



Published in final edited form as:

Addiction. 2013 February ; 108(2): 356–366. doi:10.1111/j.1360-0443.2012.04020.x.

An Intervention Targeting Service Providers and Clients for Methadone Maintenance Treatment in China: A Cluster-randomized Trial

Li Li, PhD¹, Zunyou Wu, PhD², Li-Jung Liang, PhD¹, Chunqing Lin, PhD¹, Linglin Zhang, MD³, Sam Guo, MBA¹, Keming Rou, BS², and Jianhua Li, PhD⁴

¹Semel Institute for Neuroscience and Human Behavior, University of California at Los Angeles, Los Angeles, CA, U.S.A

²Chinese Center for Disease Control and Prevention, Beijing, China

³Sichuan Provincial Center for Disease Control and Prevention, Chengdu, China

⁴Yunnan Institute on Drug Abuse, Kunming, Yunnan, China

Abstract

Aims—This study examines the preliminary outcomes of an intervention targeting service providers in methadone maintenance therapy clinics in China. The intervention effects on both service providers and clients are reported.

Design—The MMT CARE intervention pilot was developed and implemented collaboratively with local health educators. After three group intervention sessions, trained providers in intervention clinics delivered two individual motivational interviewing sessions with their clients.

Settings—Six clinics in Sichuan, China, were randomized to either the MMT CARE intervention condition or a standard care condition.

Participants—A total of 41 providers and 179 clients were sampled from the six clinics.

Measurements—At baseline and 3-, 6-, and 9-month assessments, providers completed self-administrated paper/pencil questionnaires regarding provider-client interaction, methadone maintenance therapy knowledge, perceived job-related stigma, and clinic support. Clients completed a face-to-face survey about their concurrent drug use and drug avoidance self-efficacy. Mixed-effects regression models with clinic-level random effect were used to assess the intervention effects.

Findings—Significant intervention effects for providers were found in improved methadone maintenance therapy knowledge, provider-client interaction, and perceived clinic support. For clients, better improvements in drug avoidance self-efficacy and reduced concurrent drug use were observed for the intervention compared to the standard care group.

Conclusions—The methadone maintenance therapy CARE intervention targeting providers in methadone maintenance clinics can improve providers' treatment knowledge and their interaction with clients. The intervention can also reduce clients' drug using behavior through motivational interviewing sessions conducted by trained providers.

Corresponding Author: Li Li, Ph.D., UCLA Semel Institute - Center for Community Health, 10920 Wilshire Blvd., Suite 350, Los Angeles, CA 90024, U.S.A., Phone: (310) 794-2446; Fax: (310) 794-8297, lililili@ucla.edu.

Declaration of Interest: All authors have no conflict declared

Clinical Trial Registration: NCT01532609

Keywords

Methadone maintenance therapy; providers; intervention pilot; China

INTRODUCTION

The first methadone maintenance therapy (MMT) clinic in China was established in 2004 [1]. By the end of September 2011, 716 clinics serving nearly 333,000 clients were operating in the country [2]. This rapid scale-up of MMT programs has decreased drug use, criminality, and increased quality of life and employment among drug users [3,4]. Despite the progress, MMT programs are encountering challenges including high dropout rates (about 50%) and concurrent heroin use (about one-third) [5–9]. Effective interventions are urgently needed to sustain the effectiveness of MMT.

Internationally there has been a great deal of effort to reduce concurrent drug use and increase MMT treatment adherence, with most efforts targeted clients directly [10–12]. However, providers play an important role in the success of MMT. Positive interactions between providers and clients improved treatment outcomes by increasing mutual understanding, empathy, trust, and shared decision making [13–16]. The rapid scale-up of MMT programs in China, however, has been associated with limited training and support for providers [17]. Normally, no more than two providers per clinic can receive formal national MMT training. Many providers do not have a clear understanding of the client needs, treatment dosages and risk management [18,19]. Most MMT clinics lack of the capacity to deliver psychosocial interventions and other services [17,20–22]. Moreover, difficulties in pursuing a professional career can affect a provider's morale [17] and internalized shame associated with working with a drug-using population can negatively impact interaction with clients [6].

This study was the first study to assess outcomes of an intervention targeting providers working at MMT clinics in China. Instead of directly delivering program activities to clients, we trained providers to conduct individual sessions with their clients. With the assumption that provider support and communications with clients can serve as an important contextual factor impacting client behaviors, we hypothesized that improved provider outcomes would be correlated with positive outcomes for clients.

The two specific aims of the intervention were to examine:

1. Whether providers in the intervention, compared to providers in the standard care, demonstrated improved provider-client interactions, MMT knowledge, better perceived support from clinic, and reduced perceived stigma associated with working in a drug-related field.
2. Whether MMT clients in the intervention, compared to clients in the standard care, reported increased self-efficacy to avoid drug and reduced concurrent illicit drug use.

METHODS

Study Design and Participants

This study was conducted from March 2009 to February 2011 in Sichuan, China. In 2009, Sichuan was ranked number four among provinces with the most drug users in China [23]. HIV prevalence was more than 15% among drug users [24].

The study utilized a two-armed design. Six MMT clinics were randomly selected out of 32 MMT clinics in Sichuan, and matched into three pairs based on number of clients and average retention rates. After baseline, the two clinics in each pair were randomized to MMT CARE intervention or standard care condition. The distance between the intervention and standard care clinics was far enough to avoid contamination.

