Published in final edited form as:

Addict Behav. 2014 May ; 39(5): 889–896. doi:10.1016/j.addbeh.2014.01.016.

Impact of Research Network Participation on the Adoption of Buprenorphine for Substance Abuse Treatment

Traci R. Rieckmann, Ph.D.^a, Amanda J. Abraham, Ph.D.^b, Anne E. Kovas, M.P.H.^c, Bentson H. McFarland, M.D., Ph.D.^{a,c}, and Paul M. Roman, Ph.D.^d

^aDepartment of Public Health and Preventive Medicine, Oregon Health & Science University, 3181 SW Sam Jackson Park Rd, Portland, OR, USA 97239

^bDepartment of Health Services Policy and Management, University of South Carolina, 800 Sumter St, Columbia, SC, USA 29208

^cDepartment of Psychiatry, Oregon Health & Science University, 3181 SW Sam Jackson Park Rd, Portland, OR, USA 97239

^dDepartment of Sociology, Center for Research on Behavioral Health and Human Services Delivery Institute for Behavioral Research, University of Georgia, 210 S Jackson St, Athens, GA, USA 30602

Abstract

There is a growing body of research supporting the use of buprenorphine and other medication assisted treatments (MATs) for the rapidly accelerating opioid epidemic in the United States. Despite numerous advantages of buprenorphine (accessible in primary care, no daily dosing required, minimal stigma), implementation has been slow. As the field progresses, there is a need to understand the impact of participation in practitioner-scientist research networks on acceptance and uptake of buprenorphine. This paper examines the impact of research network participation on counselor attitudes toward buprenorphine addressing both counselor-level characteristics and program-level variables using hierarchical linear modeling (HLM) to account for nesting of

© 2014 Elsevier Ltd. All rights reserved.

Corresponding author: 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.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Author Disclosure Addictive Behaviors Contributors

Dr. Traci Rieckmann provided conceptualization of the study, analysis of the results and helped in the development of all aspects of the manuscript. Dr. Amanda Abraham lead the data analysis and Dr. Bentson McFarland provided consultation and guidance on HLM analysis and interpretation. Anne Kovas assisted with data management. Dr. Paul Roman is the principle investigator for the grant that supported data collection, the study design and the study's methodology. All authors have approved the final manuscript.

Conflict of Interest

Dr. Traci Rieckmann declares that she has no conflict of interest. Dr. Amanda Abraham declares that she has no conflict of interest. Dr. Anne Kovas declares that she has no conflict of interest. Dr. Bentson McFarland declares that he has no conflict of interest. Dr. Paul Roman declares that he has no conflict of interest.

counselors within treatment programs. Using data from the National Treatment Center Study, this project compares privately funded treatment programs (n=345) versus programs affiliated with the National Institute on Drug Abuse Clinical Trials Network (CTN) (n=198). Models included 922 counselors in 172 CTN programs and 1,203 counselors in 251 private programs. Results of two-level HLM logistic (Bernoulli) models revealed that counselors with higher levels of education, larger caseloads, more buprenorphine-specific training, and less preference for 12-step treatment models were more likely to perceive buprenorphine as acceptable and effective. Furthermore, buprenorphine was 50% more likely to be perceived as effective among counselors working in CTN-affiliated programs as compared to private programs. This study suggests that research network affiliation positively impacts counselors' acceptance and perceptions of buprenorphine. Thus, research network participation can be utilized as a means to promote positive attitudes toward the implementation of innovations including medication assisted treatment.

Keywords

Buprenorphine; research network participation; implementation

1. Introduction

Opioid dependence is accelerating rapidly in the United States (Compton & Volkow, 2006; Juurlink & Dhalla, 2012; Substance Abuse and Mental Health Services Administration, 2012) and appears to be driven in part by a substantial rise in non-medical use of prescription pain relievers (Office of National Drug Control Policy, 2011; Manchikanti et al., 2012; Boyd et al., 2009). This surge in opioid abuse and dependence also corresponds with numerous impacts on public health including increased health care costs and emergency room visits (Cai, et al., 2010; Substance Abuse and Mental Health Services (SAMHSA), 2012; White et al., 2005), and a dramatic rise in treatment admissions for opioid abuse and dependence (400% from 2000 to 2010) (SAMHSA, 2012). If not treated effectively, opioid abuse/dependence will continue to hasten treatment demands, premature mortality, and health care utilization (Baser et al., 2011; Kresina & Lubran, 2011; Stein et al., 2011; Mark et al., 2001; SAMHSA, 2011).

Medication assisted treatment (MAT), when combined with psychosocial therapy, is considered the most effective intervention for patients with opioid dependence (Anton et al., 1999; Gordon et al., 2011; Ling et al., 1998; Marinelli-Casey et al., 2002; Pecoraro et al., 2012; Stotts et al., 2009; Tkacz et al., 2012). Agonist therapy, which mimics the effects of endorphins and reduces cravings and withdrawal symptoms without producing feelings of euphoria, is currently deemed the most effective treatment for opioid dependence (Amato et al., 2004; Barnett et al., 2001; Ling et al., 2001). Although methadone, a full mu-opioid agonist, has been used effectively for opioid treatment for nearly 40 years, delivery requires access to a special, highly regulated narcotics treatment program (Ling et al., 2001; Ronel et al., 2012) and daily dosing (Center for Substance Abuse Treatment, 2005). Patients also report difficulty with the social stigma of methadone maintenance (Harris & McElrath, 2012; Maremmani & Gerra, 2010; Woods & Joseph, 2012) and lack of anonymity while waiting in dispensary lines (Barnett et al., 2001).

A more recent advancement in the area of opioid treatment is the partial mu-opioid agonist buprenorphine. Approved by the U.S. Food and Drug Administration in 2002, randomized clinical trials of buprenorphine (Subutex®) and buprenorphine/naloxone (Suboxone®) indicate that it is more effective than placebos and equally effective as methadone in reducing opioid use (Donaher & Welsh, 2006; Johnson et al., 2000; Comer et al., 2005; Fiellin et al., 2006; Kahan et al., 2011). Studies suggest buprenorphine may be associated with reduced overdose risk, lower risk of abuse, overdose, and toxicity (Amass et al., 2004); diminished withdrawal symptoms (Gowing et al., 2009); and increased retention in treatment compared to placebo (Fiellin et al., 2002; Ling, 2009; Stein et al., 2005; Kakko et al., 2003; Mattick et al., 2008). Because of the flexibility in administration of buprenorphine through office-based settings, patients are relieved of the burden of daily dosing visits to methadone clinics and the associated stigma (Polsky et al., 2010). Buprenorphine's success is also demonstrated by patients' increasing preference for buprenorphine over methadone (Ridge et al., 2009). Thus, use of buprenorphine is recommended as a pragmatic and effective alternative to methadone with the potential to expand treatment access (Kahan, et al., 2011).

