes data that is collected from only the top individuals within the treatment organizations, it can be argued that the majority of variables included in the analyses are valid indicators because they primarily measure concrete concepts, rather than subjective perceptions. It is also reasonable to claim that top executives will provide correct information on their personal biographies, such as educational level and number of years in the behavioral health field, as well as accurately report structural characteristics such as profit status and the presence of a physician on the payroll.

Before discussing the literature guiding the hypotheses for the two research questions of interest, there are a few additional concepts within Rogers' theory that must be covered. To begin, there is the issue of pro-innovation bias that suggests that innovations will automatically benefit the adopters. A pro-innovation bias implies that an innovation should be utilized by all individuals (or organizations) within a social system, that the innovation should be rapidly diffused, and that it should not be re-invented (Rogers, 2003). This bias is widely recognized as a problematic issue in the diffusion field (Abrahamson, 1991; Downs and Mohr, 1976; Kimberly,

1981; Rogers 2003; Van de Ven, 1986). The pro-innovation bias must not be ignored, thus the importance in reiterating that the use of naltrexone for the treatment of all addicted clients is not recommended. However, the vast majority of private treatment facilities will have at least a few clients who could benefit from naltrexone treatment.

Naltrexone is also unique because it was reinvented, meaning that the use of naltrexone was changed and modified during the process of adoption and implementation. As stated above, naltrexone began in 1984 as solely a treatment for opiate dependence, but was reinvented in 1994 to aid in the treatment of alcohol dependence. Currently, it is used to treat both opiate and alcohol addiction. This concept of reinvention in the health care field is related to the concept of "fidelity" (Backer, 2000; Kelly, Somlia, DiFranceisco, Otto-Salaj, McAuliffe, Hackl, Heckman, Holtgrave, and Rompa, 2000). Reinvention is a common phenomenon recognized by diffusion scholars but was first acknowledged by Charters and Pellegrin (1972) in a study of an educational innovation in four schools. They found that the innovation of "differentiated staffing" was shaped differently in each of the four organizations examined in a one-year period (Charters and Pellegrin, 1972).

Another applicable example is the school-based drug abuse prevention program called DARE (Drug Abuse Resistance Education). In some schools in the California area, DARE lessons warned children that they should not join gangs, while other schools did not include this in their lesson plans because of the lack of a gang problem (Rogers, 1993). This reinvention of DARE to address the perils of both drugs use and gang involvement can be translated to the reinvention of the use of naltrexone to treatment both alcohol and opiate dependence. By and large, naltrexone was the appropriate innovation choice for this dissertation because it offered a unique opportunity to explore a pharmacological treatment that was reinvented over time.

Previous Research on the Diffusion of Naltrexone

A review of the extant literature on naltrexone in Chapter 2 revealed that most studies focused on the efficacy and efficiency of naltrexone as a treatment technique. There are, however, two existing studies that have addressed the diffusion of naltrexone within the substance abuse treatment field. Thomas, Wallack, Seift, Bishop, McCarty, and Simoni-Wastila (2001) found that 60% of physicians specializing in addictions prescribe naltrexone at least occasionally, whereas 55% of non-physician counselors have never recommended use. Barriers to adoption are still present and physician adoption behaviors differ by education, clinical setting and organizational practices (Thomas et al., 2001). Moreover, physicians cited a lack of knowledge about naltrexone and cost as the most important factors impeding adoption (Thomas et al., 2001).

A second study focuses on the organizational rather than the individual adoption of naltrexone. Roman and Johnson's (2002) cross-sectional study examined the extent to which the center's structure and caseload characteristics influenced naltrexone adoption and implementation. Age of the treatment center, administrator experience, the percentage of counselors possessing a Master's degree, the percentage of clients covered by managed care, and the percentage of relapsers were significant predictors of adoption (Roman and Johnson, 2002). Furthermore, Roman and Johnson (2002) found their analysis was more successful in predicting adoption than the extent to which naltrexone was used on a regular basis in these centers.

The present study improves upon the previous studies in several ways. First, this study is exploring the treatment organization as the unit of analysis, while the overwhelming focus in the diffusion literature has previously been on the individual. Rogers (1976) calls for researchers to overcome this psychological bias and conduct more diffusion research on dyads, networks, or

organizations. Second, this dissertation is grounded within an innovations theoretical framework (Rogers, 2003), which will aid in predicting adoption and adopter categorization. The previous studies on the diffusion of innovations have been descriptive or have used a-theoretical foundations to conduct multivariate analyses.

Third, more sophisticated analytic techniques will be utilized in the present study. While Roman and Johnson (2002) examine both adoption and implementation using logistic and ordinary least squares regression models, their data was cross-sectional, which makes causality impossible to establish. Using cross-sectional data is using an artificially halted snapshot of one observation point in time, and does not allow the research to trace the change in adoption of time (Rogers, 1976). This dissertation research has the advantage of panel longitudinal data, allowing for more robust causal models to be estimated. In examining adoption, this study explores not only the occurrence of adoption as in the Roman and Johnson (2002) study, but also the timing of events surrounding naltrexone adoption by using a discrete-time event history analysis. In contrast to a cross-sectional logistic regression, discrete-time event history analysis is able to take into account covariates (such as the number of FTE's or the degree of market competition) that may change over time. It is often the time-varying covariates that may cause an event to occur (in this case the adoption of naltrexone) at a particular time point.

Moreover, this dissertation will conduct an ordered regression analysis that focuses only on treatment centers currently using naltrexone in their treatment regimes. To be precise, treatment facilities are plotted into one of five adopter categories based on the year of adoption. Following this placement on the adopter continuum, *Socio-economic Status, Organizational Personality (Climate)*, and *Communication Behavior* are used to predict the five-category dependent variable. This is the first known examination using Rogers' (2003) theoretical

concepts to predict adopter categorization with the organization, rather than the individual, as the unit of analysis.

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 adopters of an innovation, which in the present study are substance abuse treatment providers. In fact, descriptive data from the National Treatment Center Study demonstrated that when treatment organizations currently using naltrexone were asked to rate the factors that influenced their initial adoption of naltrexone, they listed cultural ideological factors as one of the most important motivations for their center's decision to incorporate the use of naltrexone into their treatment protocols. Thus, *Organizational Culture*, although not in Rogers' (2003) theoretical framework, is included in the event history model.

Cultural compatibility, at the individual, organizational, and even at the international level (Kedia and Bhagat, 1988), is believed to be a necessary condition for technology transfer to be a successful endeavor. Tornatzky and Klein (1982) in a meta-analysis of innovation studies, found that compatibility with existing values, norms, and existing practices was the most common predictor of innovation adoption. It is suggested that the fit of the innovation with the user's current environment, is crucial in the adoption decision making process in that it can lead to the automation of innovation adoption (Leonard-Baron and Sinha, 1993). Another lexical term, organizational identity, has also been used to describe the phenomenon of *Organizational Culture*. Organizational identity can be defined as "repetitive patterns of individual behavior and interpersonal relationships that, when taken together, comprise the unacknowledged meaning of

organizational life" (Diamond, 1993; 77). The greater the overlap between the research findings and the mission and goals of an organization, the more likely the staff of that organization is to adopt and implement the innovative strategy (Brown, 1998; Glasner, Abelson, and Garrison, 1983; Rogers, 2003).

There is, however, an opposing cultural force that may have slowed the adoption of new treatment strategies, particularly pharmacological treatments. Organizations generally parallel the values of the dominant culture (Ray, 1989) and the treatment field still adheres to traditional beliefs, ideologies, and philosophical practices that arose from indigenous sources, dating back to the early 20th century (White, 1998). Specifically, the isomorphic nature of the treatment field continues to be characterized by the 12-step, drug-free model (Roman, Johnson, and Blum, 2000) and this near-universal treatment approach is also the dominant view held by the public. As such, the addiction field's approach to substance abuse treatment is rooted in the 12-step traditions of AA/NA, making these organizations hesitant to accept alternative treatment approaches that might contradict that model. Externalized ego defenses are utilized by these organizations to censor the use of innovations that may contradict the dominant status quo of the addictions field (Diamond, 1995). Accordingly, treatment centers that base their program on a 12-step model, as well as hold 12-step meetings on their premises, are posited to be less likely to adopt pharmacological therapies such as naltrexone.

H1: Substance abuse organizations characterized by a 12-step culture will be significantly less likely to adopt naltrexone across the four waves of the study.

In the case of substance abuse treatment, *Leadership* rests largely in the hands of administrators. These system administrators possess the power, status, and oftentimes technical expertise (if they are medically trained) to make authority-based innovation-decisions (Rogers,

2003), which in this analysis is the choice of whether to adopt or resist naltrexone. The type of leadership at a center may vary by the administrator's level of education and the amount of time he or she has been involved in the behavioral health care field. Rogers (2003) argues that adopters of innovations are more likely to have higher levels of formal education. Results of a meta-analysis also support the relationship between leadership professionalism and innovation adoption (Damanpour, 1991). Research demonstrates a positive relationship among health care administrator's education level and innovation adoption (Becker, 1970; Castle and Banaszak-Holl, 1997; Kimberly and Evanisko, 1988). In the case of substance abuse treatment, leaders with medical backgrounds or doctorates will likely adopt a pharmacological treatment more readily than persons with less education.

Moreover, it is expected that long-term managerial tenure in the behavioral health care field will lead to more innovative-decision makings. Damanpour (1991) found that greater tenure among management, as measured by the number of years employed by an organization, provides the necessary leadership self-confidence to adopt an innovation. Additional research in the health care field supports the finding that leaders with greater lengths of service being more receptive to innovation adoption (Castle and Banaszak-Holl, 1997; Kimberly and Evanisko, 1988; Roman and Johnson, 2002).

On the other hand, researchers have also found that, among physicians, fewer years in practice to be positively related with innovation adoption (Peay and Peay, 1994; Weiss, Charney, Baumgardner, et al., 1990). Younger professionals could possess fresh perspectives, and without the pressure of obligatory ties to organizational constituencies could be more open to the exploration of innovative treatment techniques. While Castle and Banaszak-Holl (1997) acknowledge the possibility of both a positive and a negative relationship between job tenure and

innovation adoption, they hypothesize (and later, empirically support) a positive relationship between adoption behavior and length of administrator's service. This decision was based on the lack of support for the rival hypothesis; accordingly, it shall guide the present hypothesis as well.

H2: Treatment centers employing more educated and more experienced administrators will be significantly more likely to adopt naltrexone across time.

The second area, **Internal Organizational Structure**, is further subdivided into six inter-related dimensions of management and organizational characteristics, including the *Centralization of Power*, *Complexity, Formalization, Interconnectedness, Organizational Resources*, and *Organizational Size*. First, *Centralization* is the degree to which power is concentrated in an organization. For example, the presence of a board of directors indicates a hierarchical system where administrators and counselors may have less centralized power since they are not fully autonomous in their decision-making. This is a defensive approach to innovation adoption because such a controlling and information-dominating strategy limits the learning and acceptability of both the counselors and clients who actually use the technology (Diamond, 1995). In the hospital setting, a negative relationship between centralization and the adoption of technological innovations was found (Kimberly and Evanisko, 1988). A meta-analysis reaffirms this significant negative relationship between centralization and innovation (Damanpour, 1991). The adoption of innovations is less frequent in more centralized organizations with hierarchical values that reinforce inflexibility in regards to innovation adoption (Kavanagh, 1995; Rogers, 2003; Thomas, 1991).

H3: Centralized facilities that report directly to a board of directors will be significantly less likely to adopt naltrexone during the research window.

Second, *Complexity* can be conceptualized as the extent of professional knowledge and expertise within an occupational specialty. Professionalism has a positive relationship with innovation adoption (Damanpour, 1991; Fichman, 2001). Promoting learning as a shared responsibility required of all members within the center, and not just the administrative leaders, is a characteristic associated with learning organizations (Glassman, 1995; McGill, Slocum, and Lei, 1992). Within the context of treatment centers, greater complexity is indicated by greater staff professionalism. In the addictions 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; Taleff & Swisher, 1997; Roman and Johnson, 2002).

The employment of an individual with formal training in the medical field who can prescribe pharmaceuticals, such as a psychiatrist, is a pivotal issue in regards to pharmacotherapy adoption. This occupational specialty is measured by the presence of a physician on the payroll within a treatment organization. Employing technical personnel increases the adoption (Dewar and Dutton, 1986) because this technical group comprises the skills necessary to deal with complex innovations. This reaffirms the credibility of the treatment center, as well as the addiction industry, in that medical doctors are viewed as the most credible authorities providing information on addictions treatment (McCallum, 1995).

Additionally, the current use of prescription drugs within an organization would suggest a relatively high level of technical knowledge and proficiency in the pharmacotherapeutic treatment of addictions, which may encourage the organization to adopt more novel evidenced-based pharmacotherapies such as naltrexone. Organizations possessing greater technical knowledge resources can easily learn of and grasp the application of innovative techniques thereby increasing the likelihood of innovation adoption (Dewar and Dutton, 1986; Ettlie,

Bridges, and O'Keefe, 1984). The use of other pharmaceuticals suggests a technology cluster (also known as an innovation package), which can be defined as the use of one or more elements of technology that are closely interrelated (Rogers, 2003). This type of functional interrelatedness of using complex pharmaceutical treatments should foster the adoption of naltrexone.

H4: Organizations with a high degree of Complexity (as measured by the employment of more counselors with a graduate degree, the presence of a physician on the payroll, and the use of prescription drugs) will be significantly more likely to adopt naltrexone over time.

Formalization, the third dimension, refers to the degree to which rules are emphasized when conducting organizational activities. There are two conflicting views of formal, bureaucratic outcomes. There is the negative view that bureaucracy stifles creatively and alienates workers or there is the positive view that it provides employees with the skills to increase job performance (Adler and Borys, 1996). Rogers (2003) endorses the former, negative view of the bureaucratic form of organization but also acknowledges that while some formalization acts inhibit the consideration of innovations, other acts encourage the implementation of innovations.

Damanpour (1991; pp. 589) asserts that "Formalization is typically measured by the presence of rule manuals and job descriptions, or more generally, by the degree of freedom available to organizational members as they pursue their functions and responsibilities." This operationalization is supported by other researchers as well (Cohn and Turyn, 1980; Kaluzny, Veney, and Gentry, 1974). Accordingly, an example of formalization is the presence of an employee handbook within a treatment facility. The assembly and use of a manual to impose a

variety of rules and requirements on treatment center employees is one possible indicator of a formalized organization. This indicator can be argued as a measure of formalization because there is variance in the number of establishments that possess extensive formal procedures; although, the majority of organizations have written job descriptions and the manuals delineating rules and procedures (Marsden, Cook, and Knoke, 1994).

Research suggests that formalization, as measured by written rules and procedures governing employee activities, was negatively related to innovation within several departments in an electronics firm and in a radio station (Rousseau, 1978). Among professionals, bureaucratic formalization limits the desire to learn about and subsequently adopt innovations because they lack autonomy (Aiken, Bacharach, and French, 1980; Bailyn, 1985; Raelin, 1985). Similar to the *Centralization* dimension, *Formalization* is believed to have a negative relationship with the adoption of naltrexone (Damanpour, 1991; Glassman, 1995; Rogers, 2003), because such a formal and inflexible environment inhibits the consideration of innovations.

H5: Formalized treatment facilities utilizing an employee handbook will be significantly less likely to adopt naltrexone across the four time periods.

Fourth, *Interconnectedness* refers to the extent to which an organization is embedded within a social network of other organizations and it is expected to have a positive relationship with the adoption of naltrexone (Rogers, 2003). Historically, at the individual level, interpersonal communication with other individuals has been demonstrated to have a positive relationship with innovation adoption (Becker, 1970; Burt, 1973; Coleman, Katz, and Menzel, 1966; Ryan and Gross, 1943). For research conducted in cases in which the organization is the adopting unit, one study shows support for this positive relationship (Kimberly, 1978) where another study finds no significant relationship (Kimberly and Evanisko, 1988). Substance abuse

treatment facilities that have been accredited by endorsing institutions, such as CARF and JCAHO, are more likely to be innovative. In hospitals, JCAHO accreditation requires evidence of quality improvement practices and includes regular reviews of the quality of care provided (Westphal, Gulati, and Shortell, 1997). These accredited organizations are required to fulfill certain treatment standards and as a result of this obligation, they may be more connected with others who are knowledgeable about the development and validation of innovative treatment techniques. Accredited organizations face external accountability to provide visible evidence of their commitment to improve quality of care, increasing their incentives to conform (Griffith, Sahney, and Mohr, 1995; Scott, 1995). As well, treatment facilities with memberships in treatment provider associations are tied into a larger interpersonal network of addiction practitioners. Extra-organizational involvement has been demonstrated to have a positive relationship with innovation adoption as a result of the capacity to successfully exchange information with their environment (Damanpour, 1991). Building on this perspective, the involvement in a treatment association is believed to foster the flow of new ideas that may be compatible with the use of pharmacological therapies for substance abuse treatment.

H6: Substance abuse treatment centers which are interconnected with the addictions field via accreditation status and membership within a treatment provider association are significantly more likely to adopt naltrexone during the timeframe examined.

The fifth dimension of *Internal Organizational Structure*, *Organizational Resources*, is the degree to which relevant resources are available to an organization (Rogers, 2003). In the setting of substance abuse treatment, centers based in hospitals may be more likely to adopt pharmacological therapies because they possess the medical resources to administer and oversee

the dispensing of these medications (Roman and Johnson, 2002). In addition, organizations that frequently use monetary resources, such as a budget for training and development, to build an organizational base of knowledge that can be drawn upon during the innovation adoption decision-making process are expected to be more open to newer treatment techniques. Furthermore, profit-oriented organizations are expected have a greater receptivity to using medications because 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 a comfortable environment in which innovation experimentation, and possible failure, can occur (Damanpour, 1991; Drazin and Schoonhowern, 1996).

H7: Treatment organizations that possess Organizational Resources (such as those centers which are hospital-based, maintain budgets for training and development, and operate on a for-profit basis) will be significantly more likely to adopt naltrexone over time.

Finally, *Organizational Size*, is expected to be positively related to adoption (Castle and Banaszak-Holl, 1997; Damanpour, 1991; Fennell, 1984; Kimberly and Evanisko, 1981; Moch & Morse, 1977; Roman & Johnson, 2002). Larger organizations, regardless of the industry or field, typically have more capital available for investing in new products or techniques resulting from greater volumes of activity (Rogers, 2003). Additionally, larger organizations possess the manpower necessary to implement them.

The concept of organizational size has been measured in a variety of ways in the research on innovation adoption in the health care field. Researchers have measured organizational size as the number of employees, the number of beds, an assessment of total assets, or the number of personnel; all four of which were found to be highly related, with correlations exceeding .85 (Kimberly and Evanisko, 1988). For the present study, organizational size was conceptualized as the number of full time equivalent employees because some treatment facilities do not have inpatient care making the number of beds an inappropriate measure, nor do centers readily reveal financial information making total assets an unsuitable measure. Literature using the National Treatment Center Study has repeatedly used the number of full time equivalent employees to measure the size of an organization (Knudsen, Johnson, Roman, and Oser, 2003; Knudsen and Roman, 2004; Knudsen, Roman, and Ducharme, 2004; Knudsen, Roman, Ducharme, and Johnson, 2004; Roman and Johnson, 2002).

H8: Larger substance abuse treatment centers, as captured by the number of FTE employees, will be significantly more likely to adopt naltrexone across the four time periods.

The third general area, *External Characteristics of the Organization***,** is also predicted to have an effect on the adoption of innovations over time. An organization's level of innovativeness may be affected by numerous external factors that are largely beyond its control such as the state regulations and competitive threats posed by neighboring treatment facilities. In translating this to the treatment field, external characteristics of the organization may be measured by such variables as market competition with other treatment centers signifying awareness of its competitors. This measure may serve as a proxy for the local environment. Additionally, it is related to the concept of bounded instability (Stacy, 1992). Organizations

calculating both the external level of competition in their marketplace and their own level of instability will provoke innovation adoption to produce a more stable, successful, organization in the end (Glassman, 1995). Organizations must make peace with the ambiguity associated with innovation adoption to provide validation for the counter-conventional notion that instability and competition equals a successful organization (Stacy, 1992). Rogers (2003) suggests that if other organizations are perceived of as a threat in conjunction with an increasing number of centers adopting naltrexone, then there is a powerful impetus to mimic those organizations and adopt the innovation (McGrath and Zell, 2001). Research on the adoption of technical innovations in hospitals is positively influenced by competition with neighboring facilities (Kimberly and Evanisko, 1988). Treatment centers faced with intense market competition may be more likely to adopt naltrexone in order to attract a larger clientele base.

H9: Treatment facilities facing intense competition with other treatment centers in their market area for treatment services will be significantly more likely to adopt naltrexone.

Naltrexone Adopter Categorization

After looking at the organizational predictors of adoption over time, the next logical step is to use the sub-sample of adopting organizations to depict adopter categorization. It is important to explore the characteristics of adopter categories because there appears to be a contagion effect of the innovation diffusion process (Rai, Ravichandran, and Samaddar, 1998), or "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003; 11). Network connectedness has been repeatedly demonstrated as a factor in the spread of innovations, with several organizational scholars suggesting this mimetic isomorphism results from vicarious learning fueled by

efficiency requirements (Rogers, 2003; Mansfield, 1971), whereas others assert that this outcome is the result of social cohesion and pressure to conform (Burt, 1987; Fligstein, 1985; Palmer, Jennings, and Zhou, 1993). This issue may be partially resolved by exploring the time in which a decision-making unit adopts an innovation.

It is important to know the characteristics of the organizations that compose each of the adopter categories. Acknowledging the idiosyncrasies of the adopter categories allows for the acceleration the diffusion process. Differentiating the first individuals or organizations to try a new product or service from the later adopters who wait until the vast majority of consumers has adopted, allows for the future targeting of the correct audience of potential adopters. Marketing strategies can be created to target each of the various adopter categories and differentiation allows creators of the innovations to project the adoption of their product or service over time (Martinez, Polo, and Flavian, 1998). In addition, potential influences to adopt an innovation could vary by category. Martinez and Polo (1996) found that media publicity is the dominant influence for early adopters whereas over time the dominant pressure transforms into an informal, word of mouth type of communication.

It is the second objective of this dissertation to look at the rate of adoption and further explore the theoretical predictors of innovativeness, or the degree to which a treatment facility is relatively earlier in adopting new treatment techniques than other organizations. However, before creating a categorical typology of adopters, it is crucial to look at the relative speed in which an innovation is adopted by members within a social system to document if the rate of adoption adheres to the S-shaped diffusion curve.

Rate of Adoption

Rogers identifies a continuum of innovativeness in which he argues that the adoption of an innovation, when charted, will follow a predictable pattern. According to this theoretical model, the S-shaped curve will be depicted if exploring the cumulative effects of adoption, but a bell-shaped curve will be observed if investigating frequency of adoption (Hamblin, Jacobson, & Miller, 1973; Jovanoic and Lach, 1989; Rogers, 2003). To restate, the total number of adopters of an innovation as a function of time is hypothesized to be an S-shaped curve. After the innovation is accepted by a critical mass of adopters, the adoption rate will increase drastically resulting in a steep curve. As a saturation market point is met, the number of new adopters tapers off and the curve begins to flatten out once again (Rai, Ravichandran, and Samaddar, 1998).