The study participants included providers and clients from the selected MMT clinics. To be eligible for the study, providers had to be 18 years or older and working at the participating clinics, and clients had to be at least 18 years old and receiving MMT at the clinics. The study was approved by the Institutional Review Boards of the University of California, Los Angeles, and the Chinese Center for Disease Control and Prevention.

All providers who provided direct services to clients, including doctors, nurses, and pharmacists, were invited to participate in the study. The research staff waited for potential client participants near the entry hall of each clinic, and approached them randomly in a predetermined interval. During the recruitment of both providers and clients, research staff followed standardized scripts to introduce the study purpose, procedures, the voluntary nature, potential risks, and benefits in detail. Written informed consents were obtained. A total of 41 providers and 179 clients were recruited from the six clinics. The refusal rate was zero for providers and less than 10% for clients.

Intervention

The MMT CARE intervention consisted of two linked components: 1) group sessions with service providers, and 2) individual sessions delivered by trained providers to clients. The intervention was implemented by health educators from provincial and district-level CDCs to ensure regional relevancy and sustainability.

Service providers recruited from the intervention clinics received three group sessions in three consecutive weeks. Each session was about 90 minutes and was conducted with a group of 5 to 7 providers at each clinic. The themes of the three sessions were: MMT protocol and procedures, understanding stigma and its impact, effective communication with clients and motivational interviewing concepts and skills. The contents reflected the challenges faced by MMT providers that were identified from our earlier formative studies [6,7]. The sessions incorporated interactive activities such as games, pair-share, and role-play to encourage participants' full involvement.

The second component of the intervention required trained providers to deliver two brief motivational interviewing sessions in a one-on-one format to three to six clients in promoting positive behavior changes and treatment adherence. Each session lasted about one hour and was conducted in a private room. The providers were encouraged to apply the skills, tools, and strategies learned from the provider training to assist clients in treatment adherence by enhancing their motivation and commitment to positive behavior changes. In order to ensure the fidelity of individual sessions, clients were given a journal to document their experience, including date, time, what they liked or disliked about the contents and formats of each session. We also conducted brief interviews to seek clients' opinions about the sessions and areas to be improved.

After the individual sessions with clients, there were two booster sessions for providers, each lasting about 75 minutes. The booster sessions focused on sharing experiences in working with clients and continued skill building and problem solving through a new set of interactive games and activities. The participation rate for these activities was higher than 95%.

Standard Care

The providers in the standard care clinics continued to receive regular training on MMT related policies, procedures, and side-effect management. Such training was provided by the National MMT Training Center in a didactic lecturing format. No intervention activity or additional services were delivered to the clients in the standard care clinics.

Data Collection

The intervention outcomes were evaluated with data collected at baseline (before randomization and intervention delivery) and 3-, 6-, and 9-month assessments after baseline. At each assessment, provider participants completed self-administrated paper/pencil questionnaires independently in a private room, which took approximately 25 minutes to complete. A trained interviewer was available to answer questions during the assessment. Client data collection was conducted in a one-on-one, face-to-face format by trained interviewers in a private room. After the assessment, the client participants were asked to provide a urine specimen for urine morphine test. Assessments lasted an average of 30 to 45 minutes. All participants were compensated 50 yuan (U.S. \$7.70) for each assessment. Figure 1 shows the follow-up rates for providers and clients at each follow-up point.

Provider Outcome Measures

Provider-client interaction was measured with 12 questions specifically designed for this study. Sample questions included, “Do you ask clients questions about their concerns?” and “Do you find out the reason if your client is missing a dose?” Each question was measured on a 5-point scale with 1=not at all and 5=very much likely (range=12–60). A higher score indicates better client-provider interaction ($\alpha=0.82$).

MMT knowledge was measured with 18 true-or-false questions adapted from the Methadone Knowledge Questionnaire [25] and the MMT Clinical Guidance Handbook [26]. The answers to these questions were confirmed by MMT experts in China. The measure encompassed various topics on MMT eligibility, treatment goal, dosage, potential side effects and management. Sample items included: “Purpose of current MMT program is to achieve abstinence” and “MMT increases the severity of preexisting depression.” Participants scored one for each correct answer (range=0–18).

Perceived stigma was used to measure providers’ perceived stigma associated with working in a drug-related locale. The scale was originally developed and tested in other studies among providers in China [27]. The scale included nine items such as “You suffer discrimination or stigma from other providers due to the field in which you work,” and “You feel shame to work with drug users compared with professionals in other medical fields.” Each item scored from 1=strongly disagree to 5=strongly agree (range=9–45). A higher score indicates a higher level of perceived stigma ($\alpha=0.93$).

Perceived clinic support was measured by responses to eight statements that had been validated in previous studies in China [28]. Sample statements included “My institute has enough equipments and medicine for occupational exposure protection,” and “If I work hard, I will have opportunities to be promoted.” The original responses for each statement were 1=yes, 2=not sure, or 3=no and were further dichotomized as 1=yes and 0=no/not sure. The positive answers (1=yes) were summed so that higher numbers indicating higher levels of perceived institutional support from the clinic (range=0–6; $\alpha=0.68$).

