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Effects of Treatment Type on Alcohol Consumption Partially Mediated by Alcoholics Anonymous Attendance

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Abstract

Background—As insurance coverage, funding sources and venues for drug and alcohol treatment evolve in the United States, it is important to assess how the type of treatment received may impact long-term outcomes. The current study aims were to examine effects of treatment type on alcohol consumption in the year after treatment intake and to test mediators of effects of treatment type on later alcohol use.

Methods—Longitudinal data from clients in inpatient and outpatient alcohol treatment programs in California (n=560) were used in ordinary least squares path analysis adjusting for respondent characteristics typically associated with both treatment completion and alcohol use. The primary outcome was amount of alcohol consumed in the 12 months after treatment entry; hypothesized mediators were treatment duration and participation in Alcoholics Anonymous (AA).

Results—Despite higher baseline problem severity and a shorter treatment duration, inpatient clients consumed less alcohol after treatment than outpatient clients (B [95% CI] = -0.95 [-1.67, -0.23]). AA involvement was a significant mediator of the relationship between treatment type and alcohol consumption, with inpatient clients being more involved in AA and also drinking less after treatment than outpatient clients; the bias-corrected bootstrap 95% confidence interval for the indirect effect (B = -0.20) was entirely below zero (-0.43 to -0.05).

Conclusions—Outpatient clients may benefit from customized post-treatment recommendations to identify additional resources to assist in the recovery process during the first year after treatment.

Keywords

alcohol treatment; 12-step programs; treatment outcomes

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Author Contributions

All authors contributed to the conceptualization of the study. KKJ and JLK conducted the analyses and drafted the manuscript. JW and LAK contributed to the interpretation of the results and the editing of the manuscript. LAK also was involved in data collection for the original longitudinal study. All authors have read and are in agreement with the current manuscript.

Introduction

Inpatient drug and alcohol treatment facilities provide a structured environment for clients to live and recover for a fixed period of time. These include hospital-based programs, as well as other residential treatment programs. Outpatient drug and alcohol treatment programs provide more freedom for clients to maintain their everyday responsibilities outside of treatment, as clients visit the facility to participate in treatment at regularly scheduled intervals and then return home for the night. Inpatient clients typically have more severe drug and alcohol problems and face more co-occurring challenges than outpatient clients, and inpatient treatment usually is more intense to address these patients' specific needs. Despite greater intensity, inpatient treatment—particularly hospital-based inpatient care—often is limited to a shorter period of time than outpatient treatment.

Ideally, clients are linked to treatment services that match their level of need. In terms of relapse prevention, basic outpatient treatment services are recommended for people needing minimal support to control use or maintain abstinence, intensive outpatient services are recommended for clients who have not been successful managing their substance use at a lower level of care, and residential services are recommended for those patients who are at the highest risk for relapse without around-the-clock support (Gastfriend et al., 2004). An early review concluded that there was not definitive evidence favoring inpatient care over outpatient treatment (Finney, Hahn, & Moos, 1996), and strong evidence suggests that intensive outpatient services, such as day hospitalization, may be sufficient for clients without multiple, complex comorbidities, such as co-occurring drug dependence or psychiatric diagnoses, who might otherwise be candidates for inpatient services (Belenko, Patapis, & French, 2005; McCarty et al., 2014; McKay, Alterman, McLellan, Snider, & O'Brien, 1995; Witbrodt et al., 2007). However, there is some evidence that when compared to inpatient care, intensive outpatient services may result in worse short-term outcomes (Magura et al., 2003; Timko, Moos, Finney, & Moos, 1994), and, for some clients, undertreatment (such as placement in basic outpatient care rather than intensive outpatient care) also may result in worse short-term outcomes (Magura et al., 2003). Duration of care is important (Proctor & Herschman, 2014), and longer engagement in treatment may be particularly beneficial for lower-intensity programs (Finney, Moos, & Wilbourne, 2009).

The time after treatment completion has been referred to as the "critical period," with the three- to six-month period post-discharge associated with a high risk of relapse and return to high-risk drinking patterns (Gilbert, 1988). Empirical research has emphasized the importance of enrolling patients in aftercare or follow-up programs with the goal of maintaining acquired treatment values and reducing relapse (Fortney, Booth, Blow, Bunn, & Cook, 1995; Gilbert, 1988; Gossop, Stewart, & Marsden, 2008; Proctor & Herschman, 2014), although such services may not be covered by insurance. Clinicians, including primary physicians, psychologists, and staff within treatment facilities, highly recommend clients continue seeking care after completing treatment to ease the transition from treatment back to the routine of everyday life (Gilbert, 1988; Kelly & Yeterian, 2011; Owen & Marlatt, 2001).