1.1 Implementation of Medication-Assisted Treatment

Despite the aforementioned advantages of buprenorphine, uptake and sustained use of MAT for addiction appears limited (Pecoraro et al., 2012; Knudsen et al., 2011). To examine this lag in patient access to medications, research has begun to explore factors that drive versus impede adoption. Corresponding with implementation science frameworks and diffusion theory, a broad list of domains that influence use of evidence-based practices (EBPs) has emerged and includes the following: *characteristics of the intervention* (Rogers, 2003; Damschroder et al., 2009); *organizational factors* (Knudsen, et al., 2009; Ducharme & Roman, 2009; Knudsen et al., 2007b; Wallack et al., 2010; Rieckmann et al., 2007; Fixsen et al., 2005); *staff attitudes and beliefs* (Lehman et al., 2011; Finney & Hagedorn, 2011; Abraham et al., 2009; Knudsen et al., 2006; Aarons et al., 2011); *legal and regulatory issues* (Chiqui et al., 2006; Chiqui, et al., 2007); *state policies and contracting* (Rapp et al., 2005; Chiqui et al., 2008; Rieckmann et al., 2009); and *the process of selection, preparation/adaptation, and full scale implementation of innovations* (Greenhalgh, et al., 2004; Simpson, 2002). Thus, further examination of implementation drivers related to buprenorphine access, organizational capacity, and sustained clinical utilization are warranted in addiction health services research.

1.2 Research Network Participation

To date there is paucity of research examining the impact of participation in practitioner-scientist partnerships or research networks in substance abuse and behavioral health. In such networks, real world practice implementation and comparative effectiveness trials are combined to accelerate adoption and acceptance of EBPs including buprenorphine. Participation in research networks requires organizational infrastructure or capacity, leadership, and human resources. This type of practitioner-scientist partnership builds provider and program level collaboration, and facilitates integration and coordination of services (Spoth & Greenberg, 2005). Inter-organizational research networks may also accelerate adoption of innovative treatment practices by promoting knowledge sharing and

opportunities to try new interventions (Erickson & Jacoby, 2003; Gibbons, 2007; Goes & Park, 1997; Pittway et al., 2004; Powell et al., 1996; Rogers, 2003; Westphal et al., 1997; Abraham et al., 2010). Finally, clinicians affiliated with in practitioner-scientist networks gain access to intensive training and supervision that may be unavailable outside the network and may promote more favorable attitudes toward such advancements in clinical care (Ducharme et al., 2010; Knudsen, et al., 2007a).

The National Institute on Drug Abuse's Clinical Trials Network (NIDA CTN) exemplifies the beneficial nature of provider networks (Martino et al., 2010; Knudsen et al., 2009) and promotes collaboration between community drug abuse treatment providers and university-based researchers in order to develop and implement EBPs, such as MAT in community settings (Tai et al., 2010; Martino et al., 2010; Ducharme & Roman, 2009). The inherent value of the bidirectional communication fostered in a network is considered the most fundamental aspect of the CTN infrastructure (Tai et al., 2010). Thus, the CTN is an example of a cohesive network's facilitation of EBP implementation. To date, there have been six CTN clinical trials on buprenorphine (Wells et al., 2010; Tai et al, 2010). Results from the CTN trials are disseminated to treatment programs within the network through blending products, which are created in partnership with the network of Addiction Technology Transfer Centers and are available through an online dissemination library (ATTC Network). As part of the CTN practitioner-scientist network, counselors who are not directly involved in buprenorphine trials have the opportunity to learn about this medication at bi-annual meetings, on conference calls and webinars, and through information exchange through informal channels.

Although, prior research showed that counselors in CTN affiliated programs viewed buprenorphine as more acceptable than non-CTN counselors, this difference was mediated by training and professional exposure to buprenorphine (Knudsen et al., 2007a). Preliminary research also points to provider and organizational factors potentially driving MAT use, although the direct pathways of influence related to research network participation are largely unexplored. One key limitation of earlier research is the lack of multi-level modeling which provides more realistic and conservative statistical testing than regression analysis. Given that buprenorphine has been established as an EBP for treatment of opioid dependence (Amass et al., 2004; Johnson et al., 2000; Ling, 2009; Stein et al., 2005) with the potential to improve services within an integrated care model (Ducharme et al., 2012), there is a critical need for research using advanced statistical methods to examine factors driving buprenorphine implementation.

This paper examines the impact of research network participation on counselor attitudes toward buprenorphine with hierarchical modeling to account for the nesting of counselors within treatment programs. Specifically, we address the following research questions: 1) Which counselor characteristics explain current attitudes toward buprenorphine? 2) What is the impact of research network participation on counselor attitudes, in the context of both counselor-level characteristics and program adoption of buprenorphine?

2. Material and Methods

2.1. Sample

This paper analyzes data from the National Treatment Center Study (NTCS), a family of longitudinal studies of U.S. substance use disorder (SUD) treatment programs. The current study includes pooled data taken from a nationally representative sample of privately funded treatment programs (N=345) and programs affiliated with the NIDA CTN (N=198). Data were collected from administrators and counselors from 2007 to 2009, allowing for a multi-level examination of counselor attitudes about buprenorphine.

The private sample excluded correctional and Veterans Health Administration facilities, detoxification or methadone maintenance only programs, counselors in private practice, halfway houses, driving-under-the-influence (DUI) programs, and transitional living facilities (Abraham et al., 2009). For inclusion, private programs were required to offer alcohol and drug treatment at a level of intensity at least equivalent to American Society of Addiction Medicine (ASAM) Level 1 outpatient services (Mee-Lee et al., 1996). Private programs 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 (Abraham et al., 2009; Knudsen et al., 2005, 2007b). Telephone screening established study eligibility.

To be eligible for the CTN study, programs were required to offer alcohol and drug treatment intensity at least equivalent to ASAM Level 1 outpatient services (Mee-Lee et al., 1996) or to be an opioid treatment provider (OTP). CTN treatment programs were defined as organizational units with an autonomous administrator who has discretionary control over the unit's budget. For a complete description of the CTN study methods, see Roman et al. (2010).

The final sample of 345 private facilities and 198 CTN facilities included 67% and 85% of the eligible facilities, respectively. Data collection included face-to-face interviews with administrators in private and CTN-affiliated treatment programs. At the time of the on-site interview, administrators were asked to provide a list of counselors employed in the program. Counselors were mailed a packet that included: description of the study, letter inviting them to participate, consent form, paper copy of the questionnaire, and postage paid return envelope. All research procedures were approved by the Human Subjects Committee of the University of Georgia's Institutional Review Board.

2.2. Measures

2.2.1. Dependent variables—Two dependent variables were examined: *perceived acceptability* and *perceived effectiveness* of buprenorphine (Subutex/Suboxone). Counselors were asked to rate the acceptability and effectiveness of FDA-approved addiction medications including buprenorphine. Counselors rated buprenorphine acceptability as follows: “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 buprenorphine effectiveness 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”; 60% of valid responses), and 1=scale responses of 5–7 (“acceptable”). Likewise, *perceived effectiveness* was re-coded into a second binary dependent variable, where 0=scale responses of 1–4 (“not effective”; 49% of valid responses), and 1=scale responses of 5–7 (“effective”). The coding of these variables is consistent with prior research (Abraham et al., 2009; Abraham et al. 2011; Rieckmann et al., 2011).