Client Outcome Measures

Drug avoidance self-efficacy was measured with selected questions of the Drug-Avoidance Self-efficacy Scale (DASES) [29]. We chose 8 out of 16 questions that were considered to

be relevant to the target population. Some questions were modified to fit Chinese culture. For example, “Imagine it is Chinese New Year and you plan to do something special to celebrate. Would you use drugs?” All the questions were answered with a 5-point Likert scale from 1=definitely to 5=definitely not. Some questions were reversed so that a higher score indicated higher self-efficacy to avoid drug use (range=8–40; $\alpha =0.77$).

Concurrent drug use was determined using self-report of drug use in combination with urine morphine test, as suggested by Ciesla and Spear in 2001 [30]. Frequency and severity of heroin use in the past 30 days were self-reported by using the drug use section of the Addiction Severity Index (ASI) [31]. Urine specimen collection was collected and tested for morphine. Concurrent drug use was defined if a client either self-reported the use of heroin at least one day in the prior 30 days or had a positive morphine urine result.

Statistical Analysis

We used an intention-to-treat approach to estimate intervention effects. Baseline differences between intervention and standard care samples were tested using chi-square and *t* tests (or Wilcoxon rank tests) for categorical and continuous variables, respectively. The data for providers and clients were analyzed separately. Mixed-effects regression models with clinic-level random effect were used to assess the intervention effects on the positive change of providers’ outcomes or the positive change of clients’ outcomes. Covariates included preselected provider’s or client’s characteristics, group (standard care vs. intervention), visit (baseline, 3-, 6-, or 9-month follow-up), and group-by-visit interaction. The pre-selected provider’s characteristics included age, gender, profession (doctor vs. other), and working at MMT clinic (month), and the pre-selected client’s characteristics included age, gender, marital status (married/living as married vs. other), education (no schooling, primary school, and at least junior high), income in past month (yuan), methadone dose at enrollment (ml). The visit variable in these models was treated as a categorical variable in order to relax the linearity assumption. The model included a clinic-level random effect to account for dependence within clinics and a first-order autoregressive (AR1) covariance structure to account for repeated observations for each study participant. The primary interest in this study was to examine whether the changes (improvement or reduction) in outcome measure are different between intervention and standard care at the follow-up, which we refer to as an “intervention effect” at the follow-up. Thus, we present the comparison of interest through model contrasts, i.e., the estimated baseline differences and intervention effects at each follow-up after adjusting for provider’s or client’s characteristics. We also present the results from F-tests for the main effects (group and visit effects) and the interaction term. Lastly, we explored whether, in the intervention group, the characteristics of providers or clients influenced a client’s level of drug avoidance using a mixed-effects regression model. This model included the same random-effect and covariance structure as that used for clients. Additional covariates of interest were provider characteristics (years working in the medical field and service provider’s profession) and provider time-varying covariates (provider-client interaction, MMT knowledge, perceived stigma, and clinical support). All statistical analyses were conducted using SAS for Windows (Version 9.2).

RESULTS

Baseline demographic characteristics

Of the 41 providers, 19 were recruited from the intervention clinics and 22 were recruited from the standard care clinics. About 61% of the providers were women, and around 50% were doctors. Nearly 32% of the providers in the standard care and 47% of the providers in the intervention were 46 years or older. In the standard care, about 59% reported having been working in the medical field at least 15 years, compared to 63% in the intervention. At

baseline, no significant differences were observed for gender, age, profession, or years working in the medical field. Significant differences in duration working at MMT clinics were found between the intervention and standard care groups (mean: 22.5 vs. 33.4 months, respectively, $P=0.021$). The average score of the provider-client interaction measure at baseline in the standard care was significantly lower than that for the intervention (mean: 34.1 vs. 37.8, respectively; $P=0.028$). Comparable levels of provider reports on MMT knowledge, perceived stigma, and perceived clinic support at baseline were observed across the two intervention conditions (Table 1).

As shown in Table 2, there were 89 clients in the standard care group and 90 in the intervention. About 65% of the clients were men; at least 50% of the sample reported being married or living as married; and more than 62% of the client sample reported junior high school or above in education. At baseline, no significant differences between the intervention and standard care were observed for age, gender, marital status, education, or annual income. Standard care clients reported higher average methadone dose (59.6) than intervention (50.9) clients ($P=0.042$). One-third of the client participants self-reported heroin use in the previous 30 days, and 33.1% had a positive urine morphine test. The agreement of these two measurements was moderate ($Kappa=0.47$). Altogether 39.3% of clients in the standard care and 50.0% in the intervention either reported concurrent heroin drug use or had a positive urine test, and were thus considered concurrent heroin users in this study. The drug avoidance self-efficacy, heroin use during past month, and positive urine results of clients at baseline across the two intervention conditions were comparable.