It is important to note that while some innovations diffuse quickly, others stay on the market for a lengthy period of time until they reach a point during which they are adopted by the vast majority of potential adopters (Kuman, Ganesh, and Echambadi, 1998; Martinez, Polo, and Flavian, 1998). Several researchers have found this "time to take off" for new innovations to be quite substantial (Golder and Tellis, 1997; Kohli, Lehmann, and Pae, 1999). This differential speed of innovation diffusion may be the result of innovation characteristics, the openness of communication channels, and/or the peculiarities of the potential adopting unit. To take the adoption of naltrexone by substance abuse treatment centers as an example, Rogers' model implies that a graph of the cumulative number of treatment centers adopting naltrexone over time would result in an S-shaped distribution curve while charting the frequency distribution of the mean number of adopters of naltrexone per year would result in a normal distribution.

Categorical Typology of Adopters

It is imperative to explore adopter categorization for several reasons. To begin, it allows for the exploration of characteristic differences in early versus late adopters. According to Zucker's (1983) institutionalization thesis, the motivations for adoption are altered by time, shifting from internal concerns of increasing efficiency to external concerns of ensuring legitimacy. It is posited that in the early stages of the diffusion process, network ties will facilitate a match between the organization and innovation, whereas after the innovation has become institutionalized during the later stages of the diffusion process, communication ties will help legitimate the innovation as a valid choice (Westphal, Gulati, and Shortell, 1997). The diffusion of change begins by improving performance, but reaches a threshold in which the mimetic processes only provide legitimacy (DiMaggio and Powell, 1983).

Rogers' (2003) continuum of innovation identifies five categories within the normal curve of innovation adoption: innovators, early adopters, early majority, late majority, and laggards. These five ideal types of adoption behaviors are exhaustive, mutually exclusive, and derived from a single classification principle. Other researchers have explored the use of a reduced number of categories viewing the category of adopters as a binary process or as having three categories (Bass, 1969; Fell, Hansen, and Punches, 2002; Greco and Fields, 1991; Martinez, Polo, Falavian, 1998). For example, the Bass model (1969) is the main impetus underlying diffusion research in the marketing field and assumes that the adoption of innovations is influenced by either the mass media or word of mouth. Adopter are reduced to two groups coined the "innovators" and the "imitators" (Bass, 1969). The category of innovators is primarily influenced by external forces, in particular the mass media, whereas the imitators are influenced by internal factors including informal communication. Innovators, who adopt an

innovation exclusively because of mass-media communication, in the Bass model can actually adopt an innovation at any stage of the diffusion process (Mahajan, Muller, and Bass, 1990). In a comparison of the two approaches, Mahajan, Muller, and Srivastava (1990) states that "innovators" is not an appropriate term in the Bass model, because they are not necessarily the first to adopt an innovation, as defined by Rogers.

Conversely, Peterson (1973) asserts two limitations of Rogers' adopter categorization. First, it is suggested that the number of categories, as well as the percentage of adopters in each category, should depend on the topic of study. The second criticism refers to the supposition of normality for all types of innovations. The application of a normal curve may not exist in reality as a result of external factors such as marketing efforts, which serve to differentiate the rate of adoption of different innovations (Peterson, 1973). To solve this dilemma, Peterson (1973) proposed not placing a priori size and number of category restrictions; though, this extinguishes the possibility of generalizability (Martinez, Polo, and Flavian, 1998). Rogers (2003) method of adopter categorization is the dominant method in the field because it is procured by a statistical, rather than arbitrary, approach. It must be mentioned again that the majority of studies collapse Rogers' categorization into fewer categories because of the difficulties associated with distinguishing the individuals or organizations that compose each category (Martinez, Polo, Flavian, 1998). However, some works (Mahajan, Muller, and Srivastava, 1990; Martinez and Polo, 1996) use the five-category typology.

The normal adopter distribution is segregated into the five adopter categories by laying off standard deviations from the mean time of adoption (Rogers, 2003). The first 2.5% of organizations to adopt an innovation are called innovators. This category can be found in the area set off to the far left of the average time of adoption minus two standard deviations.

According to Rogers (2003), innovators are characterized by a venturesome nature and oftentimes have cosmopolite social networks. Innovators have organizational traits that can support their intense interest in novel ideas, such as a stable economic position, technical expertise, and effective coping strategies.

The second adopter category of interest is early adopters, which are the next 13.5% of organizations to adopt the new idea (Rogers, 2003). Early adopters are found in the area between the mean minus one standard deviation and the mean minus two standard deviations. The early adopter type of organization is distinguished by the trait of respect, and is often deemed a role model for other organizations. This category of adopters is driven by a desire to improve their performance (DiMaggio and Powell, 1983). They are the opinion leaders who have noteworthy local social connections. Early adopters engage in cross-pollination because they are watched by other organizations (Berwick, 2003). Additionally, they are the most likely targets of pharmaceutical company detailing (Berswick, 2003).

Rogers (2003) asserts that the third category of adopters, termed early majority, are the next 34% of the adopters and are located in the area between the mean date of adoption and the mean minus one standard deviation. The early majority makes up one-third of the adopting organizations and is characterized by a deliberate motive to adopt new ideas just before the average organization adopts. According to Berwick (2003), early majority organizations in health care settings only scan their local environment for innovations, are likely to observe the early adopters behavior, and primarily base their adoption decision on informal communication of local proof (rather than on scientific or theoretical foundations).

Like the early majority, the late majority also composes one-third of the adopting organizations. However, the late majority does not adopt until after the average organization has

adopted due to their skeptical view of innovations. This adopter category is the next 34% and is found between the mean date of adoption and one standard deviation to the right of the mean (Rogers, 2003). The late majority is characterized by an air-of-suspicion. As such, the adoption of an innovation in this category is fostered by economic necessity and increased social network pressures. Moreover, the late majority may experience a bandwagon pressure to adopt, fearing that non-adoption will result in sub-par performance and that they will not be able to reap the finical rewards as their adopting counterparts have (Abrahamson and Rosenkopf, 1993). Consistent with the pro-innovation bias (Abrahamson, 1991; Kimberly, 1981; Rogers, 2003), research reveals that even innovations with ambiguous returns can diffuse in a bandwagon manner (Abrahamson and Rosenkopf, 1993; O'Neill, Pouder, and Buchholtz, 1998).

Laggards are the last 16% of organizations to adopt. This final category of adopters is found in the area lying to the right of mean plus one standard deviation (Rogers, 2003). Being a laggard involves an emphasis on traditional, normative practices. Adoption by laggards is impeded by a lack of organizational leadership, a deficient knowledge base surrounding innovations, and inadequate financial resources. However, Berwick (2003) notes that there is a negative connotation associated with the term "laggards," that undermines their value as traditionalist and their wisdom to use the past as a point of reference.

Advantages and Disadvantages of Being in a Category

All five adopter categories have both advantages and disadvantages. Innovators and early adopters have the advantage of higher revenues, yet must cover the expensive upstart costs (Jovanovic and Lach, 1989). But, this category of adopters may be less risk-averse and less sensitive to costs to begin with (Yan Tam, 1996). Additionally, the innovators, early adopters, and the early majority set the standards in the treatment field for legitimacy, they control

information, and they can exert political influence (Goes and Ho Park, 1997). On the other hand, for the late majority and laggards, the costs of adoption decreases as adopters accumulate. The output of the industry expands and the cost of innovation adoption contracts. This facilitates the adoption among smaller organizations, which may otherwise not have the vast amount of start-up resources to adopt and innovation (Jovanovic and MacDonald, 1994). Later adopters have the benefit of learning from the experience of earlier adopters because they can take a wait-and-see perspective to see what happens with first generation adopters (Jovanovic and Lach, 1989).

Theoretical Concepts Predicting Innovativeness

The three organizational-level components of *Socio-Economic Status, Organizational Personality*, and *Communication Behavior* are used in the ordered logistic regression model to predict the adopter categorization. This is an important issue because information on how organizational characteristics affect the adoption process over time will help the treatment industry to better understand the dynamics of private organizational adoption of pharmacotherapies. Rogers (2003) suggests that generalizations about variables related to innovativeness can be summarized under these three general headings. These three components are relevant for predicting which category within the continuum a specific treatment center is most likely to inhabit. This dissertation is contributing to the diffusion of innovations literature by looking at organizational innovativeness, rather than individual innovativeness.

The characteristics of adopting organizations suggest that *Socioeconomic Status* and innovativeness go hand in hand (Rogers, 2003). In fact, according to Martinez, Polo, and Flavian (1998), *Socioeconomic Status* is widely cited in the majority of research predicting adopter categories. To be precise, the characteristics of earlier adopters suggest that these organizations generally have a higher socioeconomic status than do later adopters. Housed under

the characteristics of *Socioeconomic Status are* such variables as age, education, social status and size. Earlier adopters have been typified as more educated, of higher social status, and larger in size (Rogers, 2003). In terms of age of the organization, the voluminous research literature suggests that there is inconsistent evidence about the relationship between age and innovativeness. At the individual level early adopters were significantly younger than later adopters (Greco and Fields, 1991). However, at the organizational level, age was found to positively impact naltrexone adoption behavior (Roman and Johnson, 2002). Nonetheless, because of the high degree of organizational death involved in the private treatment field, it could be posited that age is a proxy for an abundance of organizational resources that ensure longevity. Based on this line of reasoning, I propose a positive relationship between age and innovativeness.

H10: Earlier adopting organizations are older than later adopters.

Early adopters within a social system have a more years of formal education than do later adopters (Dickerson and Gentry, 1983; Greco and Field, 1991; Martinez, Polo and Flavian, 1998; Rogers, 2003). In regards to technological innovations, Dickerson and Gentry (1983) demonstrated that early adopters of personal computers (PCs) had higher levels of education while Greco and Field (1991) found a relationship between adoption of home video ordering systems and higher levels of education. This educational profile of early adopters is expected to hold at the organizational level as well.

H11: Earlier adopting treatment facilities will employ more educated administrators and will employ greater percentages of counselors with at least a Master's degree than will later adopters.

Social status can be measured by a variety of variables ranging from income level to prestige. Evidence suggests that there is a positive relationship between social status and innovativeness (Rogers, 2003). At the individual level, being in a higher income bracket is associated with innovativeness (Dickerson and Gentry, 1983; Greco and Fields, 1991; Martinez, Polo, and Flavian, 1998). At the macro-level, organizations may be adopting innovations in an effort of obtaining or securing a higher social status. There is a perception on among organizations that clients are innately attracted to high social status treatment institutions. According to data from the National Treatment Center Study, treatment centers list the following three items out of a possible fifteen as their most important competitive advantage over neighboring facilities: center's reputation/name recognition, staff reputation, and center's longevity.

Treatment centers with higher social status has expected to acknowledge and financially compensate for the value of emotional labor that their counselors engage in. It is known that the average counselor salary has an independent effect on the rate of counselor turnover (McEvoy and Cascio, 1987; Schwab, 1991). Meta-analytic results have indicated a negative association between pay and turnover (Cotton and Tuttle, 1986). In medical settings such as substance abuse treatment centers, high turnover may also threaten the ability of facilities to provide high quality care that results in better treatment outcomes for clients (Geurts, Schaufeli, and De Jonge, 1998; Lamb, Greenlick, and McCarty, 1998; Mor Barak, Nissly, and Levin, 2001). Providing appropriate financial rewards helps to ensure against turnover, thereby increasing the social economic status of the facility. Therefore, I hypothesize that organizations' with higher counselor salaries will adopt innovations earlier.

H12: Earlier adopters have a higher counselor salary than do organizations characterized as later adopters.

One characteristic that marks treatment centers as earlier adopters is size of the organization. Larger organizations are more likely to adopt innovations earlier. This pattern has been repeatedly demonstrated (Castle, 2001; Hannan and McDowell, 1984; Kim, 1980; Rogers, 2003; Steffensen, Sorrensen, and Olesen, 1999; Yan Tam, 1996; Zmud and Applegate, 1992). The relationship between innovators and large organizations has a variety of explanations. It is a well-know fact that because innovative organizations are the first within their social system to adopt an innovation, they accept the greatest amount of risk associated with innovation adoption. If the center is large, they will be more likely to possess the resources to absorb any loss that may result from innovation adoption. Small organizations have modest margins of error, therefore possessing the "liability of smallness," that makes them more likely to experience organizational death (Gifford and Mullner,1988). Damanpour (1987) suggests that the size effect is really the availability of slack resources within a large organization. It has also been posited that larger organizations may receive more information regarding innovations and could possess the resources to quickly implement these techniques. However, the importance of a large organization is only useful in the early stages of adoption (Yan Tam 1996).

H13: Earlier adopting treatment centers employ more full time equivalents (FTE's) than do later adopting organizations.

Organizational Personality is the second component cited by Rogers (2003) as influential in predicting adopter categorization. It is also known as the organization's climate in the literature. The relationship between *Organizational Personality* and innovativeness has been largely unexplored by researchers, partially because of the difficulties operationalizing these

concepts in diffusion surveys (Rogers, 2003). In addition, the climate or personality of an organization varies by industry.

Nonetheless, Rogers (2003) asserts that several personality variables, including dogmatism and attitudes to science, will be related to innovativeness. First, "Dogmatism is the degree to which an individual (or organization) has a relatively closed belief system, that is, a set of beliefs which are strongly held" (Rogers, 2003; pp. 259). It is posited that earlier adopters are less dogmatic because they prefer to stick with the status quo. This relationship received support at the individual consumer level (Greco and Fields, 1991). To frame this differently, it has been demonstrated that laggards show more brand loyalty (Uhl, Andrus, and Poulsen, 1970). In transferring this line of thought to the substance abuse treatment field, facilities entrenched in 12-step ideology are going to be more dedicated to this dogmatic treatment methodology and less likely to try novel treatment techniques. This type of organizational climate is characterized by a good deal of organizational inertia. Second, it is hypothesized that early adopters have a more favorable attitude towards science than do later adopters (Rogers, 2003). Since the adoption of a pharmacotherapy such as naltrexone is based on clinical trials, it is intuitive that there is a positive relationship between favorable outlooks of scientific research and innovativeness.

Innovations can be differentiated by the manner in which they congeal with an organization's climate or personality. The adoption of radical innovations results in fundamental changes, including the deviation from existing practices, in the activities of an organization whereas incremental innovations produce little departure form existing practices (Damanpour, 1991). Incremental, rather than radical, innovations are more likely to be adopted because they result in little departure from existing practices (Dewar and Dutton, 1986; Ettlie, Bridges, and O'Keefe, 1984). This terminology can be translated to the adoption of naltrexone in private

treatment facilities. Thus, if a treatment facility is already emphasizing the medical model of treatment, the adoption of naltrexone will be an incremental innovation; conversely, if the center strongly identifies with 12-step ideology, the adoption of naltrexone will be a radical innovation.

In addition, the factors influencing the original decision to adopt may vary by innovativeness. Organizations that adopted naltrexone because it was consistent with their treatment practices or because they need an alternative to treatment are more likely to be facilities portrayed as less dogmatic. The early adoption of this innovation would only been seen as an incremental, rather than radical, innovation. On the contrary, it is proposed that facilities stating that the use of naltrexone at comparable centers as an influential factor in their decision to adopt will be less likely to be early adopters. As such, it appears that these facilities are waiting until the early majority adopt before making the decision to adopt.

H14: Early adopters will be less dogmatic than later adopters. Specifically, early adopters will be more likely to emphasize a medical model and will be less likely to embrace a 12-step ideology and host 12-step meetings on site than later adopters.

H15: Early adopters will cite that naltrexone's consistency with their treatment practices/philosophies and their need for an alternative to traditional treatments as more influential factors in their decision to adopt than will later adopters. Additionally, early adopters will state that naltrexone's use at comparable treatment centers is not an influential factor in their decision to adopt as compared to later adopters.

The last measure of Organizational Culture is the extent to which a treatment center's staff is familiar with other innovative treatments, which is a proxy measure of an organization's attitude towards science. Rogers (2003) suggests that early adopters have more favorable

attitudes toward science, and because the majority of innovations are the creation of scientifically based research, it is intuitive that innovators are more favorably inclined towards science. The basic idea is quite simple. Essentially, the greater the technical expertise of an organization's employees, the earlier the innovation will be adopted. If the knowledge resources are already in existence, then new techniques can be easily understood and the infrastructure is already in place to encourage adoption (Dewar and Dutton, 1986). If the adoption of an innovation requires specific knowledge, prior experience of this type of innovation will be important in the adoption decision-making process (Dickerson and Gentry, 1983). In the field of forestry, it was found that organizations in the innovators category that had adopted a single innovation were more likely to adopt other innovations early as well (Fell, Hansen, and Punches, 2002). On the other hand, Westphal, Gulati, and Shortell (1997) examine the relationship between technological sophistications (as measured by the number of high-technology services offered in a hospital) and the adoption of an innovation (Total Quality Management); however, they find no significant results.

H16: Early adopters are more familiar with other innovative treatment techniques than later adopters.

The third component of characteristics that is expected to influence the adopter categorization is *Communication Behavior*. Rogers (2003) repeatedly stresses throughout the book the importance of *Communication Behavior* in the process of the diffusion of innovations. There is a high degree of uncertainty related with innovation adoption and organizations conduct a cost-benefits analysis. Organizations may engage in proactive strategies to decrease the perception of ambiguity associated with innovation adoption such as environmental scanning (Fahey and Narayanan, 1989). Seeking out external sources of information about one's

environment, including publications and communication with similar institutions, increases both the speed and breath of diffusion because the potential adopter is more knowledgeable about the needs of clientele base (O'Neill, Pouder, and Buchholtz, 1998). According to Aiken, Bacharach, and French (1980), innovators more likely to engage in boundary spanning which links an organization's internal network to external sources of information. Specific to the treatment field, environmental scanning had a positive effect on the adoption of aggregate measure of 15 innovative treatment techniques (Knudsen and Roman, 2004). These sources of information may be informal or formal and vary in their association with adopter categorization. When a high degree of innovation knowledge is derived from formal sources, including academic journals, pharmaceutical companies, and provider associations, then it is posited that these facilities will be early adopters. On the contrary, when a high degree of innovation knowledge is derived from informal sources, such as learning about innovation from word-of-mouth communication with employees of other organizations or through in-house professional development strategies, it is expected that these organizations will be later adopters.

To begin with formal sources of knowledge, other industries do not publish their findings on innovations as much as health care industry (Berwick, 2003). It has been documented that the majority of health care organizations do not have high levels of surveillance of appropriate scientific journals nor have they assigned as a routine job task the attendance at key scientific meetings in an effort to report back to the organization about effective treatment techniques (Berwick, 2003). This type of culture doesn't engage in combing the environment to search for ideas that could be spread (Covell, Urman, and Manning, 1985; Ely, Osheroff, Ebell, et al., 2002). According to Berwick (2003, pp. 1973), "Senior leaders appear to leave this process to an imagined, latent professional culture that they assume is constantly scanning for new ideas."

Organizations that engage in these activities, and immerse themselves are expected to be earlier adopters of innovations.

Knowledge communicated by the pharmaceutical industry plans a significant role in organizational innovativeness. This trend dates back to early marketing research in which a typical illustration by marketing researchers found that when a letter, accompanied by a coupon allowing the purchase of an innovation at a reduced price, increased the initial purchase (Arndt, 1967). But, more in-depth personal interviews with housewives in this study revealed that the significance of the coupon was overshadowed by the importance of interpersonal communication (Arndt, 1967). Nonetheless, providing an incentive, as is a common practice of pharmaceutical companies, increases adoption; however, this practice may be more important for innovators than for laggards in an effort to reduce the financial risks associated with early adoption (Rogers, 2003).

The involvement in pharmaceutical companies promotional efforts is related to the number of physicians adopting those new drugs into practice (Buban, Link, Doucette, 2001). The pharmaceutical industry has harvested huge rewards by recognizing the power of face-to-face interaction "detailing" the characteristics of new drugs to physicians (Berwick, 2003). In fact, the first news of a new drug is most often learned about from pharmaceutical representatives or from journal advertisements (Jones, Greenfield, and Bradley, 2001). Even in other industries, such as home construction, builders reported that building product suppliers were the most important source of information on novel products, followed closely by information learned through journals (Fell, Hansen, and Punches, 2002).

Involvement in provider associations is a formal means of communicating with others about innovative treatments. In a hospital setting, involvement in industry and trade associations

widens the hospitals environmental focus, encourages the sharing of technical knowledge, and fosters institutional legitimacy (Goes and Ho Park, 1997; Mohr, 1992). According to Thomas and Trevino (1993), these institutional links to industry associations are vital for increasing earlier adoption in hospitals because they foster information flow. Involvement in this type of extra-organizational contact increases communication channels by which information regarding innovative techniques is transmitted (Ibarra, 1993). In a study of home builder's innovation practices, it was demonstrated that innovators or early adopters were more likely to be members of the National Association of Home Builders (NAHB) (Fell, Hansen, and Punches, 2002). This tendency for earlier adopters to be involved in provider associations is expected to carry over into other industries, such as the substance abuse treatment industry. Overall, Rogers (2003) suggests that earlier adopters have more contact with change agents, actively seek out information on innovations, and have greater exposure to interpersonal communication channels than do later adopters.

H17: Early adopters have greater amounts of innovation knowledge from formal sources (including journals, pharmaceutical companies, and providers associations) than later adopters.

While formal sources are an important form of communicating innovation knowledge for early adopters, informal sources are the primary source of information fueling the adoption decision of later adopters. Fundamentally, innovativeness is not the same concept as adoption. It is well known that both formal and informal sources of innovation knowledge increase the likelihood of adoption, but the type of knowledge source may factor into when the organization adopts an innovation relative to its peers. So for example, even though a significant positive relationship was found between internal communication and technical innovations (Aiken,

Bacharach, and French, 1980), the manner in which internal communication affects time of adoption is unknown.

Communication with other organizations provides an opportunity to exchange technical information and resources, establish legitimacy, and it provides a point of reference (Oliver, 1990; Nohria and Eccles, 1992). Research projects have demonstrated better adoption rates when project members maintain communication with colleagues outside of their organization. In a Research and Development (R&D) setting, it is a necessity for organizations to be continuously informed of outside scientific and technological developments (Allen, Tushman, and Lee, 1979). In a study of innovation adoption in hospitals, one physician cited that talking with others and addressing their questions and concerns is what matters most for subsequent adoption (Berwick, 2003). While, greater communication with external sources is more likely to adopt an innovation, this method of communication is preferred in later stages of the adoption process (Gatigon and Robertson, 1989). This is intuitive in that some organizations in the local milieu must have experience with an innovation before they can impact other consumer's decision-making process. While innovators and early adopters' decision may adopt based on scientific findings in journals, the interface between early adopters and the early majority requires social interaction (Berwick, 2003). Additionally, once an organization becomes aware of innovation adoption in their local environment they may attempt to communicate innovation knowledge to their own staff via professional development seminars.

