Published in final edited form as:
J Subst Abuse Treat. 2011 December ; 41(4): 374–385. doi:10.1016/j.jsat.2011.05.005.

Counselor Attitudes toward the Use of Buprenorphine in Substance Abuse Treatment: A Multi-level Modeling Approach

Traci R. Rieckmann, Ph.D.,
Department of Public Health and Preventive Medicine, Oregon Health & Science University, 3181 SW Sam Jackson Park Rd, Mailcode: CB 669, Portland, OR 97239, rieckman@ohsu.edu, Phone: 503-494-6739, Fax: 503-494-4981

Anne E. Kovas, M.P.H.,
Department of Psychiatry, Oregon Health & Science University, Portland, OR 97239

Bentson H. McFarland, M.D., Ph.D., and
Department of Psychiatry, Oregon Health & Science University, Portland, OR 97239

Amanda J. Abraham, Ph.D.
Institute for Behavioral Research, University of Georgia, Athens, GA 30602

Abstract

In spite of evidence that buprenorphine is effective, safe, and offers greater access as compared with methadone, implementation for treatment of opiate dependence continues to be weak. Research indicates that legal and regulatory factors, state policies, and organizational and provider variables affect adoption of buprenorphine. This study uses hierarchical linear modeling (HLM) to examine National Treatment Center Study (NTCS) data to identify counselor characteristics (attitudes, training, beliefs) and organizational factors (accreditation, caseload, access to buprenorphine and other evidence-based practices) that influence implementation of buprenorphine for treatment of opiate dependence. Analyses showed that provider training about buprenorphine, higher prevalence of opiate dependent clients, and less treatment program emphasis on a 12-step model predicted greater counselor acceptance and perceived effectiveness of buprenorphine. Results also indicate that program use of buprenorphine for any treatment purpose (detoxification, maintenance, and/or pain management) and time (calendar year in data collection) were associated with increased diffusion of knowledge about buprenorphine among counselors and with more favorable counselor attitudes toward buprenorphine.

1. Introduction

Heroin and prescription opioid abuse have increased substantially in the U.S. during the past decade (Substance Abuse and Mental Health Services Administration, 2000, 2009). An especially troubling aspect of this trend is the significant increase in misuse of prescription opioids (Boyd, Teter, West, Morales, & McCabe, 2009; Compton & Volkow, 2006; Denisco, Chandler, & Compton, 2008; Johnston, O'Malley, Bachman, & Schulenberg, 2007), with lifetime non-medical use of prescription pain relievers increasing three-fold over

Correspondence to: Traci R. Rieckmann.

the last decade (SAMHSA, 2000, 2009). In addition to the individual pain and suffering associated with substance dependence, research also points to high rates of unintentional overdose fatalities related to the use of opioid analgesics, increased emergency room visits, and extensive costs to society in terms of criminal activity, productivity losses and greater medical and social welfare costs (Hall et al., 2008; Mark, Woody, Juday, & Kleber, 2001; Novak & Ball, 2006). Given the increasing rates of opioid abuse, and diminishing resources, the gap has widened between the number of people who need treatment and those actually receiving it (Sullivan, Chawarski, O'Connor, Schottenfeld, & Fiellin, 2005).

For opioid-dependent patients, agonist therapy has been hailed as the most effective treatment, especially when combined with psychotherapy (Amato, Davoli, Ferri, Gowing, & Perucci, 2004; Anton et al., 1999; Barnett, Rodgers, & Bloch, 2001; Ling et al., 1998; Ling, Huber, & Rawson, 2001; Monti et al., 2001). In 1998, the National Institutes of Health (NIH) consensus panel recommended increased access to agonist therapies, improved funding and coverage within health plans, regulatory revision, and training for physicians and health care practitioners (National Consensus Development Panel on Effective Medical Treatment of Opiate Addiction, 1998). To date, methadone, a full mu-opioid agonist, has been used effectively for opioid treatment. Limitations and unique challenges including access to a special, highly regulated narcotic treatment program (Ling et al., 2001), daily dosing (Center for Substance Abuse Treatment, 2005), the social stigma of methadone maintenance and a lack of anonymity while waiting in dispensary lines have served as key barriers in use of methadone (Barnett et al., 2001).

Approved by the U.S. Food and Drug Administration (FDA) in 2002, the partial mu-opioid agonist buprenorphine (Subutex®) and buprenorphine/naloxone (Suboxone®) offer a significant advance in treatment of opioid dependence. Research to date confirms lower risk of abuse, overdose, and toxicity and diminished withdrawal symptoms when compared with use of either clonidine or methadone (Bell, Butler, Lawrance, Batey, & Salmelainen, 2009; Fiellin et al., 2002; Ling et al., 2005; Ziedonis et al., 2009), and increased retention in treatment with buprenorphine as compared with no medication (Amass et al., 2004; Kakko, Svanborg, Kree, & Hellig, 2003; Stein, Cioe, & Friedmann, 2005). In randomized clinical trials, buprenorphine was found to be more effective than placebo and at least as effective as methadone in terms of reducing illicit opioid use (Johnson et al., 1995; Johnson et al., 2000). Toxological safety of buprenorphine was confirmed in a recent study of immune-compromised, opioid-dependent patients (Vergara-Rodriguez et al., 2011).

To prescribe buprenorphine, physicians must apply for a waiver which requires completion of specific training, have the capacity to refer patients for counseling, and monitor treatment adherence with drug screening and pill counts (DATA 2000; Walley et al., 2008). Physicians with waivers to prescribe buprenorphine may treat up to 30 patients at a time for the first year and up to 100 patients at a time thereafter (CSAT, 2009; Thomas et al., 2008). The ability to offer buprenorphine in community-office based settings is critical to improved opioid treatment outcomes. Provider support programs like the Physician Clinical Support System (PCSS)-Buprenorphine physician mentor project (Egan et al., 2010) offer a network of experienced providers available to advise non-specialty physicians. Thus, buprenorphine provides a potentially significant expansion of the treatment system’s capacity for opioid-dependent clients because it can be used in outpatient clinics and office-based settings that offer greater anonymity and are less stigmatized, often less regulated, and more geographically diverse compared to methadone.

In spite of this significant innovation, adoption and regular use of buprenorphine remain less than anticipated. Utilization appears to be inhibited by limited funding, a paucity of prescribing physicians, policy and regulatory issues, and provider attitudes and beliefs about

buprenorphine (Knudsen, Ducharme, & Roman, 2007; Mark, Kassed, Vandivort-Warren, Levit, & Kranzler, 2009; Rieckmann, Daley, Fuller, Thomas, & McCarty, 2007). In a recent study of diffusion in the United States, only 18% of specialty addiction treatment centers reported using buprenorphine; within private treatment centers, 33% reported use for opioid detoxification and 21% were using the medication for maintenance (Knudsen, Abraham, Johnson, & Roman, 2009). In response to the poor uptake of innovations such as new medications, preliminary studies are beginning to examine the agency level or program factors that impact adoption. In terms of buprenorphine, early research suggests that organizational characteristics including access to a physician on staff or contract (Knudsen et al., 2009), accreditation (Knudsen et al., 2007), a larger size (Ducharme & Roman, 2009), having a hospital affiliation (Knudsen et al., 2007), involvement in research (Ducharme & Roman, 2009), offering detoxification services (Koch, Arfken, & Schuster, 2006; Knudsen et al., 2009), leadership that promotes the use of buprenorphine (Friedmann, Jiang, & Alexander, 2010; Wallack, Thomas, Martin, Chilingerian, & Reif, 2010) and experience with the medication (Ducharme, Knudsen, & Roman, 2007; Netherland et al., 2009) all appear to increase the likelihood of adoption of buprenorphine.