2.2.2. Independent variables—Counselor questionnaires also collected data on counselor characteristics, caseload characteristics, and buprenorphine-specific training. Counselor characteristics included gender (1=female), race/ethnicity (1=minority, 0=White), age, level of education (1=master’s degree or higher), tenure (number of years worked in the addiction treatment field), recovery status (1=personally in recovery), and 12-step preference (3-item (range 1–7) scale, with higher scores indicating stronger endorsement of the 12-step treatment philosophy; adapted from Kasarabada and colleagues (2001) and Knudsen and colleagues (2005). Provider caseload measures included current caseload size (number of patients to whom they were assigned as primary counselor) and hours worked per week (to control for potential differences in full-time versus part-time counselors). Buprenorphine-specific training 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.”

Two organizational measures were included in the analyses. CTN research network affiliation was a dichotomous variable (1=CTN affiliated program). Adoption of buprenorphine was also a dichotomous variable (1=program reported currently prescribing buprenorphine).

2.3 Data analysis

Data were analyzed using HLM 6.08 (Raudenbush et al., 2004) to account for the nested structure of the data (counselors nested in treatment programs). Counselor- and program-level independent variables were identified from previous research (Abraham et al, 2011; Rieckmann et al., 2011; Knudsen et al., 2005; 2007a). In preparation for hierarchical modeling, SPSS version 18 was used for descriptive, bivariate, and preliminary multivariate analysis of the dependent variables. Counselor-level independent variables were examined using logistic regression. Preliminary analysis of both dependent variables also included Chi-squared tests and independent-samples t-tests to compare program-level characteristics (results not shown).

Two-level HLM 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 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) and $\pi^2/3$ is the Level 1 variance (error variance, which is fixed to $\pi^2/3 = 3.29$). 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).

Separate two-level logistic (Bernoulli) models were constructed to examine possible predictors of perceived acceptability and perceived effectiveness, respectively, among counselors who expressed an opinion about buprenorphine. Employing the binary acceptability and effectiveness outcome variables (1=effective/acceptable), logistic HLM models were constructed using the variables examined in preliminary analyses. Variables were centered on their respective grand mean values except binary variables, which were uncentered. Because the effect of each predictor was expected to be common across programs, fixed effects models were used.

3. Results

3.1. Descriptive statistics and bivariate analysis

From each facility, data were collected for at least one counselor, with an average of 9 counselors per program (range: 1–34). The final analysis sample was $N=2,125$ counselors in $N=423$ facilities, including 922 counselors in 172 CTN programs and 1,203 counselors in 251 private programs. Program adoption of buprenorphine was similar across groups, with 60 (35%) CTN programs and 95 (38%) private programs, respectively, reporting that buprenorphine is currently prescribed.

3.1.1 Counselor characteristics: CTN versus private programs—As Table 1 shows, CTN and private counselors differed significantly on almost every measure. Although women represented a similar majority of counselors in each sample, private center counselors were slightly older and more likely to be White. Private counselors also were significantly more likely to have a master's degree or higher and be certified and/or licensed. While private counselors reported longer mean tenure in the treatment field, CTN counselors reported significantly greater mean caseload and longer mean working hours per week. Private counselors were more likely to personally be in recovery and reported greater preference for the 12-step model, on average. Finally, CTN counselors reported having significantly more buprenorphine-specific training, although mean training scores approached the mid-point of the scale for counselors in both samples. All differences were significant at $p = 0.05$.

3.1.2 Counselor attitudes toward buprenorphine: CTN versus private programs—Table 1 also describes counselor attitudes toward buprenorphine among those counselors who used the scale to rate buprenorphine acceptability and effectiveness. Acceptability data were available for 85% of CTN counselors and 74% of private counselors. CTN counselors gave higher mean acceptability ratings, and were significantly more likely to consider buprenorphine “acceptable”. Similarly, effectiveness data were available for 82% of CTN counselors and 72% of private counselors. As compared to

private counselors, CTN counselors gave higher mean effectiveness ratings, and were significantly more likely to consider buprenorphine “effective”.

3.1.3 Counselors with no opinion about buprenorphine—As noted, counselors who did not provide a valid response (1-7) on the rating scale were not included in multivariate or hierarchical modeling. Bivariate analysis suggests that counselors who did not express an opinion about buprenorphine were similar to counselors included in modeling with respect to gender, age, caseload, and hours worked per week. However, counselors included in modeling were significantly more likely to be: White, certified, licensed, in recovery. As compared to counselors who did not express an opinion, counselors included in modeling also were more likely to have: master’s degree or higher, longer tenure, less preference for 12-step models, and more buprenorphine-specific training.

3.2 Hierarchical Linear Models (HLM)

Table 2 shows the final HLM models of perceived buprenorphine acceptability and effectiveness, respectively. The first column of Table 2 presents the logistic HLM model estimating the odds that a counselor perceived buprenorphine to be acceptable. As HLM cannot analyze cases with missing data, the acceptability model represents 1,246 counselors in 360 treatment programs. After controlling for other predictors, counselors with master’s degrees or higher were more likely to perceive buprenorphine as acceptable. The odds of counselors’ perceived acceptability increased 27% for each unit increase above the mean for buprenorphine training. Larger caseloads also appeared to positively predict counselor attitudes; however, confidence intervals suggest that these findings may not be meaningful. Counselor 12-step preference decreased the odds of perceived acceptability 17% for each unit increase above the mean. No other counselor-level variables were significant. After adjusting for counselor-characteristics, opinions about buprenorphine acceptability were 65% greater among counselors working in CTN-affiliated programs as compared to private programs and 55% greater among counselors working in programs that had adopted buprenorphine.

HLM modeling of perceived effectiveness (Table 2, column 2) yielded similar results using complete data from 1,206 counselors in 352 treatment programs. After controlling for other predictors, counselors with master’s degrees or higher were 44% more likely to perceive buprenorphine as effective. The odds of perceived effectiveness increased 20% for each unit increase above mean buprenorphine training. As in the acceptability model, counselor 12-step preference decreased the odds of perceived effectiveness. Finally, larger caseloads appeared to have a positive effect on perceived effectiveness, while longer tenure appeared to have a negative effect; however, confidence intervals suggest that these findings may not be meaningful. No other counselor-level variables were significant. After adjusting for counselor-characteristics, perceived effectiveness was 50% more likely among counselors working in CTN-affiliated programs as compared to private programs and 64% greater among counselors working in programs that had adopted buprenorphine.

Regarding the proportion of variance in the dependent variable attributable to differences between treatment programs, ICC estimates for the acceptability model suggest that

differences in programs accounted for approximately 19% of the total variation in the unconditional model, 15% in the counselor-level only model, and 14% in the full model. For the effectiveness model, ICC estimates suggest that differences in programs accounted for approximately 20% of the total variation in the unconditional model, 19% in the counselor-level only model, and 17% in the full model.