Many formal treatment programs encourage clients to attend Alcoholics Anonymous (AA) meetings during treatment and also as a means of continuing care after treatment. This is in part due to the widespread recognition of AA and success in terms of reduced relapse and increased abstinence rates after AA attendance (Gossop et al., 2003; Gossop et al., 2008; Kaskutas, 2009; Kaskutas et al., 2005; Moos & Moos, 2006). Inpatient clients are more commonly exposed to self-help groups held close to (Finney & Moos, 1996), or even within (Gossop et al., 2003), their treatment facilities, while outpatient clients commonly begin attending groups near their homes during treatment (Finney & Moos, 1996; Thomassen, 2002). We argue here that this difference may result in increased engagement with AA after treatment by outpatient clients who are able to identify a convenient location to attend meetings, as well as reduced engagement with AA after treatment by inpatient clients who may not live near the treatment facility in which they were introduced to AA during their inpatient stay.

To date, there has been relatively little scholarly literature comparing levels of AA exposure during inpatient versus outpatient treatment. One study of a VA sample showed that a higher degree of 12-step orientation in a treatment program was associated with greater participation in 12-step groups and in greater benefits conferred from such participation, including better substance use and psychological outcomes (Humphreys, Huebsch, Finney, & Moos, 1999). This finding was also seen in a general population sample of patients receiving three different levels of outpatient treatment: standard, intensive and partial hospitalization (Morgenstern et al., 2003). An additional general population study examined AA involvement among problem drinkers who self-selected into inpatient and outpatient treatment; they noted that 66% of the outpatient clients and 39% of the inpatient clients also attended AA, with similar levels of participation (approximately 2 meetings per week) for the two groups (Timko et al., 1994). In contrast, another study indirectly addressed differences in AA exposure for different types of treatment programs. They found that outpatients in the 12-step facilitation (TSF) condition of Project MATCH attended about half as many AA meetings at the follow-up 3 months after recruitment as the aftercare patients, regardless of condition (Tonigan, Connors, & Miller, 2003). The aftercare sample had attended inpatient treatment prior to Project MATCH recruitment, whereas the outpatient sample did not. The latter findings provide some evidence that inpatient programs, even if they are not explicitly 12-step oriented, may inculcate more AA attendance than outpatient programs, even if they are specifically 12-step oriented. Since inpatients primarily (or often exclusively) attend AA meetings at the facility while they are in treatment, increased 12-step attendance during aftercare likely begins during treatment and may be an important part of the long-term recovery process.

In order to begin to address the question of whether differences in treatment duration and/or AA attendance may contribute to differences in long-term outcomes by treatment type, we use data from a longitudinal sample of clients receiving treatment for alcohol problems. We first compare drinking of inpatient and outpatient clients in the year following treatment intake to assess whether any differences exist. Then, as recommended by Finney and colleagues (1996), to assess possible explanations for differences in drinking by treatment type, we explore the influence of number of days in treatment and AA attendance as

mediators of the relationship between treatment type and alcohol consumption in the year after treatment entry.

Given the relatively sparse research base on these questions, we test competing hypotheses. Due to differences in baseline problem severity and duration of treatment, we might expect outpatient clients to consume less alcohol in the year after treatment than inpatient clients; however, due to differences in program intensity (in part to address clients' more complex and severe problems), we might expect inpatient clients to consume less alcohol than outpatient clients. Regarding AA as a possible mediator, if outpatient clients are more successful at finding meetings near their homes to attend after completing treatment, we might expect outpatient clients to consume less alcohol in the year after treatment than inpatient clients; however, due to typical modes of integration of AA into inpatient treatment programs, we might expect inpatient clients to have better long-term outcomes in part due to increased involvement in AA after treatment. All analyses adjust for baseline characteristics including problem severity to test the relative contributions of the two hypothesized mediators, treatment duration and AA attendance, to drinking in the year after treatment.

