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Initiation and Engagement in Chronic Disease Management Care for Substance Dependence

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1. Introduction

Although substance dependence is often an illness with chronic physiological changes and a relapsing course, most addiction treatment is not structured to manage it as a chronic disease (McLellan et al., 2000; Institute of Medicine, 2006). Traditionally, patients are encouraged to enter addiction treatment for a specified period with the unrealistic expectation of “curing” their substance use disorder (SUD). Most people with SUD do not seek specialty treatment (Cunningham and Blomqvist, 2006; Hasin et al., 2007) and for the few who do, treatment is often episodic and prematurely truncated due to dissatisfaction with care, motivational issues, or program challenges (Substance Abuse and Mental Health Services Administration, Office of Applied Studies, 2008). Medical and psychiatric comorbidities are often neglected, despite their potential to interfere with addiction treatment and contribute to relapse. Patients often need help navigating complex systems of care across addiction, medical, and mental health arenas.

To address these shortcomings, the Institute of Medicine (IOM) and others have called attention to the chronic disease management/chronic care model (CDM) (Wagner 2000) to improve the health care of individuals with chronic illnesses, including SUD (Institute of Medicine 2006). Though not unequivocally supported, CDM care has shown promise for other chronic conditions including congestive heart failure, chronic pulmonary disease, and

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depressive disorders (Roy-Byrne et al., 2001; Simon et al., 2001; Rea et al., 2004; Whellan et al., 2005). Though not as yet reported in randomized trials, CDM care for substance dependence (SD) offers the potential to follow individuals longitudinally, monitor disease progression, and enhance treatment adherence (Saitz et al., 2008; McKay, 2009). Similar to treatment of other chronic illnesses, adjustments in treatment intensity and modality can be made based upon a patient's functioning, motivation, and clinical course. Multidisciplinary teams with addiction-specific skills can provide direct care, coordinate referrals, communicate with other clinical caregivers, and proactively arrange use of community resources.

CDM care for SD builds upon growing evidence supporting the effectiveness of continuing care interventions to bridge transitions from more intensive treatment (e.g., residential or intensive outpatient treatment) to less intensive treatment (e.g., group counseling). Post-treatment monitoring is effective for facilitating early readmission to treatment for relapses (Scott and Dennis, 2009). Since considerable effort is often required to maintain ongoing attendance (McKay, 2009), alternative modes of treatment delivery such as telephone-based monitoring and brief counseling have been tested and found to be effective for decreasing continuing care dropout and substance use (McKay, 2005).

Some have suggested that primary care may be an optimal setting for providing CDM care for SD (McKay, 2009). Since primary care is meant to deliver longitudinal care, linking CDM care to primary care may facilitate ongoing utilization of CDM care for periodic assessments. Linking CDM care to primary care offers the potential to identify and treat primary care patients with SD who would otherwise not seek substance abuse treatment (Saitz et al., 2008) and to facilitate the coordinating role of the primary care team with respect to the medical, addiction, and psychiatric systems of care.

Although primary care services are theoretically available to patients with SD, these services are often not received for various reasons, such as missed appointments and lack of follow-through for evaluation of medical problems. CDM located in primary care may facilitate the evaluation of comorbid medical problems by encouraging ongoing attendance and engagement with medical care to facilitate actual receipt of services.

Other potential elements of CDM care that are often not part of "real-world" primary care include a focus on SD as a chronic illness, accessible specialty addiction expertise, and a delivery system designed to facilitate coordination of addiction, medical and psychiatric care (Saitz et al., 2008). CDM care is distinct from primary care and substance abuse treatment in that CDM focuses on increasing utilization of care that is potentially available but often difficult to access. It does so by delivering some of this care directly and by actively facilitating and monitoring access to services outside of the CDM clinic.

Although CDM care for SD is potentially effective, whether this type of care is acceptable to patients with SD is unknown. McLellan specified that "a continuing care approach emphasizes making treatments attractive to patients" (McLellan, 2002). Assessing whether patients find CDM care acceptable is important because efficacious addiction treatments are often underutilized, in part, due to lack of patient acceptance (Tucker et al., 2009). Whether patients will initiate and engage with CDM care is an essential component to assessing its potential effectiveness.

