Predictors of Drinking Outcomes Among Alcoholics[†]

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ABSTRACT

Predicting outcomes for individual patients entering substance abuse treatment has long been a clinical goal in the addictions field. Intake data from the Addiction Severity Index and other standardized scales were collected on 248 alcohol dependent/abusing patients entering an urban hospital treatment program. The outcome measure was frequency of

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drinking days in the past 30 days. Baseline data were used to identify predictors of posttreatment drinking frequency at two follow-up interviews (3 and 12 months postbaseline). Stepwise multiple regressions indicated that a set of baseline predictors accounted for similar and substantial proportions of outcome variance at the two follow-ups. When psychosocial predictors were combined with an index of alcohol use severity (which included drinking frequency), the proportions of variance explained were 31% and 28% at 3 and 12 months, respectively. Two psychosocial predictors were significant at both time periods, and thus most likely to be replicated in future research: a treatment motivation index (a combination of measures of commitment to treatment success and internal motivation to seek treatment) and an index of 12-step (self-help) participation (a combination of measures of frequency of 12-step meeting attendance and perceived helpfulness of 12-step participation). While the predictability of short-term (3 month) outcomes could help clinicians tailor treatment strategies to maximize patient motivation and reduce drinking behavior, the predictability of longer term (12 month) outcomes could help counselors plan aftercare programs, encourage self-help participation, and promote recovery-oriented activities to sustain initial treatment-induced gains.

Key Words: Alcoholism; Substance abuse treatment; Drinking frequency.

INTRODUCTION

Predicting outcomes for individual patients entering substance abuse treatment has long been a clinical goal in the addictions field (1,2). Despite extensive research (1,3,4), studies attempting to identify preadmission predictors of treatment outcomes have encountered certain problems: 1) Treatment retention has been used as a proxy measure for postdischarge treatment outcomes (5,6). 2) Outcomes have been exclusively short-term (e.g., 3 months), even though longer term outcomes (e.g., 1 year) may require different predictors (1,4). 3) Smaller or homogenous samples have resulted in overlooking robust predictors (5). 4) The range of baseline measures has been restricted, e.g., to only static predictors or to only measures of prior substance use (1). 5) Heavy reliance on single-item predictors has raised concerns about the reliability of the measures and, therefore, the replicability of findings (4). and 6) Predictor selection has not extended beyond bivariate to more informative multivariate analyses (4,7,8).

This study, part of a larger research project on alcoholism treatment outcomes (9), attempts to avoid these six limitations. Based on data from

a multimodality treatment program, a naturalistic longitudinal design is used to examine preadmission predictors of drinking outcomes for alcoholics. The study investigates two types of predictors (i.e., measures of alcoholism severity and general psychosocial measures) in relation to short-term (3 months) and longer term (12 months) measures of drinking frequency.

METHODS

Setting

Smithers Treatment Center (New York, NY) accepts patients who have an addiction problem, with public or private insurance coverage as well as self-pay status. During the period of the study, Smithers offered treatment programs at three levels of care, according to the level of care criteria recommended by the American Association of Addiction Medicine: regular outpatient (with sessions of 1.5 hr on two evenings per week; normal stay of 10–12 weeks), intensive outpatient (which met 3.5 hr a day; normal stay ranging from 3 weeks to 3 months), and inpatient rehabilitation (maximum stay of 28 days).

Eligibility Criteria

Study subjects were alcohol dependent/abusing patients (determined by DSM-IV diagnosis utilizing the Structured Clinical Interview for DSM-IV [SCID]) who were accepted for treatment at Smithers. The sample included patients who were newly accepted for treatment and also those who had been discharged from hospital detoxification or inpatient care and were applying for continuing treatment. However, applicants requiring hospitalization were excluded from the study because they were referred to other facilities.

Procedures

Eligible applicants were approached in the Smithers Evaluation Unit and invited to participate in the study in order of their appearance at the program. Interviewer availability determined the number of interviews conducted each day. Participation in the research study was voluntary based on written informed consent. Participants were interviewed at admission to the program and were followed up for interviews 3 and 12 months later; they received $30

for their time for each interview. The study protocol was approved by the Institutional Review Boards of the two collaborating organizations. The baseline study sample consists of 248 applicants who were interviewed and entered treatment during the 18-month period between April 1998 and September 1999.

