

The effects of continuing care on emerging adult outcomes following residential addiction treatment



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ABSTRACT

Background: Professional continuing care services enhance recovery rates among adults and adolescents, though less is known about emerging adults (18–25 years old). Despite benefit shown from emerging adults' participation in 12-step mutual-help organizations (MHOs), it is unclear whether participation offers benefit independent of professional continuing care services. Greater knowledge in this area would inform clinical referral and linkage efforts.

Methods: Emerging adults ($N=284$; 74% male; 95% Caucasian) were assessed during the year after residential treatment on outpatient sessions per week, percent days in residential treatment and residing in a sober living environment, substance use disorder (SUD) medication use, active 12-step MHO involvement (e.g., having a sponsor, completing step work, contact with members outside meetings), and continuous abstinence (dichotomized yes/no). One generalized estimating equation (GEE) model tested the unique effect of each professional service on abstinence, and, in a separate GEE model, the unique effect of 12-step MHO involvement on abstinence over and above professional services, independent of individual covariates.

Results: Apart from SUD medication, all professional continuing care services were significantly associated with abstinence over and above individual factors. In the more comprehensive model, relative to zero 12-step MHO activities, odds of abstinence were 1.3 times greater if patients were involved in one activity, and 3.2 times greater if involved in five activities (lowest mean number of activities in the sample across all follow-ups).

Conclusions: Both active involvement in 12-step MHOs and recovery-supportive, professional services that link patients with these community-based resources may enhance outcomes for emerging adults after residential treatment.

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1. Introduction

Substance use disorders (SUDs) are widely recognized as chronic conditions, often characterized by multiple cycles of treatment, abstinence, relapse, and, in some cases, incarceration prior to full remission (Dennis and Scott, 2007; Dennis et al., 2005; McLellan et al., 2000; Substance Abuse and Mental Health Services Administration (SAMHSA), 2014; White, 2012). Not surprisingly, relapse risk appears to be greatest early post-intervention,

especially during the first 90 days (Hubbard et al., 1997; Hunt et al., 1971), though there is an elevated relapse risk across the entire post-treatment year (Dennis et al., 2007; Weisner et al., 2003) and even up through 5 years of continuous abstinence (Flynn et al., 2003; Hser et al., 2001).

1.1. The role of professional continuing care in SUD recovery

This chronic relapse risk has helped catalyze an expansion of the conventional acute care paradigm to a three-phased model of SUD treatment, marked by (a) initial detoxification and/or symptom stabilization, (b) an acute, time-limited, more intensive treatment phase, and (c) most critically, continuing care that facilitates maintenance and/or further improvements in health and functioning

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over time (Dennis and Scott, 2007; Kelly and White, 2011; McKay, 2009, 2010; McLellan, 2008; Simpson, 2004; Stout et al., 1999). Based on a narrative review (McKay, 2009) and a meta-analysis (Blodgett et al., 2014), as a broad (and heterogeneous) group of interventions, continuing care generally appears to support a modest, reliable improvement in SUD outcomes. For example, Scott and Dennis (2009) showed that receiving quarterly assessments and active assistance with treatment re-engagement enhanced outcomes 2 years post-treatment. Also, McKay et al. (2010) found that telephone-based continuing care (brief assessments, feedback, and progressively less intensive counseling) enhanced outcomes over 18 months. Among adolescents, Godley et al. (2007) showed that a package of direct and active continuing care linkages coupled with interventions that facilitate community-based prosocial activities promoted better adherence to continuing care recommendations and abstinence rates 9 months post-treatment.

1.2. Emerging adulthood: a clinically unique stage of the life course

Taken together, with some exceptions (e.g., Godley et al., 2010; McKay et al., 2013), evidence suggests well-articulated, active continuing care interventions can improve post-treatment outcomes among adolescents and adults. Little is known, however, regarding professional continuing care among treatment-seeking emerging adults (e.g., 18–25 years old; Arnett, 2000), who comprise approximately one-fifth of all SUD treatment admissions (SAMHSA, 2014), and are developmentally unique in their combination of life stressors (e.g., transition to independent living) and recovery barriers (e.g., social networks with substantial proportions of substance using individuals; Kelly et al., 2013; Mason and Luckey, 2003). Emerging adults are also clinically challenging, presenting with initially lower recovery motivation (Sinha et al., 2003) and evidencing poorer treatment engagement and retention compared to adults (Choi et al., 2013; McKay and Weiss, 2001; Schuman-Olivier et al., 2014; Shin et al., 2007; Sinha et al., 2003), as well as poorer treatment and recovery outcomes compared to both adults and adolescents (Dawson et al., 2007; Hoepfner et al., 2014; Schuman-Olivier et al., 2014; Sinha et al., 2003; Smith et al., 2011).