In addition to organizational factors that influence adoption of medications, substance abuse counselors play a significant role in the use of buprenorphine. Although counselors cannot prescribe medications, counselors generally create the treatment plan for the client, serve as the client's primary contact at the treatment program or clinic, and often suggest alternative therapies and options as the client moves through treatment. As such they function as "gatekeepers" for innovative practices including buprenorphine (Weiss et al., 2011). Evidence, however, suggests that knowledge of buprenorphine has not yet "diffused" among counselors in community-based treatment programs (Garner, 2009; Knudsen, Ducharme, Roman, & Link, 2005). Studies find a relationship between willingness to use buprenorphine with opioid-dependent patients and provider characteristics including education, treatment philosophy, experiences with medication-assisted treatment (MAT), length of time in the field, and attitudes toward the use of medications (Fuller, Rieckmann, McCarty, Smith, & Levine, 2005; Knudsen et al., 2005). Knowledge and understanding of how to use buprenorphine, the risks, and side-effects are essential to increasing information diffusion and buprenorphine delivery (Mark et al., 2003). Further, providers' perceptions about the beliefs of their peers are likely to influence use of medications to treat opiate dependence (Rieckmann et al., 2007). Finally, patient preference also appears to stimulate demand for access to buprenorphine, and increasingly patients report more positive attitudes toward buprenorphine as compared with methadone (Ridge, Gossop, Lintzeris, Winton, & Strang, 2009; Schwartz et al., 2008). Clearly, counselors play a role in access and adoption as they interact most directly with the clients considering use of this medication.

Given these preliminary studies regarding implementation of buprenorphine, one important step for understanding the delays in use is concurrent examination of relationships between *both* organizational factors and provider characteristics, attitudes, and beliefs about the use of buprenorphine. As the most direct influence on client treatment options and clinical decision-making, the therapists and physicians in addiction services serve as gatekeepers to the use of buprenorphine and other medications. The National Treatment Center Study (NTCS) is a family of longitudinal studies of substance abuse treatment programs in the United States with data collected over multiple survey waves from administrators, clinical directors, and counselors. This multi-site database allows for exploration regarding the use of buprenorphine. NTCS data collected from 2002 to 2004 has been used to assess counselor attitudes and buprenorphine adoption in public and private substance abuse treatment centers (Knudsen et al., 2005, 2007) and centers affiliated with the National Institute on Drug Abuse's (NIDA) Clinical Trials Network (Knudsen et al., 2007, 2009). Findings from these

earlier NTCS studies provided a theoretical framework to assess influences of counselor-level and program-level factors on counselor attitudes toward buprenorphine.

Because buprenorphine was FDA approved in late 2002, we were interested in more recent results, after the drug had been on the market for a few years. Therefore, the current project used the most current complete dataset wave of NTCS public center data collected from December 2004 through November 2006. Further, because we were interested in organizational factors and counselor characteristics which influence perceptions of buprenorphine, the current analysis employed Hierarchical Linear Modeling (HLM), which recognizes the nesting of counselors within treatment organizations. This type of modeling provides more realistic and conservative statistical testing than non-hierarchical approaches, such as regression analysis.

This study investigates both counselor/provider and organizational level variables that may influence the overall uptake of buprenorphine in substance abuse treatment programs. Specifically, this study examines how provider demographics, experiences, and preparation to use medications impact their attitudes and beliefs within the context of the treatment settings where they are employed.

2. Methods

Data for this study are taken from the National Treatment Center Study, a family of research studies of substance abuse treatment programs in the United States. Onsite data collection included face-to-face interviews with administrators in public drug treatment programs. At the time of onsite interview, administrators were asked to provide a list of counselors employed in the program. Subsequently, counselors were mailed a packet that included a description of the study, a letter inviting them to participate, a consent form, a paper copy of the questionnaire, and a postage paid return envelope. A $40 incentive was paid to counselors who returned a completed questionnaire.

All research procedures were approved by the Human Subjects Committee of the University of Georgia’s Institutional Review Board.

2.1. Sample

This paper analyzes data from the second wave of a nationally representative sample of publicly funded treatment programs (November 2004 – October 2006). Excluded from this sample are correctional and Veterans Health Administration facilities and programs exclusively focused on detoxification or methadone maintenance. Counselors in private practice, halfway houses, driving under the influence (DUI) programs, and transitional living facilities are also excluded from the sample (Abraham, Ducharme, & Roman, 2009). Treatment facilities were chosen using a two-stage sampling process, in which (1) all U.S. counties were grouped by population and assigned to one of ten strata, and (2) treatment facilities were randomly sampled from each stratum (for more detailed sampling scheme, see Abraham et al., 2009; Knudsen et al., 2005,2007). Telephone screening established study eligibility. Within each stratum, three percent of public treatment facilities were sampled. The final sample of 318 facilities included 80 percent of the eligible facilities.

From each facility, data were collected from one administrator and at least one counselor, with an average of 5 counselors (range: 1 to 57). Counselor data were not available from 84 facilities; reasons included “no response” and “refused to participate”. As described below, because this study used Hierarchical Linear Modeling (HLM) to analyze counselors nested within treatment facilities, those facilities with no counselor information could not contribute to the analysis. However, facilities excluded from the survey were not

significantly different than facilities included in the final analysis (Table 1). The final sample for analysis was N = 1,093 counselors in N = 234 facilities.

2.2. Measures

2.2.1. Dependent variables—Three dependent variables were examined: *perceived acceptability and perceived effectiveness* of buprenorphine, and *diffusion of knowledge* about buprenorphine. First, counselors were asked to rate the acceptability and effectiveness of FDA-approved addiction medications including buprenorphine. Counselors rated the acceptability of buprenorphine using a 1 – 7 scale: "Based on your knowledge and personal experience, to what extent do you consider buprenorphine ("Suboxone") to be acceptable? … 1=Not at all acceptable, and 7=Very acceptable. If you feel you cannot evaluate a particular technique's acceptability, please mark DK (don't know)." Counselors rated the effectiveness of buprenorphine using the same format. Histograms of buprenorphine acceptability and effectiveness data revealed skewness. Therefore, *perceived acceptability* was re-coded into a binary dependent variable, where 0 = scale responses of 1 – 4 ("not acceptable"; 41.7% of valid responses), and 1 = scale responses of 5 – 7 ("acceptable"; 58.3% of valid responses). Likewise, *perceived effectiveness* was re-coded into a second binary dependent variable, where 0 = scale responses of 1 – 4 ("not effective"; 53.7% of responses), and 1 = scale responses of 5 – 7 ("effective"; 46.3% of responses).

A third key dependent measure was diffusion of knowledge about buprenorphine. In keeping with prior research (Abraham et al., 2009; Knudsen et al., 2005; Rogers, 2003), a "don't know" response indicates lack of diffusion. A binary *diffusion of knowledge* variable was constructed, in which 1 = counselors who responded 'don't know' to *both* acceptability and effectiveness, and 0 = counselors who used the 1 – 7 scale to express an opinion about acceptability and/or effectiveness.

2.2.2. Independent variables—Consistent with prior research, several counselor-level characteristics were included in the HLM models as Level-1 predictors. From counselor surveys, data included counselor characteristics, caseload characteristics, buprenorphine training, and general attitudes about medications. Counselor characteristics included gender (1 = female), race (1 = white, 0 = non-white), age, level of education (1 = master's degree or higher), tenure (number of years the counselor had worked in the addiction treatment field), recovery status (1 = personally in recovery), and 12-step preference (3-item mean scale ranging from 1 – 7, with higher scores indicating a stronger endorsement of the 12-step treatment philosophy; adapted from Kasarabada, Hser, Parker, Hall, Anglin, & Chang et al., 2001; Knudsen et al., 2005). Provider caseload measures included current caseload size (number of patients to whom they were assigned as primary counselor), hours worked per week, and percentage of patients with heroin-dependent diagnoses. Training in buprenorphine was measured using a 1 – 7 scale, "To what extent has your center provided you with specific training about buprenorphine ("Suboxone")? … 1 = No extent, and 7 = Very great extent."

Administrator interviews collected data on treatment program characteristics which were included in the HLM models as Level-2 predictors. Organizational characteristics included profit status (1 = for-profit, 0 = non-profit), program description (1 = hospital based, 0 = freestanding unit), program size (number of full-time equivalent, FTE, employees; due to skew, this measure was log-transformed for analysis), accreditation status (1 = accredited, *e.g.,* by the Joint Commission, Commission on Accreditation of Rehabilitation Facilities, Council on Accreditation), interview year (November 2004 – October 2005 vs. November 2005 – October 2006), percent of master's level counselors, whether the program was based on the 12-step model (1 = program based on 12-step model), use of American Society of

Addiction Medicine-Patient Placement Criteria (1 = use ASAM-PPC), whether the program had access to a physician (1 = physician employed or on contract), use of the Addiction Severity Index or other standardized addiction dependence measure (1 = use ASI or other), a summed scale of seven items ranking the program's use of data to make decisions, having a quality management or continuous quality improvement plan (1 = have QM or CQI plan), and buprenorphine adoption (1 = program currently uses buprenorphine for detoxification, maintenance, and/or pain management). Finally, a variable was created based on each program's state, to identify each program's U.S. region, as defined by the U.S. Census Bureau).