Goodness of fit was examined via the variance components (Table 2). Both the models' final estimation of variance components suggest that, after controlling for counselor and program-level predictors, there is still significant unexplained variation in perceived acceptability and perceived effectiveness.

4. Discussion

This study suggests that research network (CTN) affiliation may be a driving factor of counselors' positive perceptions of buprenorphine. These findings build on previous research using earlier data (Knudsen et al., 2007a), which found CTN affiliation to be a predictor of counselor perceived acceptability of buprenorphine. Interestingly, when Knudsen and colleagues (2007a) included buprenorphine-specific training and buprenorphine adoption in regression models, CTN affiliation was no longer significant. These findings suggest that hierarchical analysis may more accurately describe these relationships and the complexities of both individual and program level factors. By accounting for counselor nesting in treatment programs, research network affiliation becomes a powerful predictor of counselor attitudes.

Overall the results from this study confirm the potential of research network participation as one strategy for enhancing or promoting positive provider attitudes and acceptance of buprenorphine. Our findings also demonstrate the value of inter-organizational research network affiliation as a facilitator of EBP adoption. Furthermore, our results indicate that buprenorphine adoption by treatment programs influences counselor attitudes, and this effect does not appear to differ significantly between CTN and private programs. While counselors cannot prescribe buprenorphine, it appears that counselors who interact with clients using buprenorphine may be exposed to positive self-report and outcome experiences, encouraging them to see it as a viable, effective treatment choice.

Several counselor-level predictors were also positively associated with endorsement or support for the use of buprenorphine. Consistent with previous research, results indicate that counselors who hold a master's degree or higher have significantly increased odds of perceiving buprenorphine as acceptable and effective (Knudsen et al., 2005; 2007a). Buprenorphine-specific training was a positive predictor of counselor attitudes toward buprenorphine, which is also consistent with earlier research and findings from hierarchical modeling of counselors nested in public treatment programs surveyed in 2004–2006 (Rieckmann et al., 2011). This finding also reinforces the idea that exposure to buprenorphine, or "triability", promotes positive opinions, which is supported in the MAT literature and in implementation science frameworks more broadly (Rieckmann et al., 2011; Damschroder et al., 2009; Greenhalgh et al., 2004; Ducharme & Roman, 2009; Knudsen et al., 2009).

Finally, there appears to be an enduring negative association between counselors' preference for 12-step treatment models and their attitudes toward buprenorphine (Abraham et al., 2011; Roman et al., 2011). Hierarchical modeling confirmed this negative association, which is consistent with previous hierarchical (Rieckmann et al., 2011) and non-hierarchical (Knusden et al., 2005, 2007a) findings. Reports have shown that program directors, clinicians, and counselors who endorse the 12-step model are significantly less likely to have knowledge of MATs (Rothrauff and Eby, 2011), and are less likely to adopt addiction medications, as compared with workforce members who employ other EBPs (McGovern et al., 2004; Oser & Roman, 2008). Rychtarik and colleagues (2000) also found a negative correlation between participants' medication adherence and attendance of Alcohol Anonymous meetings. However, sufficient training has been shown to instill adequate adherence to empirically based practices among clinicians who have pre-existing training in the 12-step program (Morgenstern et al., 2001). Furthermore, medication specific training for counselors in 12-step programs has been recommended to increase the use of MAT (Abraham et al., 2009; 2011).

4.1 Limitations

Models presented here offer a comprehensive analysis of nationally representative data. They account for the nested structure of this data, and consider both counselor and program data simultaneously. However, unexplained variance of both buprenorphine acceptability and effectiveness suggests there are other unmeasured counselor and organizational factors influencing attitudes. Thus, estimates for coefficients in both models may be biased because the models do not account for unmeasured predictors. Future research should examine a full range of organizational factors that may influence counselor attitudes toward buprenorphine. Causality is also a limitation of the cross-sectional design. Counselors with positive attitudes toward MAT may naturally cluster in treatment programs with stronger buprenorphine training and less reliance on 12-step models. Furthermore, treatment programs that offer addiction medications like buprenorphine may prefer counselors to have higher education versus non-pharmacologically oriented treatment programs.

5. Conclusions

Quite clearly, organizations and individuals that provide addiction treatment services are shaped by their environment and socio-political context (Aarons et al., 2011), which, in turn, may impact the success of EBP implementation including MATs such as buprenorphine. In particular, the environment and infrastructure created in a practitioner-scientist network appear to facilitate MAT implementation. Unlike services that are isolated or disconnected, networks of addiction providers tend to be close-knit, which strengthens their resolve and integration (Kingdon, 2002). Current findings are consistent with the literature, indicating that cohesive collaborations between clinicians and scientists can increase perceptions of acceptability and effectiveness of new practices and innovative treatment strategies (Ducharme et al., 2010; Spoth & Greenberg, 2005). Mechanisms for this accelerated sense of acceptance among providers are not fully understood in SUD treatment but appear to be influenced by core experiences from network participation including: knowledge sharing, resource exchange, skills development, triability/experience with interventions, improved

communication channels, and technical assistance to support implementation (Erickson & Jacoby, 2003; Gibbons, 2007; Goes & Park, 1997; Mansfield, 1971; Pittway et al., 2004; Powell et al., 1996; Rogers, 2003; Westphal et al., 1997; Abraham et al., 2010). However, as noted previously, the close-knit relationships of counselors may serve to either advance or restrict implementation of EBPs through their impact on social norms, as providers turn to their peers first and foremost for guidance on which interventions to explore (Rieckmann et al., 2007). Thus, increasing adoption and sustainment of any new practice, including MAT, requires attention to counselor beliefs, experiences, peer communication and/or leadership, and an overall sense of competence with the new intervention. Participation in practitioner-scientist partnerships may be one way to achieve these systems and workforce development advances in an efficient, widespread manner.

Acknowledgments

Role of Funding Sources

Funding for this study was provided by The National Institute on Drug Abuse (NIDA) K23 DA021225 and R01DA014482. NIDA had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication

References

- Aarons GA, Sommerfeld DH, Willging CE. The soft underbelly of system change: The role of leadership and organizational climate in turnover during statewide behavioral health reform. *Psychological Services*. 2011; 8(4):269–281. doi: 10.1037/a002619. [PubMed: 22229021]
- 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]
- Abraham AJ, Knudsen HK, Rothrauff TC, Roman PM. The adoption of alcohol pharmacotherapies in the clinical trials network: The influence of research network participation. *Journal of Substance Abuse Treatment*. 2010; 38(3):275–283. doi: 10.1016/j.jsat.2010.01.003; 10.1016/j.jsat.2010.01.003. [PubMed: 20117908]
- Abraham AJ, Rieckmann T, McNulty T, Kovas AE, Roman PM. Counselor attitudes toward the use of naltrexone in substance abuse treatment: A multi-level modeling approach. *Addictive Behaviors*. 2011; 36(6):576–583. doi: 10.1016/j.addbeh.2011.01.030; 10.1016/j.addbeh.2011.01.030. [PubMed: 21382667]
- Amass L, Ling W, Freese TE, Reiber C, Annon JJ, Cohen AJ, Horton T. Bringing buprenorphine-naloxone detoxification to community treatment providers: The NIDA clinical trials network field experience. *The American Journal on Addictions / American Academy of Psychiatrists in Alcoholism and Addictions*. 2004; 13(Suppl 1):S42–S66. doi: 10.1080/10550490490440807. [PubMed: 15204675]
- 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. doi: 10.1016/j.drugalcdep.2003.11.002. [PubMed: 15036544]
- Anton RF, Moak DH, Waid LR, Latham PK, Malcolm RJ, Dias JK. 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 PG, Rodgers JH, Bloch DA. A meta-analysis comparing buprenorphine to methadone for treatment of opiate dependence. *Addiction (Abingdon, England)*. 2001; 96(5):683–690. doi: 10.1080/09652140020039053.
- Baser O, Chalk M, Fiellin DA, Gastfriend DR. Cost and utilization outcomes of opioid-dependence treatments. *The American Journal of Managed Care*. 2011; 17(Suppl 8):S235–S248. [PubMed: 21761950]

- 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. doi: 10.1080/10550880903028452; 10.1080/10550880903028452. [PubMed: 20155592]
- Cai R, Crane E, Poneleit K, Paulozzi L. Emergency department visits involving nonmedical use of selected prescription drugs in the united states, 2004–2008. *Journal of Pain & Palliative Care Pharmacotherapy*. 2010; 24(3):293–297. doi: 10.3109/15360288.2010.503730; 10.3109/15360288.2010.503730. [PubMed: 20718652]
- Center for Substance Abuse Treatment. Medication-assisted treatment for opioid addiction in opioid treatment programs. Rockville, MD: Substance Abuse and Mental Health Administration; 2005.
- Chriqui JF, Eidson SK, McBride DC, Scott W, Capoccia V, Chaloupka FJ. Assessing State Regulation of Outpatient Abuse Treatment Programs in the U.S. along a Quality Continuum. *ImpacTeen*. 2006; 34:1–51.. http://www.impacTeen.org/generalarea_PDFs/ITresearch_34chriqui2006.pdf.
- Chriqui JF, Terry-McElrath Y, McBride DC, Eidson SS. State policies matter: The case of outpatient drug treatment program practices. *Journal of Substance Abuse Treatment*. 2008; 35(1):13–21. doi: 10.1016/j.jsat.2007.08.012. [PubMed: 17936550]
- Chriqui JF, Terry-McElrath Y, McBride DC, Eidson SS, VanderWaal CJ. Does state certification or licensure influence outpatient substance abuse treatment program practices? *The Journal of Behavioral Health Services & Research*. 2007; 34(3):309–328. doi: 10.1007/s11414-007-9069-z. [PubMed: 17592782]
- Comer SD, Walker EA, Collins ED. Buprenorphine/naloxone reduces the reinforcing and subjective effects of heroin in heroin-dependent volunteers. *Psychopharmacology*. 2005; 181(4):664–675. doi: 10.1007/s00213-005-0023-6. [PubMed: 16025322]
- Compton WM, Volkow ND. Major increases in opioid analgesic abuse in the united states: Concerns and strategies. *Drug and Alcohol Dependence*. 2006; 81(2):103–107. doi: 10.1016/j.drugalcdep.2005.05.009. [PubMed: 16023304]
- Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. *Implementation Science : IS*. 2009; 4:50-5908-4-50. doi: 10.1186/1748-5908-4-50; 10.1186/1748-5908-4-50. [PubMed: 19664226]
- Donaher PA, Welsh C. Managing opioid addiction with buprenorphine. *American Family Physician*. 2006; 73(9):1573–1578. [PubMed: 16719249]
- Ducharme LJ, Knudsen HK, Abraham AJ, Roman PM. Counselor attitudes toward the use of motivational incentives in addiction treatment. *The American Journal on Addictions / American Academy of Psychiatrists in Alcoholism and Addictions*. 2010; 19(6):496–503. doi: 10.1111/j.1521-0391.2010.00081.x; 10.1111/j.1521-0391.2010.00081.x. [PubMed: 20958844]
- Ducharme LJ, Roman PM. Opioid treatment programs in the clinical trials network: Representativeness and buprenorphine adoption. *Journal of Substance Abuse Treatment*. 2009; 37(1):90–94. doi: 10.1016/j.jsat.2008.09.003; 10.1016/j.jsat.2008.09.003. [PubMed: 19004597]
- Ducharme S, Fraser R, Gill K. Update on the clinical use of buprenorphine: In opioid-related disorders. *Canadian Family Physician Medecin De Famille Canadien*. 2012; 58(1):37–41. [PubMed: 22267618]
- Erickson CL, Jacoby SM. The effect of employer networks on workplace innovation and training. *Industrial and Labor Relations Review*. 2003; 56 <http://ssrn.com/abstract=307135>.
- Fiellin DA, Pantalon MV, Chawarski MC, Moore BA, Sullivan LE, O'Connor PG, Schottenfeld RS. Counseling plus buprenorphine-naloxone maintenance therapy for opioid dependence. *The New England Journal of Medicine*. 2006; 355(4):365–374. doi: 10.1056/NEJMoa055255. [PubMed: 16870915]
- Fiellin DA, Pantalon MV, Pakes JP, O'Connor PG, Chawarski M, Schottenfeld RS. Treatment of heroin dependence with buprenorphine in primary care. *The American Journal of Drug and Alcohol Abuse*. 2002; 28(2):231–241. [PubMed: 12014814]
- Finney JW, Hagedorn HJ. Introduction to a special section on implementing evidence-based interventions for substance use disorders. *Psychology of Addictive Behaviors : Journal of the Society of Psychologists in Addictive Behaviors*. 2011; 25(2):191–193. doi: 10.1037/a0023949; 10.1037/a0023949. [PubMed: 21668084]