1.3. Emerging adults' participation in community-based, 12-step continuing care

As with adolescents and adults, initial findings support 12-step mutual-help organizations (MHOs) as potent, community-based continuing care resources for emerging adults (Chi et al., 2009; Delucchi et al., 2008; Kelly et al., 2008, 2013). Given the overlap among 12-step MHOs and professional treatment (Borkman et al., 2007; Kelly, 2003), however, empirically informed continuing care recommendations require a simultaneous analysis of both professional (treatment) and non-professional (MHO) approaches. For example, among adult outpatients, studies show that 12-step MHO attendance is associated with abstinence *over and above* participation in SUD treatment as well as treatment-sanctioned, professional continuing care (Fiorentine, 1999; Fiorentine and Hillhouse, 2000). In the current study, we examined the unique effects of both professional continuing care and 12-step MHOs on post-treatment recovery rates in a sample of emerging adults.

1.4. Aims

Aims of the current study were three-fold: (1) to describe emerging adults' engagement in professional continuing care and 12-step MHOs over the year following residential treatment; (2) to investigate unique associations between professional continuing care services and abstinence while controlling for individual

factors (e.g., recovery motivation); and (3) to investigate unique associations between 12-step MHO involvement and abstinence, controlling for professional continuing care engagement and individual factors.

2. Methods

2.1. Treatment model

Participants were recruited from the Hazelden Betty Ford Foundation (HBFF) in Plymouth, Minnesota (formerly known as the Hazelden Center for Youth and Families [HCYF]), a Minnesota-model (McElrath, 1997) residential treatment program for adolescents and young adults. It employs 12-step facilitation, cognitive-behavioral, and motivational enhancement therapies in individual and group formats, and provides adjunctive psychiatric care when clinically indicated (Bergman et al., 2014b).

2.2. Procedure

Participants were reimbursed \$20, \$30, \$40, and \$50 for follow-up assessments at 1 month (83.8%), 3 months (81.1%), 6 months (73.2%), and 12 months (70.9%) after discharge from the index treatment episode, respectively. The study was conducted in accordance with the Institutional Review Board at Schulman Associates IRB, an independent review board.

2.3. Participants

Among possible participants who attended HBFF between October 2006 and April 2008 (i.e., 18–24 years old; $N=384$), 79% were enrolled and consented to participate ($N=302$). For more information on the original sample, refer to Kelly et al. (2012). In brief, participants were predominantly male (73.8%) and Caucasian (94.7%); mean age was 20.4 years old ($SD=1.5$). Alcohol and cannabis use disorders were the most common SUDs (about 75% each), and approximately one-third and one-half of the sample met criteria for opioid and cocaine use disorders, respectively, in their lifetime (*Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition; *American Psychiatric Association*, 2000). Roughly 85% of the sample completed treatment and the average participant attended for 25.5 days ($SD=5.7$). Regarding treatment payment, 61% of patients paid via insurance reimbursement and 35% via self-pay (i.e., family). Also, 50% of the sample came from areas where the median household income was below \$56,000. Apart from greater likelihood of being Caucasian, on aggregate participants were demographically similar to young adults (18–24 years old) in public sector as well as adults (18 and older) in private sector treatment (Roman and Johnson, 2004; SAMHSA, 2008).

Given the current study's focus on post-treatment continuing care, the study sample initially included 284 patients who completed at least one follow-up assessment (94%). Relative to participants who were not included in the study ($n=18$), those included in the study had significantly longer days in treatment for the index episode ($p<.001$, $d=0.74$) but were similar on several other relevant clinical characteristics at treatment admission (e.g., days abstinent in the past 90). They were also significantly more likely to have at least some college experience ($p=.01$; Odds Ratio [OR]=5.72) but similar on all other measured demographic characteristics (e.g., gender).