2.3. Data analysis

To account for the nested structure of the data (counselors nested in treatment programs), data were analyzed using HLM 6.08 (Raudenbush, Bryk, & Congdon, 2004). In preparation for HLM analysis, SPSS version 18 was used for descriptive, bivariate, and preliminary multivariate analysis of the three dependent variables. Counselor-level independent variables were examined using logistic regression. Variables were retained for HLM analysis if they were statistically significant and/or theoretically relevant based on previous research (Knudsen et al., 2005,2007). Program-level independent variables were identified from previous research (Knudsen et al., 2005,2007). Additional preliminary analysis of each dependent variable included Chi-square tests and independent-samples t-tests to compare program-level characteristics.

Using HLM 6.08, two-level models were constructed to analyze counselor characteristics (Level-1) within the context of program/organizational characteristics (Level-2). Modeling began with construction of an unconditional model of each outcome, which included only the dependent variable (no predictor variables). Because the dependent variables were coded as binary outcomes, logistic (Bernoulli) HLM modeling was used. The level-1 error variance in all logistic regression models is fixed to $\pi^2/3 = 3.29$. The proportion of the total unexplained variance at Level-1 was estimated from the unconditional model as $\tau_0/(\tau_0 + \pi^2/3)$, where τ_0 is the Level 2 intercept variance (unexplained random variance at level 2) and $\pi^2/3$ is the Level 1 variance (as noted above). This proportion is numerically equal to the intra-class coefficient (ICC), and can be viewed as the proportion of variance in the dependent variable attributable to differences between treatment programs (Snijders & Bosker, 1999).

Initially a three-level HLM model was constructed to assess the influence of stratum as a potential predictor. This model included counselors (Level-1) within programs (Level-2) within strata (Level-3). The resulting three-level model was very similar to the two-level models (described below), except that HLM was unable to compute the robust standard errors. Because it appeared that there was little if any intra-stratum correlation, the three-level model was dropped in favor of two-level modeling.

First, a two-level logistic (Bernoulli) model was constructed to examine possible predictors of diffusion. Covariates included those variables found to be significant ($p < 0.10$) in preliminary regression analyses: buprenorphine training scale item, recovery status, years employed in the treatment field, gender, education, race, certification status, and the 3-item-mean 12-step preference variable. Organizational variables entered into HLM analysis included buprenorphine adoption, proportion of clients abusing or dependent on heroin, interview year, whether the program was based on a 12-step model, use of the ASAM-PPC, accreditation status, profit status, program size, and whether the program had access to a physician. Variables were centered on their respective grand mean values except or binary variables, which were left uncentered.

Next, separate two-level logistic (Bernoulli) HLM models were constructed to predict perceived acceptability and perceived effectiveness, respectively, among counselors who expressed an opinion about buprenorphine (using the rating scale). Employing the binary acceptability and effectiveness outcome variables (1 = effective / acceptable, 0 = not effective / not acceptable), logistic HLM models were constructed using the same predictors described above in HLM diffusion analysis. Because the effect of each predictor was expected to be common across programs, fixed effects models were used.

3. Results

3.1. Descriptive statistics

Participants included 1,093 counselors within 234 public treatment programs in 40 states. Table 1 shows characteristics of the treatment programs. Because this is a sample of publicly funded facilities, almost all programs were non-profit. Table 2 shows characteristics of the counselors within the public programs in the sample. A majority of counselors were white (62%), female (65%), and certified as addiction counselors (65%). Interestingly, approximately half of counselors (45%) reported personally being in recovery. A little less than half (43%) reported having a master's degree or higher. Counselors reported an average training score of 2.13 (on a 1 – 7 scale). Lack of diffusion of knowledge about buprenorphine was estimated to be 48%.

Of counselors who rated acceptability, 58% perceived buprenorphine as acceptable. Of counselors who rated effectiveness, 46% perceived buprenorphine as effective.

3.2. Bivariate analysis

Bivariate analysis was used first, to examine the direct association between program-level characteristics and each of the three independent variables.

Counselors were less likely to respond "don't know" to questions regarding buprenorphine acceptability and effectiveness (*diffusion of knowledge*) if they were working in a program that (a) had adopted buprenorphine (13.5% versus 53.7% of counselors in centers that had not adopted buprenorphine; $p < 0.01$); (b) had a smaller proportion of heroin-dependent clients ($M = 0.13$ vs. $M = 0.20$; $p < 0.01$); (c) used ASAM-PPC (43.8% vs. 54.8%; $p < 0.01$); (d) participated in the later part of data collection for this study (35.8% between November 2005 – October 2006 vs. 52.8% between November 2004 – October 2005; $p < 0.01$); and (e) had access to a physician (44.5% vs. 54.5%, $p < 0.01$). There were no differences based on program-level adherence to the 12-step model, accreditation status, profit status, or program size.

Counselors were more likely to perceive buprenorphine as *acceptable* if they were working in a program that (a) had adopted buprenorphine (73.0% versus 53.5%; $p < 0.01$); (b) had greater proportion of heroin-dependent clients ($M = 0.24$ vs. $M = 0.18$; $p < 0.01$); (c) was not based on the 12-step model (65.9% vs. 49.8%; $p < 0.01$); (d) used ASAM-PPC (63.9% vs. 46.0%; $p < 0.01$); (e) was accredited (63.7% vs. 54.5%; $p = 0.04$); and (f) participated later in the study (66.3% in 2005 – 2006 vs. 53.9% in 2004 – 2005; $p = 0.01$). There were no differences in perceived acceptability based on program-level profit status, program size, or access to a physician.

Counselors were more likely to perceive buprenorphine as *effective* if they were working in a program that (a) had adopted buprenorphine (68.1% versus 38.6%; $p < 0.01$); (b) had greater proportion of heroin-dependent clients ($M = 0.25$ vs. $M = 0.16$; $p < 0.01$); (c) was not based on the 12-step model (60.0% vs. 33.5%; $p < 0.01$); (d) used ASAM-PPC (52.0% vs. 35.1%; $p < 0.01$); (e) was accredited (55.3% vs. 40.4%; $p < 0.01$); and (f) participated

later in the study (53.0% in 2005 – 2006 vs. 42.4% in 2004 – 2005; p = 0.03);. There were no differences in perceived effectiveness based on program-level profit status, program size, or access to a physician.

3.3. Hierarchical Linear Models (HLM)

Table 3 shows the final HLM models of buprenorphine diffusion of knowledge, perceived acceptability, and perceived effectiveness. The first column of Table 3 presents the logistic HLM model estimating the odds that a counselor responded that he or she had an opinion about buprenorphine effectiveness and/or acceptability. The diffusion of knowledge HLM analysis included N = 1,004 counselors in N = 231 programs. After controlling for other predictors, the likelihood of a "don't know" response decreased with the receipt of buprenorphine-specific training. For each unit increase above the mean training, the likelihood of responding "don't know" decreased by 40% (p < 0.01). Similarly, for each additional year of experience in the treatment field, the likelihood of a "don't know" response decreased by 2% (p = 0.03). Finally, counselors in recovery were 33% less likely (p = 0.01) to respond "don't know", as compared to counselors who did not self-identify as being in recovery. Counselor-level variables that did not have a significant impact on buprenorphine diffusion included gender, age, 12-step preference, education, race, and certification status.

At the treatment program level, likelihood of a "don't know" response decreased by 78% (p < 0.01) among counselors working in programs where the medication was available for detoxification, maintenance, and/or pain management (buprenorphine adoption). Similarly, counselors in programs with a greater proportion of heroin-dependent clients had 62% (p = 0.04) lower odds of a "don't know" response for each standard deviation increase above the mean. Further, counselors in programs interviewed later in the survey were 35% less likely (p < 0.01) to respond "don't know". Finally program-wide use of the ASAM-PPC decreased the likelihood of "don't know" response, but at p = 0.06. After adjusting for counselor-characteristics, no other program-level variables were significant.