Then again, one caveat is that not all information is positive. During the 1980's, researchers acknowledged the importance of negative word of mouth communication and its impact on decision processes (Leonard-Barton, 1985; Mahajan, Muller, and Kerin, 1984; Mizerski, 1982; Richins, 1983). Those who are less uninformed are less likely to relinquish

inappropriate treatments and adopt new treatments (Groves, Flanagan, and MacKinnon, 2002), and, if they do adopt they will do so after the vast majority.

H18: Early adopters have less innovation knowledge from informal sources (including involvement in professional development seminars and face to face communication with employees of other treatment facilities) than later adopters.

Another manner in which organizations may communicate with their industry, and thereby learn of innovations in their field, is by receiving an accredited status. Accredited organizations face considerable pressure from their accrediting agencies. These external pressures primarily include accountability – or the ability to provide tangible evidence of their commitment to improve the quality of care provided at their facilities (Griffith, Sahney, and Mohr, 1995). For organizations to obtain and maintain their accredited status by organizations such as the Joint Commission on Accreditation of Health Care Organizations (JCAHO), they must have regular reviews to examine medical records to assess the quality of care provided by hospitals and they must document evidence of quality improvement practices (Westphal, Gulati, and Shortell, 1997). While the quality of care provided by an institution is influenced by a variety of factors, the adoption of innovations has been charged with the potential to improve quality in some areas of care (Shortell, O'Brien, Carman, Foster, Hughes, Boerstler, and O'Connor, 1995). Following this theoretical reasoning, it is suggested that accredited substance abuse treatment centers will adopt innovations relatively earlier than their treatment counterparts.

H19: Early adopters are more likely to be accredited than later adopters.

Competition is the final variable related to *Communication Behavior*. The presence of repeated success among innovation adopters prompts other organizations to innovation; this pattern is particularly prominent in competitive environments (Kimberly and Evanisko, 1980).

Organizations share a limited pool of resources (such as potential clients) in competitive environments, and thus may seek out innovation adoption to distinguish their services and improve their market image (Castle, 2001). Market competition has been noted in the literature as a driving force towards isomorphism, and the resulting legitimacy pressures may provide an additional impetus towards innovation adoption (Abrahamson and Rosenkopf, 1993); however, this hypothesis did not always receive empirical support (Westphal, Gulati, and Shortell, 1997). Overall, the literature would suggest that treatment facilities facing intense market competition are more likely to be innovators or early adopters.

H20: Early adopters have more market competition than later adopters.

Now that the hypotheses derived from the theoretical and empirical work have been provided, I would like to briefly recap the material of this chapter. First, Chapter 3 began with an overview of Rogers' (2003) diffusion of innovations theory. The literature on the adoption of naltrexone of was reviewed. Second, a précis of the hypotheses measuring the impact of *Culture, Leadership, Internal Organizational Structure*, and *External Characteristics* on naltrexone adoption was provided. Third, the focus expanded from the examination of adoption to innovativeness, or the extent to which an organization adopts an innovation relatively earlier than others in its social system. This section began with methodology used to obtain adopter categories as well as provided a description of the dominant traits of each category. Furthermore, hypotheses regarding the relationship between the components *of Socio-economic Status, Organizational Personality,* and *Communication* and adopter categorization were offered. The next logical step is to move towards a discussion of the research design, analytic strategy, and operationalization of the variables in an effort to explore the organizational characteristics that are theoretically predictive of innovation adoption and adopter categorization.

CHAPTER 4

RESEARCH DESIGN & METHODS

The goal of this chapter is to provide insight on the National Treatment Center Study sample, to discuss the analytic strategy to be employed, and to address the operationalization of the variables to be included in the analyses. Specifically, the rationale for using a discrete time event history model to predict naltrexone adoption over time and an ordered logit model to predict naltrexone adopter categorization is addressed. Chapter 4 concludes by providing an overview of the measurement of the dependent and independent variables included in both the discrete time event history analysis as well as in the ordered logit analysis.

Sample: National Treatment Center Study

Data for these analyses are derived from the National Treatment Center Study (NTCS), a longitudinal study conducted by the Institute for Behavioral Research at the University of Georgia and the College of Management at the Georgia Institute of Technology from 1994 to 2003. This study began with a grant from the National Institute on Alcohol Abuse and Alcoholism (R01-AA-10130) to explore the organizational strategies employed by a nationally representative sample of private treatment centers in their effort to adapt to the turbulent environment created by managed care. Beginning in 1999 the study's funding shifted to the National Institute on Drug Abuse (R01-DA-13110) and the focus of the study shifted to the adoption and implementation of evidence-based treatment strategies within this same sample of centers.

The sample includes both private for-profit and not-for-profit treatment centers that may be hospital-based or freestanding. Inclusion criteria consisted of (1) receiving less than 50% of

their funding from state or federal block grants and (2) offering a level of care that is at a minimum consistent with the American Society of Addiction Medicine (ASAM) standards of a structured outpatient program. The initial wave of data collection consisted of on-site interviews conducted in 1994-1996 with the program administrators, clinical directors, and where applicable, marketing directors. During the scheduling process, trained employees working for the NTCS asked to speak with the top administrator at the treatment facility, whether it be the CEO or Executive Director; however, it must be noted that while interviews were scheduled with the top administrators, other treatment center employees could replace or augment the administrator's responses. The initial sample included 450 centers in 38 states, with a response rate of 89%. On-site data collection was followed by three additional waves of telephone follow-ups conducted at six-month intervals (6, 12, and 18 months post on-site interview). These follow-ups were primarily designed to assess changes the center may have experienced since the initial on-site data collection.

A second wave of on-site interviews was conducted with the same panel of centers in 1997-1998. Approximately 376 treatment facilities remained both open and eligible for participation. Using a split-panel design method, approximately 30 "new" treatment centers were added to the original sample. These facilities are defined as "new" in that they began offering substance abuse services after the initial sample was created in 1994. Following a pattern similar to the first wave of data collection, three additional waves of telephone follow-ups were conducted at six-month intervals following the 1997-1998 data collection.

Beginning in 1999 with funding from NIDA, the NTCS shifted its focus to the adoption and implementation of innovative treatment programming. The third wave of on-site data collection for the NTCS was conducted in 2000-2001 and included 305 of the original 450

treatment centers. Approximately 111 of the original centers had experienced organizational death, 19 treatment facilities were unable to participate, and seven centers were no longer eligible for participation in the study. A split-panel design method was again employed to augment the sample size, resulting in 397 completed on-site interviews.

A fourth wave of on-site interviews for the NTCS began in 2002 with a completion date of December 2003. The split panel design method will ensure that the final sample size remains at or near 400 centers. Both waves III and IV follow the same procedures and time-line as the initial two waves of data collection including the telephone follow-ups conducted at six-month intervals following the on-site data collections. The number of cases in each analysis varies by the type of statistical method being employed.

Analytic Strategy

Several analytic techniques are utilized to address the organizational-based factors effecting the adoption of naltrexone in substance abuse treatment. In addition to descriptive statistics, the present study examines the use of naltrexone in two distinct analyses. The first analysis uses a discrete time event history model to identify the factors associated with naltrexone adoption over time. The second analysis takes the sub-sample of treatment facilities that have adopted naltrexone and, using an ordered logit analysis and Rogers' five categories of adopters, identifies the characteristics of early adopters of naltrexone as compared to centers starting to use naltrexone later.

Event History Analysis

A discrete time event history analysis addresses the research question of "What shapes the likelihood that a treatment center will adopt naltrexone during the four waves of the National Treatment Center Study?" 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). Conventional methods, such as traditional regression techniques are unable to manage censored observations. Right censoring occurs when some cases have not experienced the event of interest within the research time window, which in the present study is treatment centers who have not adopted naltrexone over the course of the study. Two ad-hoc methods have been used, yet both are erroneous. One method previously employed for dealing with centers that have not adopted naltrexone is to dispose of these censored cases (Allison, 1995). However, a large proportion (over 35%) of cases have not adopted naltrexone; therefore, discarding this data would result in large biases. A second approach is to set the time of adoption to 2004 for all of the centers that have not yet adopted naltrexone by the end of the study (Allison, 1995). Again, this would result in large biases, because this is an underestimate since some centers will never adopt naltrexone. Consequently, it is necessary to use a survival analysis method that utilizes likelihood-based methods to create a consistent estimate for these censored observations by combining information for the censored and uncensored cases (Allison, 1995).

A second problem with conventional methods is the inability to handle time-varying explanatory variables, or time-dependent covariates. Time-varying covariates are those variables that may shape the likelihood of an event that can change in value over the course of observation, whereas time invariant covariates remain constant throughout the research window. Even though it is possible to handle time-dependent covariates with conventional statistical methods, it is not recommended. For example, if the time-dependent covariate is a dichotomous variable, it is possible to include a dummy variable for each year. As Allison (1995; 5) suggests estimating this model would result in "computational awkwardness and statistical inefficiency," plus there

is the vital issue surrounding cause-and-effect between the independent and dependent variables. Rather than using the information provided by time-varying independent variables in a traditional regression analysis, all methods of survival analysis allow for the inclusion of both time-invariant and time-varying covariates via likelihood-based methods (Allison, 1995).

To study the occurrence and timing of events surrounding naltrexone adoption, a discrete-time event history analysis using Stata statistical software will be conducted. In this type of model, the observation window is four waves of data. The center's history will be 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. As discussed earlier, there will be four broad categories of independent variables predicting organizational adoption of naltrexone: C*ulture, Leadership, Internal Organizational Structure*, and *External Characteristics of the Organization***.** 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.

Ordered Logit Analysis

The second analysis employs an ordered logistic regression analysis to predict adopter categorization. The ordered logit model builds upon the event history analysis because, using a sample of adopting organizations, it allows for the prediction of innovativeness, or adopter categorization. This type of model will identify significant organizational-level predictors of

being in a more innovative category, thereby providing insight into the second research question of interest. Specifically, this research question is "Among adopting organizations, what organizational level factors are important in predicting adopter categorization (also known as innovativeness)?"

This type of model, created by McKelvey and Zavoina (1975), is understood in terms of an underlying latent variable that has observed, ordered categories (Long, 1997). Yet, unlike ordinary least squares (OLS) regression, ordered logit regression does not assume equidistance between the adopter categories (Long, 1997). The consequence of incorrectly using an OLS model would be misleading results such as poor estimates of slopes and standard errors (McKelvey and Zavoina, 1975; Winship and Mare, 1984). In a similar manner, incorrectly using a binary logistic regression model and collapsing the dependent variable into a dichotomy would produce a serous loss of information. Thus, the ordered logit model is most appropriate because the idea of a continuous, latent dependent variable makes substantive sense in that naltrexone may be adopted within a treatment facility at any time, on any given day. This model is theoretically guided to allow the dependent variable to be "cut" at four points based on the rank order of innovativeness. Ordered logit models assume proportional effects in that they estimate the (log) odds that a treatment center will fall in the "next highest" category of the dependent variable.

Rogers' (1958, 1962) method of categorization will first be employed to create categories of naltrexone adopters. To begin, the year that centers adopted naltrexone is used to graph both the cumulative number of treatment centers adopting naltrexone over time as well as to chart the frequency distribution of the number of adopters of naltrexone per year. These graphs, if Rogers' theory of a continuum of innovativeness is correct, should follow an S-shaped curve and

a normal curve, respectively. From these graphs, it will then be possible to categorize these centers based on Rogers' five adopter categories (innovators, early adopters, early majority, late majority, and laggards).

After plotting the centers adopting naltrexone by the year of adoption as well as using two parameters of the distribution, the mean year of adoption and the standard deviation, to identify into which category they should be placed, an ordered logistic regression is performed using the five adopter categories as the dependent variable. Such an analysis will use a causal model specification in which a treatment center's organizational characteristics are hypothesized to predict if a treatment center will fall into the innovators, early adopters, early majority, late majority, or laggards category. Specifically, the organizational-level variables assessing the components of *Socio-economic Status*, *Organizational Personality*, and *Communication Behavior* will be included in the ordered logistic regression. In order to increase the number of cases, Wave 3 will be the source of the independent variables and the dependent variables. In the ordered logistic model, the unit of analysis is the organization. The resulting estimates will show the effects of the organizational-level characteristics on the likelihood that a treatment center will be in one of the five adopter categories. An ordered logistic regression will allow for comparisons across the different adopter categories.

Measures for the Discrete Time Event History Analysis

Dependent Variable for the Discrete Time Event History Analysis

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 using naltrexone during the time frame and 0 if they did not use naltrexone. This information was not included in

Waves 1 and 2, so data was imputed from Wave 3 to obtain this information. Specifically, respondents were asked during Wave 3, "What year did you first start using naltrexone?" Centers responding that they had adopted naltrexone between 1994 and 1996 were coded as 'yes' (coded 1) for the adoption of naltrexone during the Wave 1 time frame and centers reporting adoption after 1996 were coded as not adopting naltrexone (0 = no) during Wave 1. In a similar fashion, treatment facilities responding that they had adopted naltrexone between 1997 and 1998 were coded as 'yes' (coded 1) 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 (0 = no) 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 ($r = .495$; $p<.01$).

Independent Variables for the Discrete Time Event History Analysis

Four theoretical concepts were measured including *Organizational Culture*, *Leadership Characteristics, Internal Organizational Structure*, and *External Characteristics of the Organization*. First, Organizational Culture includes two time-varying covariates measuring the 12-step ideology that is often embedded within the culture of treatment facilities. Centers based on a 12-step model were coded 1, while centers based on a different philosophy were coded 0. Centers holding 12-step meetings on their premises were coded 1 and those that do not host on-site 12-step meetings were coded 0.

Two variables measure the concept of *Leadership Characteristics,* including the administrator's education level and the total number of years they have worked in the behavioral healthcare field. The highest degree obtained by the administrator is 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 that the

administrator has been employed in the behavioral healthcare field is 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* is subdivided into the concepts of *Centralization, Complexity, Formalization, Interconnectedness, Organizational Resources*, and *Size*. First, *Centralization* is a fixed covariate measured by the presence of a board of directors (1 =yes and 0 = no). Second, *Complexity* was assessed by three time-varying covariates including the organization's use of prescription drugs (1 = yes and 0 = no), the percentage of counselors with at least a Master's degree, and whether the center has a physician on the payroll (1 = yes and 0 = no). The presence of an employee handbook within the treatment organization (1 = yes and 0 = no) is used as an indicator of *Formalization.*

Interconnectedness, is measured by two dichotomous variables. Specifically, treatment centers that are accredited by agencies such as JCAHO or CARF are coded 1, whereas centers without accreditation are coded 0. Treatment facilities that are members of substance abuse treatment associations are also coded 1, while centers not involved in treatment associations are coded 0. Accreditation and membership in treatment associations were measured at each time-point, thus allowing for variations over time.

The fifth component, *Organizational Resources*, contains three indicators. The physical location of a treatment center, hospital-based or freestanding, is included in the model (1 = hospital-based). Centers are also distinguished by those that have a specific budget line item for training and development (1 = yes and 0 = no). Since budgetary issues are generally addressed and/or altered on a fiscal-yearly basis, the existence of a training and development budget line item may vary across data collections. Center profit status is coded as a 1 for profit centers and 0

for non-profit centers. *Organizational Size,* the final component of *Internal Organizational Structure*, is measured as the natural log of the number of full time equivalent employees (FTE's). A log transformation of this indicator is appropriate because the distribution of FTE's is positively skewed. This too may vary across data collections.

The *External Characteristics of the Organization* was assessed by the extent to which a treatment center faces competition from other treatment facilities in its market area. Administrators were asked to rate the level of competition from 1, indicating no competition, to 10, signifying intense market competition. Due to the ever-changing market for addictions treatment, this measure may vary from time-point to time-point.

Measures for the Ordered Logit Analysis

Dependent Variable for the Ordered Logit Model

The ordered logit model posits a latent trait that is "cut" at four points, producing five categories of the dependent variable. The dependent variable in the ordered logit model allows for five outcomes, taking into account innovativeness, or the year in which a substance abuse treatment facility adopted naltrexone. The innovativeness variable is partitioned into five categories by laying off standard deviations from the average time of adoption (1995-1996). As discussed in Chapter 3, the innovators compose the area lying to the left of the mean time of adoption minus two standard deviations, whereas the early adopters are included in the area between the mean minus one standard deviation and the mean minus two standard deviations. Those in the early majority category occupy the area between the mean date of adoption and the mean minus one standard deviation. Between the mean and one standard deviation to the right of the mean are coined the late majority. The laggards occupy the remaining area which is the region lying to the right of the mean plus one standard deviation. This method of categorization

of the dependent variable results in the following percentage of organizations in each of the categories including innovators (6%), early adopters (9%), early majority (31%), late majority (46%), and laggards (8%).

Independent Variables for the Ordered Logit Model

Three theoretical components are included in the ordered logit model to predict naltrexone adopter categorization including *Socio-economic Status, Organizational Personality*, and *Communication Behavior*. First, the component of S*ocio-economic Status* is composed of five variables. Age is a measure of the treatment center's age in years. Administrators education is ordinal measure of the highest degree obtained by the treatment center administrator and is composed of the categories of 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). Other variables in the socioeconomic status component include the percentage of counselors with a master's degree or above, the natural log of the number of full time equivalent employees (FTEs), and the mean counselor salary.

Seven measures of *Organizational Personality* were included in the ordered logit model. The first measure of *Organizational Personality* related to the extent to which the treatment center emphasized a medical model. This ordinal variable ranged from a value of 0 (indicating no emphasis) to a value of 5 (suggesting intense emphasis of the medical model). Two dichotomous measures assessed if the treatment center was based on a 12-step model of treatment (1 = yes and 0 = no) and if the facility held 12-step meeting on their premises (1 = yes and 0 = no). In addition, *Organizational Personality* is based on three items that ask center administrators the extent to which certain factors influenced their decision to begin using naltrexone to treat qualifying clients. The factors that may have influenced naltrexone adoption

include the extent to which naltrexone is consistent with the treatment centers practices/philosophy, the extent to which is it used at comparable centers, and the extent to which there is a need for an alternative to traditional treatments. Possible responses for each item ranged from 0 (no extent) to 5 (great extent). The last measure of *Organizational Personality*, familiarity with innovative treatments, assessing the organizations' knowledge of other innovative psychosocial and pharmacological treatment techniques including motivational enhancement therapy (MET), acupuncture, antabuse, rapid opiate detox, LAAM, buprenorphine, methadone, and SSRI's. This is an additive scale with possible responses ranging from a value of 0 (indicating no familiarity of any other innovative treatments) to a value of 40 (suggesting extreme familiarity with all innovative treatments).

The estimated model also includes seven measures of *Communication Behavior*. *Communication Behavior* is based on five items that ask center administrators to estimate the extent to which the center staff's knowledge about innovative treatment techniques comes from journal publications, participation in professional development seminars, materials from or contact with pharmaceutical company representatives, involvement in professional associations, and informal conversations with employees of other treatment organizations. Possible responses for each item ranges from a value of 0 (no extent) to a value of 5 (great extent). Centers are also distinguished by accreditation status (1 = yes and 0 = no). Finally, the extent to which a treatment center faces competition from other treatment facilities in its market area is included in the ordered logit model. Treatment center administrators were asked to rate the level of competition in their market area ranging from 1, indicating no competition, to 10, signifying intense market competition.

Summary of Research Design & Methods

Chapter 4 has outlined the sample of treatment organizations from the National Treatment Center Study to be included in the analyses. In addition, this chapter has sketched the analytic strategy and addressed the operationalization of the variables to be included in both the discrete time event history analysis and the ordered logit model. The next phase of this dissertation is to discuss the results of these multivariate models. Accordingly, it is now appropriate to briefly foreshadow the upcoming chapters. Chapter 5 will focus on the sample and the results of the discrete time event history model. The next chapter, Chapter 6, will discuss the sample of treatment organizations that have adopted naltrexone and create the categorical typology of adopters. This chapter will also present the empirical results of the ordered logit model. Chapter 7, the final chapter, will succinctly cover the key empirical findings of Chapters 5 and 6 and discuss the theoretical implications of these findings for the behavioral healthcare field. Moreover, this chapter will cover the limitations of the present study and formulate suggestions for future studies interested in the diffusion of innovative substance abuse treatments.

CHAPTER 5

PREDICTING NALTREXONE ADOPTION OVER TIME: RESULTS OF THE DISCRETE TIME EVENT HISTORY ANALYSIS

As a first step in exploring the adoption behaviors of substance abuse treatment facilities, the underlying factors influencing naltrexone adoption were examined in a descriptive manner. Accordingly, Chapter 5 begins by describing the sample of treatment organizations included in the discrete time event history analysis as well provides an overview of the descriptive statistics across each of the four waves. Next, bivariate analyses are conducted to reveal any associations among the independent variables. Chi-square and independent samples t-test analyses are performed to establish any group differences between the sample means of adopting organizations and the sample means of non-adopting facilities. The results of this bivariate analysis provide an impetus to examine adoption using a multivariate model. The distribution of organizations adopting naltrexone by study wave is also covered in this chapter. Chapter 5 concludes with the results of the discrete time event history model and discusses the next step of categorizing adopters based on innovativeness, which is covered in Chapter 6.

The analytical sample for the discrete time event history model includes a total of 165 organizations contributing 398 center-wave observations. The analysis was restricted to the population of treatment facilities that have been followed across all four waves (N=218). Nineteen facilities were excluded because they did not have information on the dependent variable, naltrexone adoption. Furthermore, to minimize problems from left censoring of important covariates associated with naltrexone adoption, the analysis is limited to centers that have not adopted naltrexone by the year 1994. Thus, the additional 19 treatment centers that had

adopted naltrexone between 1984 and 1993 (N=19) are excluded from the analysis. Missing data occurred at all time points included in the model. As a common occurrence in longitudinal analysis, missing data were imputed from the previous interview year but this was for less than 15% of the sample. This resulted in a conservative approach to deal with missing data in that some organizational inertia is assumed. However, 15 additional centers were not included in the final model because missing data was present in the initial wave of data collection.

Descriptive Statistics

Table 5.1 presents the descriptive statistics of all time-invariant and time-varying covariates included in the model across all four points in time. Consistent with the dominant dogmatic treatment culture, at the time of the initial interview, the majority of treatment facilities were based on a 12-step philosophy (93%) and hold 12-step meetings on their premises (80%). While the number of treatment centers hosting such on-site 12-step meeting as Alcoholics Anonymous or Narcotics Anonymous remains relatively consistent across the time points, the percentage of treatment facilities rooted in 12-step culture drops to 81% by the final wave.

The majority of administrators have at least a Bachelor's Degree and this remains relatively stable across all time points. Despite significant turnover at the administrator level within the treatment industry, the number of years administrators have worked in the behavioral health field grows consistently over time suggesting an aging of the occupation.