Sample Follow-Up

Of the 248 patients in the baseline sample, 219 (88%) were located and interviewed at the 3-month follow-up and 173 (70%) at 12 months. When patients followed up were compared with those not located at 3 and 12 months, only for ethnicity was there evidence of significant attrition bias; whites were significantly less likely to be reinterviewed at 12-month follow-up than non-whites ($p < 0.05$).

Measures

The study's baseline interviews were conducted as an extension of the regular intake assessment process at Smithers. These interviews, which averaged 2.5 hr, included the Addiction Severity Index (ASI) (10), which served as the primary source of this study's measures. Drawing on its individual items, the ASI provides composite scores for the severity of patient dysfunction in seven problem areas (medical, employment, alcohol, drug, legal, family/social, and psychiatric). It also provides measures of sociodemographic items such as age, sex, ethnicity, and education.

In addition, the baseline interview included six previously reported scales (see Table 1 for examples of items): Treatment Motivation Questionnaire (TMQ; separate subscales for internal and external sources of motivation) (11), an adapted subset of items from the URICA (12), the Beck Depression Inventory (BDI) (13), an abbreviated Hamilton Depression Scale (14), a spirituality scale (15), and an abbreviated 12-Step Participation Scale (15,16). Level of treatment entered by the patient (i.e., a three-category nominal variable: inpatient, intensive outpatient, and regular outpatient) was also included as a predictor variable.

The study's two follow-up interviews included the follow-up version of the ASI. The current analysis focuses on one core outcome measure, obtained from the ASI at baseline, and at both 3 and 12 months after admission: self-reported number of days in the past 30 days on which the patient consumed any alcohol. The measure does not make any adjustments for special

Table 1. Baseline predictors (derived indices)

Control variable index	Cronbach's std-item alpha	Drinking frequency (3 month postbaseline) Zero-order correlation with outcome (r, signif)	Drinking frequency (12 month postbaseline) Zero-order correlation with outcome (r, signif)
Alcoholism severity	0.78	$0.25, p < 0.001$	$0.24, p < 0.01$
Number of days used alcohol in past 30 days			
Dollars spent on alcohol in past 30 days (log transformed)			
Number of days had alcohol problems in past 30 days			

Predictor variable indices	Cronbach's std-item alpha	Partial correlation with outcome pcorr (r, signif)	Partial correlation with outcome pcorr (r, signif)
Treatment motivation	0.80	$-0.30, p < 0.001$	$-0.18, p < 0.05$
Internal treatment motivation	0.75	$-0.24, p < 0.001$	$-0.15, p < 0.10$
(*I want to make changes*)			
(*I won't feel good unless I get help*)			
(*I feel guilty*)			
(*It's important to me personally*)			
(*I was interested in getting help*)			
Commitment to treatment	0.82	$-0.25, p < 0.001$	$-0.16, p < 0.5$
(*I expect to succeed in treatment*)			
(*I plan to stick with treatment*)			
(*I plan to work hard in treatment*)			
12-step participation	0.74	$-0.30, p < 0.001$	$-0.23, p < 0.01$
Number of 12-step meetings in lifetime (log transformed)			
Helpfulness of 12-step in recovery			
Spirituality	0.88	$-0.18, p < 0.01$	
Spirituality/religion are important in my life			
I believe there is a god/Higher Power			
I get strength/support from God/- Higher Power			
I need help from God/Higher Power			
Medical problem severity	0.67	$-0.23, p < 0.01$	
I have a chronic medical problem			

circumstances, such as time that the patient may have spent in a controlled environment (e.g., inpatient program or hospitalization for detoxification).

The possible predictors of outcome were screened by selecting only those measures that had a significant partial correlation ($p < 0.05$) with drinking outcome at 3 and/or 12 months, controlling for drinking frequency at baseline.