2.4. Measures

2.4.1. Professional continuing care services. Each of four continuing care services was assessed with items from the Form-90 (Miller and Del Boca, 1994). Number of outpatient sessions per week was calculated by summing number of outpatient treatment program sessions and number of SUD-related individual sessions and dividing by total weeks in the assessment period. Percentage of days in residential treatment and percentage of days in a sober living environment were calculated by dividing total days residing in each setting by total days in the assessment period. SUD medication was modeled dichotomously based on whether the patient reported taking any medication specifically to address SUD during a follow-up period (e.g., buprenorphine/naloxone). The Form-90 has been tested with adult and adolescent samples and has demonstrated good test-retest reliability and validity (Slesnick and Tonigan, 2004; Tonigan et al., 1997).

2.4.2. Substance use. Given the abstinence-focused nature of the residential program from which the sample was recruited, the primary outcome was *abstinence* from all substances including alcohol and other drugs during each follow-up period (Form-90; Miller and Del Boca, 1994). For ease of data interpretation and to maximize the study's clinical application, we modeled abstinence dichotomously (yes/no), in order to convey the likelihood of abstinence given varying levels of service engagement (i.e., odds ratios; also see Section 2.5). Saliva tests (Cone et al., 2002) assessing for the presence of tetrahydrocannabinol (THC), cocaine metabolites, opioids, amphetamines, and phencyclidine, were administered at follow-up assessments to verify self-reported abstinence among participants that lived within 50 miles of the treatment facility and could attend assessments in person (21.7% of those who completed 1-month follow-up, 18.9% at 3 months, 7.7% at 6 months, and

6.1% at 12 months). None of these participants refused the saliva test, nor were they compensated for completion. Relative to patients who did not complete saliva tests, patients completing saliva tests had significantly longer days in treatment for the index episode (but were not different on baseline percent days abstinent, commitment to abstinence, or 12-step MHO involvement, $p > .05$) and were significantly more likely to be male (but not different on education or ethnicity; $p > .05$). Abstinence was confirmed in 97% of the 109 saliva tests conducted across all follow-up assessments.

2.4.3. 12-Step MHO participation. Based on data collected with the Multidimensional Mutual-Help Meeting Activity Scale (Kelly et al., 2011), we derived an index of active 12-step MHO involvement based on the sum of eight dichotomous indicators, such as having a sponsor, contacting other members outside meetings, and 12-step work (see Kelly et al., 2013; internal consistency was $\alpha = 0.87$ at intake, 0.81 at 1 month, 0.88 at 3 and 6 months, and 0.95 at 12 months). Active 12-step MHO involvement was chosen rather than attendance as it is a stronger and more consistent predictor of SUD outcomes (Cloud et al., 2004; Emrick et al., 1993; Humphreys et al., 2004; Kelly et al., 2013; Kelly and Urbanoski, 2012; Stout et al., 2012; Weiss et al., 2005).

2.4.4. Motivation for abstinence. Abstinence motivation was measured at treatment intake with the five-item, Commitment to Sobriety Scale (Kelly and Greene, 2014) (minimum = 5; maximum = 30). The scale has demonstrated excellent internal consistency ($\alpha = 0.89$ at intake, 0.93 at 1 month, 0.95 at 3 and 12 months, and 0.94 at 6 months) and predictive validity, as well as significant incremental validity relative to existing measures of recovery motivation (Miller and Tonigan, 1996; Morgenstern et al., 1996) in the current sample (Kelly and Greene, 2014).

2.5. Analysis plan

To examine rates of professional continuing care engagement and 12-step MHO involvement (Aim 1), we present frequencies, descriptive statistics, and inter-correlations. To examine the unique influences of professional continuing care activities on abstinence (Aim 2), and the unique influence of 12-step MHO involvement on abstinence over and above professional continuing care (Aim 3), we ran two Generalized Estimating Equation models (GEE; Liang and Zeger, 1986). We chose to test our primary hypotheses with GEE models because this approach allowed us to model dichotomous observations (abstinence during follow-up) over time (at 1-month, 3-month, 6-month, and 12-month follow-ups) nested within individuals. For these GEE models, we carried out a systematic screening process to determine covariates with a priori pools of demographic characteristics as well as treatment-related and clinical variables measured at treatment intake (initial pool of possible covariates available by request). Specifically, for each follow-up, we conducted univariate logistic regressions with each of these a priori variables as the predictor and abstinence as the outcome, then conducted one multivariate model for each follow-up including only significant univariate predictors. We retained variables as GEE covariates if they were significantly associated with abstinence in at least two multivariate models, in order to reduce multicollinearity and maximize degrees of freedom. This screening process resulted in decisions to retain abstinence motivation and length of stay for the index treatment episode, in days.