The primary objective of this study was to examine the proportion of study participants that initiated and engaged with CDM addiction care when this modality was made accessible. The secondary objective was to assess characteristics associated with initiation and engagement with CDM addiction care. Initiation and engagement were examined using an adaptation of the Washington Circle (WC) performance measures. These performance

measures, adopted by the National Committee for Quality Assurance (NCQA) for inclusion in its Health Plan Employer Data and Information Set (HEDIS) (National Quality Forum, 2007) are associated with beneficial outcomes including lower likelihood of arrests/incarcerations (Garnick et al., 2007) and improvements in alcohol addiction severity (Harris et al., 2010).

2. Materials and Methods

2.1. Study design and sample

This is a prospective cohort study of patients with alcohol and/or drug dependence enrolled in the Addiction Health Evaluation and Disease management (AHEAD) study, a randomized controlled trial designed to test the effectiveness of CDM for SD located in primary care. This study's analytic sample included only participants randomized to have access to CDM care. Control participants in the AHEAD study were not included in this study's analysis because they did not have access to CDM addiction care and thus, by design, could neither initiate nor engage with CDM care.

Recruitment for the parent study (the AHEAD randomized trial) occurred at an inpatient detoxification unit, primary care clinics and the emergency department at Boston Medical Center, and from the community by advertising on buses and in newspapers.

Eligible participants were adults with alcohol or drug dependence (Composite International Diagnostic Interview Short Form (CIDI-SF)) (Kessler et al., 1998) and current (past-month) drug (heroin or cocaine) or heavy alcohol use (5 drinks per day or >14 drinks per week for men; 4 for drinks per day or >7 drinks per week for women) who were willing to establish or continue primary medical care at Boston Medical Center (BMC) and attend an outpatient visit in primary care. Patients who were pregnant, had plans to leave the area or a Mini-mental State Examination score <21 (Smith et al., 2006) were excluded. This study's analysis included all parent study eligibility criteria along with one additional criterion: access to CDM addiction care, defined as randomization to have access to the CDM intervention.

Eligible patients were invited to enroll in a study that may include attending an outpatient visit (i.e., the AHEAD clinic) in a primary medical care clinic. Enrollment of study participants was *not* based upon an interest in utilizing CDM care or any other addiction treatment.

After completing the baseline research interview, participants were accompanied to their first CDM visit in the AHEAD clinic. Participants were compensated for study participation after research assessments and the first (intake) AHEAD clinic visit. Thereafter, AHEAD clinic visits were neither compensated nor required for continued participation in the study. Participants were assessed periodically for research purposes but were neither discouraged nor encouraged to attend the AHEAD clinic by research staff. The Institutional Review Board of Boston University Medical Center approved this study. Additional privacy assurances were secured by the issuance of a Certificate of Confidentiality by the Department of Health and Human Services.

2.2. Description of the Chronic Disease Management (CDM) clinic

The main goals of CDM care were to engage patients in longitudinal addiction treatment tailored to patients' needs (including attention to social, medical, and mental health), to re-engage patients in addiction treatments after relapse and/or loss to clinical follow-up, and to improve addiction-related health outcomes. CDM services included clinical case management, motivational enhancement counseling, addiction pharmacotherapy (i.e.,

buprenorphine, naltrexone, acamprosate and referral for methadone), psychopharmacology, and referrals for addiction, medical, and psychiatric treatment. Although the AHEAD clinic was located in a large primary medical clinic of an urban “safety-net” hospital, the AHEAD staff did not provide primary care. Instead, the clinic encouraged initiation of primary care and adherence to the evaluation and treatment plan for medical problems. Participants could access medical, psychiatric, and substance abuse services provided by the hospital without referral by the AHEAD clinic.

The AHEAD clinic team was comprised of a nurse care manager, social worker, and physicians with addiction expertise (an internist and a psychiatrist). At the first (intake) visit, the team assessed subjects’ addiction, medical, and psychosocial needs and negotiated with the patient to prioritize and address short-term needs. While there were overall clinical guidelines for what each patient should be offered in the AHEAD clinic, participants received different interventions based upon need, availability, and patient preference.

After the intake visit, the nurse care manager tried to maintain periodic contact with patients to provide relapse prevention counseling, address social service concrete needs, and facilitate referrals for care. The clinic allowed patients to attend without appointments, regardless of ongoing substance use. Efforts to encourage follow-up included multiple rescheduling attempts (phone, letter) for patients who missed their appointments.