The measures screened included 1) a systematic review of ASI baseline items (e.g., demographic variables, reports of income by source, medical disabilities, family conflicts, arrests and convictions, and psychiatric

***Table 1*.** Continued.

Predictor variable indices	Cronbach's std-item alpha	Partial correlation with outcome pcorr (r, signif)	Partial correlation with outcome pcorr (r, signif)
I take prescribed medication for a physical problem			
I receive a pension for physical disability			
Importance of treatment for medical problem			
Socioeconomic status	0.65	0.27, $p < 0.001$	
Ethnicity (white)			
Has government health insurance (reversed)			
Has drivers license			
Highest level of education attained (3 levels)			
Extent of drug treatment	0.79	-20, $p < 0.01$	
In alcohol/drug treatment environment in past 30 days			
Ever had treatment for drug			
Ever had drug detoxification			
Ever had rehabilitation			
Family life quality	0.61		-35, $p < 0.001$
Has sibling(s)			
Ever physically abused (reversed)			
Contact with parents/siblings in past 30 days			
Sees other family members at least weekly			
Has close relationship with mother			
Conflicts with family member in past 30 days (reversed)			
How bothered by family problems in past 30 days (reversed)			
Importance of treatment for family problems (reversed)			
Psychological problem severity	0.71		-0.21, $p < 0.01$
Hamilton Depression index (6 items only)			
Number of days with psychological problems in past 30 days			

symptoms; 2) ASI composite measures; 3) other previously developed scales (i.e., the TMQ, URICA, BDI, Hamilton, Spirituality, and 12-step participation scales; and 4) new indices constructed for the study (primarily from ASI items) to minimize the use of single item predictors.

The latter new indices used items that, in addition to being significantly associated with drinking outcomes at 3 and/or 12 months, were sufficiently correlated with other items in the same domain to produce an index with adequate internal reliability [i.e., coefficient alpha (standardized) > 0.60].

Mean item scores were computed for an index after all selected items had been converted to standardized scores (i.e., a scale of 0–1).

Table 1 provides psychometric data on the new indices: their component items, coefficient alpha, and their zero-order or partial correlations with the outcome measures. Where appropriate, measures were adjusted to facilitate statistical analyses. For example, they were modified via recodes, log transformations (base e), and imputation (mean substitution) to avoid problems of item reversal, skewed distributions, reduced sample size, and/or missing data.

Data Analysis Plan

As summarized in Tables 1 and 2, the data analysis included zero-order correlations, partial correlations, and multiple regressions. The regression analyses, which were run with SPSS Version 10 (17), used a combination of forced and stepwise entry of predictors. Statistical tests were two-tailed (alpha < 0.05). Parallel statistical analyses were performed on the 3- and 12-month data.

The study divided measures into two domain-based categories: first, alcoholism severity (one domain), and second, psychosocial characteristics (all other domains). Because the outcome drinking measures (i.e., drinking frequency at 3 and 12 months) were themselves measures of alcoholism severity, the study initially investigated baseline severity measures (including drinking frequency) as predictors of drinking outcomes. These measures were used to create the study's control variable in the multivariate analyses.

Specifically, zero-order correlations were computed between three potential measures of baseline alcoholism severity and drinking outcomes. These three items, which were correlated significantly with drinking outcomes and also with each other, were combined into an index of baseline alcoholism severity that became the study's control measure.

The study also investigated a set of psychosocial domains as predictors of drinking outcomes at 3 and 12 months. Partial correlations were computed between the psychosocial predictors and the drinking outcomes, controlling for the alcoholism severity measure. The significant correlates were assigned to the appropriate domain. Measures were intercorrelated to facilitate index construction in each domain.