About 80% of facilities report to a board of directors. Consistent with the medicalizing movement in the addictions treatment field, the percentages of centers using prescription drugs within their treatment protocols increases from 84% at Wave 1 to 93% at Wave 4. An examination of these variables over time also suggests a professionalization of the field. Both the percentage of counselors with a graduate degree and the presence of a physician on the

Table 5.1 Descriptive Statistics of Private Treatment Centers Included in the Discrete Time Event History Analysis

	Wave 1 (1995-1996)	***Wave 2 (1997-1998)***	***Wave 3 (1999-2001)***	***Wave 4 (2002-2003)***
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 (.76)	2.61 (.75)	2.64 (.78)	2.60 (.70)
# 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%
% of MA Counselor	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 Tx Association	51.52%	---	---	---
Hospital-Based	72.12%	---	---	---
Budget for Training/Development	75.15%	88.48%	95.15%	95.15%
Profit Status	29.09%	---	---	---
Log of FTE's	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)

N=165; Percentages or Means with Standard Deviations

payroll increase in 1997-1998 and 1999-2001 but begin to level off by the fourth on-site interview. Additionally, only 75% of centers possess a budget for training and development at the initial time point, yet, this escalates to over 95% by 2002-2003. The percentage of accredited treatment organizations decreases by approximately 6% between 1994-1996 and 2002-2003.

The majority of treatment centers possess an employee handbook (95%), are hospital-based (72%), and maintain memberships in treatment associations (52%). Moreover, about 27% of treatment facilities operate on a for-profit basis. In terms of the average number of FTEs, the average center is small and employs approximately 22 people at the initial interview in 1995-1996($e^{3.10}$). This average decreases in 1997-1998 and 1999-2001 but increases to approximately 25 FTEs in 2002-2003.

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

Bivariate Analyses

Table 5.2 displays the bivariate correlations among the independent variables included in the discrete time event history analysis. These analyses were conducted to establish associations among the variables, to check for multicollinearity, and to explore the significant differences between adopting and resisting organizations across the independent variables. If significant differences are found, then a rationale for further exploring adoption over time with a multivariate model is provided.

Table 5.2 Correlation Matrix for Time-Dependent and Time-Varying Covariates in the Discrete Time Event History Analysis

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Naltrexone Adoption	1.00																
Culture																	
12-Step Meeting on Site	-. 03	1.00															
Based on 12-Step Model	.10	.41*	1.00														
Leadership																	
Administrator's Education	.05	-.06	.10*	1.00													
# Years Beh. Health Field	-.12*	-.03	-.01	.09	1.00												
Internal Structure																	
Board of Directors	-.01	.11*	.08	-.07	-.08	1.00											
Use Prescription Drugs	.18*	.07	.17*	.19*	.02	-.02	1.00										
% of MA Counselor	.07	-.05	-.05	.22*	.06	-.06	.13*	1.00									
Physician on Payroll	.09	.10	.16*	.06	-.04	-.01	.18*	-.03	1.00								
Employee Handbook	.10*	-.08	.03	-.03	.02	.00	.09	.01	.09	1.00							
Accredited	.22*	.09	.20*	.19*	-.03	-.08	.32*	.12*	.08	.10	1.00						
Belong to Tx Association	-.02	.06	.08	-.07	.02	.01	.09	-.15*	.02	-.17*	-.08	1.00					
Hospital-Based	.09	-.01	.07	.13*	.08	-.16*	.16*	.13*	.02	.03	.39*	-.17*	1.00				
Budget for Training &Dev.	.03	.06	.00	-.01	.01	.02	.12*	-.04	.19*	.03	.11*	,10*	.10*	1.00			
Profit Status	.10*	.00	-.01	-.05	-.06	.10*	-.10*	.14	-.09	-.13*	-.20*	-.05	-.37*	-.23*	1.00		
Log of FTE's	.06	.11*	.33*	.09	.00	.21*	.32*	-.06	.18*	.11*	.24*	.21*	-.24*	.10	-.04	1.00	
External Characteristics																	
Competition	.14*	.06	.18*	.07	-.12*	-.01	.08	.00	-.06	.01	.18*	.07	.02	-.15*	.16*	.11*	1.00

Bivariate correlations indicate that treatment facilities are significantly more likely to adopt naltrexone when the leadership of the organization has fewer years of employment within the behavioral healthcare field (r = -.12). Correlations among the *Internal Structural Characteristics* and naltrexone adoption suggest that organizations that use prescription drugs, have an employee handbook, are accredited, and operate on a for-profit basis are significantly more likely to adopt naltrexone. Additionally, naltrexone adoption and the perception of competition are significantly correlated (r = .14), which is consistent with the expectation that treatment centers facing the duress of intense market competition may alter their treatment regimens by offering more treatment options, such as the use of naltrexone. None of the independent variables correlated so highly as to imply problems with statistical multicollinearity.

Table 5.3 shows the results of the chi-square and independent sample t-tests used to identify significant differences between the Naltrexone Adopters (n = 117) and Naltrexone Resisters (n = 48) across the categorical and continuous study variables. The chi-square test indicates that centers holding 12-step meetings on their premises are over-represented among naltrexone adopters. Moreover, treatment facilities that had adopted naltrexone employed administrators with significantly higher educational degrees and who had worked fewer years in the behavioral health care field as compared to administrators working at centers who had yet to adopt naltrexone.

Centers incorporating prescription drugs into their treatment regimen represent only 94% of naltrexone adopters, but only 80% of naltrexone resisters. As expected, treatment facilities that have adopted naltrexone are significantly more likely to employ a

Table 5.3 Results of Bivariate Analysis

	Naltrexone Adopters (n=117)	***Naltrexone Resisters (n=48)***
Culture		
Based on 12-Step Model	.90	.92
12-Step Meetings on Premises	.83	.74*
Leadership		
Administrator's Education [a]	2.66	2.58*
# Years in Behavioral Health Field [a]	14.50	16.70**
Internal Organizational Structure		
Board of Directors	.79	.80
Use Prescription Drugs	.94	.80**
% of MA Counselor [a]	50.52	45.85
Physician on Payroll	.56	.47*
Employee Handbook	.97	.92*
Accredited	.96	.77**
Belong to Tx Association	.50	.54
Hospital-Based	.76	.67*
Budget for Training/Development	.85	.83
Profit Status	.32	.23*
Log of FTE's [a]	3.10	2.96
External Characteristics		
Competition [a]	5.59	4.83

*p<.05; **p<.01 (one tailed significance test)
[a] Independent Samples T-Test were used for continuous variables

physician than non-adopting facilities. Furthermore, organizations characterized as naltrexone adopters are also significantly more like to have an employee handbook and to be accredited by either JCAHO or CARF.

Chi-square tests also indicate that hospital-based facilities and for-profit centers are over-represented among organizations that have adopted naltrexone. Specifically, 76% of naltrexone adopters are housed on a hospital-campus as compared to 67% of the centers that do not use this innovative treatment. In a similar fashion, for-profit centers represent 32% of naltrexone adopters, but only 23% of naltrexone resisters. There were no statistically significant differences in the two groups by the presence of a board of

directors, membership in a treatment association, or the presence of a line item in the budget for employee training and development. A t-test for differences in means also indicates no significant differences in by the percentage of counselors with a Master's degree, the number of FTE's, or the amount of competition in the center's market area.

The distribution of treatment centers adopting naltrexone by study wave is displayed in Table 5.4. During the time frame of the study 117 of the 165 treatment facilities included in the event history analysis 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, or the probability that a case will experience the event. The hazard rate is calculated as the number of centers that experienced adoption divided by the remaining number of centers that are "at risk."

Table 5.4 Distribution of Naltrexone Adoption by Study Wave

Study Wave	***Number of Centers Adopting Naltrexone***	***Number at Risk***	***Estimated Hazard Rate***
Wave 1	55	165	.333*
Wave 2	42	110	.382*
Wave 3	12	68	.176*
Wave 4	8	56	.143*

*Statistically significant change in the hazard rate ($p<.001$)

For the duration of the initial on-site interview between 1994-1996, 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 for the discrete time event history analysis appear in Table 5.5. One of the two time-varying covariates measuring organizational *Culture* was predictive of naltrexone adoption, thereby providing partial support for Hypothesis 1. Consistent with this hypothesis, the estimated net hazard of naltrexone adoption decreases by about half among centers that are based on a 12-step model of treatment (O.R. = .442, $p<.05$). Centers based on a 12-step model are significantly less likely to adopt naltrexone over time.

Hypothesis 2 proposed that treatment centers employing more educated, experienced administrators would be significantly more likely to adopt naltrexone across time. This hypothesis was not supported by the data. Among the variables measuring *Leadership*, the number of years that the administrator has been employed within the behavioral healthcare field is the only significant time-varying covariate related to the risk of naltrexone adoption. However, this relationship was in the un-hypothesized direction. Each additional year that the leader of the treatment organization has been employed in the behavioral health care field produces a 3% decrease in the likelihood of the adoption of naltrexone net of the effects of the other independent variables in the model. The administrator's education is unrelated to the risk of naltrexone adoption, despite a significant difference at the bivariate level between the highest educational degree held by the administrator among adopting and resisting organizations.

Table 5.5 Coefficients from the Discrete Time Event History Model of Naltrexone Adoption Behavior on Organizational Culture, Leadership Characteristics, Internal Organizational Structure, and External Characteristics (n=398 center-year observations)

	Coefficient	***S.E.***	***Odds Ratio***	***90% C. I. Lower***	***Upper***
Culture					
Based on 12-Step Model	-.817*	.470	.442	-1.585	-.049
12-Step Meetings on Premises	.442	.363	1.556	-.154	1.039
Leadership					
Administrator's Education	-.008	.180	.992	-.305	.288
# Years in Behavioral Health Field	-.035*	.015	.966	-.061	-.010
Internal Organizational Structure					
Board of Directors	-.057	.308	.945	-.563	.450
Use Prescription Drugs	1.099*	.485	3.001	.301	1.897
% of MA Counselor	.001	.004	1.001	-.005	.008
Physician on Payroll	.254	.248	1.289	-.155	.663
Employee Handbook	1.181*	.660	3.258	.094	2.267
Accredited	1.681**	.546	5.371	.783	2.579
Belong to Tx Association	.032	.250	1.033	-.380	.444
Hospital-Based	.184	.348	1.202	-.383	.751
Budget for Training/Development	.239	.358	1.270	-.349	.827
Profit Status	.866**	.306	2.377	.363	1.368
Log of FTE's	-.105	.138	.900	-.332	.121
External Characteristics					
Competition	.050	.047	1.051	-.028	.128

*p<.05; **p<.01 (one-tailed)

As mentioned earlier, *Internal Organizational Structure* contains six separate but inter-related components *including Centralization, Complexity, Formalization, Interconnectedness, Organizational Resources*, and *Size*. *Centralization*, as measured by the presence of a board of directors, was in the hypothesized direction but failed to reach statistical significance. Therefore, hypothesis 3, or the hypothesis that centralized facilities which report directly to a board of directors will be significantly less likely to adopt naltrexone during the research window, was not empirically supported.

Hypothesis 4 suggested that organizations with a high degree of complexity will be significantly more likely to adopt naltrexone over time. *Complexity* includes three time-varying covariates: the use of prescription drugs, the percentage of counselor's with a graduate degree, and the presence of a physician on the payroll. The multivariate event history model indicates that, holding all other variables in the model constant, centers using prescription drugs are significantly more likely to adoption naltrexone (1.099; $p<.01$). This association is quite dramatic with use of prescription drugs increasing the odds of adopting naltrexone three-fold (O.R. = 3.001). The other two time-varying covariates measuring *Complexity* were not predictive of naltrexone adoption, thus hypothesis 4 was only partially confirmed.

The fixed-time indicator of *Formalization*, the use of an employee handbook, also increased the likelihood of naltrexone adoption net of the effects of the other independent variables in the model, supporting hypothesis 5. Specifically, organizations with employee handbooks are over three times more likely to adopt naltrexone (O.R. = 3.258; $p<.05$).

Hypothesis 6 anticipated that substance abuse treatment centers that are interconnected with the addictions field via accreditation status and memberships within a treatment provider association would be significantly more likely to adopt naltrexone during the timeframe examined. Yet, only one of the two variables assessing *Interconnectedness*, were predictive of naltrexone adoption, providing partial support for hypothesis 6. Although the membership in a treatment association was not significant, being accredited by JCAHO or CARF had a very strong relationship with naltrexone adoption. Treatment facilities accredited by agencies such as JCAHO or CARF were at

considerable risk for naltrexone adoption over the course of the study, relative to their non-accredited counterparts. Accredited facilities were 5.4 times more likely to adopt naltrexone than non-accredited treatment centers.

Three measures of *Organizational Resources* were included in the event history model, including one time-varying covariate. As articulated in hypothesis 7, it is expected that treatment centers possessing organizational resources would be significantly more likely to adopt naltrexone over time. Though there was a significant difference at the bivariate level between the physical location of the organization and adoption behavior, this relationship did not hold in the multivariate model. Specifically, hospital based centers were not significantly more likely to adopt naltrexone than freestanding facilities. Likewise, having a line item in the budget for training and development was not statistically significant. However, for-profit centers were significantly more likely than non-profit organizations to adopt naltrexone. For-profit centers were 2.4 times more likely to use naltrexone than non-profit organizations, producing some support for hypothesis 7.

Finally, the measure for *Organizational Size*, the natural log of FTEs, was not a statistically significant predictor of naltrexone adoption. Thus, the results of the event history analysis didn't validate hypothesis 8 that larger organizations would be significantly more likely to adopt naltrexone across the four time periods. Additionally, hypothesis 9 was not supported because the *External Characteristics* indicator, level of competition, was not significant. Hypothesis 9 proposed that treatment facilities facing intense competition with other centers in their market area would be significantly more likely to adopt naltrexone; however, the empirical findings suggests that the varying

intensities of market competition for treatment services neither increases nor decreases the likelihood of naltrexone adoption.

In sum, several of the hypotheses put forth in Chapter 3 were empirically supported by the discrete time event history model. As expected, *Culture* had a significant impact on the adoption of naltrexone across the four waves of data. *Leadership* was also predictive of adoption over time; however, the relationship was in the unexpected direction. Moreover, four of the six dimensions assessing the *Internal Organizational Structure* component were supported by the event history model. Several of the variables measuring the dimensions of *Complexity, Formalization, Interconnectedness*, and *Organizational Resources* increased the risk of naltrexone adoption during the course of the study. The relationship between *Formalization* and adoption defied the expectation that formalized organizations would be significantly less likely to adopt naltrexone over time. Finally, *External Characteristics* did not have a significant impact on the adoption of naltrexone during the four waves studied.

Chapter 5 achieved its goal of identifying the significant theoretical predictors of naltrexone adoption during the research window of interest. Now that the adoption of naltrexone over time has explored, the concentration will shift to centers that have adopted naltrexone. In particular, Chapter 6 will discuss the results of the ordered logit model in an attempt to discover the organizational-level characteristics that are predictive of more innovative organizations.

CHAPTER 6

A CATEGORICAL TYPOLOGY OF NALTREXONE ADOPTERS: RESULTS OF THE ORDERED LOGIT MODEL

Chapter 6 extends the previous chapter by focusing on treatment organizations that have already adopted naltrexone. The purpose of this chapter is two-fold. First, descriptive statistics will display the cumulative number of treatment centers adopting naltrexone over the course of the study, as well as the distribution of adopting organizations by categorical type. These graphs are used as a first step to visually assess Rogers' theory of a continuum of innovativeness. A categorical typology of adopters will be created based on Rogers' (1958) method of adopter categorization. The five categories range from most innovative to least innovative and are based on the year of naltrexone adoption. These five categories include innovators, early adopters, early majority, late majority, and laggards. Second, results of the ordered logistic regression model are reported. This type of analysis uses a causal model specification to predict if a treatment center will fall into a more innovative category. An ordered logistic regression model is used to estimate the effects of Rogers' theoretical predictors of adopter categorization including socio-economic status, organizational personality, and communication behavior on the likelihood that a treatment center will be in one of the five-adopter categories.

The analytical sample for this chapter includes 158 organizations that have adopted naltrexone by Wave 3. Both independent and dependent variables for these analyses are derived from Wave 3 of the NTCS, rather than Wave 4, because Wave 4 was

still in the field at the time of analysis. This decision was made in an effort to maximize the number of treatment facilities that had adopted naltrexone. This sample of 158 adopting organizations is from a possible sample of 163 treatment facilities. Five cases were excluded because they did not have information on the year of naltrexone adoption. To display the true pattern of adopters, centers that adopted naltrexone between 1984 and 1993 are included in the sample. Limiting the sample to centers that have adopted naltrexone since 1994 would truncate the data and exclude the true category of innovators and early majority from the analysis.

Naltrexone Adoption Over Time

To achieve the second objective of this dissertation, which is to classify and predict adopter categories on the basis of innovativeness, I first used the year that centers adopted naltrexone to graph both the cumulative number of treatment centers adopting naltrexone over time as well as to chart the number of adopters of naltrexone per year. As displayed in Figure 6.1, when the cumulative number of adopting treatment organizations is plotted, the result is an S-shaped curve. This is consistent with Rogers' theoretical predictors that the S-shaped adopter distribution will advance slowly at first when there are few adopters at each year. This trend is followed by a period of accelerated adoption until approximately half of the treatment facilities have adopted naltrexone. Next, the S-shaped curve increases at a gradually slower pace as fewer and fewer of the remaining treatment organizations adopt naltrexone.

This S-curve of adoption has a relatively long "tail" to the left, indicating that about ten years were required before the rate of adoption started to accelerate. This pattern coincides with the "reinvention" of naltrexone for the treatment of alcohol

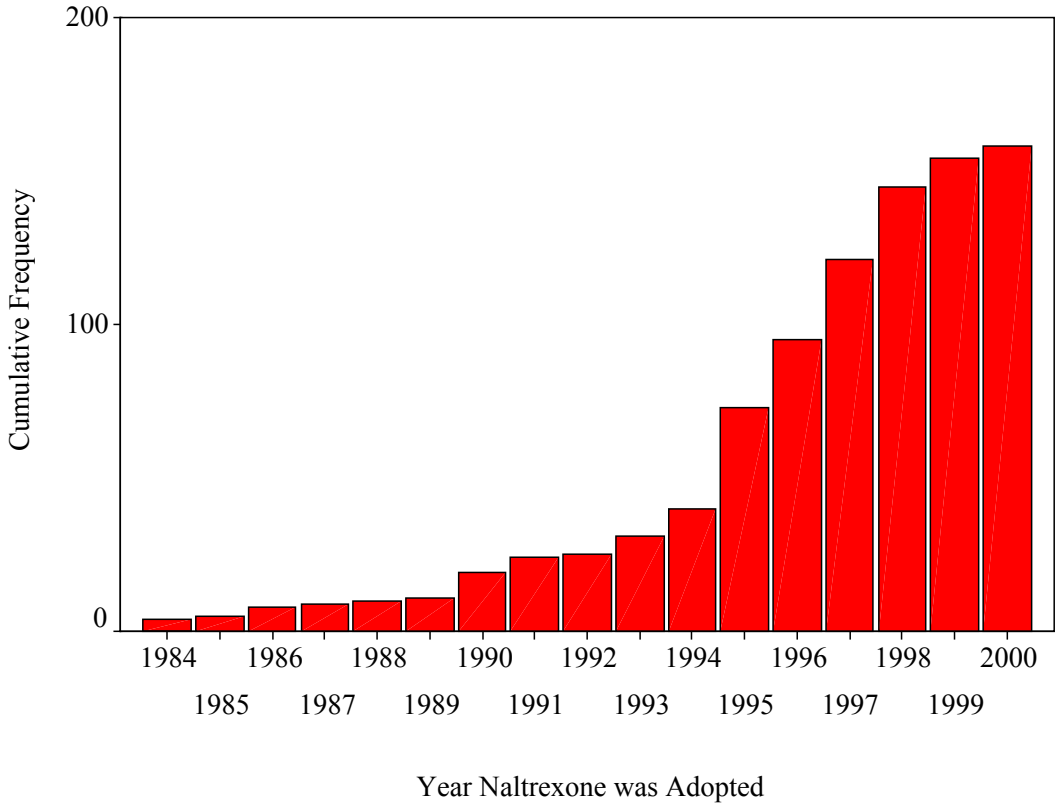

Figure 6.1 Cumulative Number of Naltrexone Adopting Centers (n=158)

dependence which was FDA approved in 1994. Thus, the degree to which this innovation was changed or modified allowed the innovation to be applied to treat more than one type of substance dependence. This undoubtedly contributes to the rapid acceleration of adoption that began in 1995. The S-shaped curve of diffusion "takes off" around this time because of an influx of information exchange that occurred through the medium of journal articles publicizing the "reinvention" and effectiveness of naltrexone for the treatment of alcohol dependence (O'Malley et al., 1992; Volpicelli et al., 1992). These seminal articles may have sparked information exchange among organizations in the treatment system. The part of the diffusion curve from about 10% adoption to 20%

adoption is the core of the diffusion process, which Rogers (2003) suggests results from the activation of peer networks about the innovation in a system.

Figure 6.2 displays the frequency distribution of the number of mean naltrexone adopter from 1984 to 2000 (n=158). Though negatively skewed, this frequency distribution approaches a bell-shaped curve. This could be a result of an idiosyncratic reason – specifically, the "re-invention" or FDA approval of naltrexone in 1994 to aid in the treatment of alcohol dependence in addition to the prior use, which focused only on the treatment of opiate addiction. Rogers (2003) postulates that organizations gain knowledge of an innovation through a learning process that typically follows a normal curve when plotted over time. Many traits in nature are normally distributed, including the process of adopting or learning new information. A normal adopter distribution for an innovation is expected based on empirical evidence from many innovation investigations (Ryan, 1948; Rogers, 1958). It is interesting to note that when the analysis is limited to organizations adopting naltrexone between 1994 and 2000 (n = 127), the result more closely approximates a normal bell curve distribution (see Figure 6.3).

Creation of a Categorical Typology of Adopters

Because of an examination of both the cumulative number of treatment centers adopting naltrexone over time and the frequency distribution of the number of naltrexone adopters per year is consistent with Rogers' theory, Rogers' method of adopter categorization is used to place adopting organizations into one of five categories (Rogers, 1958, 1962). The innovativeness dimension, as measured by the year an organization adopts naltrexone, is continuous; yet, it can be separated into five adopter categories by examining standard deviations from the average time of adoption (1995-1996).