2.3. Measures

2.3.1. Outcomes—Each of this study’s main outcomes, initiation and engagement with CDM care, were derived from the Washington Circle (WC) performance measures for outpatient addiction treatment (Garnick et al., 2002). Because the study’s objective was to examine initiation and engagement with CDM care, we adapted these measures to only include CDM visits rather than any outpatient treatment service. Initiation of CDM care was defined as two or more AHEAD visits within 14 days of study entry and engagement with CDM care as two or more AHEAD visits within 30 days of initiation. Even though a significant portion of the study sample was recruited from detox, we did not use the Washington Circle continuity of care measure after detox because we were specifically interested in initiation and engagement with CDM care rather than the effect of CDM care on continuity of care after a detox admission.

Because participants were not specifically seeking CDM care, we also examined the proportion of the study sample who eventually attended two or more AHEAD visits (“linkage with CDM care”) and four or more visits (“continuation of CDM care”) over the course of the study. AHEAD clinic attendance was prospectively assessed in a standard fashion using templates specifically created for the clinic in an electronic medical record.

2.3.2. Independent variables—Using Gelberg’s vulnerable populations modification of Andersen’s behavioral model as a guide for the choice of independent variables, we categorized independent variables, all assessed at study entry, as Need, Enabling, or Predisposing factors (Gelberg et al., 2000). Relevant indicators of need for CDM care were conceptualized into four categories: addiction, social, psychiatric, and medical needs. Addiction-related needs were dependence type (alcohol, drug or both) (CIDI-SF) (Kessler et al., 1998); addiction severity (Addiction Severity Index) (McLellan et al., 1992); history of overdose, and patient-assessed treatment need, which although was not directly measured, was partly reflected by a readiness to change scale.

Social needs included homelessness (any night in a shelter or on the street in the past 3 months) (Kertesz et al., 2006) and current legal problems. Psychiatric needs, assessed with the Mini International Neuropsychiatric Interview (MINI) (Sheehan et al., 1998), were

major depressive episode and post-traumatic stress disorder. Medical needs were reflected by two self-report comorbidity questionnaires, one validated by Katz et al (Katz et al., 1996) and another assessing substance-related medical conditions (De Alba et al., 2004).

Enabling variables were: unfavorable social network (most or all of the people that the participant spends time with are either heavy/problem drinkers or drug users); health insurance; and health services utilization of 1) residential addiction treatment (excluding care for detoxification), 2) mutual-help (such as Alcoholics, Cocaine, or Narcotic Anonymous), 3) psychiatric care (counseling or therapy for emotional/psychological problems including full-day treatment, partial hospital program, or treatment by a psychiatrist); and 4) medical hospitalizations.

Predisposing variables included age, sex, and race/ethnicity. To account for potential changes in clinic practices at different points in the study, we included the time of participant enrollment with respect to the first day of cohort recruitment ("study enrollment month").

2.4. Statistical analysis

We calculated the proportion of the study sample that initiated and engaged with CDM care along with 95% confidence intervals. Descriptive statistics were used to characterize utilization of CDM services, substance abuse treatment (outpatient or inpatient treatment, excluding treatment for detoxification); and addiction pharmacotherapy. The latter two variables were assessed at a 3-month follow-up interview. Separate multivariable logistic regression models were used to identify predictors of 14-day initiation of CDM care and 30-day engagement with CDM care. All regression models were fit including a single independent variable of interest as well as a core set of covariates: age, sex, race/ethnicity, and study enrollment month. If more than one non-covariate independent variable was statistically significant ($P < 0.05$), then a single model was fit to include all statistically significant variables, again with core covariates. We verified that no pair of independent variables included in a regression model was highly correlated (i.e. > 0.40), minimizing the potential for collinearity. Due to the exploratory nature of the analyses, no adjustments were made for multiple comparisons.

As secondary outcomes, we calculated the proportion of the study sample who met criteria for linkage with CDM care and continuation of CDM care using the Kaplan-Meier estimator to account for differential lengths of follow-up. To evaluate predictors of these CDM care utilization measures, we used a model-building approach similar to the one described above using Cox proportional hazards models. All statistically significant independent variables ($P < 0.05$) were combined into a single model with the same core covariates listed above. All analyses were completed using SAS/STAT software, Version 9.1, SAS Institute Inc. Cary, NC.