Also, as mentioned in Section 2.2, the number of participants completing a follow-up decreased over time. GEE models can handle missing observations provided they are missing at random. Thus, in order to reduce bias associated with missing a follow-up assessment, variables associated with missing any of the four follow-up assessments were also included in the models (ethnicity, education, and length of stay for the index treatment episode).

In the first GEE model (Aim 2), abstinence over time (at 1-, 3-, 6-, and 12-month follow-ups) was the outcome, time invariant covariates were entered on the first predictor block, and professional continuing care services over time (also at 1-, 3-, 6-, and 12-month follow-ups) were entered on the second predictor block. The second GEE model (Aim 3) was estimated as above, but with 12-step MHO involvement over time added in the third block.

In order to test whether the effects of professional continuing care services on abstinence were consistent over time, we conducted four GEE models as in Aim 2, one for each service, which also included the service by time interaction. To test whether the effect of 12-step MHO involvement on abstinence was consistent over time, we conducted a GEE model as in Aim 3, that also included a 12-step MHO involvement by time interaction. Each significant interaction was probed by conducting four post hoc logistic regressions (where predictors were identical to models used in Aim 2 or Aim 3, for professional continuing care and 12-step MHO involvement, respectively) to examine the continuing care activity's associations with abstinence at each time point (1-, 3-, 6-, and 12-month follow-ups).

Regarding interpretation of associations between continuous predictors and a dichotomous outcome as was the case in these analyses, a one-unit change in the predictor of interest with regression coefficient b corresponds with an odds ratio of e^b (where e is a mathematical constant approximately equal to 2.718). Similarly, a two-unit change corresponds with an odds ratio of e^{2b} , a three-unit change with an odds ratio of e^{3b} , and so on (Twisk, 2013).

It is important to note, prior to conducting contemporaneous analyses outlined above, consistent with our recent work on this sample (Bergman et al., 2014a;

Kelly et al., 2013), we first conducted time-lagged analyses (e.g., the effect of 1-month outpatient treatment on 3-month abstinence), in order to bolster support for a causal relationship between professional continuing care services/12-step MHO involvement and abstinence. The pattern of results from both the time-lagged and contemporaneous models was the same. However, to be included in time-lagged analyses, of the 284 included in the study, participants needed to have data on all of the covariates and completed two consecutive assessments at least once (1- and 3-month follow-up, 3- and 6-month follow-up, or 6- and 12-month follow-up) whereas, to be included in contemporaneous analyses, they needed to have data on all of the covariates and completed at least one assessment. Thus, time-lagged analyses included a smaller, less representative sub-sample of the whole sample ($N = 284$) than contemporaneous analyses ($n = 246$ vs. $n = 281$, respectively) biased toward participants with better outcomes. For example, in lagged analyses, the parameter estimate for time (i.e., abstinence over time) was positive, indicating an improvement in abstinence over time. However, raw data using the whole sample as well as other longitudinal studies show that post-treatment abstinence rates tend to decline over time. Given the disadvantages of using the time-lagged models in this context, and the similar pattern of results, we report findings from the contemporaneous models.

3. Results

3.1. Professional continuing care participation and 12-step MHO involvement during the post-treatment year

As shown in Table 1, patients reported modest rates of attendance in outpatient treatment, with no more than 20% reporting attendance at any follow-up. Among all patients, on average, they attended less than one session per week. Approximately half attended a “step-down” (i.e., less intensive) residential level of care after discharge from the index treatment episode. While that proportion remained stable through 3-month follow-up, the proportion in residential treatment decreased substantially by the 6- and 12-month follow-ups. The proportion residing in a sober living environment at 1-month (approximately 20%) increased up through 6-month, and decreased by 12-month follow-up. Average percent days in a sober living environment followed a similar pattern, ranging from approximately 15 (at 1 month) to 25 (at 6 months). Rates of SUD medication were quite low across all follow-up assessments, ranging from 4 to 7%. In contrast, 12-step MHO involvement was common; participants reported involvement in five to six activities on average across the post-treatment year.