Intervention effects on service providers

Table 3 presents the estimated intervention effects, differences in improvement or reduction of outcome measures between intervention and standard care, from the mixed-effect regression models for providers. We found that doctors reported significantly higher level of perceived stigma ($P=0.011$) and lower level of clinic support ($P=0.014$) as compared to the other profession. At 6-month, significant intervention effects on provider-client interaction (estimated difference=4.84, 95% CI: 0.71–8.97; $P=0.023$) and MMT knowledge (estimated difference=1.97, 95% CI: 0.71–3.22; $P=0.003$), after adjusting for provider's characteristics, were observed. At 9-month, the intervention effect on provider-client interaction remained (estimated difference=4.82, 95% CI: 0.44–9.19; $P=0.033$), and the providers in the intervention group reported a significant increase in perceived clinic support (estimated difference=1.82, 95% CI: 0.55–3.09; $P=0.006$). The average estimated intra-class correlation was about 0.05 (range: 0.027–0.095), and the AR1 correlation parameters were all significantly positive (range: 0.23–0.60). Since a significant difference in provider-client interaction at baseline was observed, we performed a sensitivity analysis by including the provider-client interaction measurement at baseline in the model. The results were very similar to those discussed above.

Intervention effects on clients

Results from mixed-effect regression models for clients are shown in Table 4. Age and marital status were found to be positively associated with level of drug avoidance self-efficacy ($P=0.036$ and 0.013, respectively). At 3-month, a significant intervention effect on the level of drug avoidance self-efficacy (estimated difference=2.93, 95% CI: 0.94–4.92; $P=0.004$) was observed (i.e., the clients in the intervention had a significantly better improvement in drug avoidance self-efficacy). We also found that the clients in the intervention had significantly lower odds of concurrent heroin use (i.e., heroin use in the past month or positive urine results) as compared to those in the standard care (OR=0.26, 95% CI: 0.08–0.79; $P=0.018$).

Linking drug avoidance self-efficacy to providers' and clients' characteristics

In an effort to explore associations between intervention effects on providers and clients, we conducted further analyses within the intervention group. Table 5 presents the selected characteristics of clients or their providers that were associated with client drug avoidance self-efficacy in the intervention. Male clients reported a significantly lower level of drug avoidance self-efficacy as compared to female clients ($P=0.024$). Providers' years of working in the medical field was also positively associated with drug avoidance self-efficacy ($P=0.036$). A lower level of perceived stigma from providers was significantly associated with a higher client drug avoidance self-efficacy ($P=0.017$). Unexpectedly, increasing providers' MMT knowledge was significantly associated with a lower level of drug avoidance ($P=0.010$).

DISCUSSION

Compared to Western nations, MMT programs in China are still at an early stage of development. Although previous work using strategies such as contingency management has shown promising results in enhancing retention among clients, efficacy is not likely to be sustainable if providers are not adequately trained [10–12,21]. There is an urgent need to broaden the focus from solely on individual clients to their treatment provision [32,33]. The current study takes an important step in this direction.

Preliminary outcomes of the MMT CARE intervention are promising. For providers, we observed significant intervention effects on improved MMT knowledge and provider-client interaction at the 6-month follow-up, and elevated perceived clinic support reported at both the 6- and 9-month. Our program evaluation showed that the intervention was well received by providers. The vast majority of them completed the assignment - 73% conducted individual sessions with five or more clients. It is likely and hopeful that trained providers will incorporate the knowledge and communication skills they learned into their routine practice.

This study also evaluated potential connections between client outcomes and sessions delivered by trained providers. Although clients did not participate in the group intervention activities, they showed evident improvement in drug avoidance self-efficacy and a reduction in concurrent drug use at 3-month. In this study, the effort to link provider and client outcomes was exploratory. It is important to establish the connections between providers and clients in future efficacy studies of interventions targeting both providers and clients.

This study identified a provider's years working in the medical field and occupation as a nurse was significantly associated with clients' drug avoidance self-efficacy. These findings can inform program improvements. For example, training could be individualized based on occupation or the provider's work experience. Also, the negative association between stigma perceived by providers and client's drug avoidance self-efficacy implies the importance of reducing internalized shame among providers in the role of achieving positive client outcomes. It is difficult to explain the unexpected findings in provider MMT knowledge and client drug avoidance self-efficacy; this may be due to the small sample size and the pilot nature of the study. Another explanation could lead to the role of MMT knowledge in treatment services. In a previous study, MMT knowledge was not found to be related to a provider's willingness to interact with clients or their negative attitude toward drug users, suggesting that information alone is not sufficient to change provider attitudes or their behaviors toward MMT clients [6].

This study offers further evidence of the usefulness of motivational interviewing at MMT clinics [34]. Although MMT clients come to clinics every day for a routine procedure,

unless special sessions are scheduled, providers normally interact only briefly with clients. This can become a barrier to effective provider-client communication. In this study, trained providers conducted brief motivational interview sessions with their clients, which could enhance provider-client interaction. Previous studies demonstrated that relationships between providers and clients could be positively associated with treatment outcomes [14,35–38]. Findings from this study further support the importance of the interaction between providers and clients in the context of MMT clinics.

There are limitations to this study. Foremost, data were collected from six clinics in one province of China so caution must be used in generalizing the findings to other geographic areas. Second, issues related to social-desirability bias could be raised because the measures mostly relied on self-reported data. Third, the small sample size and short follow-up period could not provide conclusive evidence of intervention efficacy. Also, some imbalances in background characteristics were observed between intervention and standard care such as clients' methadone dosage, possibly due to the small sample size. Nonetheless, this study reported important data for future programs targeting MMT providers, including how to localize intervention contents and core messages, how to use tools and participatory activities in implementation, and how to link provider and client outcomes in data analysis.