3. Results

3.1. Study subjects

This study's analytic sample was derived from participants enrolled in the AHEAD study randomized trial. Among 650 eligible individuals, 87% ($n=563$) enrolled in the AHEAD randomized trial, and 282 were randomly assigned to have access to CDM addiction care comprising the sample for this study.

The baseline sociodemographic and health characteristics of the study sample ($n=282$) are displayed in Table 1. Recruitment was largely from an inpatient detoxification unit (73%, 206/282). Most of the sample met criteria for both alcohol and drug dependence (56%),

fewer (27%) for drug dependence only, and 17% for alcohol dependence only. Social problems, psychiatric and medical comorbidities were common including homelessness (56%), legal problems (36%), post-traumatic stress disorder (36%), major depression (78%), and substance-related medical conditions (67%).

Approximately half of the cohort (45%, 95% Confidence Interval [CI] 39–51%) met criteria for 14-day initiation and 23% (95% CI 18–28%) for 30-day engagement with CDM care (Table 2). By the end of study follow-up, more than three-fourths (81%, 95% CI 76–85%) of the cohort met criteria for linkage with CDM care and almost two-thirds (62%, 95% CI 56–68%) with continuation of CDM care.

Among those with CDM care linkage, the range of time from study enrollment to the second AHEAD visit was wide (1–458 days), however, the median was 12 days (interquartile range [IQR] 5, 34) and most (72% [164/227]) did so within 30 days of study entry. Similarly, among those with four or more AHEAD visits, the range of time from study enrollment to the fourth AHEAD visit was also remarkably wide (6 to 1,059 days), but the median was 49 (IQR 21, 116) and most (67%) attended at least four AHEAD visits within 90 days.

Utilization of CDM care did not end with engagement. Participants who engaged with CDM care attended a median of 17 AHEAD visits (IQR 8, 27) over an extended period of time (median 514 days, IQR 180, 873). Participants with CDM continuation attended a median 14 visits (IQR 7, 25) over more than a year (median 550 days, IQR 287, 876).

We conducted a supplemental analysis to test whether engagement with CDM was associated with receipt of addiction treatments. Relative to those who did not engage with CDM care, a higher proportion of participants who engaged with CDM services utilized addiction treatment (79% versus 56%, respectively, p value = 0.001) and addiction pharmacotherapy (39% versus 18%, respectively, p value < 0.001).

3.2. Multivariable regression results

Major depressive episode was the only factor associated with initiation of CDM care (Table 3). Participants with major depressive episode had almost twice the odds of initiating CDM care (AOR 2.60, 95% CI 1.39, 4.87). Female sex was associated with lower odds of linkage with CDM care over the course of the study (Adjusted HR 0.67, 95% CI 0.49, 0.90).

Results of analyses (Table 3 and 4) examining 30-day CDM engagement and CDM continuation were similar: younger age, female sex, and higher alcohol addiction severity were associated with lower odds of 30-day CDM engagement and a lower risk of CDM continuation. Later study enrollment was also associated with the latter CDM measure. Major depressive episode, while significant in the preliminary model, was not significant in a final model that combined all statistically significant factors and core covariates.

Since the sample was composed of individuals with alcohol dependence, drug dependence, or both alcohol and drug dependence, those with lower alcohol addiction severity may have been more likely to be primarily drug users who were seeking services available at the CDM clinic like office-based opioid therapy. We accounted for this possible confounding factor by adding a covariate for past 30-day opioid use, which did not substantially alter results.

4. Discussion

In this cohort of adults with substance dependence with access to CDM care located in primary care, approximately half initiated and a quarter engaged with CDM addiction care in the time frame specified by Washington Circle performance measures. Broadening the time interval, about three quarters of the sample made at least two CDM visits and about

two-thirds at least four CDM visits over the course of the study. Regardless of the interval of time used to define these measures, most participants who engaged with CDM care continued to utilize CDM for more than a year.