In addition, we descriptively tested correlations among the professional continuing care services and 12-step MHO involvement for each follow-up (not shown). Across each time point the pattern of results was largely similar. Involvement in 12-step MHOs was significantly correlated with percent days in residential treatment (r s ranged from .15 at 12-month to .35 at 3 month follow-up) and percent days in a sober living environment (r s ranged from .21 at 1-month to .36 at 6-month follow-up). Percent days in residential treatment was significantly and negatively correlated with outpatient sessions per week and percent days in a sober living environment. SUD medication was generally not correlated with 12-step MHO involvement or the other professional continuing care services. Of note, percent days in a sober living environment was positively and significantly correlated with outpatient sessions per week at 1- and 3-month follow-ups (r s = .15 and .19, respectively), but not 6- and 12-month follow-ups.

3.2. Is participation in professional continuing care associated with abstinence?

With the exception of SUD medication, each professional continuing care service was associated with abstinence, over and above covariates and other services in the model (Table 2, Model 1). Specifically, for outpatient sessions per week, relative to zero sessions, odds of abstinence were 1.25 times greater for 1 session per week, and correspondingly, 1.5 times greater for 2, and 2 times greater for 3. For sober living environment, relative to 0 of 100 days, odds of abstinence were 6.2 times greater for 100 days (i.e.,

Table 1
Continuing care descriptive statistics and abstinence over time.

	1 month (n = 253)	3 months (n = 245)	6 months (n = 221)	12 months (n = 214)
<i>Outpatient treatment</i>				
Any (% yes)	49 (19.4%)	47 (19.2%)	44 (19.9%)	36 (16.8%)
M weekly sessions (SD)	0.4 (1.2)	0.4 (1.1)	0.2 (0.5)	0.1 (0.3)
<i>Residential treatment</i>				
Any (% yes)	135 (53.4%)	125 (51.0%)	48 (21.7%)	25 (11.7%)
M percent days (SD)	50.2 (48.4)	39.0 (44.1)	9.5 (23.7)	3.6 (13.8)
<i>Sober living environment</i>				
Any (% yes)	53 (20.9%)	66 (26.9%)	80 (36.2%)	51 (23.8%)
M percent days (SD)	14.5 (32.5)	19.3 (35.9)	25.1 (38.4)	15.5 (32.0)
SUD medication (% yes)	17 (6.7%)	15 (6.1%)	8 (3.6%)	15 (7.0%)
M 12-step involvement (0–8)	5.5 (2.2)	5.7 (2.6)	5.3 (3.0)	5.1 (3.1)
Abstinence (% yes)	188 (74.6%)	156 (63.7%)	123 (55.7%)	90 (42.1%)

M, mean; SUD, substance use disorder.

100%, or 1.00) and, correspondingly, 1.7 times greater for 30 days, 3 times greater for 60 days, and 5.2 times greater for 90 days. For residential treatment, relative to 0 of 100 days, odds of abstinence were 10.5 times greater for 100 days and, correspondingly, 2 times greater for 30 days, 4 times greater for 60 days, and 8 times greater for 90 days. Also of note, both length of stay for the index treatment episode and baseline abstinence motivation were significant predictors of abstinence ($p < .05$ and $.01$, respectively).

3.3. Is 12-step MHO involvement associated with abstinence independent of professional continuing care participation?

Independent of covariates and continuing care services, 12-step MHO involvement was a significant predictor of abstinence over time ($p < .01$; Table 2, Model 2). Relative to zero 12-step MHO activities, odds of abstinence were 1.26 times greater for 1 activity, 1.59 times greater for 2, and 3.2 times greater for 5 (the lowest mean 12-step MHO involvement among all follow-ups). Although outpatient sessions per week was not significant when 12-step MHO involvement was included in the model, residential treatment and

Table 2
Generalized estimating equations characterizing the unique effects of professional continuing care services (Model 1) and 12-step mutual-help organization involvement (Model 2) on continuous abstinence across 1-month, 3-month, 6-month, and 12-month follow-up assessments.