The second column of Table 3 presents the logistic HLM model estimating the odds that a counselor perceived buprenorphine to be acceptable. This model includes only counselors who expressed an opinion about buprenorphine acceptability (N = 480 counselors in N = 173 programs). In this analysis, after controlling for other predictors, odds of perceived acceptability increased 39% (p < 0.01) for each unit increase above mean buprenorphine training. No other counselor-level variables were significant. Interestingly, at the treatment program level, opinions about buprenorphine acceptability were not predicted by whether the program had adopted medication. However, use of the ASAM-PPC increased odds of perceived acceptability by 81% (p = 0.03). Finally, in programs based on the 12-step model, counselors were 59% less likely to perceive buprenorphine as acceptable (p < 0.01). After adjusting for counselor-characteristics, no other program-level variables were significant.

The third column of Table 3 presents the logistic HLM model estimating odds that a counselor perceived buprenorphine to be effective. This model includes only counselors who expressed an opinion about buprenorphine effectiveness (N = 426 counselors in N = 168 programs). In this analysis, after controlling for other predictors, odds of perceived effectiveness increased 24% (p = 0.01) for each unit increase above the mean for buprenorphine training. No other counselor-level variables were significant. At the treatment program level, the odds of perceived effectiveness were more than one-and-a-half times (156%) greater (p = 0.02) in programs that had adopted buprenorphine. Similarly, odds of perceived buprenorphine effectiveness were significantly greater among counselors in accredited programs (88% increase, p = 0.05), and in programs with a greater proportion of heroin-dependent clients (413% per unit increase above the mean proportion, p = 0.01).

However, as in the acceptability model, in programs based on the 12-step model, counselors were 77% less likely to perceive buprenorphine as effective. Finally, as in the diffusion of knowledge model, use of the ASAM-PPC increased odds of perceived effectiveness by 90% but the p-value was p = 0.06. After adjusting for counselor-characteristics, no other program-level variables were significant.

In comparison to bivariate analysis, very few program-level characteristics held significance in HLM analysis of diffusion of knowledge, perceived acceptability, and perceived effectiveness. This finding may reflect correlation between counselor and organizational characteristics. For example, buprenorphine training (a counselor characteristic) was greater in organizations that had adopted buprenorphine (M = 3.75 versus M = 1.86 on the 1 – 7 scale, p < 0.01). Similarly, 12-step preference was greater among counselors in organizations that emphasized the 12-step model (M = 4.75 versus M = 4.04 on the 1 – 7 scale, p < 0.01).

Estimates of ICC for the diffusion of knowledge model suggest that differences in programs accounted for approximately 21% of the total variation in the unconditional model, 11% in the counselor-level only model, and 8% in the full model. For the acceptability model, ICC estimates suggest that differences in programs accounted for approximately 16% of the total variation in the unconditional model, 12% in the counselor-level only model, and 10% in the full model. For the effectiveness model, ICC estimates suggest that differences in programs accounted for approximately 28% of the total variation in the unconditional model, 24% in the counselor-level only model, and 21% in the full model.

Goodness of fit was examined via the variance components. Both the diffusion of knowledge and perceived acceptability models appeared to fit the data well, as represented by p-values for the variance components (p = 0.06 and p = 0.08, respectively). However, the perceived effectiveness model's final estimation of variance components suggests that, after controlling for counselor and program-level predictors, there is still significant unexplained variation in effectiveness (variance component = 0.90, Chi-square = 201.85, df = 158, p = 0.01).

4. Discussion

Overall when compared with similar data collected in 2002–2004, our findings suggest that counselors' willingness to respond to questions about buprenorphine (diffusion of knowledge) has increased (52% compared to 34%) (Knudsen et al., 2005). Counselors also rated the effectiveness and acceptability of buprenorphine as higher than past studies, suggesting that there has been progress with implementation and positive experiences with this new medication (Knudsen et al., 2005). This result also corresponds with our finding that time was a consistent predictor of knowledge diffusion over the course of this project, such that counselors interviewed later in the study were more likely to express opinions about buprenorphine, as knowledge about this medication diffused into practice. Although encouraging overall, these findings also point to the slow and challenging process of adoption of innovations that has been reported throughout the literature on substance abuse treatment.

At a more focal level, our findings are consistent with prior research which found that counselor level characteristics were associated with attitudes toward buprenorphine (Knudsen et al., 2005,2007). Further, buprenorphine training for counselors was a significant predictor across all three models, and counselors who received greater levels of buprenorphine-specific training were more likely to express an opinion about the medication and rate buprenorphine as acceptable and effective for opiate treatment. Our results are

consistent with research which suggests that workforce development continues to influence adoption of innovations (Aarons, 2004; Bartholomew, Joe, Rowan-Szal, & Simpson, 2007; McCarty, Rieckmann, Green, Gallon, & Knudsen, 2004; Pagoto et al., 2007), and an absence of such training limits client access (Thomas & Miller, 2006). In other research regarding training and staff development, the lack of time to choose, learn, and master new interventions was found to be a significant barrier to adoption (Cook, Biyanova, & Coyne, 2009). Research has also shown that the quality of materials disseminated to staff, and the relevance, acceptability, and benefit of using the intervention all influence adoption (Simpson & Flynn, 2007). Thus, on-going training and supervision, coaching and feedback are necessary for successful implementation of new interventions, including medication-assisted treatments like buprenorphine (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005; Thomas et al., 2011).

The impact of additional counselor characteristics from this study also indicates that those with greater tenure in the field and those who identify as being in recovery were more likely to express an opinion about buprenorphine. This is consistent with previous findings from the nationally representative sample of counselors (Knudsen et al., 2005). However, in contrast to prior research, counselor education was not a significant predictor of knowledge of or attitudes toward buprenorphine. Interestingly, we did not find significant effects of the individual counselors' 12-step preference in relation to perceptions of buprenorphine acceptability and effectiveness, which is similar to some recent research (Lundgren, Krull, & Zerden, 2011) and also corresponds with findings in previous National Treatment Center Studies (Knudsen et al., 2005, 2007). These findings suggest that counselors' 12-step treatment preference and overall education at the individual clinician level may be less salient barriers to implementation of buprenorphine.

In terms of organizational-level determinants of implementation of buprenorphine, our results also show that factors such treatment program culture or philosophy, use of other evidence-based practices, client needs and demands, program accreditation, and access to the medication for clients currently in treatment all had a significant impact on counselor perceptions of buprenorphine. However, when examining each of the three multi-level models, the impact of each of these organizational characteristics varied. It is notable that access to a physician was not significant in multi-level modeling. Although we cannot be sure why, one explanation is that the National Treatment Center Survey addresses counselor attitudes and beliefs, rather than medication usage *per se*. It may also be that correlations between organizational factors and counselor characteristics obscured the importance of physician access.

Consistent with emerging research on implementation of new interventions, our findings reflect the importance of treatment program culture and philosophy. In our study, counselors working within a program based on the 12-step model were significantly less likely to view buprenorphine as either acceptable or effective. This is not surprising given that a 12-step treatment ideology is traditionally more abstinence-based (Schroeder, 2005) and is often not supportive of the use of medication assisted treatment as this approach is viewed as substituting one drug for another (McDowell & Cocke, 2006; White & Kurtz, 2005). This finding suggests that the stigma associated with opiate treatment has a strong influence on counselors' willingness to recommend buprenorphine to patients, and acknowledges the need to address the stigma and stereotypes present at the organizational level (McKenzie, Nunn, Zaller, Bazazi, & Rich, 2009; Thomas et al., 2008). However, given that buprenorphine does not require clients to obtain daily doses on-site, some of the social stigma and work-related interruptions may be removed; this is a benefit that 12-step programs must acknowledge if they seek expansion of evidence-based services and public funding (Thomas et al., 2008; Wallack et al., 2010). Finally, this finding was also consistent

with research regarding emphasis on a 12-step approach and attitudes toward alternate treatments such as medications and behavioral interventions. McGovern et al (2004) found that individuals who consistently support a 12-step model displayed less interest in addiction medications and less current use and motivation for most behavioral treatments. Additionally, practitioners who supported and encouraged cognitive behavioral therapy were also more open to pharmacotherapies (McGovern et al., 2004).