An important point to consider is that recruitment of study participants was not based upon interest in utilizing CDM care. Although most of the study sample was recruited from a detoxification unit, they were not specifically seeking CDM care, or for that matter, any addiction treatment. Instead, they agreed to participate in a study that included an outpatient CDM clinic visit within primary care (i.e., the AHEAD clinic) or simply a referral to primary care. Therefore, participants in this study who were introduced to CDM care at study entry might return to utilize services in their “own time” instead of utilizing services within the timeframe specified in the WC performance measures. Accordingly, we found that most of the study sample returned to the clinic and CDM services during the follow-up period. Since engagement is considered to be a measure of patients’ assessment of the appropriateness and attractiveness of treatment (McLellan et al., 2007), most participants appear to view CDM care favorably.

Because participants were not specifically seeking CDM care, initiation and engagement results approaching those of standard addiction treatment should be considered favorable. This study’s initiation estimates are comparable to those reported by Massachusetts public sector addiction treatment sites and by the NCQA in an analysis of Medicaid data (42% for initiation and 27% for engagement) (Garnick et al., 2009). This study’s engagement estimate was also comparable to Massachusetts public treatment sites but higher than the Medicaid rates reported by the NCQA (43% and 12%, respectively) (National Committee for Quality Assurance, 2010). Other treatment systems have reported higher treatment engagement rates (Kilbourne et al., 2006; Garnick et al., 2007).

A secondary objective was to evaluate predictors of initiation and engagement. Surprisingly, very few of the long list of variables we examined were significantly associated with initiation and engagement including factors associated with utilization of other types of addiction treatment, such as homelessness, legal problems, and readiness to change. Several of the variables associated with lower odds of ongoing CDM utilization have been noted with other types of addiction care. The association of younger age with lower likelihood to engage with CDM care is consistent with many others including one using WC performance measures (Garnick et al., 2007). As in the National Survey on Drug Use and Health, female gender has been associated with less addiction treatment (Wu et al., 2003). Since women living with children are less likely to use substance abuse treatment (Kertesz et al., 2006), women may have been unable to access ongoing addiction CDM due to family responsibilities, difficulty arranging transportation, and/or child care. Future CDM efforts may need to focus on women with substance dependence, possibly by providing child care, making home visits, or using alternate modalities to clinic visits like telephone contacts (McKay, 2009; Godley et al., 2010).

We also found that higher alcohol addiction severity was associated with lower odds of CDM engagement and continuation. The reasons for this are not clear. A few studies have found an association between higher alcohol addiction severity or higher frequency of alcohol use and less continuity of care after discharge from residential addiction treatment (Greenberg et al., 2002; Harris et al., 2006). As all participants in this study had substance dependence, those with lower alcohol severity may have been more likely to have comorbid opioid dependence; as those individuals would have been the comparison group for this characteristic, their desire to return to the clinic to access opioid pharmacotherapy may account for this finding. However, these results were similar even after adjusting for past 30-day opioid use. Hence, these findings suggest that those with higher alcohol addiction

severity may require additional effort (e.g., motivational enhancement therapy, contingency management, more desirable pharmacotherapies) to engage and continue with CDM care.

4.2. Limitations

The importance of these findings depends upon whether CDM care is found to be effective. There is growing evidence that integrated medical and addictions care is more effective than either alone (Weisner et al., 2001; Bartels et al., 2004; Saitz et al., 2005) and CDM care contains effective components of addiction treatment (e.g., case management) endorsed by the IOM and others. Even if CDM care per se is not found to be effective, these findings are of interest, given the growing interest in transforming a system of time-limited episodic addiction care to one that spans different stages of substance use recovery (McLellan et al., 2007) and even a lifetime.

Generalizability of the study's results is another consideration when interpreting these findings. Since CDM care is a type of care that likely does not exist in many places, the results of this study are not applicable to models of care now in widespread use. However, there are several reasons that these findings may be applicable to urban general healthcare settings where such clinics could be implemented. First, this study had broad eligibility criteria to allow individuals with significant social, psychiatric, and medical needs to participate in the study regardless of readiness to change or desire for specialty addiction treatment, and most who were eligible enrolled; these were individuals that one might find in general medical practice or populations often excluded from efficacy studies (Humphreys et al., 2008). Second, the AHEAD clinic was located within primary care but was not dependent upon addiction training of the primary medical care staff. Third, many services commonly needed by individuals with SD were subject to the usual financial, administrative, and limited availability constraints. These services included addiction pharmacotherapy, specialty addiction treatment, primary medical care, diagnostic testing, and all other medical treatment provided by the hospital. In sum, the CDM clinic itself had no barriers but for any services outside the clinic, there were constraints, and in those circumstances, CDM clinicians worked to facilitate receipt of those services. CDM is a treatment model that could be implemented in other sites, albeit with variation in local available specific treatments outside the clinic.