	Model 1 OR (95% CI)	Model 2 OR (95% CI)
Time	0.96 (.93–1.00)*	0.95 (.91–.99)**
<i>Demographic characteristics</i>		
Ethnicity (Caucasian vs. not)	1.31 (.52–3.30)	1.35 (.59–3.10)
Education (some college vs. not)	0.78 (.52–1.18)	0.79 (.52–1.20)
<i>Clinical characteristics</i>		
Length of stay (days)	1.05 (1.01–1.10)*	1.05 (1.00–1.10)*
Abstinence motivation (at intake)	1.09 (1.05–1.14)**	1.07 (1.03–1.11)**
<i>Professional continuing care services</i>		
Outpatient sessions per week	1.25 (1.02–1.53)*	1.19 (.97–1.46)
% Days in sober living environment	6.24 (3.86–10.08)**	4.77 (2.83–8.03)**
% Days in residential treatment	10.50 (6.54–16.58)**	7.09 (4.31–11.64)**
SUD medication (any vs. none)	1.80 (.99–3.25)	1.77 (.98–3.18)
Active 12-step MHO involvement		1.26 (1.17–1.35)**

OR, odds ratio; CI, confidence interval; SUD, substance use disorder; MHO, mutual-help organization.

* $p < .05$.

** $p < .01$.

sober living remained significant. Specifically, controlling for 12-step MHO involvement, other professional continuing care services, and covariates, odds of abstinence were 4.8 times greater if residing in a sober living environment for 100% of days in a follow-up period versus none. Fig. 1 illustrates this additive effect for residing in a sober living environment and 12-step MHO involvement.

Regarding professional continuing care interactions with time, only the residential treatment by time interaction was significant ($p = .017$). The interaction between 12-step MHO involvement and time was also significant ($p = .003$). Results of post hoc logistic regression analyses for percent days in residential treatment revealed significant associations with abstinence at 1-, 3-, and 6-, but not the 12-month follow-up ($p < .05$; odds ratios [OR] = 25.81, 22.88, 13.19, and 0.70 over time, respectively). For 12-step MHO involvement, analyses revealed significant associations with abstinence at 1-, 6-, and 12-month – but not 3-month follow-up ($p < .05$; ORs = 1.25, 1.04, 1.43, 1.61, over time, respectively).

3.4. Subsidiary GEE interpretations

In order to explore hypotheses for future tests of mediation (e.g., “Does 12-step MHO involvement mediate the association between residing in a sober living environment and abstinence?”), we examined change in each significant continuing care service effect from the model without and with 12-step MHO involvement included (Model 1 vs. Model 2, respectively). First, the effect of outpatient sessions per week on abstinence decreased from significant to non-significant. Second, although they were significant predictors in both models, effects of percent days in residential treatment and sober living were smaller in Model 2 compared to Model 1. These findings indicate the positive associations between participation in professional continuing care services and abstinence may be explained, in part, by 12-step MHO involvement.

4. Discussion

In the current study we examined emerging adults' patterns of professional and non-professional continuing care utilization and associations with abstinence following residential SUD treatment. Findings indicated that attending “step-down” residential treatment and outpatient treatment, as well as residing in a sober living environment were each significant predictors of continuous abstinence. Extending prior mutual-help investigations among this cohort, findings also showed patients' 12-step MHO involvement was predictive of abstinence over and above professional continuing care participation and other confounding variables.