Acknowledgments

This study was supported by the National Institute of Mental Health (NIMH) Grant R34-MH083512. We thank project team members in Sichuan, Beijing, and Los Angeles for their contributions to this study.

References

1. Wu ZY, Sullivan SG, Wang Y, Rotheram-Borus MJ, Detels R. Evolution of China's response to HIV/AIDS. *Lancet*. 2007; 369(9562):679–90. [PubMed: 17321313]
2. China Ministry of Health, Joint United Nations Programme on HIV/AIDS, World Health Organization. 2011 Estimates for the HIV/AIDS Epidemic in China. 2007. [cited 2012 Feb 13]. Available from: <http://news.sciencenet.cn/upload/news/file/2012/1/20121291555312820.pdf>
3. Pang L, Hao Y, Mi GD, Wang CH, Luo W, Rou KM, et al. Effectiveness of first eight methadone maintenance treatment clinics in China. *AIDS*. 2007; 21(Suppl 8):S103–7. [PubMed: 18172377]
4. Sullivan GS, Wu Z. Rapid scale up of harm reduction in China. *Int J Drug Policy*. 2007; 18:118–28. [PubMed: 17689354]
5. Cao XB, Pang L, Rou KM, Yin WY, Wang CH, Luo W, et al. Five-year follow-up study of the retention rate and its risk factors for the first 1057 methadone maintenance treatment patients in China. *Chinese Journal of AIDS/STD*. 2010; 16(3):211–4.
6. Li L, Wu ZY, Cao XB, Zhang LL. Provider-Client Interaction in Methadone Treatment Clinics in China. *J Drug Issues*. in press.
7. Lin C, Wu ZY, Rou KM, Yin WY, Wang CH, Shoptaw S, et al. Structural-level factors affecting implementation of the methadone maintenance therapy program in China. *J Subst Abuse Treat*. 2010a; 38:119–27. [PubMed: 20015606]
8. Liu EW, Liang T, Shen LM, Wang B, Wu Z, Detels R. Correlates of methadone client retention: A prospective cohort study in Guizhou province, China. *Int J Drug Policy*. 2009; 20(4):304–3. [PubMed: 18951777]
9. Yin WY, Hao Y, Sun XH, Li F, Li JH, Rou KM, et al. Scaling up the national methadone maintenance treatment program in China: achievements and challenges. *Int J Epidemiol*. 2010; 39(Suppl 2):ii29–37. [PubMed: 21113034]
10. Darker CD, Sweeney BP, El Hassan HO, Smyth BP, Ivers JH, Barry JM. Brief interventions are effective in reducing alcohol consumption in opiate-dependent methadone-maintained patients: Results from an implementation study. *Drug Alcohol Rev*. 2011 Sep 15.10.1111/j.1465–3362.2011.00349.x