4.3. Implications

This study's findings are relevant to recent efforts to provide longitudinal rather than episodic addiction care to improve the quality of care (McLellan et al., 2005; Institute of Medicine, 2006; McKay, 2006; Dennis and Scott, 2007). Evidence is growing for the utility of continuing care interventions to maintain progress from an initial, more intensive treatment and facilitate earlier re-entry into addiction treatment with relapse (Patterson et al., 1997; McKay et al., 2005; Bennett et al., 2007). CDM care shares this longitudinal perspective of care and goes further by facilitating access to a range of addiction treatment modalities including addiction pharmacotherapy, engaging with patients to acquire self-management skills, and addressing comorbidities. CDM care for substance dependence co-located with primary care has the potential to address the needs of the overwhelming majority of individuals with SD who would otherwise not seek any addiction treatment (Saitz et al., 2008; McKay, 2009). Sustaining participation with CDM care is likely to be instrumental to its efficacy (McKay, 2005). Knowing more about factors associated with CDM initiation and engagement can help clinicians target those who are more likely to drop out of care.

In summary, patients with substance dependence appear to be willing to initiate and follow-up with CDM care, although often not in time frames specified by performance measures

developed to evaluate the quality of outpatient addiction care. CDM has the potential for improving the quality of addiction care for people with addictions.

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Table 1

Characteristics of patients given access to chronic disease management (CDM) for substance dependence (n=282)

	N (%)
Need variables	
<i>Substance-related</i>	
Substance dependence diagnosis ^a	
Alcohol only	49 (17%)
Drug only	76 (27%)
Alcohol and Drug	157 (56%)
Overdose ^b (lifetime)	84 (30%)
Readiness to change ^c	
10	171 (61%)
Less than 10	111 (39%)
<i>Social needs</i>	
Homeless ^d	159 (56%)
Legal problems, ^e any	101 (36%)
<i>Psychiatric needs</i>	
Post traumatic stress disorder ^{f,g}	100 (36%)
Major depressive episode ^{f,h}	219 (78%)
<i>Medical needs</i>	
Comorbid medical condition ⁱ	133 (47%)
Substance use disorder -related medical condition ^j	189 (67%)
Enabling Variables	
Unfavorable social network ^k	197 (70%)
Health insurance, any	221 (79%)
Mutual-help, 12-step program ^l , any vs none (recent ^m)	136 (48%)
Substance abuse treatment, residential ⁿ (recent ^m)	60 (21%)
Psychiatric care ^o , any (recent ^m)	43 (15%)
Hospitalization, for medical problem (recent ^m)	55 (20%)
Predisposing variables	
Age, mean (SD) ^p	38.6 (9.9)
Female	84 (30%)
Race/ethnicity	
Black	93 (33%)
Hispanic	28 (10%)
Other	29 (10%)
White	132 (47%)
Study enrollment month ^q	
13	119 (42%)

	N (%)
7–12	65 (23%)
6	98 (35%)

^aComposite International Diagnostic Interview Short Form (past year) and past 30 day drug use or heavy alcohol use

^bOverdose includes accidental and deliberate overdose of illegal drugs, over the counter medications, prescription medications, or alcohol

^cReadiness to change drinking or drug use: “How are ready are you to change your drinking or drug use?” using a scale from 1 to10 with 10 indicating more readiness to change.