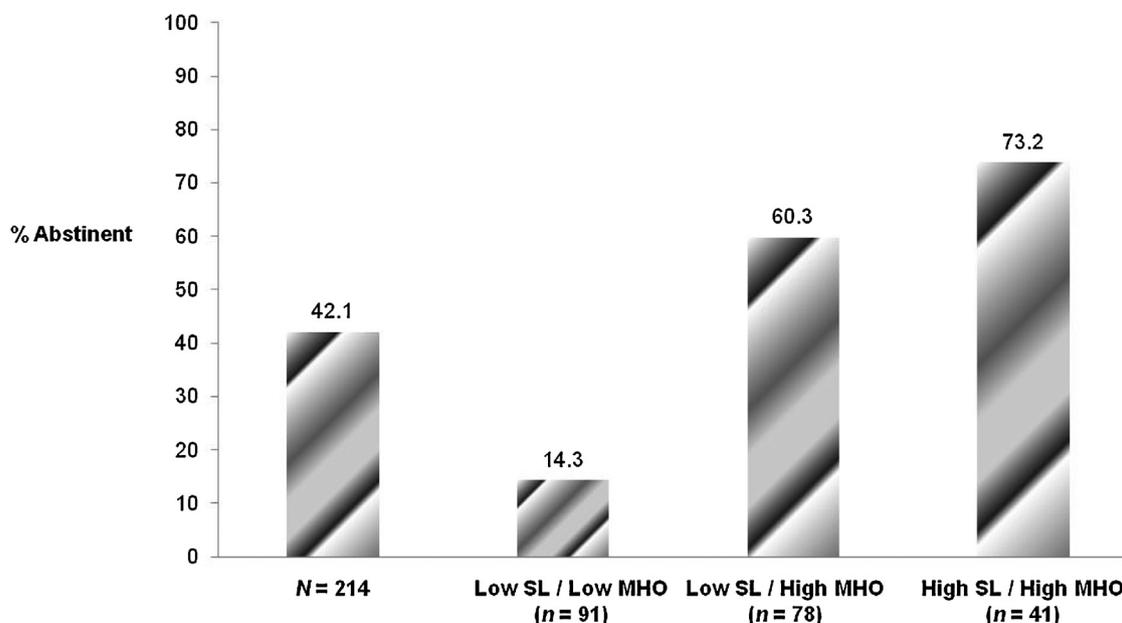


Fig. 1. Raw abstinence rates during the 12-month follow-up period as a function of sober living environment residence (SL) and 12-step mutual-help organization involvement (MHO). SL was split by mean percent days (15.5% or lower [low] versus greater than 15.5% [high]), and MHO was split by mean number of activities (five or lower [low] versus six or greater [high]). Note that only four patients had high SL/low MHO, none of whom were abstinent during follow-up (not shown).

4.1. Engagement with continuing care after residential treatment

First, patients were engaged with both professional and community-based (i.e., MHOs) continuing care options, consistent with a recovery management framework (Kelly and White, 2011; White, 2008). Second, this emerging adult sample was far more likely to attend “step-down” residential than outpatient continuing care (maximum of 50% versus 20% of the sample). This finding was somewhat surprising, given that among patients attending publicly funded programs, outpatient treatment is the most commonly sought modality, serving 60% of all admissions (SAMHSA, 2014). The structure of the residential program from which patients were recruited may account in part, for the sample’s unique pattern of continuing care service utilization, as patients were offered geographically accessible, longer-term, and less-intensive residential treatment as a continuing care option. More residential than outpatient continuing care may also reflect the sample’s substance use severity (Kelly et al., 2010), where greater engagement with higher levels of care would be clinically appropriate. Also of note, residential treatment engagement in the latter two follow-up time periods may reflect response to relapse rather than step-down care associated with the initial continuing care plan.

Third, participation in medication-assisted treatment was rare, though in post hoc exploratory analyses (not shown), rates were slightly higher among patients with an opioid use disorder, and increased marginally over time (6.7%, 11.1%, 12.0%, and 13.6% at 1-month, 3-month, 6-month, and 12-month follow-ups). Importantly, between 2006 and 2010 (the time period during which our sample was recruited), only 8% of SUD treatment programs offered medication-assisted treatment (SAMHSA, 2011). Emerging evidence regarding the efficacy and safety of the partial agonist buprenorphine/naloxone (Gray, 2007; Li et al., 2014; Mattick et al., 2014) and intramuscular extended release formulation of the antagonist naltrexone (Gastfriend, 2011), may shift clinical perspectives, leading to greater likelihood of referral for SUD medication. For example, among SUD treatment seekers in 2012, 28% of primary heroin and 18% of primary non-heroin opioid patients reported engagement with medication-assisted treatment (SAMHSA, 2014).

4.2. Professional and 12-step mutual-help continuing care are each uniquely associated with positive outcomes

Although the study was naturalistic and patients were not randomized to continuing care services, results are consistent with prior research showing that continuing care interventions provide post-treatment support for recovery efforts (Blodgett et al., 2014; McKay, 2009). Findings here suggest after an acute episode of care, programs can increase the likelihood that patients will remain abstinent in the first year by facilitating their engagement in a structured recovery-supportive setting. It is not surprising that participation in residential treatment was associated with increased odds of abstinence given the exaggerated emotional scaffolding and protection from environmental risks it offers. Critically, however, similar to other studies showing structured sober housing provides recovery benefit (Jason et al., 2006, 2007; Polcin et al., 2010), we found that residing within a sober living environment during a follow-up period uniquely enhanced the odds of abstinence by a factor of 5.