Results also suggest that client needs and demands help drive the implementation of a new medication such as buprenorphine. In our study, counselors working in programs with a greater proportion of heroin-dependent clients were more likely to have opinions about buprenorphine and rate it as an effective treatment technique. Client needs and demands might influence counselor beliefs via organizational factors. As noted, there were correlations between organizational factors and counselor characteristics. For example, counselors in organizations that had adopted buprenorphine reported more buprenorphine-specific training than other providers. Conceivably, client needs could have motivated organizations to adopt buprenorphine and to provide buprenorphine training to counselors. As opiate abuse and dependence have increased (Boyd et al., 2009; Compton & Volkow, 2006; Denisco et al., 2008; Johnston et al., 2007; SAMHSA, 2000, 2009), counselors are seeking evidence-based practices and innovations such as buprenorphine to improve quality of care. This finding also suggests that counselors are more likely to have positive views of innovations that fit with the needs of their patients (i.e., organizational fit) (Rogers, 2003). Further, it is likely that counselors working in programs that prescribe buprenorphine to opiate patients have seen positive outcomes or the benefits associated with buprenorphine use and are therefore more receptive to the medication, which corresponds with Rogers' work on observability and triability (2003).

Another organizational characteristic that appears to impact counselors perceptions is the use of other evidence-based practices and tools (Horgan, Reif, Ritter, & Lee, 2001; Kitson, 2009; Thomas, Wallack, Lee, McCarty, & Swift, 2003). Consistent with this research, in our study counselors working in programs that used the ASAM-PPC were more likely to perceive buprenorphine as acceptable for use in opiate treatment. Use of ASAM-PPC may be a marker for a treatment orientation that is more consistent with research and science-based tools, suggesting that these programs may be early adopters of best practices. This finding also corresponds with the research on organizational and institutional culture and adoption of innovations. According to Glisson and colleagues (2008), organizations that emphasized high levels of proficiency and low levels of rigidity and resistance sustain new treatments or services twice as long as those with low proficiency expectations and high rigidity. This suggests that encouraging programs to deemphasize rigidity and resistance by trying new practices and accelerating the use of several evidence-based practices should lead to a greater openness and acceptance of medications such as buprenorphine.

Use of buprenorphine in the program was a significant predictor of diffusion and buprenorphine acceptability, indicating that exposure to the medication via use in the program was associated with more positive views of the buprenorphine. Therefore, when the organization's leadership and treatment culture support innovation and adoption of evidence-based practices, the staff appear to engage and respond more positively to use of buprenorphine.

Finally, counselors employed in programs with national accreditation were more likely to view buprenorphine as an effective treatment. Accreditation or certification typically involves the review, critique and adjustment of specific indicators regarded as linked to improved outcomes and quality of care overall (Alexander, Wheeler, Nahra, & Lemak, 1998; Chassin, Loeb, Schmaltz, & Wachter, 2010; Ducharme, Knudsen, Roman, 2007; Joint

Commission, 2010). Prior research also suggests that accredited programs offer a greater number of some evidence-based practices such as wrap-around services and continuing care which were linked with improved treatment outcomes (Chriqui, Terry-McElrath, McBride, Eidson, & VanderWaal, 2007). Thus, our findings are consistent with previous research which indicates that accreditation standards may contribute to use of evidence-based practices and as such these external accrediting bodies may promote implementation of medications such as buprenorphine (Knudsen, Ducharme, & Roman, 2006a; Knudsen, Ducharme, & Roman, 2006b; Oser & Roman, 2007). Further, our findings suggest that the influence of accreditation criteria may extend beyond the organization or program-level directly to counselors' opinions and decision-making about the effectiveness of interventions.

Overall, our findings suggest that (a) specific training about buprenorphine is useful, (b) counselor attitudes toward buprenorphine are improving over time, and (c) having a program-wide treatment philosophy that does not emphasize a 12-Step model facilitates implementation. These findings are important in terms of translational research as they confirm the need to address knowledge and attitudes of front line providers, but they also emphasize the importance of organizational culture and support for the adoption of new practices. Thus, policies and funding that promote the hiring and continued training of clinical staff as well as efforts that encourage a program-wide emphasis on empirically-based treatment may positively influence providers' acceptance of and perceptions about medication-assisted treatments including buprenorphine. As a critical link to the diffusion of medications, the important role of counselors and associated efforts to improve their willingness to suggest buprenorphine to their clients cannot be ignored.

4.1. Limitations

One limitation is the issue of causality. With a cross-sectional design, it is difficult to know the causality between knowledge and organizational characteristics and services. It is possible that counselors who believe in medical treatments would choose to cluster in organizations that offer continuing education, or do not rely on 12-step programs. It is also possible that a program's provision of buprenorphine on-site could be the result of counselor attitudes and support for medication-assisted treatment.

Second, there may be unmeasured factors that affect counselor attitudes toward buprenorphine. The HLM models presented here are comprehensive in the sense of looking at both individual (counselor) and institutional (treatment program) factors simultaneously. Furthermore, models of diffusion and acceptability appeared to fit the data well. However, even after adjusting for counselor and program characteristics, unexplained variance remained in terms of beliefs regarding buprenorphine effectiveness, suggesting there are unmeasured factors at play. Indeed, estimates for coefficients in all three models may be biased because the models do not account for unmeasured predictors.

Another limitation is the amount of missing data. At the counselor-level, the diffusion analysis represented 1,004 counselors (91.9% of the counselor sample) in 231 programs (98.7% of the program sample). However, respondents who did not rate buprenorphine acceptability and/or effectiveness (either by answering "don't know" or leaving the item blank) could not contribute data to the respective HLM analyses. Therefore, the acceptability analysis represented 480 counselors in 173 programs (43.9% of the counselor sample, 73.9% of the program sample), while the effectiveness analysis represented 426 counselors in 168 programs (39.0% of the counselor sample, 71.8% of the program sample). This finding that the majority of participants were unable to rate buprenorphine acceptability and/or effectiveness may be related to time. Buprenorphine was approved by the Food and Drug Administration in October 2002, and some study respondents were interviewed just

two years later. The significant relationship between study year and diffusion found in this study suggests that buprenorphine use is increasing and it may be becoming more accessible for clients with opioid dependence.

Taken together, this work represents a large sample of counselors nested within treatment programs, and the sample appears to be nationally representative of all publicly funded programs. At the same time, because the data is focused on publicly funded treatment programs, results are not necessarily generalizable to other sectors of the treatment system. Future research should examine counselor attitudes toward buprenorphine in privately funded treatment programs as well as in other settings such as community health clinics. Finally, as the largest sector of our service delivery system, continued examination of nationally representative samples of treatment programs and their use of a range of evidence-based practices including medications is certainly warranted and critical in ensuring high quality services for all clients.

Acknowledgments

This work was supported by the National Institute on Drug Abuse, Award #5K23DA021225 and NIDA Grant R01DA13110.

References

Aarons GA. Mental health provider attitudes toward adoption of evidence-based practice: The evidence-based practice attitude scale (EBPAS). Mental Health Services Research. 2004; 6(2):61–74. [PubMed: 15224451]

Abraham AJ, Ducharme LJ, Roman PM. Counselor attitudes toward pharmacotherapies for alcohol dependence. Journal of Studies on Alcohol and Drugs. 2009; 70(4):628–635. [PubMed: 19515305]

Alexander JA, Wheeler JR, Nahra TA, Lemak CH. Managed care and technical efficiency in outpatient substance abuse treatment units. The Journal of Behavioral Health Services & Research. 1998; 25(4):377–396.

Amass L, Ling W, Freese T, Reiber C, Annon J, Cohen A, Horton T. Bringing buprenorphine-naloxone detoxification to community treatment providers: The NIDA Clinical Trials Network field experience. The American Journal of Addictions. 2004; 13(1):542–566.