Methods

Sample

Participants were drawn from a longitudinal study that recruited clients from all public and private alcohol treatment programs in a Northern California county. Adult clients (at least 18 years old) gave consent to participate in an in-person structured interview administered by trained interviewers. Clients were recruited for the study within three days after entering treatment ($N=926$; 80% participation rate); at the time of initial interview, 93% agreed to participate in the follow-up study ($n=864$). A second interview was conducted by telephone one year after intake ($n=713$, 83% response rate among those who agreed to follow-up). The present secondary data analysis included 176 inpatient clients (57% of baseline sample) and 384 outpatient clients (82% of baseline sample) who were in treatment for alcohol problems, who were living independently at baseline (that is, they were not in jail or homeless at the time of treatment enrollment), and who had data for the primary drinking outcome one year after the baseline assessment. All study protocols for the original longitudinal study and the present analysis were approved by the relevant institutional review boards.

In the subsample of eligible cases, those who did not complete the follow-up interview ($n=105$) were significantly more likely to be male and they had higher rates of unemployment and lower incomes compared to the analysis sample ($n=560$). They also had more baseline dependence symptoms and were more likely to have received prior drug or alcohol treatment than those in the analysis sample who did participate in the follow-up interview. There were no differences on age, race/ethnicity, marital status, level of education, neighborhood poverty, baseline AA attendance or baseline alcohol consumption.

There was a higher rate of attrition for the inpatient subsample, so we reassessed characteristics associated with completion of the follow-up interview separately for the inpatient clients. As in the full sample, inpatient clients who completed the follow-up interview had lower baseline severity ($F(1, 208)=6.85$, $p=.01$) and higher baseline

involvement in AA ($F(1, 253)=4.77, p=.03$) than those who did not complete follow-up. None of the other comparisons were statistically significant.

Measures

Our primary outcome was amount of alcohol consumed in the 12 months after treatment entry. This was assessed using a Graduated Frequency Scale (Greenfield, 2000). This type of measure is very effective for measuring consumption among individuals who occasionally drink very heavily (Rehm et al., 1999). Five questions asked about the frequency of drinking in the past 12 months, assessing descending quantity levels ranging from 12 or more drinks to 1 or 2 drinks of any kind of alcoholic beverage in a single day. Frequency was captured on a 9-point scale ranging from “never” to “every day or nearly every day”. An overall volume measure was calculated by summing the cross-products of the frequency and quantity (using the midpoint for number of drinks). Volume measures obtained from a Graduated Frequency Scale correlate strongly with consumption documented in daily diaries ($r>.87$), with particularly good coverage of heavy drinking days (Greenfield, Kerr, Bond, Ye, & Stockwell, 2009). As in prior analyses with these data (Delucchi, Matzger, & Weisner, 2004; Witbrodt & Delucchi, 2011), we capped the measure at 13 drinks per day (average maximum number of drinks respondents reported consuming on any single day in the past 12 months). Since the distribution of total volume was positively skewed ($M=677.30$ drinks/year, $SD=1,225.72$ drinks/year), we used a natural log to transform this outcome measure ($M=3.55, SD=3.14$).

Treatment programs were classified as inpatient (hospital or other residential) or outpatient. We grouped hospital and other residential programs together because treatment is structured such that clients live at the facility for a period of time. This is in contrast to outpatient programs, in which clients live at their home residence and commute back and forth to attend treatment sessions at the facility. Outpatient treatment was the reference group. The programs in the study had abstinence goals and integrated 12-step approaches into their treatment models. During treatment, clients at inpatient programs were taken to 12-step meetings in the community, while outpatient clients were simply encouraged to attend AA meetings. Additional description of the different treatment programs is provided elsewhere (Delucchi & Weisner, 2010; Weisner, Matzger, Tam, & Schmidt, 2002).

AA attendance in the year after treatment was one of the hypothesized mediators. Clients reported the number of times they went to Alcoholics Anonymous (AA) in the 12 months prior to the baseline interview. They also reported the number of meetings attended after leaving the treatment program. Engagement with AA was coded in terms of the number of meetings attended ($M=26.6, SD=59.1$ meetings at baseline; $M=61.8, SD=95.1$ meetings at follow-up). AA attendance at both time points ranged from 0 to 365 meetings. The measure was capped to signify attending one meeting per day for 12 months prior to the interview. Analyses controlled for baseline AA attendance.