11. DeFulio A, Silverman K. Employment-based abstinence reinforcement as a maintenance intervention for the treatment of cocaine dependence: post-intervention outcomes. *Addiction*. 2011 May; 106(5):960–7. [PubMed: 21226886]
12. Nyamathi AM, Nandy K, Greengold B, Marfisee M, Khalilifard F, Cohen A, et al. Effectiveness of intervention on improvement of drug use among methadone maintained adults. *J Addict Dis*. 2011 Jan; 30(1):6–16. [PubMed: 21218306]
13. Heritage J, Maynard DW. Problems and prospects in the study of physician-patient interaction: 30 years of research. *Annu Rev Sociol*. 2006; 32:351–74.
14. Jackson TR. Treatment practice and research issues in improving opioid treatment outcomes. *Science & Practice Perspective*. 2002; 1(1):22–8.
15. Matthias MS, Parpart AL, Nyland KA, Huffman MA, Stubbs DL, Sargent C, et al. The patient-provider relationship in chronic pain care: providers' perspectives. *Pain Med*. 2010 Nov; 11(11):1688–97. [PubMed: 21044259]
16. Neumann M, Edelhauser F, Kreps GL, Scheffer C, Lutz G, Tauschel D, et al. Can patient-provider interaction increase the effectiveness of medical treatment or even substitute it?--an exploration on why and how to study the specific effect of the provider. *Patient Educ Couns*. 2010; 80:307–14. [PubMed: 20691557]
17. Lin C, Wu ZY, Rou KM, Pang L, Cao XB, Shoptaw S, et al. Challenges in providing service in methadone maintenance therapy clinics in China: Service providers' perceptions. *Int J Drug Policy*. 2010b; 21(3):173–8. [PubMed: 19818591]
18. Han L, Ling L, Xia Y, Chen W, Chen A, Chen J, et al. Status quo and policy recommendations of methadone maintenance treatment clinics in Guangdong Province. *Chinese Journal of Health Policy*. 2010; 3(3):34–38.
19. Lin C, Detels R. A qualitative study exploring the reason for low dosage of methadone prescribed in the MMT clinics in China. *Drug Alcohol Depend*. 2011; 110.1016/j.drugalcdep.2011.01.004
20. Chawarski MC, Zhou W, Schottenfeld RS. Behavioral drug and HIV risk reduction counseling (BDRC) in MMT programs in Wuhan, China: A pilot randomized clinical trial. *Drug Alcohol Depend*. 2011; 110.1016/j.drugalcdep.2010.09.024
21. Hser YI, Li J, Jiang H, Zhang R, Du J, Zhang C, et al. Effects of a randomized contingency management intervention on opiate abstinence and retention in methadone maintenance treatment in China. *Addiction*. 2011 Oct; 106(10):1801–9. [PubMed: 21793958]
22. Yang YC, Duan S, Xiang LF, Ye RH, Gao J, Yang SS, et al. Adherence and related determinants on methadone maintenance treatment among heroin addicts in Dehong prefecture, Yunnan province. *Zhonghua Liu Xing Bing Xue Za Zhi*. 2011 Feb; 32(2):125–9. [PubMed: 21518618]
23. Ministry of Health, China, Joint United Nations Programme on HIV/AIDS, World Health Organization. 2009 Estimates for the HIV/AIDS Epidemic in China. 2010. [cited 2012 Feb 13]. Available from: www.unaids.org.cn/.../2009%20China%20Estimation%20Report-En.pdf
24. Bao YP, Liu ZM. Systematic review of HIV and HCV infection among drug users in China. *Int J STD AIDS*. 2009 Jun; 20(6):399–405. [PubMed: 19451325]
25. Caplehorn J, Irwig L, Saunders JB. Attitudes and beliefs of staff working in methadone maintenance clinics. *Subst Use Misuse*. 1996; 31:437–52. [PubMed: 8851811]
26. National MMT working group. Methadone Maintenance Therapy clinical guidance handbook. 2005. [cited 2012 Feb 13]. Available from: <http://www.chinaaids.cn/chinammt/download/support/guide2006.pdf>
27. Li L, Lin C, Wu ZY, Wu S, Rotheram-Borus MJ, Detels R, et al. Stigmatization and shame: Consequences of caring for HIV/AIDS patients in China. *AIDS Care*. 2007a; 19:258–63. [PubMed: 17364408]
28. Li L, Liang LJ, Wu ZY, Lin C, Wu S. Institutional Support for HIV/AIDS Care in China: A Multilevel Analysis. *AIDS Care*. 2008; 20(10):1190–6. [PubMed: 19012080]
29. Martin GW, Wilkinson DA, Poulos CX. The drug avoidance self-efficacy scale. *J Subst Abuse*. 1995; 7:151–63. [PubMed: 7580226]
30. Ciesla JR, Spear SF. Concordance of Self-Reported Drug Use and Qualitative Urinalysis in Adolescents Treated for Substance Abuse. *Clin Drug Invest*. 2001; 21 (11):789–95.

31. McLellan AT, Kushner H, Metzger D, Peters R, Smith I, Grissom G, et al. The Fifth Edition of the Addiction Severity Index. *J Subst Abuse Treat.* 1992; 9:199–213. [PubMed: 1334156]
32. Deering DE, Sheridan J, Sellman JD, Adamson SJ, Pooley S, Robertson R, et al. Consumer and treatment provider perspectives on reducing barriers to opioid substitution treatment and improving treatment attractiveness. *Addict Behav.* 2011 Jun; 36(6):636–42. [PubMed: 21276664]
33. Strathee SA, Hallett TB, Bobrova N, Rhodes T, Booth R, Abdool R, et al. HIV and risk environment for injecting drug users: the past, present and future. *Lancet.* 2010; 376:268–84. [PubMed: 20650523]
34. Burke BL, Arkowitz H, Menchola M. The efficacy of motivational interviewing: A meta-analysis of controlled clinical trials. *J Consult Clin Psychol.* 2003; 71(5):843–61. [PubMed: 14516234]
35. Joe GW, Simpson DD, Dansereau DF, Rowan-Szal GA. Relationships between counseling rapport and drug abuse treatment outcomes. *Psychiatr Serv.* 2001; 52:1223–9. [PubMed: 11533397]
36. Magura S, Nwakeze PC, Kang SY, Demsky S. Program quality effects on patient outcomes during methadone maintenance: A study of 17 clinics. *Subst Use Misuse.* 1999; 34(9):1299–324. [PubMed: 10419225]
37. Simpson DD, Joe GW, Rowan-Szal GA, Greener JM. Drug abuse treatment process components that improve retention. *J Subst Abuse Treat.* 1997; 14(6):565–72. [PubMed: 9437628]
38. Blaney T, Craig RJ. Methadone maintenance. Does dose determine differences in outcome? *J Subst Abuse Treat.* 1999; 16(3):221–8. [PubMed: 10194739]