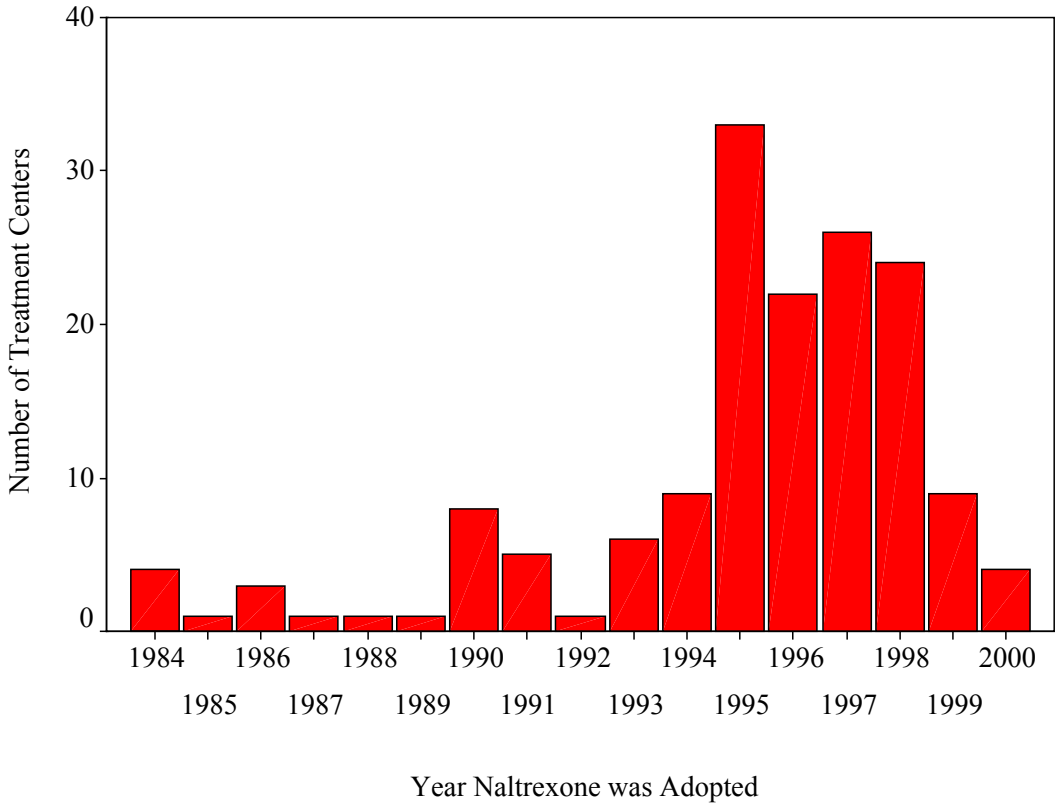

Figure 6.2 Number of Treatment Centers Adopting Naltrexone 1984-2000

This type of classification is a conceptual simplification that allows for a better understanding of adoption behavior and is based on the design that the categories should be exhaustive, mutually exclusive, and derived from a classificatory principle (Rogers, 2003). Rogers' method of adopter categorization is used in the present study because it is the dominant method in the diffusion field. According to this method, the mean and the standard deviation are used to partition a normal distribution into five categories. Essentially, the innovativeness variable is partitioned into these five categories by laying off standard deviations from the average time of adoption. These five categories are ideal types and should theoretically include a standardized percentage of organizations in each

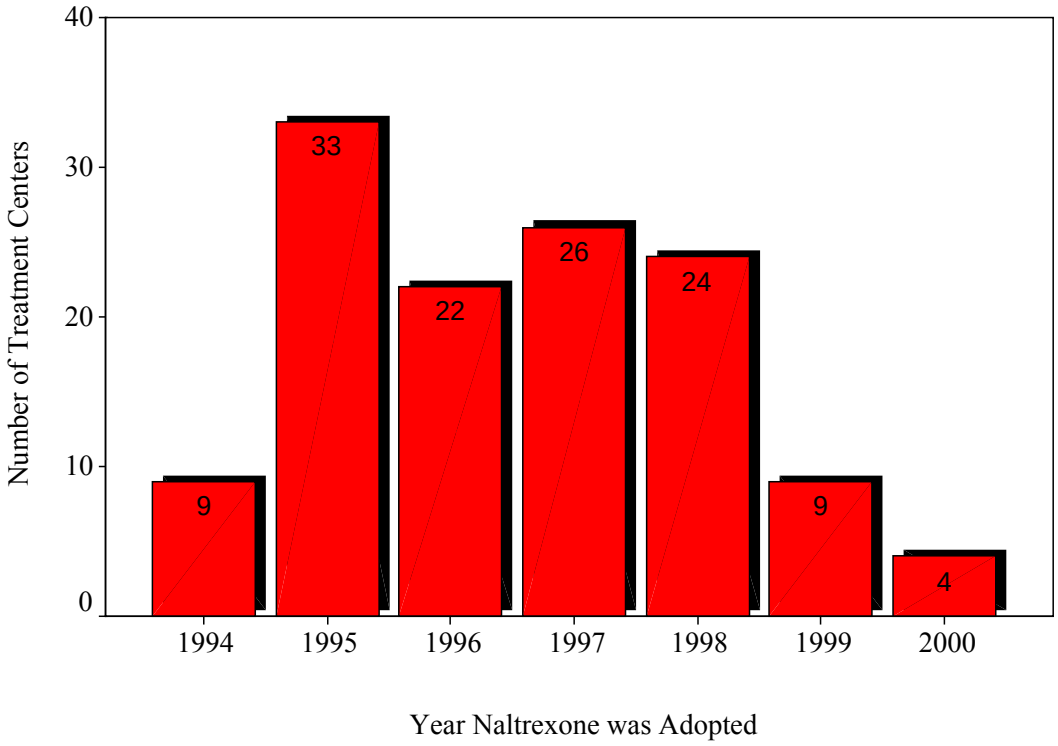

Figure 6.3 Number of Treatment Centers Adopting Naltrexone 1994-2000 (n=127)

of the categories including innovators (2.5%), early adopters (13.5%), early majority (34%), late majority (34%), and laggards (16%). However, while the present study does not precisely adhere to the standardized percentage of organizations in each category, it does bear a close resemblance to Rogers' original typology. Figure 6.4 displays the percentage of organizations within each of the adopter categories.

The area to the left of the mean time of naltrexone adoption minus two standard deviations (s.d. = 3.46 years) includes the first 5.7% of organizations in a social system to adopt naltrexone. This class is called the innovators because they adopted naltrexone

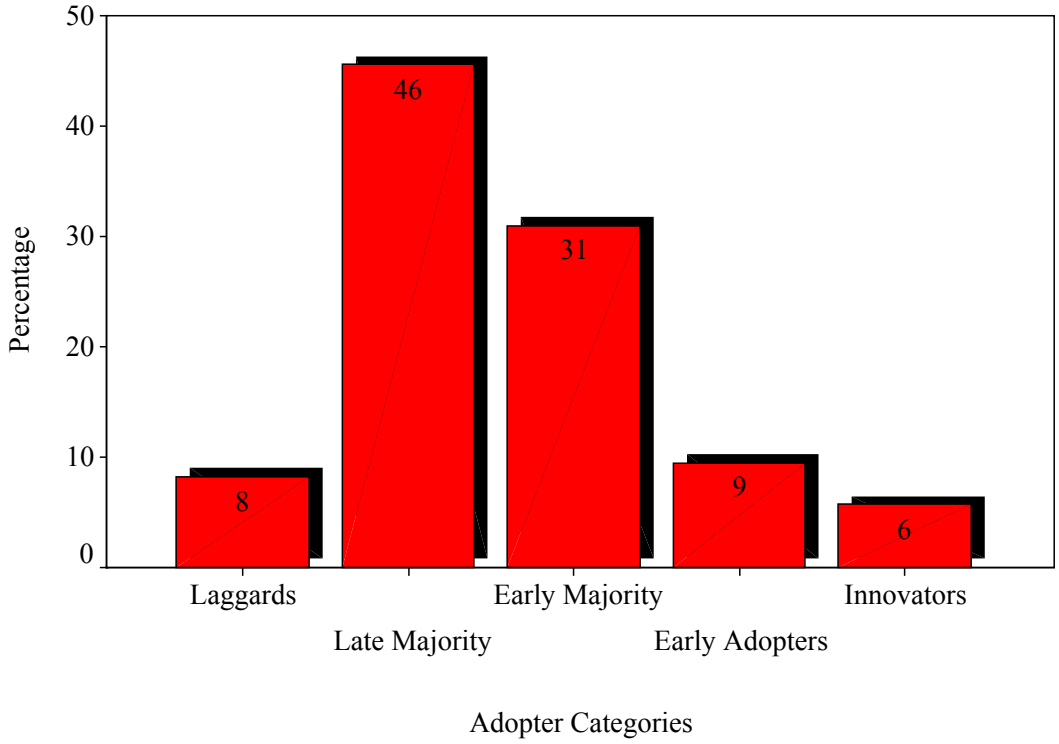

Figure 6.4 Categorical Typology of Adopting Treatment Centers on the Basis of Innovativeness (n=158)

between 1984 and 1987. The next 9.5% to adopt the innovation, known as early adopters, are included in the area between the mean minus one standard deviation and the mean minus two standard deviations. These are organizations that adopted naltrexone between 1988 and 1991.

The next 31.0% of adopting treatment facilities, called the early majority, are included in the area between the mean date of adoption and the mean minus one standard deviation. The early majority adopted naltrexone between the years of 1992 and 1995. The category labeled the late majority is located in the area between the mean and one standard deviation to the right of the mean. The late majority adopted this innovation

between 1996 and 1998 and is composed of the next 45.6% of adopters. Finally, the last 8.2% of adopting organizations are called the laggards and they adopted naltrexone between 1999 and 2000.

Descriptive Statistics

Table 6.1 displays the descriptive statistics for all variables to be included in the multivariate model. In terms of the variables assessing *Socioeconomic Characteristics*, the average treatment center is a little over 20 years old and is relatively small in that it employs about 21 full time equivalents employees. Additionally, the average center employs administrators with at least a college degree and approximately 58% of counselors have at least a Master's degree. The salary for counseling positions range from $15,600 to $53,040, with a mean salary of $34,512.

There are seven variables included in the *Organization's Personality*, or the treatment philosophy, component. To begin, the average center appears to emphasize the medical model (x = 3.55). Roughly 90% of treatment facilities are based on a 12-step model but only 85% have a 12-step meeting on their premises. Treatment organizations that currently incorporate naltrexone into their treatment protocol were asked to provide insight into the factors that influenced their initial adoption of naltrexone on a scale of 0 to 5, with 0 indicating no extent and 5 indicating a great extent. Cultural ideological factors, including the consistency with the center's treatment practices/philosophy (x = 3.25) and the need for an alternative to traditional treatments (x = 2.97), were two of the most important motivations for the organization's decision to incorporate the use of naltrexone. Adopting organizations state that naltrexone's use at comparable centers was not an important factor influencing their decision to use naltrexone (x = 1.15). On a scale

Table 6.1 Descriptive Statistics for Variables Included in Ordered Logit Model (n=158)

Variable	Mean	Standard Deviation	Range
Socio-Economic Status			
Age of Center	20.53	13.34	4 – 116
Administrator's Education	2.65	.78	1 – 4
% MA Counselors	58.67	31.49	0 – 100
FTE's	3.04	1.11	0 – 5.82
Counselor's Salary	34,531.12	5819.63	15,600 – 53,040
Organizational Personality			
Emphasize Medical Model	3.56	1.54	0 – 5
Based on 12-Step	.90	.30	0 – 1
12-Step on Site	.85	.35	0 – 1
Consistent with Tx Philosophy	3.25	1.96	0 – 5
Used at Comparable Centers	1.15	1.59	0 – 5
Need Alternative Treatment	2.97	2.01	0 – 5
Familiar with Innovative Tx's	25.25	6.92	11 – 40
Communication Behavior			
Learn from Journals	3.51	1.11	0 – 5
Learn from Prof Development	4.08	.92	0 – 5
Learn from Pharmaceutical Co.'s	2.40	1.56	0 – 5
Learn from Provider Associations	3.15	1.29	0 – 5
Learn from Informal Conversations	3.36	1.26	0 – 5
Accredited	.87	.34	0 – 5
Level of Competition	3.76	1.82	1 – 10

measuring a center's familiarity with other innovations (ranging from 11 to 40), the average center reported a mean score of 25.25.

Seven variables are used to assess *Communication Behavior*. On of scale ranging from 0 to 5, with 0 indicating no extent and five indicating a great extent, treatment program administrator's were asked the extent to which they received information on innovations from particular sources. The greatest source of information on innovative treatment practices came from seminars on professional development (x = 4.08) whereas the least information was derived from pharmaceutical companies (x = 2.40). Employees at treatment organizations also received much of their knowledge about innovative

treatments from academic journals (x = 3.51), membership in provider associations (x = 3.15), and from informal conversations with employees at other treatment centers (x =3.36). The majority of treatment facilities held memberships in provider associations. In terms of competition from other treatment providers, using a scale of 1 to 10, the average substance abuse treatment center reported a low level of competition for treatment services with other centers in its market area (x = 3.76).

Bivariate correlations among the independent variables included in the ordered logit model are shown in Table 6.2. None of the independent variables correlated so highly as to imply problems with statistical multicollinearity.

Multivariate Analysis

The results of the ordered logit model estimating the correlates of adopter categorization are displayed in Table 6.3. Again, an ordered logit model is used as it allows for five outcome categories, taking into account the rank order of innovativeness. The categorical typology includes is laggards, late majority, early majority, early adopters, and innovators. Because the statistical program used in this analysis, Stata, interprets larger values to correspond to "higher" outcomes, I am modeling innovativeness – the likelihood of being in a more innovative adopter category. Overall, the McKelvey and Zavoina's R^2 for this model is .14 but is not statistically significant (χ^2 = 23.23, df (19), p<.23). The McKelvey and Zavoina's R^2 is used because it is the closest approximation of the R^2 obtained by fitting a linear regression model on an underlying latent variable (Long and Freese, 2001). A significant test statistic (Wolfe and Gould, 1998) provides evidence that the parallel regression assumption, or

Table 6.2 Correlation Matrix of the Independent Variables in the Ordered Logit Model

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Socioeconomic Status																			
Age	1.00																		
Ad Educ	.18*	1.00																	
% MA Coun	-.12	.22*	1.00																
FTE's	.09	.09	.07	1.00															
Coun Salary	-.17*	.06	.20*	-.01	1.00														
Org. Personality																			
Med Model	-.06	.13	.12	.11	.11	1.00													
12-Step on Site	.048	.23*	.12	.32*	.07	.04	1.00												
12-Step Model	-.02	-.02	-.02	.18*	.06	.11	.34*	1.00											
Tx Phil.	.09	.05	-.05	.07	.06	-.05	.11	.01	1.00										
Used Other Centers	-.07	.01	.03	.03	-.01	-.01	.03	-.01	.17*	1.00									
Need Alt. Tx	-.09	.09	.06	-.02	.12	.00	-.01	-.03	.24*	.37*	1.00								
Familiar w/ Innovations	.02	.08	-.17*	.13	.24*	-.04	.08	-.03	.14	.12	.08	1.00							
Com. Behavior																			
Journals	.00	-.06	-.15	-.04	.08	.02	-.03	.03	.02	.09	.09	.21*	1.00						
Prof Deve.	.04	.07	-.01	.05	.14	.19*	-.00	.14	-.01	-.02	-.06	.13	.12	1.00					
Pharm. Co's	.22*	.11	-.01	.11	-.12	.13	-.04	.04	-.10	.04	-.10	.17*	.28*	.34*	1.00				
Pr. Assoc.	.04	.00	.17*	-.01	.07	.10	-.14	-.10	.02	-.02	-.04	.13	.21*	.05	.33*	1.00			
Informal Conversations	.13	.14	-.14	.10	-.03	.01	-.09	.11	.01	-.04	-.07	.17*	.32*	.11	.31*	.24*	1.00		
Accredited	.10	.03	-.04	.28*	.10	.37*	.26*	.24*	.11	-.07	.01	.03	-.08	.10	-.00	.02	.02	1.00	
Level of Competition	.21*	.16*	.04	.32*	.01	.22*	.16*	.10	.14	.09	-.06	.11	-.01	.11	.11	-.13	-.00	.20*	1.0

Table 6.3 Coefficients from the Ordered Logit Model (n=158)

	B	Z	bStdY	BstdXY	%
Socio-Economic Status					
Age of Center	.01	.78	.14	.07	1.0
Administrator's Education	.05	.22	.04	.02	4.9
% MA Counselors	.00	.29	.05	.03	0.2
FTE's	.14	.86	.15	.08	14.5
Counselor's Salary	-.00	-.25	-.04	-.02	-0.0
Organizational Personality					
Emphasize Medical Model	-.07	-.61	-.11	-.06	-6.8
Hold 12-Step Meeting on Premises	-.89*	-1.69	-.32	-.16	-59.0
Based on 12-Step	.20	.36	.06	.03	22.0
Consistent with Tx Philosophy	-.02	-.24	-.04	-.02	-2.0
Used at Comparable Centers	-.16	-.49	-.26	-.13	-14.9
Need Alternative Treatment	-.07	-.76	-.13	-.07	-6.4
Familiar with Innovative Tx's	.05**	2.09	.37	.19	5.5
Communication Behavior					
Learn from Journals	-.14	-.92	-.16	-.08	-13.3
Learn from Prof Development	-.41**	-2.22	-.37	-.19	-33.3
Learn from Provider Associations	-.00	-.01	-.00	-.00	-.1
Learn from Pharmaceutical Co.'s	.04	.32	.06	.03	3.8
Learn from Informal Conversations	-.24*	-1.73	-.31	-.16	-21.6
Accredited	-.20	-.37	-.07	-.03	-17.9
Level of Competition	.02	.13	.02	.01	1.3
Ll_0 = -207.53					
Ll = -195.92					
LR χ^2 = 23.23, df = 19, p<.23					

*p<.10; **p<.05
b = raw coefficient
z = z-score for test of b=0
bStdX = x-standardized coefficient
bStdXY = fully standardized coefficient
% = percent chance in odds for a unit increase in x

proportional odds assumption, has not been violated, implying that the coefficients across the four equations are considered "close" to being equal (χ^2 = 71.54, df (57), p<.09). [1]

[1] The parallel regression assumption, also known as the proportional odds assumption, implies that the coefficients across the four equations are considered "close" to being equal. Based on Wolfe and Gould's (1998) "omodel" command in Stata (Long and Freese, 2001), the approximate likelihood ratio test of proportionality of odds across response categories indicated the assumption was on the verge of being violated in the present study. Thus, while Allison (1995) as well as Long and Freese (2001) caution that a violation of this assumption is commonplace, a multinomial model, which does not impose the constraint of

Only four variables are statistically significant in predicting adopter categorization based on innovativeness. First, in the component looking at *Socioeconomic Characteristics* of treatment organizations, none of the five variables approached statistical significance. Therefore, hypotheses 10, 11, 12, and 13 were not empirically validated. Hypothesis 10 and 11 respectively suggested that earlier adopting organizations would be older and would employ more educated administrators and counselors. Additionally, it was hypothesized that earlier adopting treatment facilities would have higher counselor salaries (hypothesis 12) and employ more full time equivalent employees (hypothesis 13) than later adopting organizations.

Second, two of the variables in the *Organizational Personality* component were predictors of adopter categorization. Net of the other variables in the model, centers that host 12-step meetings on their premises ($b = -.89$, $p<.10$) are 59% less likely to be in a higher innovative category than in a lower innovative category, providing partial support for hypothesis 14. Hypothesis 15 suggested that early adopting organizations, as compared to later adopting facilities, will cite that naltrexone's consistency with their treatment practices and their need for an alternative to traditional treatments are very influential factors in their decision to adopt and will state that naltrexone's use at comparable centers is not a very influential factor in their decision to adopt. These variables were not statistically significant in the ordered logit model, thereby providing no empirical support for hypothesis 15. Consistent with expectations articulated in

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parallel regressions, was also explored. After performing a likelihood-ratio test for independent variables in the multinomial model, it was found that several of the same variables improved the model fit including holding 12-step meetings on site, being familiar with other innovative treatments, and receiving a great deal of innovation knowledge from participation in professional development activities ($p<.10$). While learning about innovations from informal conversations with other treatment providers was not significant, endorsing a 12-step model did reach statistical significance. This model was marginally statistically significant ($\chi^2 = 94.09$, df (76), $p<.08$).

hypothesis 16, as treatment centers become more familiar with other psychosocial and pharmacological innovative treatments, the organizations percentage change in the odds of being more innovative (or being in a more innovative category because they adopted naltrexone earlier) increases by 5.5%.

Two variables in the *Communication Behavior* component were significant in predicting the likelihood of being in a more innovative category. Hypothesis 17 posed that early adopting organizations have greater amounts of innovation knowledge from formal sources (including journals, pharmaceutical companies, and provider associations) than do later adopters. This hypothesis was not empirically validated.

On the other hand, hypothesis 18 suggested that early adopters have less innovation knowledge from informal sources (including involvement in professional development seminars and face to face communication with employees of other treatment facilities) than later adopters. Hypothesis 18 was fully supported by the results of the ordered logit model. Treatment centers that said they learn about innovations from participation in professional development seminars and from informal conversations with employees of other treatment organizations are more likely to be less innovative (or be in a lower category). For instance, it was found that organizations that rely more heavily on professional development seminars (i.e., moving from 0 (lower) to 5 (higher) on an ordinal scale) for information about innovations decrease their odds of being in a more innovative category by 33.3%. In a similar fashion, centers indicating that they have learned about innovative treatment techniques from informal conversations with individuals employed at other treatment centers decrease their odds of being in a more innovative adopter category by 21.6%.

The predicted probabilities of adopter categorization across levels of innovation knowledge derived by informal conversations with employees at other treatment facilities are examined. The predicted probabilities were explored while all other values are set at their mean. This is in an effort to add insight into the importance of communication channels. Table 6.4 displays the predicted probabilities of adopter categorization by innovation knowledge from informal sources.

Table 6.4 Predicted Probabilities of Adopter Categories by Extent of Innovation Knowledge Derived from Informal Conversations with Employees at Other Centers

	Categories				
Level of Knowledge	***Laggards***	***Late Majority***	***Early Majority***	***Early Adopters***	***Innovators***
0 (no knowledge)	.0304	.3075	.4093	.1545	.0984
1	.0385	.3559	.3960	.1309	.0788
2	.0486	.4052	.3741	.1093	.0628
3	.0612	.4535	.3453	.0902	.0499
4	.0768	.4983	.3118	.0737	.0395
5 (extensive knowledge)	.0959	.5373	.2758	.0597	.0312

Particularly notable is the last row, which represents programs that rely heavily on informal conversations with employees at other centers. With the exception of the laggard category, when the center learns about innovative treatment techniques through informal sources, they have a greater probability of being in a less innovative category. The small size of the laggard category, however, could account for the lack of findings. The probability of being at categorized as an innovator is virtually nonexistent (.03) because the treatment facilities in the innovative category are the first to adopt naltrexone. This relationship holds for all categories of informal innovation knowledge and the probability of being categorized as an innovator. The probability of being in the

late majority category is .54 when the treatment facility receives a great deal of knowledge via informal channels of communication. Treatment centers in the late majority category have adopted naltrexone just after the average treatment center. Thus, it is intuitive that treatment centers relying on knowledge of innovations from employees of other treatment centers would have the highest probability of being in the late majority category. This pattern is visually depicted in Figure 6.5.