Treatment duration was the other hypothesized mediator. This was assessed using a self-report item (4.5% missing data) eliciting the length of time clients stayed at the residential program (for inpatient clients) or participated in the program (for outpatient clients). Duration was coded in terms of the number of days ($M=90.9, SD=137.6, \text{median}=42$ days).

Outpatient clients also reported the number of sessions they attended at the program site ($M=33.2$, $SD=55.9$, median=16 sessions), and this was modestly positively correlated with their treatment duration ($r=.37$, $p<.05$).

We also controlled for respondent characteristics typically associated with both treatment completion (Mutter, Ali, Smith, & Strashny, 2015) and alcohol use (Karraker-Jaffe et al., 2012): gender, age, ethnicity (Caucasian as reference with two mutually-exclusive dichotomous indicators for Black and other race/ethnicity), marital status (married as reference with two dichotomous indicators for separated/divorced/widowed and never married), total household income before taxes (less than \$10,000 as reference with three dichotomous indicators for \$10,000 to \$19,999, \$20,000 to \$35,000, and more than \$35,000), education (less than high school diploma as reference with two dichotomous indicators for high school diploma and at least some college or technical education after high school), employment status (employed versus unemployed/out of workforce), and neighborhood disadvantage (dichotomous indicator of living within a neighborhood where 15% or more of the residents have annual incomes below national poverty standards). Neighborhood disadvantage was based on census tract-level data from the 2000 US Decennial Census; 25% of the sample was residing in a disadvantaged neighborhood at baseline. Disadvantaged neighborhoods often have a high density of alcohol outlets such as bars and liquor stores (Pollack, Cubbin, Ahn, & Winkleby, 2005), which may be triggers for relapse or heavy drinking after treatment.

Distance to treatment was calculated using each client's self-reported home address at the time of treatment intake, with the number of roadway miles calculated using the ArcGIS (v. 10.2) Geographic Information System (ESRI, 2013). The control variable was a dichotomous indicator for distances of more than 10 miles (53% with $M=98.28$, $SD=366.51$ miles) versus 10 miles or less (47% with $M=4.58$, $SD=2.85$ miles) to the treatment site. The 10-mile cut-point represents a travel time of approximately 30 minutes given local traffic patterns and road types, and a 30-minute travel time is a common measure of healthcare accessibility (Sherman, Spencer, Preisser, Gesler, & Arcury, 2005).

Control variables also included baseline severity of alcohol problems and history of prior treatment. Baseline severity was assessed using a 9-item measure of past 30-day symptoms of alcohol use disorder based on criteria from the American Psychiatric Association's Diagnostic and Statistical Manual-IV (American Psychiatric Association, 2000). Sample items include "had your hands shake a lot the morning after drinking" and "felt you should cut down your drinking or stop all together." Values ranged from 0 to 9 ($M=4.42$, $SD=2.78$), with higher scores indicating more severe alcohol problems in the month prior to initiating treatment. Prior alcohol and drug treatment was based on survey items asking respondents if they had attended inpatient or residential programs, outpatient programs, or methadone or detox programs for alcohol or drug problems prior to the current (baseline) treatment episode. About half of the sample (53%) reported attending treatment at some point prior to the current episode.

Analysis strategy

Bivariate associations of treatment type with client demographics and other characteristics were assessed using chi-squares and t-tests. We used adjusted multiple regression models with data weighted to adjust for sampling and non-response to assess the direct effect of treatment type on alcohol consumption in the year after treatment. We employed ordinary least squares path analysis to test for mediation; these models also were fully adjusted for covariates. We calculated bias-corrected bootstrap confidence intervals for the indirect effects based on 10,000 bootstrap samples. Mediation analyses were conducted in SPSS version 17 (SPSS Inc., Released 2008) using the INDIRECT macro (Preacher & Hayes, 2008). Path analysis is able to accommodate control variables at each stage in the mediation process, and multiple mediator models provide an efficient and powerful test of mediated effects when the mediators may be correlated with each other (Hayes, 2013).

Results

Table 1 displays demographic characteristics of the samples. Inpatient and outpatient clients varied on baseline alcohol problems at treatment intake, with inpatient clients reporting significantly more symptoms of problem drinking, higher alcohol consumption in the year prior to entering treatment and a higher prevalence of at least one prior treatment episode. Outpatient clients reported a significantly longer duration of treatment than inpatient clients.