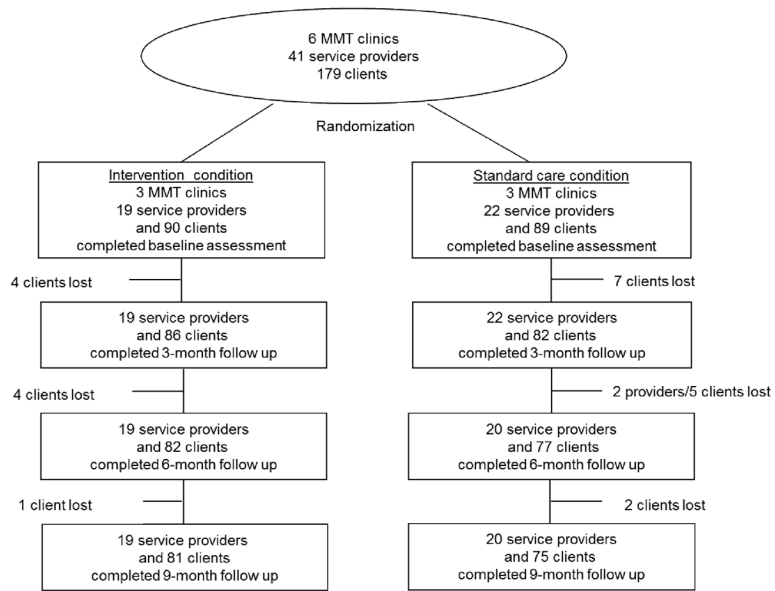


Figure 1.
Flow of Study Participants

Table 1

Demographic and Background Characteristics by Group Service Providers

Characteristics	Standard Care	Intervention	P
	N (%)	N (%)	
Number of Participants	22	19	
Gender			0.707 ¹
Male	8 (36.4)	8 (42.1)	
Age (Year) (Mean ± SD)	39.2 ± 10.8	45.3 ± 12.2	0.097 ²
35 or younger	9 (40.9)	3 (15.8)	
36–45	6 (27.3)	7 (36.8)	
46 or older	7 (31.8)	9 (47.4)	
Profession			0.613 ¹
Doctor	11 (50.0)	8 (42.1)	
Nurse/Pharmacist/Other	11 (50.0)	11 (58.9)	
Years Working at Medical Field	15.5 ± 10.1	20.8 ± 13.8	0.168 ²
5 or less	6 (27.3)	4 (21.1)	
6–15	3 (13.6)	3 (15.8)	
16–25	9 (40.9)	5 (26.3)	
26 or more	4 (18.2)	7 (36.8)	
Working at MMT Clinic (Months) (Mean ± SD)	22.5 ± 15.8	33.4 ± 12.5	0.021 ²
12 or Less	5 (22.7)	2 (10.5)	
13–24	11 (50.0)	1 (5.26)	
25–36	1 (4.55)	10 (52.6)	
37 or More	5 (22.7)	6 (31.6)	
<u>Baseline</u>			
Provider-Client Interaction			
Mean ± SD	34.1 ± 4.26	37.8 ± 6.18	0.028 ²
Perceived Stigma			
Mean ± SD	21.4 ± 6.04	18.4 ± 8.05	0.190 ²
MMT Knowledge			
Mean ± SD	14.7 ± 1.42	15.1 ± 0.97	0.405 ²
Perceived Clinic Support			
Mean ± SD	2.41 ± 1.68	1.74 ± 1.41	0.177 ²

¹ Chi-square test;

² t-test or Wilcoxon test

Table 2

Demographic and Background Characteristics by Group Clients

Characteristics	Standard Care	Intervention	P
	N (%)	N (%)	
Number of Participants	89	90	
Gender			0.795 ¹
Male	59 (66.3)	58 (64.4)	
Age (Year) (Mean ± SD)	36.4 ± 5.6	38.4 ± 5.4	0.021 ²
35 or younger	36 (40.5)	23 (25.6)	
36–40	32 (36.0)	43 (47.8)	
41 or older	21 (23.6)	24 (26.7)	
Marital status			0.112 ¹
Married/living as married	55 (61.8)	45 (50.0)	
Other	34 (38.2)	45 (50.0)	
Education			0.495 ¹
No schooling	16 (18.0)	16 (17.8)	
Primary school	12 (13.5)	18 (20.0)	
Junior high or higher	61 (68.5)	56 (62.2)	
Income in Past Month (Yuan) (Mean ± SD)	792 ± 1382	1128 ± 2421	0.257 ²
100 or Less	33 (37.1)	37 (41.1)	
101 – 600	24(27.0)	16 (17.8)	
601 or more	32 (36.0)	37 (41.1)	
Methadone Dose at enrollment (Mean ± SD)	59.6 ± 26.3	50.9 ± 29.7	0.042 ²
<u>Baseline</u>			
Drug Avoidance Self-Efficacy			
Mean ± SD	26.4 ± 6.87	24.9 ± 5.41	0.105 ²
Heroin Use Past Month or Positive Urine			
Results (%)	35 (39.3)	45 (50.0)	0.151 ¹

¹ Chi-square test;

² t-test or Wilcoxon test

Table 3
Results (Estimate and 95% CI) from Mixed-Effects Regression Models - Service Providers