Building on prior work among adults indicating additive 12-step MHO and professional service effects (Fiorentine and Hillhouse, 2000; Moos et al., 2001), analyses showed, over and above individual factors and continuing care service engagement, odds of abstinence for emerging adults who become actively involved in 12-step MHOs during the post-treatment year (i.e., in five activities, the lowest mean level of involvement at any follow-up) are more than 3 greater than those with no involvement. Regarding nonsignificant associations between 12-step MHO involvement and abstinence at 3-months and between residential treatment and abstinence at 12-months, speculatively, it could be that the greater variability in percent days in residential treatment early in the post-treatment year allows for stronger prediction of abstinence (see Table 1). However, as variability in residential treatment engagement declines over time, this provides more fertile statistical ground to detect the impact of community-based, 12-step MHO involvement effects.

Exploratory analyses also provided some preliminary insights about the relationship between professional and non-professional continuing care activities. Specifically, the effects of professional

continuing care services on abstinence may have been explained, at least in part, by engaging patients with freely available 12-step MHOs, in keeping with the primary goal of many professional programs. Formal tests of mediation (e.g., MacKinnon et al., 2007) that examine whether the impact of professional continuing care services on abstinence is explained by 12-step MHO involvement are warranted.

Specifically regarding evidence for sober living environments, these housing supports provide patients with a heterogeneous array of recovery resources, both across and within settings (Polcin, 2009). Oversight and monitoring can vary substantially, including toxicology screens, mandated 12-step MHO attendance, and requirements that residents either have employment or otherwise seek employment, a strong predictor of sustaining recovery (White, 2008). Highlighted by their potential ability to bolster abstinence self-efficacy (Jason et al., 2006) and to reduce the financial burden of SUD via reductions in SUD-related illegal activity (Lo Sasso et al., 2012), as well as to facilitate 12-step MHO participation, research on a diversity of recovery-supportive housing options, the services they offer, and their relative effects on recovery rates are needed to inform and enhance clinical referral.

4.3. Limitations

Conclusions from this study should be considered carefully in light of some important limitations. First, our sample was primarily male and Caucasian and recruited from a single high-quality, residential treatment facility in the Midwest. Also, although half of participants resided in areas where the median household income was below \$56,000, given families' ability to support patients' engagement in residential treatment, findings might not generalize to families with fewer resources and/or limited health care access. Second, we chose to focus the study on the role of SUD continuing care for emerging adults, though some research suggests concurrent psychiatric treatment may boost SUD recovery rates (Moos et al., 2001; Ray et al., 2005), indicating follow-up inquiry regarding the interplay of SUD, psychiatric, and community-based continuing care is warranted. Finally, while several steps were taken to assess the unique effects of professional continuing care services and 12-step MHO involvement (e.g., use of GEE and statistical control for variables associated with abstinence and missed follow-ups), we cannot eliminate all alternative explanations for effects attributed to these activities due to the study's non-experimental design.

4.4. Summary, conclusions, and future directions

Research supports the clinical need to establish recovery-oriented systems of care (Hser and Anglin, 2011; White, 2008) rather than acute, unrelated, and episodic interventions. Similar to prior studies on adults and adolescents, this study found that participation in professional recovery services (step-down residential treatment and sober living environments) and community-based supports (12-step MHOs) uniquely promote improved abstinence rates among treatment-seeking emerging adults during the year after discharge from residential treatment. This study is also among the first to document additive benefits of professional and non-professional (i.e., 12-step MHO) continuing care participation specifically among this age group. In light of the consistency between these continuing care findings and others examined across the life course, however, clinicians might explicitly focus facilitation efforts on engaging patients with structured, recovery-supportive environments that link individuals with freely available 12-step MHOs after the initial episode of care. Regarding future investigations, the impact and reach of continuing care for young adults might be augmented through testing the broad array of settings and services within the sober living framework (Polcin,

2009), through adapting and testing 12-step facilitation approaches specifically for this age group to help reduce the financial burden of professional continuing care (Labbe et al., 2014), and through investigation of innovative mobile health applications (e.g., Gustafson et al., 2014) that may help overcome barriers to traditional approaches.

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Contributors

Drs. Bergman and Kelly contributed to study design, analyses, and manuscript preparation. Dr. Hoepfner was responsible for primary conduct of analyses. Ms. Nelson contributed to data collection and management. Dr. Slaymaker contributed to data collection and study design.

Conflict of interest

No conflict declared.

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