In multivariable regression models (Table 2), there was a significant main effect of treatment type on alcohol consumption, with inpatient clients consuming significantly less alcohol in the year after entering treatment than outpatient clients. Sensitivity analyses showed that the difference in alcohol consumption between inpatient and outpatient clients was robust to inclusion of additional covariates such as whether treatment was court-ordered (4% of sample) and the number of social network members who supported the client's efforts to cut down or stop drinking (results not shown).

We used a multiple mediation model to investigate whether there were indirect effects of treatment type through either treatment duration or AA attendance. This analysis showed inpatient treatment indirectly influenced alcohol consumption in the year after treatment through its effects on both treatment duration and AA attendance (see Figure 1 for model coefficients). Inpatient treatment clients had significantly shorter treatment durations than outpatient clients (path a_1), but longer treatment duration was associated with significantly less alcohol consumption in the year after treatment (b_1). The bias-corrected bootstrap 95% confidence interval for the indirect effect ($ab_1 = 0.21$) was entirely above zero (0.03 to 0.45). Inpatient treatment clients also had significantly greater engagement with AA in the year after treatment than outpatient clients (a_2), and more AA attendance was associated with significantly less alcohol consumption in the year after treatment (b_2), with the bias-corrected bootstrap 95% confidence interval for the indirect effect ($ab_2 = -0.20$) entirely below zero (-0.43 to -0.05). The direct effect of treatment type on alcohol consumption (c') remained significant in the multiple mediator model.

Post-hoc analyses

The mediation analyses showed countervailing effects among the inpatient clients. This may be due to a condition of moderated mediation, or the situation in which there are both moderation and mediation effects simultaneously at work (Muller, Judd, & Yzerbyt, 2005; Preacher, Rucker, & Hayes, 2007). We suspected associations of treatment duration with drinking might vary for inpatient and outpatient clients given likely differences in program intensity (Finney et al., 2009); that is, duration of treatment may matter more for outpatient clients than inpatient clients in our sample. To assess this possibility, we conducted post-hoc regression analyses testing an interaction of treatment duration with treatment type, and we also looked at the association of treatment duration with the drinking outcome in models stratified by treatment type. Although the interaction was not statistically significant ($B = -0.005$; $p = .38$) in a fully-adjusted model, the adjusted stratified models suggested that this alternative mechanism may be at work: For inpatients, treatment duration was marginally negatively associated with drinking in the year after treatment ($B = -0.009$; $p = .09$), but for outpatients, duration was significantly negatively associated with drinking in the year after treatment ($B = -0.003$; $p = .02$), with both relationships suggesting longer treatment durations were associated with less drinking after treatment. For the inpatient clients, treatment duration did not include any aftercare, and 39% did attend at least one aftercare session (mean = 32.9 sessions attended by those who attended any aftercare; mean = 11.7 for the full inpatient sample, including zeroes for those who did not attend at all). In sensitivity analyses, fully-adjusted regression models limited to inpatient clients ($n = 132$) showed that longer duration of treatment was associated with significantly less drinking in the year after treatment ($B = -0.011$, $p = .05$) when adjusting for whether or not the client had attended aftercare, which was not significantly associated with drinking ($B = 0.65$, $p = .29$), and when adjusting for the number of aftercare sessions attended ($B = -0.013$, $p = .02$ for treatment duration, with the number of aftercare sessions not statistically significant, $B = 0.0004$, $p = .95$).

In further post-hoc analyses, we looked at sub-types of inpatient programs by separating the hospital-based programs (with an average treatment duration of 14 days) from the long-term inpatient residential programs (with an average treatment duration of approximately 100 days). For the hospital-based programs ($n = 85$ clients), longer duration was marginally **positively** associated with drinking in the year after treatment ($B = 0.04$; $p = .07$), suggesting that perhaps the clients who stayed in the hospital programs longer had the most severe alcohol problems or the highest risk of relapse in the subsequent year. For the long-term inpatient residential programs ($n = 58$ clients), longer duration was significantly negatively associated with drinking in the year after treatment ($B = -0.02$; $p = .01$). An additional interaction model suggested that the association of treatment duration did not vary significantly for the long-term residential clients when compared to the outpatient clients ($n = 393$; $B = -0.009$ for the interaction; $p = .28$). We note that both groups of inpatient clients consumed less alcohol than the outpatient clients in the year after treatment (for hospital-based vs. outpatient, $B = -0.71$, $p = .09$; for long-term residential vs. outpatient, $B = -0.97$, $p = .06$), although the differences were only marginally significant.