A similar pattern was found when examining the predicted probabilities of adopter categorization based on the extent of innovation knowledge learned from participation in professional development seminars. Again, the predicted probabilities of this variable were examined while all other values are set at their means (see Table 6.5). Specifically, when the treatment facility receives a great deal of knowledge about innovative treatment techniques from professional development, they have the largest probability of being in the late majority category (.53). Generally, the pattern is that the more a treatment facility receives knowledge from professional development, the less likely they are to be in an innovative category. Again, the laggard's category is an anomaly that could be the result of a small number of treatment organizations in this category (n=8). Treatment facilities in the less innovative categories have higher probabilities of learning about innovations through participation in professional development activities because they approach innovations with skepticism. After the innovation is established, the weight of system norms may encourage professional development activities surrounding innovations, and ultimately motivating adoption. Figure 6.6 visually displays this pattern of predicted probabilities of adopter

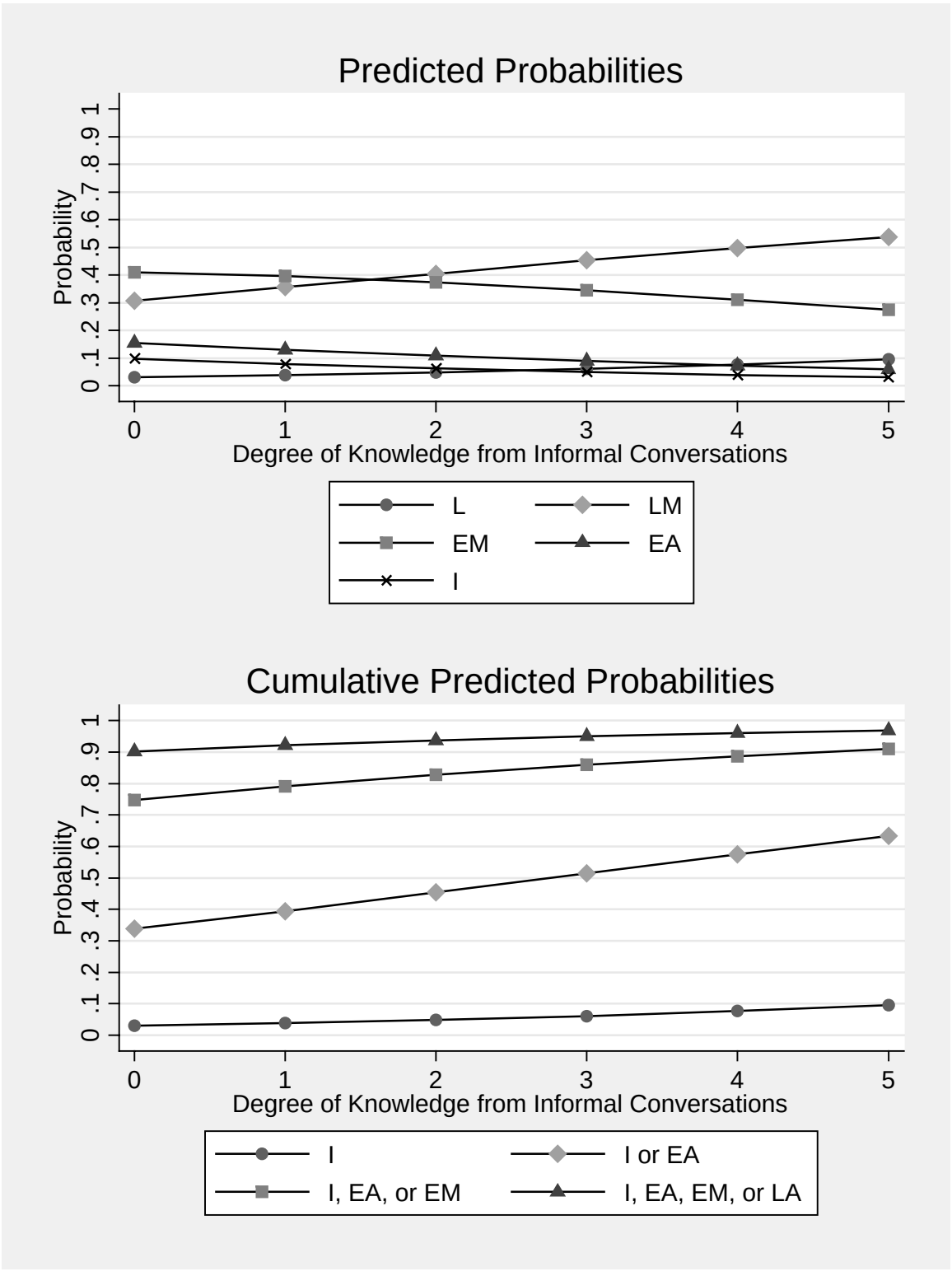

Figure 6.5 Predicted & Cumulative Predicted Probabilities of Adopter Categories by Extent of Innovation Knowledge Derived from Informal Conversations with Employees at Other Centers

Table 6.5 Predicted Probabilities of Adopter Categories by Extent of Innovation Knowledge Derived from Professional Development

	Categories				
Level of Knowledge	***Laggards***	***Late Majority***	***Early Majority***	***Early Adopters***	***Innovators***
0 (no knowledge)	.0134	.1677	.3804	.2374	.2010
1	.0200	.2291	.4085	.1987	.1437
2	.0297	.3026	.4104	.1571	.1006
3	.0439	.3835	.3874	.1185	.0694
4	.0644	.4638	.3381	.0863	.0474
5 (extensive knowledge)	.0935	.5332	.2800	.0612	.0321

categorization based on the program's reliance on professional development activities for knowledge about innovations.

In summary, the naltrexone adopter categorization on the basis of innovativeness is useful for descriptive purposes but the theoretical model using *Socioeconomic Status, Organizational Personality*, and *Communication Behavior* to predict adopter categorization was not particularly insightful. At the organizational-level, despite expectations, none of the variables assessing a treatment facilities' *Socioeconomic Status* were related to innovativeness. Moreover, holding 12-step meeting on the premises of a treatment center was the only significant *Organizational Personality* variable associated with innovativeness. Perhaps, Rogers' *Socioeconomic Status* and *Organizational Personality* components could have been operationalized differently. These components may be best suited for explaining individual adopting units rather than organizational adopting units.

The majority of variance in adopter categorization was explained by the third component of *Communication Behavior*. A treatment center's familiarity with other

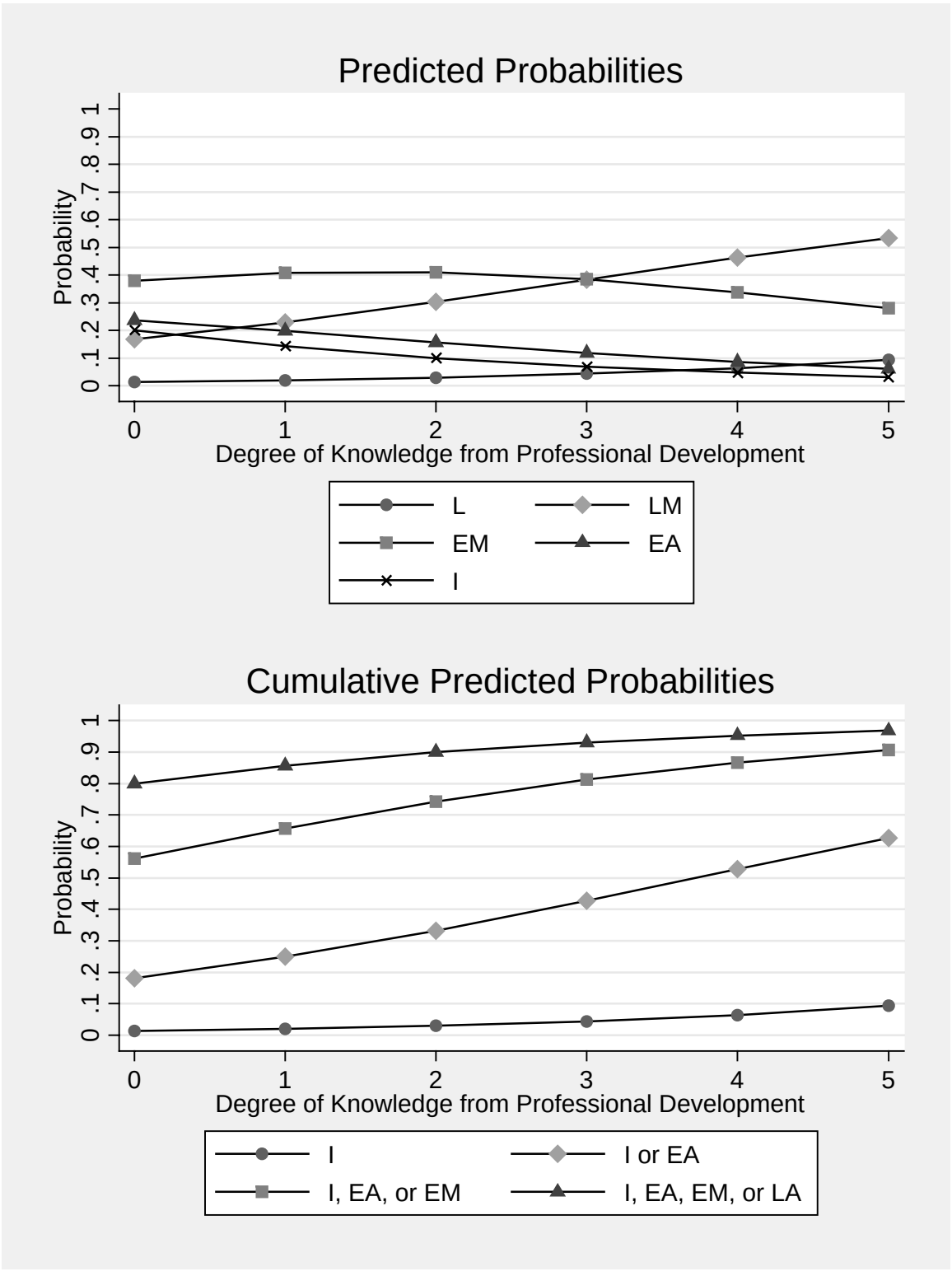

Figure 6.6 Predicted & Cumulative Predicted Probabilities of Adopter Categories by Extent of Innovation Knowledge Derived from Professional Development

innovative treatment techniques is positively related to innovativeness, suggesting that earlier adopters may seek information about innovations more actively and may have a greater knowledge of innovations than do later adopters. Also, organizations that rely on knowledge about innovative treatment techniques from participation in professional development seminars or from informal conversations with employees of neighboring treatment facilities are significantly less likely to be in a more innovative category. This implies that the centers that learn about innovations via these two modes of communication are the centers that are adopting innovations relatively later than other treatment centers in their social system. It is plausible that these organizations are conducting in-house professional development training on the use of pharmacotherapies or are informally conversing with other treatment practitioners about innovative treatment techniques after the average treatment center has already adopted naltrexone. This ex-post facto tactic may occur out of economic necessity or may be the result of peer pressure.

While Chapter 6 has provided a description of the categorical typology of naltrexone adopters and explored a theoretical model predicting adopter categorization, the next chapter will extend these results. Specifically, Chapter 7 briefly summarizes the key empirical findings from both Chapters 5 and 6, discusses the theoretical implications of the results for the treatment field, addresses the limitations of the present study, and concludes with suggestions for future research.

CHAPTER 7

CONCLUSIONS & RESEARCH TO PRACTICE IMPLICATIONS

Guided by the sociological theory on organizational innovation, this dissertation has attempted to shed light onto the organizational-level characteristics that impact pharmacological innovation adoption and adopter categorization in the substance abuse treatment field. Rogers (2003) suggests that the rate of innovation adoption could be affected by either the attributes of the innovation, the quantity of communication between innovation creators and potential adopters, and/or the characteristics of the decision-making unit. The latter factor is the primary concern of this research, which applies this aspect of the theory to the case of naltrexone adoption and innovativeness in private substance abuse treatment centers. In particular, this dissertation considered two general research questions. First, a discrete time event history model was employed to answer the question, "What organizational-level characteristics are significant in predicting naltrexone adoption during the past decade?" Second, the emphasis shifted to those treatment centers that had adopted naltrexone in an effort to predict an unexplored area, organizational innovativeness, as measured by an adopter categorical typology. An ordered logit model was used to answer the last research query posed, "Among adopting treatment facilities, what organizational-level characteristics have a significant impact on adopter categorization, or innovativeness?"

The objective of the remainder of this Chapter is to amass the sentiments from the previous chapters. In view of that, the précis of Chapter 7 begins by providing a summary of the empirical findings from Chapters 5 and 6. Next, the limitations of the

study are presented with recommendations for future research on the adoption of innovations. Chapter 7 concludes by providing implications for practitioners in the addictions field seeking to improve patient care by closing the "research to practice gap."

Empirical Findings of the Organizational-Level Predictors of Adoption

The first objective was to examine the adoption of naltrexone over time, and more specifically, to explore the impact of *Culture, Leadership, Internal Organizational Structure*, and *External Characteristics* on the likelihood of adopting this pharmacotherapy during the four waves of the National Treatment Center Study. The rate of adoption fluctuated over time in that the estimated hazard rate, or the probability that an organization would adopt naltrexone, did not remain constant. During waves one and two of the NTCS, the "risk" of naltrexone adoption, or hazard rate, was double the risk found during waves 3 and 4. Thus, the timeframe during which the majority of organizations were most likely to adopt an innovation was within the first five years after FDA approval. Immediately after FDA approval there was a high risk of adoption. Within 2-3 years, this risk of adoption significantly increased to yield an even higher hazard rate. After about five years on the market, the hazard rate began to decrease at statistically significant levels.

In the multivariate model predicting adoption over time, it was revealed that the *Culture* of an organization does impact its risk of naltrexone adoption. While *Culture* is not an original category in Rogers' (2003) theoretical framework on the adoption of innovations in an organizational context, it does add substantive insight into the adoption behavior of organizations. Embracing a 12-step ideology is a salient aspect for many substance abuse treatment facilities because this philosophy of treatment does not

endorse the use of pharmacotherapies; rather it promotes abstinence from all drugs. Thereby, an organizational culture based on a 12-step model, rather than a medical model, reduces the likelihood of naltrexone adoption over time. However, hypothesis 1 was only partially supported because while it suggested that centers embracing a 12-step model and those hosting 12-step meetings on their premises would be significantly more likely to adopt naltrexone over the course of the study, only the former variable reached statistical significance. It is plausible that holding 12-step meetings on-site is more a matter of spatial and managerial logistics than of the strength of commitment to a 12-step culture.

Hypothesis 2 proposed that treatment organizations employing more educated and more experienced administrators would be significantly more likely to adopt naltrexone across time. Yet, only one of two measures assessing *Leadership* was predictive of naltrexone adoption over time, but this relationship was not in the hypothesized direction. Thus, no support was found for hypothesis 2. While research in other types of health care found support for a positive relationship between a leader's education level and innovation adoption (Becker, 1970; Castle and Banaszak-Holl, 1997; Damanpour, 1991), this relationship did not achieve statistical significance in the present study. Some treatment facilities are complex hierarchical organizational entities, yet data from the NTCS collects educational information from only one administrator. Perhaps a more accurate picture could be displayed by assessing the entire leadership team's educational achievements.

It was also hypothesized that long-term managerial tenure would lead to more innovative decision-making (Castle and Banaszak-Holl, 1997; Kimberly and Evanisko,

1988; Roman and Johnson, 2002). Contrary to expectations, a negative relationship between length of the administrator's service within the behavioral healthcare field and adoption was revealed. Although this negative relationship was not initially hypothesized, it is consistent with several studies that reported a negative effect of the physician's number of years employed on adoption behavior (Peay and Peay, 1994; Weiss, Charney, Baumgarnder, et al., 1990). The finding that less experienced administrators were more likely to adopt naltrexone suggests that these professionals may be more open to novel treatment techniques and less entrenched in the normative forms of substance abuse treatment. More experienced administrators may be reluctant to engage in risk-taking behaviors, such as the introduction of naltrexone into its treatment protocols because greater tenure has resulted in an experiential knowledge base of "what works" in treatment.

The discrete time event history model supported four of the six hypotheses under the theoretical component of Internal Organizational Structure. *Complexity, Formalization, Interconnectedness, and Organizational Resources* all had a significant impact on the adoption of naltrexone over time, whereas the concepts of *Centralization of Power* and *Organizational Size* did not. The specific findings of each of the hypotheses measuring Internal Organizational Structure are discussed. Hypothesis 3, which suggested that centralized organizations that reported directly to a board of directors would be significantly less likely to adopt naltrexone during the research window, was not empirically supported. While centralized organizations have been shown in the literature to be less likely to adopt an innovation, centralization is associated with implementation once a decision to adopt has been made (Rogers, 2003).

As expected in hypothesis 4, *Complexity* had a significant positive effect on naltrexone adoption across the four waves of the study. However, this hypothesis was only partially supported because just one of the three variables assessing *Complexity* was statistically significant. Specifically, the employment of more counselors with a graduate degree and the presence of a physician on the payroll were not predictive of naltrexone adoption over time. It is commonsensical that the use of prescription drugs is the most salient measure of *Complexity* because substance abuse treatment centers using pharmaceuticals inherently implies that they have access to a physician and that they employ individuals more knowledgeable about advanced treatment techniques.

Furthermore, it is intuitive that treatment centers already using pharmacological treatments experience a contagion effect because they already possess the knowledge, expertise, and infrastructure to adopt other innovative treatments, such as naltrexone. Essentially, organizations may view pharmacological innovations as an interrelated bundle of treatment techniques, even though specific medications differ in terms of pharmacological properties, efficacy, and efficiency. Rogers (2003) asserts that the adoption of one innovation triggers the adoption of other interrelated innovations. Therefore, this pattern was not surprising because it is consistent with others who have examined incremental versus radical innovations.

As expected in hypothesis 5, *Formalization* had a negative impact on the adoption of naltrexone during the course of the study. Bureaucratic formalization has been demonstrated to limit the aspiration to learn about and adopt innovations as a result of limited job autonomy (Aiken, Bacharach, and French, 1980; Bailyn, 1985; Raelin, 1985). This pattern was demonstrated in the present study in that treatment organizations

utilizing employee handbooks are those characterized by more formal and inflexible structural environments, thus limiting the time, desire, and capacity to learn about innovative treatment techniques.

Accredited treatment organizations are significantly more likely to adopt naltrexone over time, thereby providing some support for hypothesis 6. This measure of *Interconnectedness* was hypothesized to have a positive relationship with the adoption of innovations because it assesses the degree to which a treatment center is entrenchment within a social network of other addiction organizations, which subsequently increases communication channels. In addition, it creates normative pressures to be like others in their social system (DiMaggio and Powell, 1984). Receiving accreditation by an endorsing institution, such as JCAHO, requires accountability for the use of best practices and evidence of quality of care. Accredited treatment centers are involved in an association of treatment organizations that are committed to providing a high standard of care. The federal government has supported the adoption of evidenced based pharmacological treatments, such as naltrexone, therefore it is likely that those accredited organizations experience pressure to conform and are increasing their treatment repertoire by adopting innovative treatments. Hypothesis 6 also suggested that facilities with memberships in a treatment provider association would be significantly more likely to adopt naltrexone, but this relationship was not empirically supported.

Hypothesis 7 anticipated that treatment centers that possessed *Organizational Resources* (including hospital-based centers that maintained training and development budgets and operated on a for-profit based) would be significantly more likely to adopt naltrexone over the four waves. However, hypothesis 7 was not fully supported by the

multivariate model, because only profit status had a significant relationship with naltrexone adoption. The lack of significant findings could be the result of interaction effects between physical location (hospital based versus freestanding) and profit status (for-profit and non-profit). Moreover, the analysis only included if the center had a budgetary line for training and development, not the size of the budget. Assessing the monetary input of training and development funds per employee may be a better measure of *Organizational Resources*. This would determine a more precise degree to which centers build an organizational based of knowledge that may be drawn upon during the innovation adoption decision-making process.

For-profit agencies were more likely to adopt naltrexone across the four time periods than their non-profit counterparts. Naltrexone as a pharmacological treatment necessitates a physician in order to prescribe to patients, so organizations without these resources will be less likely to adopt. Then again, if these *Organizational Resources* are not already in place, profit-oriented centers are more likely to possess uncommitted resources that are required for the start-up costs related to the adoption of more expensive innovations. Moreover, for-profit organizations with an innovation-friendly institutional structure in place will be more receptive to using medications because of the low labor costs associated with pharmacotherapies. This strategy is the result of an impetus faced by for-profit centers to increase the capacity of patients served, while maintaining treatment costs (McGrath and Zell, 2001; Roman and Johnson, 2002). Thus financial and human resource slack is important in the innovation adoption process (Miller and Friesen, 1982). 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).

Hypothesis 8 articulated that larger treatment facilities would be significantly more likely to adopt naltrexone across the four time periods. This hypothesis was not supported. Kimberly and Evanisko (1988) state that there are a variety of ways in which organizational size has been measured in the literature on innovation adoption in the health care field. Perhaps, it would be fruitful to explore other approaches of conceptualizing organizational size, such as looking at the total capacity of the facility or by exploring the total assets.

Rogers (2003) also suggested a positive relationship between *External Characteristics* of an organization and the adoption of innovations over time. This relationship fueled hypothesis 9, but was not supported by the discrete time event history model. Treatment facilities facing intense competition with other centers in their market area for treatment services were neither significantly more nor significantly less likely to adopt naltrexone over the course of the study. This lack of relationship could simply be the result of center location. It is possible that rural centers would report little to no competition primarily as a result of isolation, or physical distance from other treatment facilities. Conversely, urban organizations may operate in a more saturated market. This translates into an increased level of market competition. Therefore, including a variable assessing either the number of competitors or the location of the treatment center (rural, suburban, or urban) could be a useful control.

In sum, some of the empirical findings were consistent with Rogers' theoretical framework predicting innovation adoption. In order for the adoption of naltrexone to

occur during the research window of interest, treatment centers had to possess a culture conducive to adoption and employ leaders with certain characteristics. In particular, centers embracing a 12-step treatment philosophy and employing more tenured administrators were less likely to adopt naltrexone over the course of the study. Additionally, complex, formalized, and interconnected treatment facilities that possessed more organizational resources were at significantly higher risk of adopting naltrexone over the past decade. Specifically, treatment facilities already using prescription drugs, utilizing an employee handbook, possessing accreditation, and operating on a for-profit basis were significantly more likely to adopt naltrexone during the four waves examined.

Empirical Findings of the Organizational-Level Predictors of Innovativeness

After identifying the significant organizational characteristics associated with adoption, Chapter 6 created an adopter categorization and conducted an ordered logit model to predict the likelihood of an organization falling into a more innovative category. This is pioneering research because this is the first known study to explore the concept of organizational, rather than individual, innovativeness using Rogers' (2003) theoretical components. The adoption of naltrexone followed the S-shaped curve model of adoption, with a relatively long time period of about 10 years until the rate of adoption began to accelerate. This largest period of growth occurred between 1994 and 1995, the time period immediately following the FDA's approval of naltrexone for the treatment of alcohol dependence. This timeframe coincided with the publication of promising findings by O'Malley and colleagues (1992), as well as that by Volpicelli and colleagues (1992), fueling the media hype and incorrectly popularizing the advertisement of naltrexone as a "magic bullet" cure to treatment alcohol dependence. Among adopting

organizations, communication via media or informal means appears to be associated with naltrexone adoption. Additionally, this expansion may be the result of increased utility. The NTCS suggests that the majority of clients at private substance abuse treatment centers are alcohol dependent, so this innovation has more utility than when it was just used for the treatment of opiate dependence.