Amato L, Davoli M, Ferri M, Gowing L, Perucci CA. Effectiveness of interventions on opiate withdrawal treatment: An overview of systematic reviews. Drug and Alcohol Dependence. 2004; 73(3):219–226. [PubMed: 15036544]

Anton R, Moak D, Waid R, Latham P, Malcolm R, Dias J. Naltrexone and cognitive behavioral therapy for the treatment of outpatient alcoholics: Results of a placebo-controlled trial. The American Journal of Psychiatry. 1999; 156(11):1758–1764. [PubMed: 10553740]

Barnett P, Rodgers J, Bloch D. A meta-analysis comparing buprenorphine to methadone for treatment of opiate dependence. Addiction. 2001; 96(5):683–690. [PubMed: 11331027]

Bartholomew NG, Joe GW, Rowan-Szal GA, Simpson DD. Counselor assessments of training and adoption barriers. Journal of Substance Abuse Treatment. 2007; 33(2):193–199. [PubMed: 17434707]

Bell JR, Butler B, Lawrance A, Batey R, Salmelainen P. Comparing overdose mortality associated with methadone and buprenorphine treatment. Drug and Alcohol Dependence. 2009; 104(1–2):73–77. [PubMed: 19443138]

Boyd CJ, Teter CJ, West BT, Morales M, McCabe SE. Non-medical use of prescription analgesics: A three-year national longitudinal study. Journal of Addictive Diseases. 2009; 28(3):232–242. [PubMed: 20155592]

Bryk, A.; Raudenbush, S. Hierarchical linear models: Applications and data analysis methods. 2nd ed.. Thousand Oaks, CA: Sage Publications; 2002.

Center for Substance Abuse Treatment. Medication-assisted treatment for opioid addiction in opioid treatment programs. Rockville, MD: Substance Abuse and Mental Health Administration; 2005.

Center for Substance Abuse Treatment. Buprenorphine: A guide for nurses. Rockville, MD: Substance Abuse and Mental Health Administration; 2009.

Chassin MR, Loeb JM, Schmaltz SP, Wachter RM. Accountability measures--using measurement to promote quality improvement. The New England Journal of Medicine. 2010; 363(7):683–688. [PubMed: 20573915]

Chriqui JF, Terry-McElrath Y, McBride DC, Eidson SS, VanderWaal CJ. Does state certification or licensure influence outpatient substance abuse treatment program practices? Journal of Behavioral Health Services and Research. 2007; 34(3):309–328. [PubMed: 17592782]

Compton W, Volkow N. Major increases in opioid analgesic abuse in the United States: Concerns and strategies. Drug and Alcohol Dependence. 2006; 81:103–107. [PubMed: 16023304]

Cook JM, Biyanova T, Coyne JC. Barriers to adoption of new treatments: An internet study of practicing community psychotherapists. Administration and Policy in Mental Health. 2009; 36:83–90. [PubMed: 19104928]

Denisco R, Chandler R, Compton W. Addressing the intersecting problems of opioid misuse and chronic pain treatment. Experimental and Clinical Psychopharmacology. 2008; 16(5):417–428. [PubMed: 18837638]

Ducharme L, Knudsen H, Roman P. Innovation adoption in substance abuse treatment: Exposure, trialability, and the Clinical Trials Network. Journal of Substance Abuse Treatment. 2007; 32:321–329. [PubMed: 17481455]

Ducharme L, Roman P. Opioid treatment programs in the Clinical Trials Network: Representativeness and buprenorphine adoption. Journal of Substance Abuse Treatment. 2009; 37(1):90–94. [PubMed: 19004597]

Egan JE, Casadonte P, Gartenmann T, Martin J, McCance-Katz EF, Netherland J, Renner JA, Weiss L, Saxon AJ, Fiellin DA. The Physician Clinical Support System-Buprenorphine (PCSS-B): A novel project to expand/improve buprenorphine treatment. Journal of General Internal Medicine. 2010; 25(9):936–941. [PubMed: 20458550]

Fiellin DA, Pantalon MV, Pakes JP, O'Connor PG, Chawarski M, Schottenfeld RS. Treatment of heroin dependence with buprenorphine in primary care. American Journal of Drug and Alcohol Abuse. 2002; 28(2):231–241. [PubMed: 12014814]

Fixsen, DL.; Naoom, SF.; Blase, KA.; Friedman, RM.; Wallace, F. Implementation research: A synthesis of the literature. Tampa, FL: University of South Florida, Louis de la Parte Florida Mental Health Institute; 2005.

Friedmann PD, Jiang L, Alexander JA. Top manager effects on buprenorphine adoption in outpatient substance abuse treatment programs. The Journal of Behavioral Health Services & Research. 2010; 37(3):322–337.

Fuller B, Rieckmann T, McCarty D, Smith K, Levine H. Adoption of naltrexone to treat alcohol dependence. Journal of Substance Abuse Treatment. 2005; 28(3):273–280. [PubMed: 15857728]

Garner BR. Research on the diffusion of evidence-based treatments within substance abuse treatment: A systematic review. Journal of Substance Abuse Treatment. 2009; 36(4):376–399. [PubMed: 19008068]

Glisson C, Landsverk J, Schoenwald S, Kelleher K, Hoagwood KE, Mayberg S. Research Network on Youth Mental Health. Assessing the organizational social context (OSC) of mental health services: Implications for research and practice. Administration and Policy in Mental Health. 2008; 35(1–2): 98–113. [PubMed: 18085434]

Hall AJ, Logan JE, Toblin RL, Kaplan JA, Kraner JC, Bixler D, Paulozzi LJ. Patterns of abuse among unintentional pharmaceutical overdose fatalities. Journal of American Medical Association. 2008; 300(22):2613–2620.

Horgan CM, Reif S, Ritter GA, Lee MT. Organizational and financial issues in the delivery of substance abuse treatment services. Recent Developments in Alcoholism. 2001; 15:9–26. [PubMed: 11449759]

Johnson R, Chutuape M, Strain E, Walsh S, Stitzer M, Bigelow G. A comparison of levomethadyl acetate, buprenorphine, and methadone for opioid dependence. The New England Journal of Medicine. 2000; 343(18):1290–1297. [PubMed: 11058673]

Johnson R, Eissenberg T, Stitzer M, Strain E, Liebson I, Bigelow G. A placebo controlled clinical trial of buprenorphine as a treatment for opioid dependence. Drug and Alcohol Dependence. 1995; 40(1):17–25. [PubMed: 8746920]

Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Bethesda, MD: National Institute on Drug Abuse; 2007. Monitoring the Future national survey results on drug use, 1975–2006: Volume I, secondary school students. NIH publication no. 07-6205

Joint Commission. Facts about behavioral health care accreditation. Oakbrook Terrace, IL: Joint Commission; 2010. >http://www.jointcommission.org/assets/1/18/Behavioral_Health_Care_Accreditation.pdf

Kakko J, Svanborg K, Kree M, Hellig M. 1-year retention and social function after buprenorphine-assisted relapse prevention treatment for heroin dependence in Sweden: A randomized, placebo-controlled trial. The Lancet. 2003; 361:662–668.

Kasarabada ND, Hser YI, Parker L, Hall E, Anglin MD, Chang E. A self-administered instrument for assessing therapeutic approaches of drug-user treatment counselors. Substance Use and Misuse. 2001; 36(3):273–299. [PubMed: 11325167]

Kitson AL. The need for systems change: Reflections on knowledge translation and organizational change. Journal of Advanced Nursing. 2009; 65(1):217–228. [PubMed: 19032518]

Knudsen H, Abraham A, Johnson A, Roman P. Buprenorphine adoption in the National Drug Abuse Clinical Trials Network. Journal of Substance Abuse Treatment. 2009; 37(3):307–312. [PubMed: 19577406]

Knudsen H, Ducharme L, Roman P. The adoption of medications in substance abuse treatment: Associations with organizational characteristics and technology clusters. Drug and Alcohol Dependence. 2006a; 87:164–174. [PubMed: 16971059]

Knudsen H, Ducharme L, Roman P. Early adoption of buprenorphine in substance abuse treatment centers: Data from the private and public sectors. Journal of Substance Abuse Treatment. 2006b; 30:363–373. [PubMed: 16716852]

Knudsen H, Ducharme L, Roman P. The adoption of medications in substance abuse treatment: Associations with organizational characteristics and technology clusters. Drug and Alcohol Dependence. 2007; 87:164–174. [PubMed: 16971059]

Knudsen H, Ducharme L, Roman P, Link T. Buprenorphine diffusion: The attitudes of substance abuse treatment counselors. Journal of Substance Abuse Treatment. 2005; 29(2):95–106. [PubMed: 16135338]

Knudsen HK, Ducharme LJ, Roman PM. Research network involvement and addiction treatment center staff: Counselor attitudes toward buprenorphine. The American Journal on Addictions. 2007; 16(5):365–371. [PubMed: 17882607]

Koch AL, Arfken CL, Schuster CR. Characteristics of U.S. substance abuse treatment facilities adopting buprenorphine in its initial stage of availability. Drug and Alcohol Dependence. 2006; 83(3):274–278. [PubMed: 16413146]

Ling W, Charuvastra C, Collins J, Batki S, Brown L, Kintaudi P, Segal D. Buprenorphine maintenance treatment of opiate dependence: A multicenter, randomized clinical trial. Addiction. 1998; 93(4): 475–486. [PubMed: 9684386]

Ling W, Huber A, Rawson R. New trends in opiate pharmacotherapy. Drug and Alcohol Review. 2001; 20:79–94.