- 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, the National Implementation Research Network (FMHI Publication #231); 2005. <http://ctndisseminatnlibrary.org/PDF/nirnmonograph.pdf> [Accessed on March 12, 2013]
- Gibbons DE. Interorganizational network structures and diffusion of information through a health system. *American Journal of Public Health*. 2007; 97(9):1684–1692. doi: 10.2105/AJPH.2005.063669. [PubMed: 17329666]
- Goes JB, Park SH. Interorganizational links and innovation: the case of hospital services. *The Academy of Management Journal*. 1997; 40:673–696.
- Gordon MS, Kinlock TW, Miller PM. Medication-assisted treatment research with criminal justice populations: Challenges of implementation. *Behavioral Sciences & the Law*. 2011; 29(6):829–845. doi: 10.1002/bsl.1015; 10.1002/bsl.1015. [PubMed: 22086665]
- Gowing L, Ali R, White JM. Buprenorphine for the management of opioid withdrawal. *Cochrane Database of Systematic Reviews (Online)*. 2009; (3):CD002025. doi(3), CD002025. doi: 10.1002/14651858.CD002025.pub4; 10.1002/14651858.CD002025.pub4.
- Greenhalgh T, Robert G, Macfarlane F, Bate P, Kyriakidou O. Diffusion of innovations in service organizations: Systematic review and recommendations. *The Milbank Quarterly*. 2004; 82(4):581–629. doi: 10.1111/j.0887-378X.2004.00325.x. [PubMed: 15595944]
- Harris J, McElrath K. Methadone as social control: Institutionalized stigma and the prospect of recovery. *Qualitative Health Research*. 2012; 22(6):810–824. doi: 10.1177/1049732311432718; 10.1177/1049732311432718. [PubMed: 22232295]
- Johnson RE, Chutuape MA, Strain EC, Walsh SL, Stitzer ML, Bigelow GE. A comparison of levomethadyl acetate, buprenorphine, and methadone for opioid dependence. *The New England Journal of Medicine*. 2000; 343(18):1290–1297. doi: 10.1056/NEJM200011023431802. [PubMed: 11058673]
- Juurlink DN, Dhalla IA. Dependence and addiction during chronic opioid therapy. *Journal of Medical Toxicology : Official Journal of the American College of Medical Toxicology*. 2012; 8(4):393–399. doi: 10.1007/s13181-012-0269-4; 10.1007/s13181-012-0269-4. [PubMed: 23073725]
- Kahan M, Srivastava A, Ordean A, Cirone S. Buprenorphine: New treatment of opioid addiction in primary care. *Canadian Family Physician Medecin De Famille Canadien*. 2011; 57(3):281–289. [PubMed: 21402963]
- Kakko J, Svanborg KD, Kreek MJ, Heilig M. 1-year retention and social function after buprenorphine-assisted relapse prevention treatment for heroin dependence in sweden: A randomised, placebo-controlled trial. *Lancet*. 2003; 361(9358):662–668. doi: 10.1016/S0140-6736(03)12600-1. [PubMed: 12606177]
- 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 & Misuse*. 2001; 36(3):273–299. [PubMed: 11325167]
- Kingdon. *Agendas, Alternatives, and Public Policies*. 2nd ed. Wiegman, LA., editor. Addison-Wesley Longman; 2002.
- Knudsen HK, Abraham AJ, Johnson JA, Roman PM. Buprenorphine adoption in the national drug abuse treatment clinical trials network. *Journal of Substance Abuse Treatment*. 2009; 37(3):307–312. doi: 10.1016/j.jsat.2008.12.004; 10.1016/j.jsat.2008.12.004. [PubMed: 19577406]
- Knudsen HK, Abraham AJ, Roman PM. Adoption and implementation of medications in addiction treatment programs. *Journal of Addiction Medicine*. 2011; 5(1):21–27. doi: 10.1097/ADM.0b013e3181d41ddb; 10.1097/ADM.0b013e3181d41ddb. [PubMed: 21359109]
- Knudsen HK, Ducharme LJ, Roman PM. Early adoption of buprenorphine in substance abuse treatment centers: Data from the private and public sectors. *Journal of Substance Abuse Treatment*. 2006; 30(4):363–373. doi: 10.1016/j.jsat.2006.03.013. [PubMed: 16716852]
- Knudsen HK, Ducharme LJ, Roman PM. Research network involvement and addiction treatment center staff: Counselor attitudes toward buprenorphine. *The American Journal on Addictions / American Academy of Psychiatrists in Alcoholism and Addictions*. 2007a; 16(5):365–371. doi: 10.1080/10550490701525418. [PubMed: 17882607]

- Knudsen HK, Ducharme LJ, Roman PM. The adoption of medications in substance abuse treatment: Associations with organizational characteristics and technology clusters. *Drug and Alcohol Dependence*. 2007b; 87(2-3):164–174. doi: 10.1016/j.drugalcdep.2006.08.013. [PubMed: 16971059]
- Knudsen HK, Ducharme LJ, Roman PM, Link T. Buprenorphine diffusion: The attitudes of substance abuse treatment counselors. *Journal of Substance Abuse Treatment*. 2005; 29(2):95–106. doi: 10.1016/j.jsat.2005.05.002. [PubMed: 16135338]
- Kresina TF, Lubran R. Improving public health through access to and utilization of medication assisted treatment. *International Journal of Environmental Research and Public Health*. 2011; 8(10):4102–4117. doi: 10.3390/ijerph8104102; 10.3390/ijerph8104102. [PubMed: 22073031]
- Lehman WE, Simpson DD, Knight DK, Flynn PM. Integration of treatment innovation planning and implementation: Strategic process models and organizational challenges. *Psychology of Addictive Behaviors : Journal of the Society of Psychologists in Addictive Behaviors*. 2011; 25(2):252–261. doi: 10.1037/a0022682; 10.1037/a0022682. [PubMed: 21443294]
- Ling W. Buprenorphine for opioid dependence. *Expert Review of Neurotherapeutics*. 2009; 9(5):609–616. doi: 10.1586/ern.09.26; 10.1586/ern.09.26. [PubMed: 19402772]
- Ling W, Charuvastra C, Collins JF, Batki S, Brown LS Jr, Kintaudi P, Segal D. Buprenorphine maintenance treatment of opiate dependence: A multicenter, randomized clinical trial. *Addiction (Abingdon, England)*. 1998; 93(4):475–486.
- Ling W, Huber A, Rawson R. New trends in opiate pharmacotherapy. *Drug and Alcohol Review*. 2001; 20:79–94.
- Manchikanti L, Helm S 2nd, Fellows B, Janata JW, Pampati V, Grider JS, Boswell MV. Opioid epidemic in the united states. *Pain Physician*. 2012; 15(3 Suppl):ES9–E38. [PubMed: 22786464]
- Mansfield, E. *Technological Change*. New York: W.W. Norton; 1971.
- Maremmani I, Gerra G. Buprenorphine-based regimens and methadone for the medical management of opioid dependence: Selecting the appropriate drug for treatment. *The American Journal on Addictions / American Academy of Psychiatrists in Alcoholism and Addictions*. 2010; 19(6):557–568. doi: 10.1111/j.1521-0391.2010.00086.x; 10.1111/j.1521-0391.2010.00086.x. [PubMed: 20958853]
- Marinelli-Casey P, Domier CP, Rawson RA. The gap between research and practice in substance abuse treatment. *Psychiatric Services (Washington, D.C.)*. 2002; 53(8):984–987.
- 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]
- Martino S, Brigham GS, Higgins C, Gallon S, Freese TE, Albright LM, Condon TP. Partnerships and pathways of dissemination: The national institute on drug abuse-substance abuse and mental health services administration blending initiative in the clinical trials network. *Journal of Substance Abuse Treatment*. 2010; 38(Suppl 1):S31–S43. doi: 10.1016/j.jsat.2009.12.013; 10.1016/j.jsat.2009.12.013. [PubMed: 20307793]
- Mattick RP, Kimbler J, Breen C, Davoli M. Buprenorphine maintenance versus placebo or methadone maintenance for opioid dependence. *Cochrane Database of Systematic Reviews*. 2008; (Issue 3)
- McGovern MP, Fox TS, Xie H, Drake RE. 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(4):305–312. doi: 10.1016/j.jsat.2004.03.003. [PubMed: 15182895]
- Mee-Lee, D.; Gartner, L.; Miller, M.; Schulman, GR.; Wilford, BB. *Patient placement criteria for the treatment of substance-related disorders*. 2nd ed. Chevy Chase, MD: American Society of Addiction Medicine; 1996.
- Morgenstern J, Morgan TJ, McCrady BS, Keller DS, Carroll KM. Manual-guided cognitive-behavioral therapy training: A promising method for disseminating empirically supported substance abuse treatments to the practice community. *Psychology of Addictive Behaviors : Journal of the Society of Psychologists in Addictive Behaviors*. 2001; 15(2):83–88. [PubMed: 11419234]
- Office of National Drug Control Policy. [Accessed on March 12, 2013] Epidemic: Responding to America's prescription drug abuse crisis. Office of National Drug Control Policy. 2011. http://www.whitehouse.gov/sites/default/files/ondcp/policy-and-research/rx_abuse_plan.pdf