Using Rogers' (2003) method of adopter categorization, facilities adopting naltrexone were partitioned into one of five categories using two parameters of the distribution, the mean and the standard deviation. Chapter 6 acknowledged the relationships between a center's *Socio-economic Status, Organizational Personality*, and *Communication Behavior* and its adopter categorization. Despite expectations, the ordered logistic regression demonstrated that organizational *Socioeconomic Status* characteristics did not have a statistically significant relationship with adopter categorization. Based on hypotheses 10, 11, 12, and 13, it was expected that earlier adopting organizations would be older, employ more educated employees, have higher counselor salaries, and employ more FTEs than later adopting treatment facilities. However, these hypotheses did not receive empirical support in the multivariate model. Perhaps, this theoretical model is better suited for predicting an individual's innovativeness, rather than an organization's innovativeness. The absence of an effect could be the result of differing principles operating for the prediction of organizational, rather than individual innovativeness. Additionally, some of the structural characteristics included in the earlier adoption model would have a significant relationship with innovativeness. For example, it could be easily argued that facilities possessing greater *Organizational Resources* would adopt naltrexone relatively earlier than other treatment

centers within its social system. Rogers (2003) states his generalizations about the differences between earlier and later adopters with the individual as the unit of analysis. An organizational model equivalent to that of the individual model could help guide organizational researchers in their creation of adopter categories, identification of the predictors of innovativeness, and the development of audience segmentation.

Another possible explanation for the non-significant effect of *Socioeconomic Status* on innovativeness could be the operationalization of the independent variables. Several variables, such as age, education, income level, and size were taken directly from Roger's theory, but others could have been included such as the profit margin. However, treatment organizations are reluctant to provide financial information, and as a result of missing data, these measures were not included in the analyses.

Organizational Personality, operationalized in terms of climate, did have a significant relationship with naltrexone innovativeness. Two measures appraising the organization's climate were predictive of adopter categorization, partially supporting hypotheses 14 and fully validating hypothesis 16. Hypothesis 14 posited that early adopters would be less dogmatic than later adopters, while hypothesis 16 suggested that early adopters would be more familiar with other innovative treatment techniques than later adopters. Results indicate that treatment centers hosting 12-step meetings on-site were 59% less likely to be in a more innovative category whereas facilities that are familiar with other innovative treatment techniques are 5.5% more likely to be in a more innovative category. This reiterates the dominant bifurcated view of treatment, the 12-step model and the medical model, respectively. Highly dogmatic organizations, such as treatment facilities that host 12-step meetings on their premises, may be less receptive to

new ideas and prefer to hew to their normative practices. On the contrary, organizations familiar with other innovative treatments have a greater ability to deal with scientific abstraction and may adopt a new treatment technique on the basis of rather abstract scientific knowledge, such as information about other innovations. Organizations reporting stronger knowledge of innovations suggests they are more favorably inclined towards science, which may enhance their willingness to adopt scientifically based treatment practices.

Hypothesis 15 stated that early adopters would cite an adherence to treatment philosophy and a need for an alternative treatment as important factors in their decision to adopt naltrexone, but state that naltrexone's use at comparable centers is not an influential factor in their decision to adopt. This hypothesis was not supported by the data. It is possible that reasons influencing an organization's adoption behavior consist of more concrete resource-related, rather than opinion related, factors. However, these tangible explanations may be unrelated to an organization's personality. Nonetheless, while *Personality* variables have not received much research attention, several hypotheses were supported in the present organizational study suggesting that it is an important explanatory variable in the diffusion process.

Four hypotheses measured *Communication Behavior*; however, just one was supported by the data. Hypothesis 17 proposed that early adopters would have greater amounts of innovation knowledge from formal sources of knowledge (such as journals, pharmaceutical companies, and provider associations) and hypothesis 18 suggested that later adopters would have greater amounts of innovation knowledge from informal sources (such as professional development seminars and informal conversations with

other treatment providers). The former hypothesis was not supported by the multivariate model suggesting that innovative organizations are learning about psychosocial and pharmacological treatment innovations via other sources. Perhaps, these early adopters are affiliated with research universities or have participated in clinical trails, thus gaining their innovative knowledge firsthand.

Conversely, hypotheses 18, which posited that organizations that learn about psychosocial and pharmacological treatment innovations from participation in professional development seminars and from informal conversations with employees at other treatment facilities are more likely to be later adopters, received strong empirical support. Indeed, organizations that receive innovation knowledge via these informal communication channels are respectively 33% and 22% less likely to be in a more innovative category. Organizations receiving information knowledge from professional development and casual exchanges with other treatment industry workers must first wait until others within their social system have adopted naltrexone before they can mimic their neighbors' adoption practices. According to Gatigon and Roberston (1989), external communication is a significant source of innovation knowledge during later stages of the adoption process (Gatigon and Robertson, 1989). Furthermore, once an organization learns of innovation adoption by others in their local milieu, they may conduct in-house professional development activities to remain reputable and competitive.

It is important to identify characteristics of later adopters, seeing as the research literature oftentimes places a primary focus on innovators. By definition, innovators are not affected by their peers' adoption behavior. The salient value of the innovator is

venturesomeness. Innovators are willing to accept the setbacks that may accompany the launch of a new idea and they may trigger a critical mass adoption. However, later adopters compose half of the adopters and it is important to identify the vehicles through which these organizations learn of innovative practices in order to understand what accelerates the diffusion process. This analysis has shed light onto this phenomenon by providing empirical support for the negative relationship between informal sources of innovation knowledge and organizational innovativeness.

Hypothesis 19 suggested that early adopters would be more likely to be accredited and hypothesis 20 proposed that early adopters would have more market competition than later adopters. Neither of the hypotheses received empirical support in the ordered logit model. In retrospect, possessing accreditation may only be related to adoption, not innovativeness. Accredited organizations face intensive pressure to improve their quality of care; however, adopting a novel treatment technique that is not yet in widespread use in the treatment field could be viewed as a risky endeavor, rather than as tangible evidence of an organization's commitment to improve the quality of care.

Moreover, while it was expected that treatment facilities facing intense market competition would be more likely to be in a more innovative category in an effort to distinguish their services and provide legitimacy, it is also possible to make an argument that a competitive environment fosters isomorphism. Market competition could possibly serve as a driving force towards neither early adoption nor late adoption. It is possible that treatment centers facing intense market competition are more likely to be an average member of the social system, thus adopting naltrexone after the innovators but before the laggards.

The prediction of organizational innovativeness was partially supported by Rogers' theoretical arguments. Thus, in sum, early adopters of naltrexone did not differ from later adopters in terms of *Socioeconomic Status*, but there were divergences in terms of *Organizational Personality*. Early adopters are less likely to hold 12-step meetings on site and are more likely to be familiar with other innovative psychosocial and pharmacological treatment techniques. Early adopters also differed from later adopters in terms of *Communication Behavior*. Later adopters are significantly more likely than early adopters to learn about treatment innovations from participation in professional development activities and from informal communication with other treatment providers. As suggested above, an organizational equivalent to Rogers' (2003) theoretical model predicting individual innovativeness could significantly add to the overall body of literature on innovativeness.

Limitations of Present Study

These empirical findings substantially contribute to both theory and research on innovation adoption in private treatment settings, yet there are several limitations of the present study that needed to be noted. First, the National Treatment Center Study uses the administrator as a proxy for the organization. The use of a top executive may be an oversimplification, reducing the organization to the equivalent of an individual (Rogers, 2003). Furthermore, this makes it impossible to assess the validity of the data in regards to how sufficiently it represents the entire organization's knowledge and behavior in regard to innovation adoption. In addition, some facilities are quite large and job titles and duties differ across treatment organizations. Thus, it is unclear if the administrator which completed the on-site interview was in fact the top executive director, or CEO, or

if the interview was delegated to an administrator with less authority, clout, or knowledge about the innovation decision making processes.

Second, the use of secondary data analysis limits the concepts measured in the analyses. Data from the NTCS are not always able to measure all of the theoretical concepts in the desired manner. For example, other measures assessing the impact of *External Characteristics* on the likelihood of naltrexone adoption over time could prove fruitful. To be specific, information on the impact of government regulations on some scheduled pharmacological treatments as well as the availability of managed care reimbursement for innovative treatments could affect an organization's adoption behavior. Another case in point can be provided to illustrate the relationship between *Organizational Personality* and adopter categorization. It could be that other measures assessing a treatment center's ability to cope with uncertainty, organizational aspirations, and attitude towards change could better measure the concept of *Organizational Personality*. However, the benefits of secondary data analysis outweighed the negative aspects.

Third, this dissertation only examines private centers, thereby limiting the generalizability to other types of treatment settings such as public facilities and therapeutic communities. For example, publicly funded treatment facilities operate under a different set of environmental constraints, especially in terms of reliance on local and state government financial support. Therefore, different organizational-level factors may come into play when exploring adoption in these types of treatment facilities.

Finally, the present study only examined one innovation, naltrexone. This singular focus is similar to the design of many innovation studies (Damanpour, 1991;

Kimberly and Evanisko, 1981). However, it is not known if these findings generalize to the adoption of other pharmacotherapies in the private substance abuse treatment field. An argument can be made that the adoption of naltrexone would work in a similar fashion to other antagonist treatments, but the examination of a technology cluster of similar innovations would be a better approach. Other researchers suggest the use of an aggregate measure of innovations to truly gauge the innovation "pulse" of an organization (Fichman, 2001; Meyer, Johnson, and Ethington, 1997; Rogers, 2003). While pharmacological and psychosocial addiction treatments are not packaged together by marketers to increase their adoption, they are perceived of as being functionally interrelated. While investigating each innovation within a technology cluster independently is preliminary, it may be an oversimplification of the innovation process because innovations are often not viewed in a singular fashion by potential adopters. Rogers (2003) calls for more scholarly adoption research on technology clusters.

Recommendations for Future Research

Future research could contribute to bridging the research to practice gap in several ways. To begin, naltrexone adoption could be examined in other treatment settings, to see if the organizational predictors operate in a similar manner. Additional research can also take a step forward to examine an aggregate form of innovation adoption. Perhaps, exploring the organizational-level predictors of a composite of innovations as categorized by their pharmacological properties (agonists and antagonists) would add to the knowledge base.

Additional research is called for to explore the innovation process. Rogers (2003) asserts that the innovation process in an organization consists of five domains including

agenda setting, matching, redefining/restructuring, clarifying and routinizing. The first two domains capture the concept of "initiation," whereas the last three domains encapsulate the term "implementation." The decision to adopt an innovative treatment or idea occurs after an innovation is matched with an issue on the organization's agenda and before the innovation is re-defined to fit the organization and the organizational structures are altered. More specifically, future research needs to explore implementation because the majority of extant work only explores adoption. According to Rogers (2003) the relationship between organizational characteristics and adoption differs from the relationship between organizational characteristics and implementation. For example, low centralization, high complexity, and low formalization increase adoption; however these structural characteristics make it difficult to implement an innovation. Therefore, Rogers (2003) suggests that high centralization, low complexity, and high formalization facilitate the implementation process.

Other technology transfer models exist. For example, in the substance abuse treatment field, Simpson's (2002) comprehensive framework suggests there are four stages involved in transferring research into practice. These domains include exposure, adoption, implementation, and practice. This is a more inclusive approach to innovation adoption because it incorporates organizational-level predictors, community treatment practitioner's attitudes and beliefs, external factors, and cultural components.

Research to Practice Implications for Substance Abuse Treatment Field

The research to practice gap discussed in the treatment literature has real world application to increases patient access to evidence-based treatments. These implications increase the quality of care received by patients, ultimately increasing the quality of life.

The multivariate models of adoption and innovativeness within privately funded substance abuse treatment centers provide several recommendations for administrators wishing to adopt innovative pharmacological treatment techniques, such as naltrexone. It is important to stress that treatment facilities entrenched in a 12-step ideology, are less open to naltrexone adoption. Differing philosophies of treatment have considerably different frames of reference that govern their rhetoric, actions, and behaviors. Accordingly, steps need to be taken to decrease these cultural divergences. For example, naltrexone is a theoretically ideal pharmacological treatment, in that it is non-addictive and has a generally good side effect profile and it is consistent with the desired outcome of abstinence held by those entrenched in a 12-step disease model. Therefore, increasing awareness that some patients can benefit from pharmacological treatment techniques will help blend the disease concept with the medical model to create a more applicable use of the disease label.

In a related fashion, there is also the need to "teach old dogs new tricks." Increasing awareness among administrators with experiential knowledge could help increase innovation adoption because they intuitively seek to maintain the status quo. Knowledge of innovations can be achieved by reading professional journals, participating in professional development activities, involvement in provider associations, informally speaking with other treatment providers, and through requesting promotional materials from pharmaceutical companies. The use of mediated communication in the form of company newsletters, videos, or magazines, may help to create an innovation-friendly environment (Meyer, Johnson, and Ethington, 1997). This in-house strategy may be more cost efficient than other strategies.

It would also be beneficial for change agents to target treatment facilities already using prescription drugs, because they possess the skills and knowledge necessary to experiment with other pharmacotherapies such as naltrexone. By the fourth wave of data, over 90% of the centers in the NTCS already use prescription drugs, so the infrastructure is already present to implement pharmacological-based treatments. Whereas, it is quite unlikely that the other 10% of treatment facilities that do not use prescription drugs could easily adopt naltrexone. Berwick (2003) also suggests a strategy of investing in innovators and early adopters. However, this raises the issue of the innovativeness/needs paradox, which suggests that individuals or organizations which need the benefits of a new idea are generally the last to adopt an innovation, whereas those units in a social system who adopt first generally least need the benefits of the innovation adoption (Rogers, 2003). This innovativeness/needs paradox serves to dichotomize the treatment field into the information-rich and the information-poor as a result of the prevalent tendency of innovation creators, or change agents, to ignore the hard-to-reach sub-audience of the late majority and laggards. The diffusion of innovations serves to widen the socioeconomic gap between early and later adopters within a social strategy. In order to overcome this unwanted consequence, a segmentation strategy in which change agents, such as addiction researchers, target the faction of treatment facilities that they believe will be the last to adopt for intensified communication. Therefore, it would be fruitful to target these 10% of organizations without the innovation-friendly infrastructures to remove them for dispensing sub-par treatment.

Finally, there is a five-fold increase in adoption among accredited treatment centers. As alluded to above, accredited centers are measured against national standards

set forth by the health care professionals. Accreditation provides a staff education tool, it evaluates performance, and it stimulates quality improvement efforts. Accreditation may be particularly pertinent for small organizations as a formal, deliberate, organized strategy to search for innovations (Berwick, 2003). Targeting non-accredited treatment facilities seems important to increase adoption, because non-accredited centers are less likely to adopt when left to their own devices.

In conclusion, the characteristics of the potential pool of innovation adopters do affect the adoption and innovativeness within a sample of private substance abuse treatment centers. Organizational-level characteristics are often an under explored area in the diffusion literature, the majority of which focuses on the attributes of the innovation. Thus, this study shed light onto the managerial and structural factors impacting adoption and adopter categorization. Identifying and targeting categories of adopting organizations will help to reduce to the research to practice gap. Addiction is a chronic illness and as such, addicted and dependent individuals have the right to adequate health care. The social implications of ignoring best practices are profound. It is estimated that at any given point in time between 2 and 10% of the adult population in the United States abuses or is addicted to illegal drugs and between 5 and 10% have an alcohol use problem (Doweiko, 2002). When one considers the impact of drug abuse related deaths, the death toll is between 20,000 and 30,000 per year in this country (Miller, 1999; Prater, Miller, and Zylstra, 1999). Moreover, it is estimated that over 200,000 people in the United States die as a result of alcohol use and abuse (Mosier, 1999), suggesting that alcohol contributes to 5% of the annual death toll (Miller, 1999).

As such, reducing the research to practice gap is an important federal government endeavor. The identification of the significant organizational predictors guides the implications offered to the substance abuse treatment field in an effort to reduce the research to practice gap that currently exists. The gap between the creation of evidenced based treatment practices and adoption by community practitioners cannot continue to go unnoticed.

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APPENDIX A

CLINICAL LITERATURE REVIEW ON THE USE OF NALTEXONE FOR THE TREATMENT OF OPIATE DEPENDENCE

The need for a long-acting narcotic antagonist can be traced back to an article by Wikler in 1948. Wikler (1948) suggests that antagonists could decrease or extinguish substance use by attenuating or blocking the pleasurable effects of opiates or by diminishing the conditioned withdrawal response that develops when stimuli associated with drug use are present. However, it was not until 1965 that naltrexone was first synthesized by Blumberg and Dayton (1973).

There are two manners in which naltrexone is used to treat opiate dependence. First, the conventional use of naltrexone is as a relapse prevention intervention, which serves to reduce the likelihood of relapse to opiod use. Essentially, naltrexone maintenance serves as an interim phase between opiate addiction and complete abstinence. When this approach is selected, the patient must already be detoxified from opiate before initiating naltrexone maintenance. The detoxification period can be achieved relatively easy with the advent of clonicdine-assisted therapy (Miller and Gold, 1995). The objective of the traditional usage of naltrexone for the treatment of opiate dependent individuals is that the patient will not experience an opiate high if he/she ingests opiates.

There is an additional controversial technique that is gaining popularity termed rapid opiate detoxification (ROD). This process of using an opiate antagonist as a withdrawal induction tool was first proposed by Kurland and McCabe in 1976. The

premise of ROD, expanded by Resnick and colleagues (1977), is to use opiate antagonists to accelerate the withdrawal in opiate addicts, thereby avoiding a lag time and allowing for a quick induction onto naltrexone maintenance. As noted before, naltrexone significantly attenuates the effects of morphine, heroin, and other opiate derivatives without producing side effects. Taking this drug will send an untreated opiate-dependent individual into an immediate severe withdrawal. The acute narcotic withdrawal syndrome usually begins within 5 minutes of ingestion and lasts upwards of 48 hours. The most commonplace symptoms include varying degrees of restlessness, insomnia, fever, perspiration, changes in mental states, and significant fluid loss through diarrhea and violent vomiting; therefore, the patient needs to be opiate-free for 10 days before induction into a naltrexone program. Several incidents have been noted in which individuals regularly taking narcotics (such as methadone or heroin) self-administered this potent narcotic antagonist because they drank the red substance mistaking it for methadone (Tornabene, 1974).

To be able to use naltrexone as a maintenance treatment for opiod addicts and individuals on agonist maintenance treatment, it is critical to reach the point of complete opiate detoxification. Unfortunately, relapse is a common occurrence between the sensitive stages of traditional detoxification and the initiation of naltrexone as a maintenance treatment. Individuals on methadone often relapse to illicit opiate use due to the prolonged withdrawal period during dose reduction, also known as methadone taper (Eklund, Hiltunen, Melin, and Borg, 1997). Thus, endeavors to use a pharmacological strategy of opiate antagonists (such as naltrexone, or its cousins naloxone or nalmefene)

to accelerate withdrawal from opiates date back almost thirty years. This strategy, now in regular clinical use despite controversy, is known today as rapid opiate detox.

Rapid Opiate Detoxification

While there are a variety of rapid opiate detoxification procedures used, they all consist of several stages. Patients first undergo a naloxone challenge test (NCT) to verify and quantify opiod dependence. Clonidine is generally used because is inhibits opiate withdrawal and anxiety symptoms (Gerra, Zaimovic, Rustichelli, Fontanesi, Zambelli, Timpano, Bocchi, and Delsignore, 2000; Gold, Pottash, and Extein, 1982). Benzodiazepines are also commonly used in the rapid opiate detoxification schedule to induce sedation (Bearn, Gossop, and Strang, 1999).

Since the opiate antagonist naloxone is seven times weaker than naltrexone, it was first used in the initial pilot opiate antagonist treatment studies on individuals in methadone maintenance therapy. In one of the earliest studies, patients receiving low doses of methadone received naloxone injections until withdrawal responses ceased, usually after two days (Blachly, Casey, Marcel, and Denney, 1975). In an analogous study by Resnick and colleagues (1977), patients receiving minimal levels of methadone, were divided into a treatment conditions in which patients were administered naloxone injections for either two days or were given naloxone more frequently over a 24 hour period. Each treatment schedule was followed by naltrexone maintenance. Within both studies, severe withdrawal symptoms were experienced after the initial naloxone injection; yet, patients described the treatment as ‘favourable’ and subjectively rated the second day of treatment as ‘reasonably comfortable’ (Blachly et al., 1975; Resnick et al., 1977).

Rapid opiate detoxification studies were extended to include patients with more severe levels of addiction by combining clonidine and opiate antagonists. In a study by Charney and colleagues (1986), patients received high doses of clonidine for the first two days (after which the amounts were drastically tapered) in conjunction with low levels of naltrexone. By the fourth-day mark, patients were administered the normal 50mg dose of naltrexone and reported little to no withdrawal symptoms (Charney et al., 1986). In a similar study using a sample of heroin addicts rather than patients engaged in methadone maintenance, patients were administered a single daily dose of naltrexone and after successful detoxification, patients stated the withdrawal period was 'relatively comfortable' (Vining, Kosten, and Kleber, 1988). Studies suggest that patients treated with larger doses of opiate antagonists, rather than smaller increments, experienced milder withdrawal symptoms and recovered more quickly (Merrill and Marshall, 1997; Vining, Kosten, and Kleber, 1988; Vlissides, Jenner, and Liappas, 1988).

Several studies have attempted to examine the treatment effectiveness of rapid opiate detoxification. In a placebo-controlled double-blind study, Gerra and colleagues (1995) examined 152 patients treated with clonidine and/or naltrexone for three months following ROD. The naltrexone treated group returned fewer positive urine samples and experienced lower depression ratings and behavioral difficulties in comparison to the placebo group (Gerra, Maracato, Caccavari, Fontanesi, Delsignore, Fertonani, Avanzini, Rustichelli, and Passeri, 1995). An additional study found that an astounding 93% of patients undergoing rapid opiate detoxification, followed by a naltrexone maintenance therapy schedule, remained opiate-free at one month; however, it must be noted that the sample consisted of a highly motivated sample population who had a supervising

significant other (Seoane, Carrasco, Cabre, Puiggros, Hernadez, Alvarez, Costa, Molina, and Sobrepere, 1997).

Ultra-Rapid Opiate Detoxification

Ultra-rapid opiod detoxification (UROD) is a novel treatment technique, which markedly accelerates the opiod withdrawal process by administering an opiate antagonist while the patient is under general anaesthesia. The concept of modifying ROD protocols, by using general anaethesia to ease patient discomfort during the opiod withdrawal, was first proposed by Loimer and colleagues (1989, 1990, 1991a, 1991b). While ROD accelerates the acute withdrawal period using a light sedative to about 8-10 days, patients undergoing UROD are in withdrawal for 1-2 days and avoid experiencing the worst withdraw symptoms as a result of the use of a general anesthetic (Hall and Mattick, 2000). Nonetheless, anesthesia doesn't eliminate all withdrawal symptoms and the most frequent of which are diarrhea, vomiting, anxiety, and muscle pain (Brewer, 1997). Ultra rapid opiate detox allows for the swift and painless transfer from an opiate agonist to an opiate antagonist such as naltrexone.