Ling W, Amass L, Shoptaw S, Annon JJ, Hillhouse M, Babcock D. Buprenorphine Study Protocol Group. A multi-center randomized trial of buprenorphine-naloxone versus clonidine for opioid detoxification: Findings from the National Institute on Drug Abuse Clinical Trials Network. Addiction. 2005; 100(8):1090–1100. [PubMed: 16042639]

Lundgren L, Krull I, Zerden LD, McCarty D. Community based addiction treatment staff attitudes about the usefulness of evidence-based addiction treatment and CBO organizational linkages to research institutions. Evaluation and Program Planning. 2001 2011 Mar 9. [Epub ahead of print].

Mark T, Kassed C, Vandivort-Warren R, Levit K, Kranzler H. Alcohol and opioid dependence medications: Prescription trends overall and by physician activity. Drug and Alcohol Dependence. 2009; 99:345–349. [PubMed: 18819759]

Mark T, Kranzler H, Poole V, Hagen C, McLeod C, Crosse S. Barriers to the use of medications to treat alcoholism. The American Journal of Addiction. 2003; 12(4):281–294.

Mark TL, Woody GE, Juday T, Kleber HD. The economic costs of heroin addiction in the United States. Drug and Alcohol Dependence. 2001; 61(2):195–206. [PubMed: 11137285]

McCarty D, Rieckmann T, Green C, Gallon S, Knudsen H. Training rural practitioners to use buprenorphine: Using the change book to facilitate technology transfer. Journal of Substance Abuse Treatment. 2004; 26(3):203–208. [PubMed: 15063914]

McDowell DM, Cocke C. Office-based treatment of opiate-dependent patients with buprenorphine: It's about time. Primary Psychiatry. 2006; 13:68–73.

McGovern M, Fox T, Xie H, Drake R. A survey of clinical practices and readiness to adopt evidence-based practices: Dissemination research in an addiction treatment system. Journal of Substance Abuse Treatment. 2004; 26:305–312. [PubMed: 15182895]

McKenzie M, Nunn A, Zaller ND, Bazazi AR, Rich JD. Overcoming obstacles to implementing methadone maintenance therapy for prisoners: Implications for policy and practice. Journal of Opioid Management. 2009; 5(4):219–227. [PubMed: 19736902]

Monti P, Rohsenow D, Swift R, Gulliver S, Colby S, Mueller T, Asher M. Naltrexone and cue exposure with coping and communication skills training for alcoholics: Treatment process and 1-year outcomes. Alcoholism: Clinical and Experimental Research. 2001; 25(11):1634–1647.

National Consensus Development Panel on Effective Medical Treatment of Opiate Addiction. Effective medical treatment of opiate addiction. Journal of American Medical Association. 1998; 280:1936–1943.

Netherland J, Botsko M, Egan JE, Saxon AJ, Cunningham CO, Finkelstein R. BHIVES Collaborative. Factors affecting willingness to provide buprenorphine treatment. Journal of Substance Abuse Treatment. 2009; 36(3):244–251. [PubMed: 18715741]

Novak, S.; Ball, J. Emergency department visits involving nonmedical use of selected pharmaceuticals. Rockville, MD: Office of Applied Studies, Substance Abuse and Mental Health Services Administration; 2006. No. 23)

Oser CB, Roman PM. Organizational-level predictors of adoption across time: Naltrexone in private substance-use disorders treatment centers. Journal of Studies on Alcohol and Drugs. 2007; 68(6): 852–861. [PubMed: 17960303]

Pagoto SL, Spring B, Coups EJ, Mulvaney S, Coutu MF, Ozakinci G. Barriers and facilitators of evidence-based practice perceived by behavioral science health professionals. Journal of Clinical Psychology. 2007; 63(7):695–705. [PubMed: 17551940]

Ridge G, Gossop M, Lintzeris N, Witton J, Strang J. Factors associated with the prescribing of buprenorphine or methadone for treatment of opiate dependence. Journal of Substance Abuse Treatment. 2009; 37(1):95–100. [PubMed: 19004598]

Rieckmann T, Daley M, Fuller B, Thomas C, McCarty D. Client and counselor attitudes toward the use of medications for treatment of opioid dependence. Journal of Substance Abuse Treatment. 2007; 32(2):207–215. [PubMed: 17306729]

Rogers, EM., editor. Diffusion of innovations. 5th ed.. New York: Free Press; 2003.

Schroeder SA. An agenda to combat substance abuse. Health Affairs. 2005; 24:1005–1013. [PubMed: 16012140]

Schwartz R, Kelly S, O'Grady K, Mitchell S, Peterson J, Reisinger H, Brown B. Attitudes toward buprenorphine and methadone among opioid-dependent individuals. American Journal on Addictions. 2008; 17(5):396–401. [PubMed: 18770082]

Simpson DD, Flynn PM. Moving innovations into treatment: A stage-based approach to program change. Journal of Substance Abuse Treatment. 2007; 33(2):111–120. [PubMed: 17434704]

Snijders, TAB.; Bosker, RJ. Multilevel analysis: An introduction to basic and advanced multilevel modeling. London, United Kingdom: Sage; 1999.

Stein M, Cioe P, Friedmann P. Buprenorphine retention in primary care. Journal of General Internal Medicine. 2005; 20:1038–1041. [PubMed: 16307630]

Substance Abuse and Mental Health Services Administration. National Household Survey on Drug Abuse: Main findings, 1998. Rockville, MD: U.S. Department of Health and Human Services; 2000.

Substance Abuse and Mental Health Services Administration. Results from the 2008 National Survey on Drug Use and Health: National findings. Rockville, MD: U.S. Department of Health and Human Services; 2009. (office of applied studies, NSDUH series H-36, HHS publication no. SMA 09-4434)

Substance Abuse and Mental Health Services Administration, Office of Applied Studies. Heroin and other opiate admissions to substance abuse treatment: The TEDS report. Rockville, MD: U.S. Department of Health and Human Services; 2009.