^dAny shelter use or night on the street in the past 3 months

^eOn probation, parole, pretrial release, or in diversion program (Drug Court)

^fMini International Neuropsychiatric Interview (MINI)

^gPast month

^hPast 2 weeks

ⁱKatz Comorbidity Questionnaire

^jIncludes seizures, heart failure, atrial fibrillation, rapid heart beat, hepatitis, cirrhosis, peripheral neuropathy, cancer of mouth/esophagus/stomach, skin infections, pneumonia, tuberculosis, gastritis, pancreatitis, anemia, septic arthritis, endocarditis, or blood clots

^kEnvironment favoring substance use defined as most or all of the people that you spend time with are either heavy/problem drinkers or heavy/problem drug users

^lAlcoholics Anonymous, Narcotic Anonymous, or Cocaine Anonymous

^mPast 3 months

ⁿExcludes admission for detoxification

^oAny counseling or therapy for emotional/psychological problems including full-day treatment, partial hospital program, or treatment by a psychiatrist

^pStandard deviation

^qMonth of participant enrollment with respect to the first day of Addiction Health Evaluation and Disease management (AHEAD) cohort recruitment (September 11, 2006)

Table 2

Utilization of CDM care for substance dependence

Outcome	Definition	Proportion (95%CI)
14-day initiation of CDM care ^a	2 CDM visits within 14 days after study entry	45% (39,51)
Linkage with CDM care ^b	2 CDM visits between study entry and the end of the follow-up period ^c	81% (76, 85)
30-day engagement with CDM care ^a	2 CDM visits within 30 days after “14- day initiation” criteria are met	23% (18, 28)
Continuation of CDM care ^b	4 visits between study entry and the end of the follow-up period ^c	62% (56, 68)

^a Adapted from Washington Circle performance measures for initiation and engagement with outpatient addiction treatment

^b Kaplan-Meier survival estimate

^c Median follow-up was 944 days with interquartile range of 743, 1096.

Table 3

Factors associated with utilization of CDM care for substance dependence in multivariable regression models

Need variables	14-day initiation ^a		CDM linkage ^b		30-day engagement ^c		CDM continuation ^d	
	OR ^e	95% CI	HR ^f	95% CI	OR ^e	95% CI	HR ^f	95% CI
<i>Addiction-related needs</i>								
Substance dependence diagnosis								
Drug only	1.47	0.62, 3.46	0.86	0.53, 1.37	2.43	0.85, 6.92	1.17	0.68, 2.01
Alcohol and Drug	1.23	0.62, 2.41	0.87	0.60, 1.25	1.75	0.74, 4.13	0.96	0.62, 1.49
Alcohol only	1	---	1	---	1	---	1	---
Alcohol addiction severity ^g								
0.70	0.49	0.25, 0.95 ^h	0.69	0.48, 1.00	0.30	0.14, 0.67	0.49	0.32, 0.75
0.30 – < 0.70	0.55	0.28, 1.05	0.94	0.65, 1.35	0.34	0.15, 0.74	0.68	0.45, 1.02
< 0.30	1	---	1	---	1	---	1	---
Drug addiction severity ^g								
0.38	1.31	0.68, 2.55	0.72	0.50, 1.03	1.47	0.66, 3.25	0.76	0.50, 1.15
0.25 – < 0.38	1.06	0.57, 1.99	0.68	0.48, 0.96	1.24	0.59, 2.61	0.75	0.50, 1.13
< 0.25	1	---	1	---	1	---	1	---
Overdose (lifetime) (yes vs no)	0.88	0.52, 1.51	0.91	0.68, 1.22	0.97	0.51, 1.85	0.88	0.63, 1.23
Readiness to change								
10	0.90	0.55, 1.48	0.89	0.67, 1.17	0.78	0.43, 1.41	0.82	0.59, 1.12
Less than 10	1	---	1	---	1	---	1	---
<i>Social needs</i>								
Homeless, any vs none	0.80	0.49, 1.30	0.86	0.66, 1.12	0.79	0.44, 1.42	0.78	0.58, 1.06
Legal problems, any vs none	1.59	0.96, 2.63	1.26	0.95, 1.66	1.37	0.75, 2.51	1.27	0.93, 1.73
<i>Psychiatric needs</i>								
Post traumatic stress disorder	1.11	0.67, 1.82	1.08	0.82, 1.42	1.11	0.61, 2.04	1.12	0.82, 1.53
Major depressive episode	2.60	1.39, 4.87	1.27	0.92, 1.76	2.53	1.11, 5.80	1.26	0.86, 1.84
<i>Medical needs</i>								
Concomitant medical condition	1.34	0.81, 2.20	1.27	0.96, 1.68	1.66	0.90, 3.07	1.11	0.81, 1.53
Substance use disorder-related medical condition	1.50	0.89, 2.53	1.13	0.85, 1.51	1.58	0.82, 3.04	1.18	0.84, 1.66
Enabling variables								