In the initial four day study on UROD by Loimer and colleagues (1989), six opiate dependent patients were administered a short anesthetic, which lasted between 30 and 50 minutes, and a naloxone infusion lasting over the next 72 hours. Initially, the short-acting anesthetic suppressed the acute withdrawal symptoms, a function which is subsequently served by the naloxone (Loimer, Schmid, Presslick, and Lenz, 1989). In an additional double-blind controlled study by Loimer et al. (1990), patients were administered either naloxone or a placebo while under a general anesthetic. Problems were encountered when the placebo group was administered a naloxone provocation test

resulting in the administration of a second brief anesthetic (Loimer, Schmid, Lenz, Presslick, and Grunberger, 1990). Modern UROD protocols have been adapted to use longer time periods under general anesthesia (approximately 6-8 hours), incorporate the opiate antagonist naltrexone rather than naloxone, and utilize adjunctive medications such as guanfacine, loperamide and ondansetron to manage the gastrointestinal side effects associated with opiate withdrawal (Bearn, Gossop, Strang, 1999).

It is difficult to methodologically assess UROD in comparison to conventional slower detoxification treatment approaches, because of its rapid nature and the use of a general anesthetic, which disables sedated patients to withdrawal from treatment (Bearn, Gossop, and Strang, 1999). However, a few studies of this nature, albeit flawed, do exist. Loimer and colleagues (1991) compared a sample of patients undergoing a methadone tapering approach to those who underwent UROD for a three-week period. There were no differences between the two groups in withdrawal symptom severity at the first opiate free urine sample, thus, suggesting that the UROD group had achieved this stage in recovery in days, whereas it took the decremental methadone detox group several weeks to reach this status (Loimer, Linzmayer, Schmid, and Grunberger, 1991). In another study, Rabinowitz, Cohen, and Atias (2002) examined the relapse rates of 30 patients who had received UROD followed by nine months of naltrexone treatment and 33 demographically similar clients detoxified in a 30 day intensive residential program. No statistically significant difference in relapse rates were found between the two groups; however, findings should be viewed with caution because of methodological difficulties including a lack of random assignment and the use of toxicology measures rather than

self-reports during a follow-up telephone interview (Rabinowitz, Cohen, and Atias, 2002).

Advantages and Disadvantages of ROD/UROD Techniques

Proponents argue that there are a plethora of advantages to using rapid and ultra rapid opiate detox including that it shortens the withdrawal period to days or even hours (Daws and White, 1999; Hall, Mattick, Saunders, and Wodak, 1997), thereby reducing dropouts during the detoxification process, a rate that is upwards of 25% during inpatient detoxification (Stark, 1992; Wickizer, Maynard, Atherly, et al., 1994). ROD and UROD produce a reduction in the lag time period between last opiate use and the induction of an opiate antagonist, which is the timeframe most sensitive to relapse to illicit opiate use (Glasgow, Taylor, Bell, Young, and Bammer, 2001).

Additionally, rapid opiate detox is less disruptive to familial and work commitments and it is more cost effective than a 10-day inpatient detoxification program (Bearn, Gossop, and Strang, 1999; Rabinowitz, Cohen, and Atias, 2002). While costs geographically vary, an estimation of cost in New York State suggests that with Medicaid reimbursement, a one-month traditional treatment program comprising a week of inpatient detox and three weeks inpatient stay would cost approximately $11,000; whereas, the price of UROD in the private for-profit sector, which includes 15 aftercare sessions and six months of naltrexone therapy, approximates $6,000 (Rabinowitz, Cohen, and Atias, 2002). As such, after adjusting for differences in the costs of Medicaid coverage and private for-profit treatment, UROD offers significant cost saving over the dominant mode of 28-day inpatient treatment. Most importantly, ROD and UROD

permit the immediate induction of naltrexone and encourages compliance to naltrexone maintenance therapy (Hall et al., 1997; Rabinowitz, Cohen, Tarrasch, and Kotler, 1997).

In contrast, skeptics contend that ROD has been improperly popularized by the mass media as a 24-hour cure for opiate addiction (Spanagel, 1999). Treatment specialists have expressed disapproval of the unethical promotion of the antagonist induction protocols (Mayor, 1997; Brewer, Williams, Carreno-Rendueles, and Garcia, 1998). Thus, the need to emphasize that detoxification is only the first ingredient in maintaining an opiate free lifestyle, and the employment of long-term psychosocial therapy and pharmacological adjuncts should not be overshadowed. Moreover, it has been suggested that rapid opiate detoxification unnecessarily adds to the costs of treatment as a result of additional procedures involved, especially when the vast majority of patients can withdraw with the use of anaesthesia (Brewer, 1997; Hall, Mattick, Saunders et al., 1997).

Concerns have been raised about the increased risk involved in comparison to more conventional treatment techniques (Hall and Mattick, 2000; Spanagel, 1999) and the majority of extant studies have examined ROD/UROD techniques for individuals primarily dependent on opiate despite the notion that the majority of individuals seeking treatment are polydrugusers (Bearn, Gossop, and Strang, 1999). Moreover, the use of naltrexone as a maintenance technique enhances the possibility of a drug overdose if and when the patient experiences a relapse (Miotto, McCann, Rawson, Frosch, and Ling, 1997). In addition, the efficacy of rapid opiate detoxification is in question because of a lack of publications in peer-reviewed journals, and those in existence usually employ

small protocols with convenience samples only researching short-term outcomes (Gossop and Strang, 1997; Spanagel, 1999; Ward, Hall, and Mattick, 1999).

Overall, based on the extant research literature, the expert consensus is that additional research on ROD and UROD is needed to fully understand the pharmacological bases, treatment effectiveness, and safety of these approaches. Moreover, it is suggested that rapid detoxification treatments may be most fitting for a select subset of patients. In particular, this treatment detoxification option may be the most appropriate for well-motivated patients and for individuals who refuse to experience opiate withdrawal via conventional treatment methods because they are sensitive to withdrawal symptoms (Hall and Mattick, 2000). However, it must be noted that opiate dependent patients can benefit for the conventional use of naltrexone as a relapse prevention intervention.

Conclusion

In sum, the use of naltrexone for the treatment of opiate dependence has received mixed reviews by clients, addiction researchers, and community practitioners. Research has shown that using naltrexone as a relapse prevention intervention has been effective with certain demographic populations. Specifically, naltrexone treatment has demonstrated good outcomes with patients whose careers depended on compliance with treatment, such as medical professionals or business executives (Ling and Wesson, 1984; Washton, Pottash, and Gold, 1984), or in patients under contingency contracting, such as prisoners or probationers (Brahen et al., 1984). However, clinical trials have demonstrated there is still a need to increase medication compliance for naltrexone treatment. In contrast, the use of naltrexone as a withdrawal induction tool during rapid

opiate detox or during ultra rapid opiate detox is still deemed a controversial technique. Additional research is needed to prove naltrexone's efficiency and efficacy as an adjunct to psychosocial treatments for the treatment of opiate dependence. More promise has been established with the use of naltrexone in the treatment of alcohol dependence.

APPENDIX B

CLINICAL LITERATURE REVIEW ON THE USE OF NALTREXONE FOR THE TREATMENT OF ALCOHOL DEPENDENCE

Despite alcoholism being the most prevalent addiction, up until 1994 there was only one pharmacotherapy used to aide in the treatment of alcoholism – disulfiram (Antabuse®). Disulfiram serves as a negative reinforcement technique, in that it causes a disulfiram-ethanol reaction (DER) that includes facial flushing, headache, nausea, vomiting, and difficulties breathing. Despite disulfiram's widespread availability over the past half century, few rigorously controlled studies are in existence (Litten and Allen, 1998) and its use has been limited. In the a well-designed study by Fuller and colleagues (1986), 605 patients across nine sites received one of three treatment conditions of either 250 mg of disulfiram per day, a placebo of 1 mg of disulfiram per day, or no disulfiram. No significant differences among the three groups were found for abstinence, time until first drink, employment, and social stability (Fuller, Branchey, Brightwell, Derman, Emrick, Iber, James, Lacourseire, Lee, Lowstam, Maany, Neiderhiser, Nocks, and Shaw, 1986). Medication compliance in this study of veterans was low (Fuller et al., 1986).

A second carefully designed study found that disulfiram as an adjunct to psychosocial therapy, decreased the quantity and frequency of drinking at six months (Chick, Gough, Falkowski, Kershaw, Hore, Mehta, Ritson, Ropner, and Torley, 1992). However, this aversion therapy has not been embraced by the treatment community or its clients because it doesn't diminish the desire to drink. Thus, when the hallmark feature of alcoholism (the uncontrollable urge, desire, or craving to drink alcohol) overshadows

the power to control alcohol intake, the patient may quit taking the drug and perpetuate the cycle of alcoholism. This lack of interest in disulfiram by both the treatment community and patients results in need to uncover additional pharmacotherapies to treat the alcohol addicted population.

A Novel Treatment for Alcohol Addiction - Naltrexone

The approval of naltrexone by the U.S. Food and Drug Administration (FDA) in December of 1994 produced a good deal of media hype and was primarily based upon two landmark studies (O'Malley, Jaffe, Chang, Schottenfield, Meyer, and Rounsaville, 1992; Volpicelli, Alterman, Hayashida, and O'Brien, 1992). Both trials demonstrated that a 50mg daily dose of naltrexone reduced alcohol intake and decreased the relapse to heavy drinking over the course of twelve weeks. However, the Volpicelli et al. (1992) sample included a predominantly African-American sample of unemployed veterans who had been drinking heavily for approximately 20 years, whereas the O'Malley et al. (1992) sample included a predominately white sample of both males and females, the majority of which were unmarried and possessed full-time employment.

The first investigation was a double blind, placebo-controlled 12-week study of seventy alcohol dependent veterans by Volpicelli and colleagues (1992) at the Treatment Research Center in Philadelphia, PA. In conjunction with standard psychosocial therapy, patients received either 50 mg of naltrexone or a placebo daily on an outpatient basis. Naltrexone proved superior to placebo in that the naltrexone-treated subjects experienced a decrease in alcohol cravings whereas the placebo-treated patients experienced no reduction in their levels of craving (Volpicelli et al., 1992). The naltrexone group also reported less alcohol consumption, and those who did drink during the study consumed

alcohol on fewer days than the placebo group. Relapse was also assessed differently from previous studies, in that sampling alcohol, or "slipping," did not constitute a relapse. Volpicelli and colleagues defined relapse to alcohol abuse and dependence as consuming five or more drinks per setting, the presence of a blood alcohol concentration greater than the legal limit of 100 mg percent, or consuming alcohol five or more times during the previous week. According to this criterion, about 25% of the patients administered naltrexone relapsed, whereas over 50% of the placebo-treated subjects relapsed (Volpicelli et al., 1992). Only two patients withdrew as a result of side effects and the intensive psychosocial intervention aided in medication compliance (Volpicelli et al., 1992)

In an effort to replicate and extend the study by Volpicelli et al. (1992), a second 12-week double blind, placebo-controlled study, which added to the body of literature by incorporating two different psychosocial therapies, was conducted at the Yale University School of Medicine (O'Malley et al., 1992). Ninety-seven patients were randomly assigned into one of four treatment cells including: naltrexone and coping skills/relapse prevention therapy, naltrexone and supportive therapy, placebo and coping skills/relapse prevention therapy, or placebo and supportive therapy. In this study, O'Malley and colleagues (1992) found that naltrexone enhanced abstinence rates, and was superior to placebo on a number of alcohol consumption measures and alcohol-related problems. Specifically, naltrexone-treated subjects had fewer drinking days, and a reduction in alcohol consumption on those drinking days, than did placebo-treated subjects (O'Malley et al., 1992). Additionally, naltrexone-treated subjects had lower relapse rates and

exhibited fewer problems on the Addiction Severity Index (ASI) measures of alcohol, drugs, and employment problems (O'Malley et al., 1992).

Researchers also found an interaction effect between the use of medication and type of psychotherapy group. Whereas the naltrexone-treated subjects receiving supportive therapy were significantly less likely to sample a drink than the other three treatment groups, the naltrexone-treated subjects attending the coping skills therapy sessions were significantly less likely to relapse once a slip had occurred (O'Malley et al., 1992). Similar to the Volpicelli et al. (1992) study, only three patients withdrew from the study because of side effects and medication compliance was typically high.

The evidence produced in these two independent, double blind clinical trials has shown that naltrexone, when used in conjunction with psychosocial therapy, significantly reduces drinking levels, alcohol relapse, and the "high" feeling associated with drinking alcohol. In particular, these two milestone studies backed the use of this opiate antagonist as a safe and effective adjunct during the critical early stages of treatment for alcohol dependence, which resulted in a quick FDA approval of only six months. These promising preliminary findings provided the fuel for the media frenzy surrounding the phenomenon of naltrexone as a "magic bullet" cure to treat alcoholism. Additionally, other factors have contributed to piquing the interest of the general public and the substance abuse treatment field about the use of naltrexone. These other reasons include the absence of other pharmacotherapies, with the exception of disulfiram, to assist in the treatment of this chronic relapsing disease, the novelty of naltrexone, the reinvention of naltrexone to serve as an adjunct to psychosocial treatments of alcoholism, the non-addictive and non-abusive nature of naltrexone, and the hope that this drug will serve to

validate addiction as a disease (just as the advent of Prozac mainstreamed the mental disease of depression).

Articles targeted to the general public, such as "A Pill to Combat Alcoholism," (US. News & World Report, 1995), "A Sobering Pill for Problem Drinkers" (Cary, Chen, and Mason, 1995), and "Can this Pill Stop you from Hitting the Bottle?" (Kalb et al., 2001), disseminate information on naltrexone. However, articles in more practitioner/medical-oriented publications tout titles cautioning the attachment of the label "magic bullet" to naltrexone including "Naltrexone Promising, but No 'Silver Bullet,' Experts Say" (Alcoholism Report, 1995), "Drug Cuts Alcoholics' Relapse Rates in Half, but it's No Magic Bullet" (Modern Medicine, 1995), and "Far from 'Magic Bullet,' is Naltrexone even on the Radar Screen?" (Alcoholism & Drug Abuse Weekly, 1996). Experts in the field, including NIAAA Director Dr. Enoch Gordis and NIAAA Director of Research Dr. Richard Fuller, have warned that while naltrexone has the capacity to help many patients with their addictions, it is not a "magic bullet" or a "cure." Naltrexone must be used with established psychotherapy or counseling and, initially only be prescribed by physicians specializing in the field of addictions.

Subsequently, medication compliance was found to play a critical part in the use of naltrexone. An additional study by Volpicelli et al. (1997) found that despite the dropout rate of 27%, the efficacy of naltrexone (including less relapse and fewer drinking days) could only be found in patients who had taken over 90% of their medication, as determined by pill counts. It must also be noted, that there were no significant differences between the naltrexone-treated group and the placebo-treated group (Volpicelli, Rhines, Rhines, Volpicelli, Alterman, and O'Brien, 1997).

In an attempt to replicate and extend the extant studies on the efficacy of naltrexone (Volpicelli et al., 1992; O'Malley et al., 1992; Volpicelli et al., 1997) and to maximize internal validity via focusing on study group selection, size, and the measurement of compliance, Anton and colleagues (1999) conducted a randomized, double blind 12-week outpatient trial of the efficacy of naltrexone or placebo used in concert with cognitive behavioral therapy. The study included 131 alcohol-dependent individuals who received a treatment regime of 12-weekly sessions of manual-guided cognitive behavioral therapy and either 50 mg of naltrexone or a placebo treated with riboflavin to serve as a marker of compliance. High levels of medication compliance, therapy participation, and study completion were found among both treatment groups in this sample of motivated individuals with moderate alcohol dependence (Anton, Moak, Waid, Latham, Malcolm, and Dias, 1999). In regards to the efficacy of naltrexone, participants treated with naltrexone drank less, had a longer time until relapse, and had greater control over craving sensations (Anton et al., 1999). Additionally, over 62% of the naltrexone-treated group did not relapse to heavy drinking over the course of the study, in comparison with 40% of the placebo group (Anton, et al., 1999). The authors conclude that the combination of naltrexone and cognitive behavioral therapy may have a synergistic effect in treatment alcohol dependency among this demographic group (Anton et al., 1999).

Additional studies have supported the efficacy of naltrexone. In particular, research has reported that naltrexone, relative to placebo, reduces the high after the consumption of alcohol (Volpicelli, Watson, King, Sherman, and O'Brien, 1995), decreases both the level of intoxication and the incentive to drink after a "slip drinking"

has occurred (Davidson, Swift, and Fitz, 1996; O'Malley, Jaffe, Rode, and Rounsaville, 1996; Morris, Hopwood, Whelan, Gardiner, and Drummond, 2001). Consistent with the initial landmark studies, naltrexone-treated subjects have also had fewer relapses after sampling alcohol, demonstrated a lower consumption level per week, and reported drinking a lower number of drinks on drinking days than placebo-treated subjects (Morris et al., 2001).

Naltrexone also significantly reduces the urge to drink in response to alcohol cues (Davidson, Swift, and Fitz, 1996; Rohsenow, Monti, Hutchison, Swift, Colby, and Kaplan, 2000). Moreover, some of the benefits of short-term naltrexone treatment persist after the discontinuation of naltrexone treatment. One study reported that alcoholic patients treated with naltrexone have shown a reduction in abstinence rates through one month after the discontinuation of naltrexone treatment and were significantly less likely to meet the criteria for a diagnosis of alcohol abuse or dependence for upwards of six months (O'Malley, Jaffe, Chang, Rode, Schottenfeld, Meyer, and Rounsaville, 1996). The first multi-center controlled study of naltrexone revealed no safety concerns and found that naltrexone was effective when used in combination with psychosocial therapy in patients who comply with treatment (Chick, Anton, Checinski, Croop, Drummond, Farmer, Labriola, Marshall, Moncrieff, Morgan, Peters, and Ritson, 2000).

Naltrexone's Clinical Effectiveness is Questioned

Despite naltrexone's preliminary success and initial fame, a study published in the *New England Journal of Medicine* in 2001 raised questions about its' effectiveness. Researchers at the Department of Veterans Affairs (VA) Alcohol Research Center, Veterans Affairs Connecticut Health Care System conducted a multi-center, double blind,

placebo controlled evaluation of naltrexone (Krystal, Cramer, Krol, Kirk, Rosenheck, 2001). Krystal and colleagues (2001) randomly assigned 627 male veterans with chronic, severe alcohol dependence into one of three treatment conditions including12 months of 50mg of daily naltrexone, 3 months of naltrexone followed by 9 months of placebo, or 12 months of placebo. All patients received individual twelve-step facilitation counseling and were encouraged to attend Alcoholics Anonymous meetings. The three outcome variables of time to relapse during the first three months, the percentage of drinking days over a 12-month period, and the number of drinks per drinking day over the 12-month period were examined. The results from Krystal et al. (2001) revealed that naltrexone did not prevent or impede relapse to heavy drinking, decrease the overall number of drinking days, or reduce the amount of alcohol consumed during drinking days. As such, the data from this large, long-term multi-site study did not support the use of naltrexone treatment in men with chronic, severe alcohol dependence (Krystal, et al., 2001).

The Krystal et al. (2001) has received a great deal of publicity. An editorial by Dr. Richard K. Fuller, Director of NIAAA's Division of Clinical and Prevention Research, and Dr. Enoch Gordis, Director of NIAAA, accompanied the article in the *New England Journal of Medicine*. Fuller and Gordis (2001) note that six other well-designed studies have supported the efficacy of naltrexone in preventing relapse in compliant patients and the dis-concordant findings may be explained by several factors. These include that the typical patient in the Krystal et al. study differed from the other studies in that they were more likely to be male, veterans, were about 10 years older, were less likely to be married or cohabitating, and had been diagnosed as having severe alcohol dependence with a long duration of alcoholism (Fuller and Gordis, 2001). Moreover, the

importance of counseling and coping skills have been repeatedly validated; thus, a severely afflicted population, typical of the male Veterans Affairs population, might require more psychosocial therapies rather than a simple involvement in Alcoholics Anonymous (Fuller and Gordis, 2001). Fuller and Gordis (2001;1771) conclude "Until we have more information, we recommend that physicians continue to prescribe naltrexone for patients they think might benefit. Such patients appear to be those who have been drinking heavily for 20 years or less and have stable social support and living situations."

There are also additional reasons for the lack of significant effects of naltrexone in Krystal et al. multi-site trial. For example, the trial by Krystal and colleagues analyzed data for all patients who entered the study, despite compliance, while the previous studies only had significant naltrexone effects only when analyzing a sample of reasonably compliant patients (Rohsenow, 2001). Moreover, Krystal et al. did not report on the effects of two variables that were consistently affected by naltrexone in previous studies – the effect on heavy drinking days and the severity of drinking after the first drink (Rohsenow, 2001).

In addition to Krystal et al., other studies have found a lack of effects for patients using naltrexone. One double blind, placebo controlled study, randomly assigned patients to receive either 50 mg of naltrexone per day or a placebo during an inpatient setting in conjunction with cognitive-behavioral therapy and 12-step programming (Knox and Donovan, 1999). A comparison group of patients refusing any medication was included. No significant differences were found between the naltrexone-treated subjects and the placebo group for daily craving scores or for recidivism at three- and six-month

follow-ups (Knox and Donovan, 1999). However, Knox and Donovan (1999) reported that patients receiving naltrexone demonstrated greater improvement on the mean scores of irritability, anger, energy, self-confidence, and well-being but less improvement on stress, depression, paranoia, anxiety, and optimism that the other two groups. The authors suggest that naltrexone may not be effective in an inpatient treatment setting; however, since it has shown to be effective in outpatient settings, further long-term studies using a larger patient sample in an inpatient setting are warranted (Knox and Donovan, 1999).

Conclusion

Overall, naltrexone has demonstrated clinical efficacy and efficiency as a treatment for alcohol dependence, but only when used in concert with psychosocial therapies. Again, the results vary according to client's demographic characteristics with the ideal client being young, married, employed, and having minimal involvement in the criminal justice system (Farren, O'Malley, and Rounsaville, 1997). Additionally, an ideal patient would be motivated, under pressure from their employer or involved in contingency contracting (Ling and Wesson, 1984; Washton, Pottash, and Gold, 1984, Brahen et al., 1984), have family involvement, and be early in his/her substance abuse career (Farren, O'Malley, and Rounsaville, 1997).

Despite negative findings by the Krystal et al. study, in additional to other research, about the effectiveness of naltrexone in the treatment of alcoholism, the treatment field still supports the use of naltrexone with certain patients. This negative study must be weighed against a preponderance of randomized, placebo-controlled clinical trails supporting the effectiveness of naltrexone. In conclusion, the majority of

research supports the use of naltrexone as a pharmacological agent for reducing drinking behavior.