Given these differences within the inpatient sample, we also checked the multiple mediator models comparing each of the two types of inpatient programs with the outpatient program clients. The findings using the outpatients and hospital-based inpatient sub-sample followed the same pattern as the primary analyses, with the countervailing mediation processes both significant, but the findings using the outpatients and long-term residential sub-sample showed a different pattern from the primary analyses. As in the full sample, long-term residential inpatient clients had greater engagement with AA in the year after treatment than outpatient clients (a_2), and more AA attendance was associated with significantly less alcohol consumption in the year after treatment (b_2), with the bias-corrected bootstrap 95% confidence interval for the indirect effect ($ab_2 = -0.21$) entirely below zero (-0.47 to -0.03). Long-term residential inpatient clients did not have significantly different treatment durations than outpatient clients (path a_1), however, and the bias-corrected bootstrap 95% confidence interval for the indirect effect ($ab_1 = 0.02$) included zero (-0.09 to 0.17). As in the primary analysis, the direct effect of treatment type on alcohol consumption (c') remained significant in the multiple mediator model.

Discussion

We examined differences in drinking in the year after initiating alcohol treatment for inpatient and outpatient clients and assessed mediation by both treatment duration and AA attendance. We saw that, despite greater baseline problem severity and a shorter stay in treatment, inpatient clients consumed less alcohol in the year after treatment than outpatient clients; this was counter to our initial hypotheses. Mediation analyses showed inpatient treatment increased involvement with AA in the year after treatment, which reduced alcohol consumption during this same period. This mediated effect suggests a role for AA attendance after treatment. Post-hoc analyses showed that this indirect effect was similar for hospital-based and long-term residential inpatient programs. Many treatment programs encourage clients to attend AA meetings after treatment as a form of aftercare because of evidence that greater AA attendance is associated with reduced relapse and increased abstinence (Gossop et al., 2008; Kaskutas, 2009; Kaskutas et al., 2005; Moos & Moos, 2006). A survey of American and Canadian drug and alcohol treatment clients revealed that almost half of the respondents reported their treatment programs “played an important part in directing them to AA” (Gross, 2010, p. 2361). Our post-hoc analyses also revealed that among the inpatient clients, engagement in AA was significantly related to alcohol consumption in the year after treatment, but formal aftercare attendance was not, which is similar to findings of Witbrodt and colleagues (2007). This deserves replication in other samples, using rigorous designs to isolate causal relationships.

AA attendance is a potentially modifiable factor that contributes to successful outcomes after treatment. With many clients turning to AA as a source of support for sobriety after treatment, and with problem drinkers increasingly treated in outpatient settings, research that more thoroughly tests whether differences in AA utilization exist across treatment types (and how this contributes to outcomes) can inform the mix of services provided. For example, outpatient programs in particular could integrate structured TSF sessions into their treatment programs to bring rigor to and evidence-based consistency in the way clients are introduced to AA (Kaskutas & Subbaraman, 2011). This can involve matching clients up with AA

members who will take them to a meeting (Timko & DeBenedetti, 2007; Timko, DeBenedetti, & Billow, 2006; Timko, Sutkowi, Cronkite, Makin-Byrd, & Moos, 2011), helping clients understand the philosophy of AA and work the first steps of AA (Project MATCH Research Group, 1997; Walitzer, Dermen, & Barrick, 2009), and providing homework assignments that help clients become more comfortable with the available support provided by AA members (Kaskutas, Subbaraman, Witbrodt, & Zemore, 2009). Additional research on effective ways to integrate 12-step resources into the outpatient setting also may be beneficial, as many of these programs do not take clients directly to AA meetings in the community as part of treatment; their patients often are responsible for finding and engaging with community AA groups on their own. Although many clients who enter treatment have some prior experience with AA, in our sample this was less common among the outpatient clients (45% had been to AA at some point prior to the index treatment event) than the inpatient clients (75%). This suggests formal linkages of outpatient clients with AA during the treatment process may be particularly beneficial for long-term outcomes.