For any domain that had multiple candidates for predictors, the measures were further screened by regression analysis within that domain. These regressions for individual domains used forced entry for the alcoholism severity measure and (forward) stepwise procedures for

Table 2A. Stepwise regressions of drinking days at 3-month follow-up on baseline predictors

Model statistics	Control variable only	Full model
Sample size	219	219
R square	0.06	0.31
Adjusted R square	0.06	0.29
Significance (model)	$p < 0.001$	$p < 0.001$
Increment in R square	—	0.25
Significance (increment)	—	$p < 0.001$

Statistics on predictors (full model)	Regression coefficient	Standardized beta cofficient	Stnd. error	P value
Control variable only				
DV: drinking days/past 30 (log transformed)				
Baseline alcohol severity	1.192	0.251	0.312	0.000
Full model including control variable				
DV: Drinking Days/Past 30 (log transformed)				
Alcohol severity	0.909	0.191	0.278	0.001
Treatment motivation	−2.053	−0.196	0.617	0.001
12-step involvement	−1.110	−0.255	0.255	0.000
Medical problem severity	−0.710	−0.170	0.243	0.004
Has sibling(s)	−0.356	−0.123	0.167	0.034
Has child(ren)	−0.343	−0.141	0.144	0.018
Number of relatives ever had psychiatric problem (log transformed)	0.398	0.157	0.150	0.009

Table 2B. Stepwise regressions of drinking days at 12-month follow-up on baseline predictors

Model statistics	Control variable only	Full model
Sample size	173	173
R square	0.06	0.28
Adjusted R square	0.05	0.25
Significance (model)	$p = 0.002$	$p < .001$
Increment in R square	—	0.22
Significance (increment)	—	$p < 0.001$

Statistics on predictors (full model)	Regression coefficient	Standardized beta cofficient	Stnd. error	P-value
Control variable only				
DV: drinking days/past 30 (log transformed)				
Baseline alcohol severity	1.134	0.238	0.354	0.002
Full model including control variable				
DV: Drinking Days/Past 30 (log transformed)				
Alcohol severity	0.871	0.183	0.325	0.009
Treatment motivation	−1.856	−0.173	0.724	0.011
12-step involvement	−0.649	−0.145	0.307	0.036
ASI drug composite	−1.242	−0.138	0.609	0.043
Psychological problem severity	0.633	0.152	0.291	0.031
Family life quality	−1.689	−0.305	0.379	0.000

the psychosocial predictors in each domain. The regression results indicated which psychosocial predictors (items, indices, or scales) in a particular domain significantly predicted drinking frequency under multivariate control (i.e., after partialing out the variance contributed by the alcohol severity measure).

Finally, drinking frequency at follow-up was regressed on all those significant predictors that had survived the screening at the domain level, again controlling for baseline alcohol severity. The steps in the regression followed the same sequence: forced entry for the alcohol severity measure and (forward) stepwise entry for the psychosocial predictors.

These final regressions for the 3- and 12-month outcomes provided information on the overall amount of variance in drinking outcomes accounted for (i.e., model statistics) by the list of significant predictors of drinking outcomes for each time period, and the unique contribution of each predictor in the final model (i.e., unstandardized and standardized partial regression coefficients, and significance level).

The reports of the regression analysis also include the results of the initial regressions in the stepwise sequence. These contained only the alcoholism severity measure as a predictor, whereas the final regressions included psychosocial measures as well as the alcoholism severity measure as predictors. Comparisons between initial and final regressions indicated the incremental contribution of the psychosocial predictors.

RESULTS

Baseline Characteristics of the Sample

The 248 subjects in the sample included a mix of working and middle-class patients, as well as those socioeconomically disadvantaged. The majority were male (72%); there were more African Americans (44%) than whites (35%) or Hispanics (17%). Almost one quarter (23%) had less education than a high school diploma or GED, another quarter (26%) had a high school diploma (or its equivalent), and the remaining one half (51%) had more education than a high school diploma. Their ages ranged from 19 to 72 (mean = 39.8; sd = 8.8). Over one half (58%) had some form of government-related insurance (usually Medicaid); one third (35%) had private insurance; and 7% were self-pay; 44% of the subjects were employed either full- or part-time.

The 248 subjects were distributed among the three treatment programs at Smithers: regular outpatient (28%), intensive outpatient (18%), and inpatient rehabilitation (54%).