Parameter	Provider-Client Interaction			MMT Knowledge			Perceived Stigma			Clinic Support		
	Est.	95% CI	P	Est.	95% CI	P	Est.	95% CI	P	Est.	95% CI	P
<i>Provider's Characteristics</i>												
Male (vs. Female)	-1.977	(-4.621, 0.667)	0.145	-0.115	(-0.825, 0.595)	0.751	2.911	(-0.441, 6.263)	0.091	0.319	(-0.353, 0.991)	0.354
Age	-0.051	(-0.173, 0.071)	0.410	-0.031	(-0.064, 0.002)	0.062	-0.034	(-0.189, 0.121)	0.668	-0.011	(-0.042, 0.020)	0.508
Doctor (vs. Others)	-0.462	(-2.888, 1.964)	0.710	0.403	(-0.250, 1.056)	0.228	4.051	(0.988, 7.114)	0.011	-0.785	(-1.404, -0.166)	0.014
Months at MMT	-0.032	(-0.116, 0.052)	0.452	0.023	(0.001, 0.045)	0.050	-0.037	(-0.143, 0.069)	0.492	-0.013	(-0.035, 0.009)	0.246
<i>Main effect¹</i>												
Group			<0.001			0.014			0.053			0.502
Visit			0.148			0.846			0.009			0.315
<i>Interaction¹</i>												
Group × Visit			0.111			0.001			0.414			0.038
<i>Comparison of Interest</i>												
Baseline comparison ²	4.502	(0.735, 8.269)	0.021	0.334	(-0.742, 1.410)	0.544	-2.479	(-6.813, 1.855)	0.264	-0.524	(-1.718, 0.670)	0.391
<i>Intervention Effect³</i>												
3-Month	2.002	(-1.432, 5.436)	0.255	1.002	(-0.086, 2.090)	0.073	-0.175	(-3.360, 3.010)	0.915	0.387	(-0.720, 1.494)	0.494
6-Month	4.837	(0.705, 8.969)	0.023	1.966	(0.714, 3.218)	0.003	-2.876	(-6.959, 1.207)	0.170	1.218	(-0.029, 2.465)	0.057
9-Month	4.815	(0.438, 9.192)	0.033	-0.144	(-1.440, 1.152)	0.828	-1.866	(-6.394, 2.662)	0.421	1.819	(0.545, 3.093)	0.006

¹ P-value from F-test. The significances of the main effects were not of interest.

² Estimated difference in provider's outcome measure at baseline between Intervention and Standard Care through model contrasts.

³ Intervention effect = Estimated difference in changes from baseline between Intervention and Standard Care through model contrasts.

Table 4
Results (Estimate and 95% CI) from Mixed-Effects Regression Model - Clients

Parameter	Drug Avoidance Self-Efficacy			Heroin Use Past Month or Positive Urine Results		
	Estimate	95% CI	P	OR	95% CI	P
<u>Client's Characteristics</u>						
Male (vs. Female)	-1.167	(-2.386, 0.052)	0.061	1.215	(0.588, 2.510)	0.598
Age	0.114	(0.008, 0.220)	0.036	0.948	(0.891, 1.010)	0.099
Married/Living as Married (vs. Other)	1.481	(0.321, 2.641)	0.013	0.845	(0.423, 1.689)	0.633
<u>Education (Ref=At least Junior High)</u>						
No Schooling	1.405	(-0.143, 2.953)	0.076	0.827	(0.329, 2.078)	0.685
Primary School	0.011	(-1.510, 1.532)	0.989	2.038	(0.811, 5.120)	0.131
Income in Past Month (in 10 yuan)	3.996	(-2.566, 10.56)	0.233	2.519	(0.052, 122.3)	0.641
Methadone Dose at Enrollment	-0.010	(-0.032, 0.012)	0.358	1.007	(0.993, 1.021)	0.353
<u>Main Effect¹</u>						
Group						0.816
Visit						0.424
<u>Interaction¹</u>						
Group Visit			0.037			0.065
<u>Comparison of Interest</u>						
Baseline Comparison ²	1.689	(-0.630, 4.008)	0.155	2.354	(0.384, 14.426)	0.355
<u>Intervention Effect³</u>						
3-Month	2.929	(0.942, 4.916)	0.004	0.255	(0.083, 0.786)	0.018
6-Month	1.535	(-0.784, 3.854)	0.195	0.789	(0.252, 2.469)	0.684
9-Month	1.252	(-1.173, 3.677)	0.312	0.362	(0.115, 1.144)	0.084

¹ P-value from F-test. The significances of the main effects were not of interest.

² Estimated difference in provider's outcome measure at baseline between Intervention and Standard Care through model contrasts.

³ Intervention effect = Estimated difference in changes from baseline between Intervention and Standard Care through model contrasts.

Table 5

Results from Model on Linked Provider and Client Data within Intervention Group

	<u>Outcome: Drug Avoidance Self-Efficacy</u>		
	Estimate	95% CI	P
<i>Client's Characteristics</i>			
Male	-1.81	(-3.358, -0.262)	0.024
Age	0.13	(-0.007, 0.267)	0.057
Visit (Ref=Baseline)			
3-month	2.52	(1.070, 3.970)	0.001
6-Month	2.19	(0.544, 3.836)	0.010
9-Month	2.73	(1.025, 4.435)	0.002
<i>Providers' Characteristics</i>			
Years working at medical field	0.14	(0.003, 0.227)	0.036
Profession (Ref=Doctor)			
Nurse	3.06	(0.159, 5.961)	0.041
Other	2.07	(-1.732, 5.872)	0.288
<i>Provider's Time-Varying Covariate</i>			
Provider-Client Interaction	-0.09	(-0.227, 0.047)	0.222
MMT Knowledge	-0.71	(-1.239, -0.181)	0.010
Perceived Stigma	-0.14	(-0.258, -0.022)	0.017
Clinic Support	0.14	(-0.291, 0.571)	0.537