The mediation analysis also showed inpatient clients attended treatment for a shorter duration than outpatient clients, and that shorter duration of treatment was associated with more drinking later. Post-hoc analyses revealed that this difference in treatment duration was specific to the hospital-based inpatient programs; the long-term residential programs did not evidence shorter durations of treatment than the outpatient programs in our sample. In the context of a shift toward a model of long-term disease management for substance use disorders and a drive to curtail healthcare costs by reducing use of acute (inpatient) care (McLellan & Woodworth, 2014), it will be essential to monitor the match between client needs, duration of care and types of services received, as well as the general impacts of treatment type on patients' long-term outcomes. There is some evidence suggesting that, in combination with pharmacotherapy, intensive outpatient management through primary care may be a promising alternative to specialty alcohol treatment (Oslin et al., 2014). In this context of shorter treatment stays, our findings suggest there may be an important role for AA in reducing drinking in the period immediately after treatment—particularly for inpatient clients—as the effects were strong even after accounting for the duration of treatment.

The current study is unique in several ways. Knowledge of decreased AA attendance after treatment among outpatient clients (compared to inpatients) can help inform treatment programs of possible disparities in use of this form of support for sobriety after treatment, with the fundamental goal of encouraging staff and case workers to customize post-treatment recommendations to help establish recovery resource contacts for after treatment. The study benefitted from detailed information about clients' baseline characteristics, past treatment episodes, severity of alcohol problems, and self-help attendance, allowing for many potential confounds to be controlled. We also focused on alcohol consumption after treatment, rather than abstinence, because substance use disorders involve high relapse rates and abstinence may not be a highly sensitive indicator of client improvement (Owen & Marlatt, 2001; White, 2008).

There also are a few important limitations of our study. First, mediation analysis may be biased if there are unmeasured confounders (VanderWeele & Vansteelandt, 2014). The dichotomous categorization of treatment type may have introduced error, as there may be more subtle differences between types of programs (such as hospital inpatient and other residential programs). Additionally, only self-report information was available regarding clients' length of stay and engagement with AA after treatment. Replication with other datasets using official program records to verify treatment program characteristics and duration and nature of treatment received would be informative, as these data were collected prior to the implementation of important U.S. mental health and substance use treatment reforms that are expected to influence the duration and nature of care received for substance use disorders. Other limitations to consider include reliability of self-report measures of alcohol use—although researchers in the alcohol field have verified the validity of these measures (Connors & Volk, 2003; Greenfield et al., 2009)—as well as the relatively short duration of the follow-up period and only two data points that did not allow for more detailed lagged analysis of causal processes (such as whether people reduce drinking and then increase AA attendance, for example). Additional research on the comparative costs of different treatment modalities also would be informative (see, for example, Kaskutas, Zavala, Parthasarathy, & Witbrodt, 2008), particularly when paired with clients' long-term outcomes to assess a full range of costs and benefits of treatment.

This study adds to the current literature by facilitating a greater understanding of post-treatment alcohol consumption among patients struggling with substance use disorders. Recently there have been many changes to funding for drug and alcohol treatment in the United States (US) under the Mental Health Parity and Addiction Equity Act (Parity Act) and the Affordable Care Act (ACA). For example, screening and brief intervention, as well as targeted drug and alcohol treatment, are now considered essential health benefits that must be covered by all plans, both private (purchased by either an employer or an individual) and public (including expanded Medicaid coverage) (Mann, 2012, 2013). These reforms are likely to shift some care for substance use disorders out of specialty treatment and into general medical practice (McLellan & Woodworth, 2014). Reform also may change the nature of care clients receive, as the cost of inpatient services is generally higher than for outpatient (Belenko et al., 2005), as well as the duration received in both inpatient and outpatient specialty care settings. Research should examine how AA and other recovery support services can be better integrated into treatment to help address clients' long-term needs once the ACA and Parity Act are fully implemented.

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Figure 1.

Multiple mediation model for effect of treatment type (inpatient vs. outpatient) on alcohol consumption after treatment (n=467)

Note: Unstandardized regression coefficients and standard errors (in parentheses) from unweighted simultaneous multiple mediator model; * $p < .05$; ** $p < .01$. Model adjusts for respondent sex, age, race/ethnicity, marital status, income, education, residential neighborhood poverty status, baseline alcohol problem severity, past treatment and baseline Alcoholics Anonymous (AA) attendance prior to treatment entry. R-square = 0.15, $p < .01$.