- Oser CB, Roman PM. A categorical typology of naltrexone-adopting private substance abuse treatment centers. *Journal of Substance Abuse Treatment*. 2008; 34(4):433–442. doi: 10.1016/j.jsat.2007.08.003. [PubMed: 17997266]
- Pecoraro A, Ma M, Woody GE. The science and practice of medication-assisted treatments for opioid dependence. *Substance use & Misuse*. 2012; 47(8-9):1026–1040. doi: 10.3109/10826084.2012.663292; 10.3109/10826084.2012.663292. [PubMed: 22676570]
- Pittway L, Robertson M, Munir K, Denyer D, Neely A. Networking and innovation: a systematic review of the evidence. *International Journal of Management Reviews*. 2004; 5:137–168.
- Polsky D, Glick HA, Yang J, Subramaniam GA, Poole SA, Woody GE. Cost-effectiveness of extended buprenorphine-naloxone treatment for opioid-dependent youth: Data from a randomized trial. *Addiction (Abingdon, England)*. 2010; 105(9):1616–1624. doi: 10.1111/j.1360-0443.2010.03001.x; 10.1111/j.1360-0443.2010.03001.x.
- Powell WW, Koput KW, Smith-Doerr L. Interorganizational collaboration and the locus of innovation: networks of learning in biotechnology. *Administrative Science Quarterly*. 1996; 41:116–145.
- Rapp CA, Bond GR, Becker DR, Carpinello SE, Nikkel RE, Gintoli G. The role of state mental health authorities in promoting improved client outcomes through evidence-based practice. *Community Mental Health Journal*. 2005; 41(3):347–363. [PubMed: 16131012]
- Raudenbush, SW.; Bryk, AS.; Congdon, RT. HLM 6.08 (computer software). Lincolnwood, IL: Scientific Software International; 2004.
- 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. doi: 10.1016/j.jsat.2008.09.007; 10.1016/j.jsat.2008.09.007. [PubMed: 19004598]
- Rieckmann T, Daley M, Fuller BE, Thomas CP, 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. doi: 10.1016/j.jsat.2006.09.002. [PubMed: 17306729]
- Rieckmann TR, Kovas AE, Fussell HE, Stettler NM. Implementation of evidence-based practices for treatment of alcohol and drug disorders: The role of the state authority. *The Journal of Behavioral Health Services & Research*. 2009; 36(4):407–419. doi: 10.1007/s11414-008-9122-6; 10.1007/s11414-008-9122-6. [PubMed: 18543111]
- Rieckmann TR, Kovas AE, McFarland BH, Abraham AJ. A multi-level analysis of counselor attitudes toward the use of buprenorphine in substance abuse treatment. *Journal of Substance Abuse Treatment*. 2011; 41(4):374–385. doi: 10.1016/j.jsat.2011.05.005; 10.1016/j.jsat.2011.05.005. [PubMed: 21821379]
- Rogers, EM. Diffusion of innovations. 5th ed. New York: Free Press; 2003. p. 423-424.
- Roman PM, Abraham AJ, Knudsen HK. Using medication-assisted treatment for substance use disorders: Evidence of barriers and facilitators of implementation. *Addictive Behaviors*. 2011; 36(6):584–589. doi: 10.1016/j.addbeh.2011.01.032; 10.1016/j.addbeh.2011.01.032. [PubMed: 21377275]
- Roman PM, Abraham AJ, Rothrauff TC, Knudsen HK. A longitudinal study of organizational formation, innovation adoption, and dissemination activities within the national drug abuse treatment clinical trials network. *Journal of Substance Abuse Treatment*. 2010; 38(Suppl 1):S44–S52. doi: 10.1016/j.jsat.2009.12.008; 10.1016/j.jsat.2009.12.008. [PubMed: 20307795]
- Ronel N, Gueta K, Abramsohn Y, Caspi N, Adelson M. Can a 12-step program work in methadone maintenance treatment? *International Journal of Offender Therapy and Comparative Criminology*. 2011; 55(7):1135–1153. doi: 10.1177/0306624X10382570; 10.1177/0306624X10382570. [PubMed: 20921264]
- Rothrauff TC, Eby LT. Counselors' knowledge of the adoption of tobacco cessation medications in substance abuse treatment programs. *The American Journal on Addictions / American Academy of Psychiatrists in Alcoholism and Addictions*. 2011; 20(1):56–62. doi: 10.1111/j.1521-0391.2010.00095.x; 10.1111/j.1521-0391.2010.00095.x. [PubMed: 21175921]
- Rychtarik RG, Connors GJ, Dermen KH, Stasiewicz PR. Alcoholics anonymous and the use of medications to prevent relapse: An anonymous survey of member attitudes. *Journal of Studies on Alcohol*. 2000; 61(1):134–138. [PubMed: 10627107]