Sullivan L, Chawarski M, O'Connor P, Schottenfeld R, Fiellin D. The practice of office-based buprenorphine treatment of opioid dependence: Is it associated with new patients entering into treatment? Drug and Alcohol Dependence. 2005; 79:113–116. [PubMed: 15943950]

Thomas C, Reif S, Haq S, Wallack S, Hoyt A, Ritter G. Use of buprenorphine for addiction treatment perspectives of addiction specialists and general psychiatrists. Psychiatric Services. 2008; 59(8): 909–916. [PubMed: 18678689]

Thomas C, Wallack S, Lee S, McCarty D, Swift R. Research to practice: Adoption of naltrexone in alcoholism treatment. Journal of Substance Abuse Treatment. 2003; 24:1–11. [PubMed: 12646325]

Thomas SE, Miller PM. Knowledge and attitudes about pharmacotherapy for alcoholism: A survey of counselors and administrators in community-based addiction treatment centres. Alcohol and Alcoholism. 2007; 42(2):113–118. [PubMed: 17172258]

Thomas CP, Garnick DW, Horgan CM, McCorry F, Gmyrek A, Chalk M, Thatcher J. Advancing performance measures for use of medications in substance abuse treatment. Journal of Substance Abuse Treatment. 2011; 40:35–43. [PubMed: 20934836]

Vergara-Rodriguez P, Tozzi MJ, Botsko M, Nandi V, Altice F, Egan JE, O'Connor PG, Sullivan LE, Fiellin DA. BHIVES Collaborative. Hepatic safety and lack of antiretroviral interactions with buprenorphine/naloxone in HIV-infected opioid-dependent patients. Journal of Acquired Immune Deficiency Syndromes. 2011; 56(Suppl 1):S62–S67. [PubMed: 21317596]

Wallack SS, Thomas CP, Martin TC, Chilingerian J, Reif S. Substance abuse treatment organizations as mediators of social policy: Slowing the adoption of a congressionally approved medication. Journal of Behavioral Health Services & Research. 2010; 37(1):64–78. [PubMed: 18668369]

Walley A, Alperen J, Cheng D, Bottice M, Castro-Donlan C, Samet J, Alford D. Office-based management of opioid dependence with buprenorphine: Clinical practices and barriers. Journal of General Internal Medicine. 2008; 23(9):1393–1398. [PubMed: 18592319]

Weiss L, Netherland J, Egan JE, Flanigan TP, Fiellin DA, Finkelstein R, Altice FL. BHIVES Collaborative. Integration of buprenorphine/naloxone treatment into HIV clinical care: lessons from the BHIVES collaborative. Journal of Acquired Immune Deficiency Syndromes. 2011; 56(Suppl 1):S68–S75. [PubMed: 21317597]

White, W.; Kurtz, E. The varieties of recovery experience. Chicago, IL: Great Lakes Addiction Technology Transfer Center; 2005.

Ziedonis DM, Amass L, Steinberg M, Woody G, Krejci J, Annon JJ, Ling W. Predictors of outcome for short-term medically supervised opioid withdrawal during a randomized, multicenter trial of buprenorphine-naloxone and clonidine in the NIDA Clinical Trials Network drug and alcohol dependence. Drug and Alcohol Dependence. 2009; 99(1–3):28–36. [PubMed: 18805656]

Table 1

Descriptive public treatment program statistics

Program-level characteristics	Programs in modeling (n = 234)		Programs not in modeling (n = 84)	
Center currently uses buprenorphine (adoption)	24 (10.26%)		13 (15.47%)	
Heroin-dependent caseload, proportion *M* (SD)		17.09 (21.34)		15.48 (19.22)
Counselors employed (Size: log-transformed FTEs)		2.8 (0.8)		2.76 (1.38)
Accredited by JCAHO or CARF	79 (33.76%)		23 (27.38%)	
12-step model	118 (50.43%)		38 (45.24%)	
ASAM-PPC used	129 (55.13%)		49 (58.33%)	
Non-profit	219 (93.59%)		79 (94.05%)	
Access to a physician	136 (58.12%)		55 (65.48%)	

Table 2

Descriptive counselor statistics for each analysis

Counselor-level characteristics	Counselors in total sample (N = 1093) N (%)	
Female	711 (65.05%)	
Age, *M* (*SD*)		45.53 (11.56)
Race: White	677 (61.94%)	
In recovery	491 (44.92%)	
Master's degree or higher	469 (42.91%)	
Certified addictions counselor	690 (63.22%)	
Years in substance abuse treatment field		9.52 (7.41)
12-Step preference (sum scale 1 – 7)		4.39 (1.55)
Buprenorphine training (scale 1 – 7)		2.13 (1.84)
Diffusion (counselors who responded "don't know" to both buprenorphine effectiveness and acceptability)	522 (47.76%)	
Perceived acceptability of buprenorphine		
Counselors who expressed an opinion	515 (47.12%)	
Acceptability (scale 1 – 7)		4.75 (1.88)
"Acceptable" (binary, scale responses 5 – 7)	300 (58.25%)	
Perceived effectiveness of buprenorphine		
Counselors who expressed an opinion	456 (41.72%)	
Effectiveness (scale 1 – 7)		4.24 (1.72)
"Effective" (binary, scale responses 5 – 7)	211 (46.27%)	

Table 3

Logistic HLM Models of Diffusion of Knowledge, Perceived Acceptability, and Perceived Effectiveness of Buprenorphine

	Diffusion of Knowledge [1] (N = 1,004 Counselors N = 231 Centers)			Perceived Acceptability (N = 480 Counselors N = 173 Centers)			Perceived Effectiveness (N = 426 Counselors N = 168 Centers)		
Predictors	**Odds Ratio**	**Confidence Interval**	**P-value**	**Odds Ratio**	**Confidence Interval**	**P-value**	**Odds Ratio**	**Confidence Interval**	**P-value**
Counselor-level									
Buprenorphine training, scale 1–7	**0.60**	**(0.52, 0.67)**	**<0.01**	**1.39**	**(1.22, 1.59)**	**<0.01**	**1.24**	**(1.08, 1.43)**	**0.01**
In recovery	**0.67**	**(0.49, 0.92)**	**0.01**	0.66	(0.41, 1.05)	0.08	1.15	(0.70, 1.91)	0.58
Years in treatment field	**0.98**	**(0.96, 0.99)**	**0.03**	1.01	(0.97, 1.05)	0.57	0.99	(0.95, 1.02)	0.46
Female	1.36	(0.97, 1.89)	0.07	1.08	(0.67, 1.74)	0.74	1.50	(0.87, 2.56)	0.14
12-Step preference (3-item *M*)	1.02	(0.92, 1.14)	0.71	0.99	(0.85, 1.16)	0.93	1.07	(0.90, 1.26)	0.47
Education (Master's vs. lower)	0.86	(0.63, 1.18)	0.37	1.50	(0.93, 2.44)	0.10	1.30	(0.73, 2.31)	0.37
Race (White vs. non-white)	1.00	(0.72, 1.38)	0.99	1.36	(0.81, 2.28)	0.24	1.39	(0.86, 2.25)	0.18
Certified addiction counselor	1.04	(0.73, 1.48)	0.83	0.86	(0.54, 1.38)	0.54	0.79	(0.45, 1.37)	0.39
Program-level									
Buprenorphine adoption	**0.22**	**(0.11, 0.48)**	**<0.01**	1.46	(0.74, 2.90)	0.28	**2.56**	**(1.14, 5.75)**	**0.02**
Heroin-dependent caseload, proportion	**0.38**	**(0.15, 0.96)**	**0.04**	1.78	(0.62, 5.06)	0.28	**5.13**	**(1.64, 16.03)**	**0.01**
Interview Year	**0.64**	**(0.49, 0.85)**	**<0.01**	1.40	(0.95, 2.06)	0.09	1.32	(0.84, 2.09)	0.23
Center based on 12-step model	0.91	(0.65, 1.28)	0.61	**0.41**	**(0.26, 0.66)**	**<0.01**	**0.23**	**(0.13, 0.42)**	**<0.01**
Use ASAM-PPC	0.71	(0.49, 1.01)	0.06	**1.81**	**(1.07, 3.05)**	**0.03**	1.90	(0.98, 3.71)	0.06
Accredited JACHO, CARF	1.36	(0.95, 1.96)	0.09	1.00	(0.58, 1.71)	0.99	**1.88**	**(1.01, 3.53)**	**0.05**
For-profit (vs. non-profit)	1.18	(0.69, 2.03)	0.55	0.79	(0.34, 1.84)	0.66	0.64	(0.20, 2.05)	0.45
Size (log-transf. FTEs)	0.91	(0.75, 1.10)	0.32	1.01	(0.77, 1.34)	0.92	0.93	(0.67, 1.29)	0.64
Access to a physician	1.01	(0.70, 1.44)	0.98	0.69	(0.39, 1.21)	0.20	0.66	(0.33, 1.33)	0.24
Intra-class correlation(ICC)	0.19			0.10			0.32		
Reliability estimate	0.17			0.14			0.24		
Variance component (p-value)			0.06			0.08			0.01

[1] Note: Diffusion coded 1 = counselors who responded "don't know" to *both* acceptability and effectiveness, and 0 =.counselors who used the 1 – 7 scale to express an opinion about acceptability and/or effectiveness