Substance Use

At intake, the mean number of days that subjects reported drinking alcohol in the last 30 was 15.4 (sd = 9.5). Use of additional psychoactive drugs was prevalent (68%), with 53% also using cocaine, 16% opiates, 24% cannabis, and 12% other drugs at least one day in the past 30 days.

Frequency of drinking diminished substantially and significantly between intake and the two follow-ups. Three- and 12-month drinking days were 4.5 (sd = 8.6) and 4.8 (sd = 9.0), respectively.

Alcohol Severity as a Predictor

As noted, three items measuring baseline alcoholism severity predicted posttreatment drinking outcomes at both the 3- and 12-month follow-ups (Table 1). These items were number of drinking days in past 30, number of dollars spent on alcohol in past 30 days, and number of days with alcohol problems in past 30. Their high intercorrelations justified the construction of the three-item index of alcoholism severity (coefficient alpha = 0.77). The percentage of outcome variance accounted for by this alcohol severity composite index was the same for the 3- and 12-month data (i.e., 6%).

Psychosocial Measures as Predictors

Table 2 also reports results of the regressions for the 3- and 12-month drinking outcomes, which included the control on baseline alcoholism severity. The total percentage of outcome variance accounted for by all independent variables was substantial and similar for both time periods: 31% at 3 months and 28% at 12 months. The increment in variance accounted for (i.e., change in R square) by the addition of the psychosocial predictors to alcohol severity was 25% at 3 months and 22% at 12 months (both $p < 0.001$).

Six of the final set of 10 baseline predictors in the regression for the 3-month outcome data were statistically significant. Those who drank less often at 3-month follow-up were more likely at intake to have reported the following: high treatment motivation (i.e., high commitment to succeed in treatment, and strong internal motivation for entering treatment), extensive

12-step participation, serious medical problems, being a parent, having a sibling, and having few family members with psychological problems.

Five of the final set of eight baseline predictors in the 12-month regression were significant. Those who drank less often at the 12-month follow-up were more likely at baseline to have reported the following: high treatment motivation, extensive 12-step participation, high-quality of family life, illegal drug use, and few psychological problems.

When treatment level was added as a predictor to the 3- and 12-month regressions, it was not significant for either time period.

DISCUSSION

This study of intake predictors of drinking outcomes of substance abuse treatment sought to avoid prior methodological problems, i.e., avoid proxy measures of drinking outcomes, short-term outcomes exclusively, small homogeneous samples, a narrow range of baseline measures, single-item predictor measures, bivariate analyses exclusively, and attrition bias. In the latter instance, although a lower proportion of whites than non-whites were reinterviewed at 12 months, the lack of association between race and drinking frequency at 12 months suggests that the study's findings were not distorted by retrieval bias.

Although the study did not use a controlled design, the substantial reduction in frequency of drinking between intake and follow-up assessments among this heterogeneous sample of alcoholics suggests that the alcoholism treatment program was effective.

The study also provided substantial evidence of the predictability of drinking outcomes using only intake information. The clinical significance of this predictability depends on whether the outcomes are short-term or longer term (4). Information about short-term outcomes can inform decisions about designing treatment programs to effectively reduce or even eliminate drinking, and, where relevant, to discourage drug use as well. By comparison, information about longer term outcomes pertains more to planning aftercare programs, encouraging self-help participation, and promoting recovery-oriented activities intended to sustain initial treatment-induced gains. In short, the types of findings reported in this study could potentially help programs improve both short-term and longer term treatment outcomes for patients.

Given the reasonable expectation that predictability would decline between 3 and 12 months, the small reduction in variance accounted for by baseline measures (from 31% to 28%) suggests that, notwithstanding an

intervening treatment episode, historical and other baseline characteristics remain associated with drinking outcomes for an extended period.

Six of 10 psychosocial predictors emerged as significant in the 3-month regressions, and five of eight in the 12-month regressions were significant. Most of the significant predictors were multi-item measures, specifically, three of the six in the 3-month regression (i.e., treatment motivation, 12-step participation, medical problem severity) and all five in the 12-month regression.