Need variables	14-day initiation ^a		CDM linkage ^b		30-day engagement ^c		CDM continuation ^d	
	OR ^e	95% CI	HR ^f	95% CI	OR ^e	95% CI	HR ^f	95% CI
Unfavorable social network	1.17	0.68, 1.99	1.03	0.77, 1.37	1.32	0.68, 2.56	0.83	0.60, 1.16
Health insurance, yes vs no	0.66	0.35, 1.23	0.74	0.53, 1.05	1.27	0.57, 2.80	1.04	0.70, 1.54
AA, any vs none (recent)	1.08	0.67, 1.76	1.16	0.89, 1.51	1.10	0.61, 1.98	1.01	0.74, 1.37
Substance abuse treatment, residential (recent)	1.67	0.92, 3.04	1.20	0.86, 1.67	1.32	0.64, 2.72	1.36	0.94, 1.98
Psychiatric care, any (recent)	1.08	0.55, 2.08	1.09	0.76, 1.56	1.35	0.63, 2.90	1.17	0.76, 1.78
Hospitalization, for medical problem (recent)	1.76	0.96, 3.22	1.17	0.84, 1.61	1.42	0.71, 2.84	0.96	0.66, 1.41
Predisposing variables								
Younger age (1 SD decrease)	0.86	0.66, 1.13	0.90	0.78, 1.05	0.66	0.47, 0.92	0.84	0.71, 1.00
Female	0.65	0.38, 1.10	0.67	0.49, 0.90	0.36	0.17, 0.75	0.61	0.43, 0.86
Race/ethnicity								
Non-white vs. white	1.07	0.63, 1.80	0.99	0.75, 1.32	0.86	0.46, 1.62	0.84	0.61, 1.17
Study enrollment month								
13	0.88	0.49, 1.58	0.92	0.67, 1.26	0.59	0.29, 1.21	0.56	0.39, 0.82
7-12	1.17	0.61, 2.23	1.04	0.73, 1.48	1.31	0.62, 2.77	0.87	0.58, 1.28
6	1	---	1	---	1	---	1	---

^a 2 CDM visits within 14 days of study entry

^b 2 CDM visits between study entry and the end of the follow-up period

^c 2 CDM visits within 30 days after achieving "14-day initiation"

^d 4 CDM visits between study entry and the end of the follow-up period

^e Odds ratio from logistic regression models predicting 14-day initiation of CDM care and 30-day engagement with CDM care (separate models for each independent variable of interest, all adjusted for core covariates: age, gender, race/ethnicity, and study enrollment month)

^f Hazard ratios from Cox proportional hazards models predicting CDM linkage and CDM continuation (separate models for each independent variable of interest, all adjusted for core covariates)

^g Categories represent tertiles of Addiction Severity Index score (0-1) with 1 indicating higher severity

^h P=0.08

Bolded values indicate an association at p<0.05

Table 4Factors associated with “30-day engagement” and “CDM continuation” in the final multivariable model^a

Independent Variable	<u>30-day engagement</u>		<u>CDM continuation</u>	
	<i>OR</i>	<i>95% CI</i>	<i>HR</i>	<i>95% CI</i>
Younger age (1 SD)	0.64	0.47, 0.88	0.77	0.65, 0.93
Female	0.54	0.29, 0.98	0.60	0.43, 0.85
Race/ethnicity (non-white vs white)	0.89	0.49, 1.59	0.93	0.67, 1.30
Alcohol Severity Index				
0.70	0.34	0.17, 0.71	0.49	0.32, 0.75
0.30 – < 0.70	0.48	0.24, 0.96	0.68	0.45, 1.02
< 0.30	1	---	1	---
Major depressive episode	1.42	0.73, 2.75	---	---
Study enrollment month				
13	0.89	0.45, 1.77	0.63	0.42, 0.94
7–12 months	1.31	0.65, 2.65	0.84	0.57, 1.25
6	1	---	1	---

^aResults from one multivariable logistic regression model predicting “30-day engagement” with CDM care and one multivariable Cox proportional hazards model predicting “CDM continuation.” Both models include all variables listed in the table.