- Simpson DD. A conceptual framework for transferring research to practice. *Journal of Substance Abuse Treatment*. 2002; 22(4):171–182. [PubMed: 12072162]
- Snijders, TAB.; Bosker, RJ. *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling*. London: Sage Publications; 1999.
- Spoth RL, Greenberg MT. Toward a comprehensive strategy for effective practitioner-scientist partnerships and larger-scale community health and well-being. *American Journal of Community Psychology*. 2005; 35(3-4):107–126. [PubMed: 15909789]
- Stein BD, Gordon AJ, Sorbero M, Dick AW, Schuster J, Farmer C. The impact of buprenorphine on treatment of opioid dependence in a medicaid population: Recent service utilization trends in the use of buprenorphine and methadone. *Drug and Alcohol Dependence*. 2011; 123(1-3):72–78. doi: 10.1016/j.drugalcdep.2011.10.016; 10.1016/j.drugalcdep.2011.10.016. [PubMed: 22093488]
- Stein MD, Cioe P, Friedmann PD. Buprenorphine retention in primary care. *Journal of General Internal Medicine*. 2005; 20(11):1038–1041. doi: 10.1111/j.1525-1497.2005.0228.x. [PubMed: 16307630]
- Stotts AL, Dorrill CL, Kosten TR. Opioid dependence treatment: Options in pharmacotherapy. *Expert Opinion on Pharmacotherapy*. 2009; 10(11):1727–1740. doi: 10.1517/14656560903037168; 10.1517/14656560903037168. [PubMed: 19538000]
- Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. Drug Abuse Warning Network, 2008: National Estimates of Drug-Related Emergency Department Visits. HHS Publication No. SMA 11-4618. Rockville, MD: 2011.
- Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. Treatment Episode Data Set (TEDS): 2000–2010. National Admissions to Substance Abuse Treatment Services. DASIS Series S-61, HHS Publication No. (SMA) 12-4701. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2012.
- Tai B, Straus MM, Liu D, Sparenborg S, Jackson R, McCarty D. The first decade of the national drug abuse treatment clinical trials network: Bridging the gap between research and practice to improve drug abuse treatment. *Journal of Substance Abuse Treatment*. 2010; 38(Suppl 1):S4–S13. doi: 10.1016/j.jsat.2010.01.011; 10.1016/j.jsat.2010.01.011. [PubMed: 20307794]
- Tkacz J, Severt J, Cacciola J, Ruetsch C. Compliance with buprenorphine medication-assisted treatment and relapse to opioid use. *The American Journal on Addictions / American Academy of Psychiatrists in Alcoholism and Addictions*. 2012; 21(1):55–62. doi: 10.1111/j.1521-0391.2011.00186.x; 10.1111/j.1521-0391.2011.00186.x. [PubMed: 22211347]
- 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. *The Journal of Behavioral Health Services & Research*. 2010; 37(1):64–78. doi: 10.1007/s11414-008-9132-4; 10.1007/s11414-008-9132-4. [PubMed: 18668369]
- Wells EA, Saxon AJ, Calsyn DA, Jackson TR, Donovan DM. Study results from the clinical trials network's first 10 years: Where do they lead? *Journal of Substance Abuse Treatment*. 2010; 38(Suppl 1):S14–S30. doi: 10.1016/j.jsat.2009.12.009; 10.1016/j.jsat.2009.12.009. [PubMed: 20307792]
- Westphal JD, Gulati R, Shortell SM. Customization or conformity? An institutional and network perspective on the content and consequences of TQM adoption. *Administrative Science Quarterly*. 1997; 42:366–394.
- White AG, Birnbaum HG, Mareva MN, Daher M, Vallow S, Schein J, Katz N. Direct costs of opioid abuse in an insured population in the united states. *Journal of Managed Care Pharmacy : JMCP*. 2005; 11(6):469–479. [PubMed: 15998164]
- Woods JS, Joseph H. Reducing stigma through education to enhance medication-assisted recovery. *Journal of Addictive Diseases*. 2012; 31(3):226–235. doi: 10.1080/10550887.2012.694599; 10.1080/10550887.2012.694599. [PubMed: 22873184]

Highlights

- We use hierarchical linear modeling to examine counselor attitudes toward buprenorphine.
- Models show counselor characteristics that influence perceptions of buprenorphine.
- Research network participation may promote positive attitudes toward medications.

Table 1

CTN versus private counselors: NTCS 2007 – 2009

	CTN N = 922	Private N = 1,203	
	N(%) or M(SD)	N(%) or M(SD)	P-value
Characteristics			
Female	616 (66.74%)	779 (65.08%)	0.43
Age	45.42 (12.13)	46.37 (12.10)	0.04
Race (White vs. non-white)	637 (73.05%)	990 (86.61%)	<0.01
Master's or higher	447 (48.27%)	657 (53.94%)	0.01
Certified addiction counselor	490 (53.93%)	737 (60.51%)	<0.01
Licensed addiction counselor	421 (45.81%)	723 (59.56%)	<0.01
Tenure in the treatment field	9.98 (8.26)	11.43 (8.88)	<0.01
Caseload	25.37 (20.40)	20.80 (19.37)	<0.01
Hours worked/week	38.46 (9.48)	36.36 (11.97)	<0.01
In recovery	379 (41.06%)	568 (46.41%)	0.01
12-step preference (3-item M, 1–7)	3.34 (1.54)	4.49 (1.61)	<0.01
Buprenorphine training (scale 1–7)	3.76 (2.14)	3.47 (2.19)	<0.01
Attitudes toward buprenorphine			
Perceived acceptability	<i>n</i> =779	<i>n</i> =894	
Acceptability (1–7)	5.76 (1.59)	5.31 (1.75)	<0.01
“Acceptable” (1=scale responses 5–7)	624 (80.10%)	643 (71.92%)	<0.01
Perceived effectiveness	<i>n</i> =758	<i>n</i> =865	
Effectiveness (scale 1–7)	5.42 (1.51)	4.94 (1.61)	<0.01
“Effective” (1=scale responses 5–7)	560 (73.88%)	551 (63.70%)	<0.01

CTN = National Institute on Drug Abuse Clinical Trials Network

NTCS = National Treatment Center Study

Table 2

Logistic HLM models of perceived buprenorphine acceptability and effectiveness

Predictors	Perceived Acceptability		Perceived Effectiveness	
	N = 1,246 Counselors		N = 1,206 Counselors	
	N = 360 Programs		N = 352 Programs	
Counselor-level	Odds	Confidence	Odds	Confidence
	Ratio	Interval	Ratio	Interval
Female	0.98	(0.73, 1.32)	0.90	(0.77, 1.28)
Age	1.00	(0.99, 1.02)	0.59	(1.00, 1.02)
Race (White vs. non-white)	0.71	(0.48, 1.04)	0.08	(0.57, 1.15)
Master's or higher	1.46	(1.07, 1.99)	0.02	(1.06, 1.96)
Certified addiction counselor	1.13	(0.81, 1.57)	0.48	(0.77, 1.43)
Licensed addiction counselor	1.13	(0.86, 1.50)	0.39	(0.79, 1.36)
Tenure in the treatment field	0.99	(0.97, 1.01)	0.24	0.98
Caseload	1.01	(1.00, 1.02)	0.01	(1.00, 1.02)
Hours worked/week	0.99	(0.98, 1.01)	0.29	(0.99, 1.01)
In recovery	0.93	(0.69, 1.27)	0.66	(0.65, 1.15)
12-step preference (3-item M, 1-7)	0.83	(0.76, 0.90)	<0.01	(0.81, 0.95)
Buprenorphine training (scale 1-7)	1.27	(1.19, 1.36)	<0.01	(1.12, 1.28)
Program-level				
CTN (vs. private)	1.65	(1.15, 2.19)	0.01	(1.01, 2.10)
Buprenorphine adoption	1.55	(1.12, 2.16)	0.01	(1.18, 2.26)
Intra-class correlation(ICC)	0.14		0.17	
Reliability estimate	0.20		0.27	
Variance component (p-value)			0.01	<0.01

HLM = hierarchical linear model

CTN = National Institute on Drug Abuse Clinical Trials Network