Table 1

Characteristics of alcohol treatment program clients

	Inpatient	Outpatient	P-value
Weighted sample sizes	167	283	
Age at treatment intake (mean, SD)	39.6 (10.5)	37.4 (11.5)	0.03
Women (%)	32.2	47.2	< 0.01
Ethnicity (%)			<0.001
White	57.0	74.6	
Black	27.9	13.5	
Other	15.1	11.9	
Marital status at treatment intake (%)			< 0.01
Married/live with significant other	30.3	44.3	
Separated/divorced/widowed	39.4	29.4	
Never married	30.3	26.3	
Employed at treatment intake (%)	20.4	53.4	< 0.01
Education completed (%)			> 0.10
Less than high school	22.4	15.3	
High school graduate	51.0	53.5	
At least some college or technical/vocational school	27.1	31.2	
Yearly income (%)			< 0.01
Less than \$10,000	47.7	16.2	
\$10,000 – \$34,999	26.7	31.0	
More than \$35,000	25.6	52.9	
High-poverty neighborhood (%)	32.9	20.3	<0.01
Symptoms of problem drinking at intake (mean, SD)	4.9 (2.5)	4.2 (2.9)	0.01
Prior treatment (lifetime %)	68.2	44.6	< 0.01
Prior AA attendance (meetings in prior 12 months; mean, SD)	35.7(.60)	21.2 (56.5)	0.10
Days in treatment (mean, SD)	50.5 (60.0)	115.5 (168.0)	< 0.01
Distance from home to treatment (miles; mean, SD)	62.8 (283.9)	48.7 (275.4)	> 0.10
AA attendance at follow-up (meetings in 12 months; mean, SD)	78.8 (83.3)	52.2 (100.3)	< 0.01
Alcohol consumption at intake (drinks in 12 months; mean, SD)	1,877.4 (1,461.2)	1,493.1 (1,534.0)	0.01 ^a
Alcohol consumption at follow-up (drinks in 12 months; mean, SD)	770.8 (1,263.5)	622.1 (1,176.0)	> 0.10 ^a

Note: SD, standard deviation.

^a Difference between logged values not statistically significant ($p>0.10$).

Table 2

Results of weighted linear regressions testing effects of treatment type, distance to treatment, and covariates on alcohol consumption at 1-year follow-up (Weighted N = 400)

Baseline Predictors	B (95% CI)	P-value
Inpatient program ^a	-0.95 (-1.67, -0.23)	0.01
Age	-0.01 (-0.04, 0.02)	0.50
Male ^b	0.84 (0.23, 1.44)	0.01
Black ^c	-0.28 (-1.12, 0.55)	0.50
Other race/ethnicity ^c	-0.47 (-1.35, 0.41)	0.30
Divorced/separated/widowed ^d	0.14 (-0.54, 0.82)	0.41
Never married ^d	0.31 (-0.44, 1.06)	0.42
\$10K-\$19,999 ^e	0.26 (-0.85, 1.38)	0.65
\$20K-\$34,999 ^e	-0.36 (-1.29, 0.56)	0.44
\$35K or more ^e	-0.18 (-1.05, 0.69)	0.68
High school graduate ^f	0.78 (-0.02, 1.58)	0.06
More than high school ^f	0.45 (-0.46, 1.36)	0.33
Employed ^g	-0.03 (-0.67, 0.62)	0.94
Disadvantaged NBH ^h	0.61 (-0.13, 1.35)	0.11
Distance to treatment >10mi ⁱ	0.21 (-0.37, 0.78)	0.48
Baseline problem severity	0.11 (0.00, 0.22)	0.04
Prior treatment ^j	0.37 (-0.22, 0.96)	0.21
Constant	2.33 (0.83, 3.83)	<0.01

Notes: B, unstandardized regression coefficient; CI, confidence interval; NBH, neighborhood.

Reference groups:

^aOutpatient program.

^bFemale.

^cCaucasian.

^dMarried.

^eLess than \$10K/year.

^fLess than high school education.

^gUnemployed or out of workforce.

^hNBH less than 15% of residents below poverty level.

ⁱLess than or equal to 10mi.

^jNo past treatment (lifetime).