Two predictors were significant for both follow-ups: the indices of treatment motivation and 12-step participation. These two predictors would seem more likely to be replicated in future studies because they alone met four relevant criteria: 1) robust predictors in the expected direction under multivariate control, 2) multi-item indices of demonstrated internal reliability, 3) significant at both 3 and 12 months, and 4) consistent with findings in prior studies. None of the other significant predictors met more than two of these four criteria.

The index of treatment motivation was a mean score of two component indices: commitment to treatment, and strength of internal treatment motivation. Although representing distinct concepts, the two measures had approximately the same partial r with the outcome measures, and were sufficiently correlated ($r = 0.40$) to warrant combining into a single measure of treatment motivation for the regression analysis. In prior studies, extent of treatment motivation has frequently predicted positive outcomes (4).

The data suggest that clinicians could identify those new admits who have a high risk of poor treatment outcomes because of low internal treatment motivation and/or low commitment to treatment, and could assign a high priority to involving these patients in motivational interventions such as individual (or group) motivational interviewing.

Twelve-step (self-help) participation was, likewise, a significant predictor of outcomes at both time periods. Although prior studies have shown that 12-step group attendance both during and after treatment predicts positive outcomes (4,15,16,18–20), pretreatment history of self/mutual help has rarely been included as a baseline predictor. An important, but unresolved, issue is whether pretreatment 12-step meeting attendance is associated with 12-step participation during treatment. If so, the foregoing findings would suggest that a history of 12-step participation at intake might help patients take advantage of self-help groups during treatment, which in turn have been shown as related to positive treatment outcomes (4).

These data suggest that continuous engagement in self-help activities may offer patients considerable clinical benefit. Clinicians may thus favor participation in 12-step groups throughout all stages of the treatment

cycle—before, during, and after treatment episodes. Such continuity may be especially valuable for patients low on motivation because 12-step participation predicted fewer drinking days independent of treatment motivation.

The statistical significance of the remaining predictors, none of which was significant for both time periods, may be less likely to be replicated in future studies. The study's screening of many predictors would be expected to produce some false positives, so that other attributes of the measures (e.g., the four "robustness" criteria cited above) should be considered in assessing the importance of each significant correlation.

Such qualifications notwithstanding, some of the other significant predictors suggest plausible interpretations. For the 3-month data, being a parent, having a sibling, and having few family members with psychological problems may all indicate a family network capable of providing social support for the client.

Furthermore, although severity of medical problems may appear counterintuitive as a predictor of positive drinking outcomes, prior studies report significant results in each direction (4). In the present study, the medical problem severity index's component items (i.e., recognizing the chronicity of the medical problem, taking prescribed medicine, receiving a disability pension, and assigning importance to getting medical treatment) all reflect rational problem assessment and problem solving regarding one's health. In addition, ongoing voluntary participation in the health care system may foster a more realistic appraisal of excessive drinking.

For the 12-month data, the previously reported associations between high quality of family life and positive drinking outcomes parallel the 3-month findings concerning a supportive family network (4). In addition, as other studies have found, better mental health (i.e., fewer psychological problems) is plausibly related to less frequent drinking at follow-up (4).

The apparently counterintuitive relationship between illegal drug use at baseline and less frequent drinking at follow-up may be interpretable. Measures of drinking and drug use have been shown to be negatively associated (23), presumably because the two classes of substances may function partly as alternatives. For example, alcoholics who use illicit drugs consume less alcohol on a drinking day than those who abstain from illicit drug use (23).

Although known at intake, treatment modality was not strictly a baseline characteristic because it included treatment effects (i.e., the effect of treatment intensity). Nonetheless, the failure of treatment level to uniquely predict outcomes or affect the significance of other predictors underscores the generality of the findings across treatment conditions and thus supports the study's use of a heterogeneous sample.

Study Limitations

Some other types of drinking outcome measures (e.g., those involving continuous drinking, heavy drinking, abstinent periods, etc) that have been used to advantage in other studies (4) were not used in this study.

Second, other important outcomes of substance abuse treatment include use of illicit drugs, employment (education/training, earnings, reliance on public assistance), family life (marital stability, child custody, unintended pregnancies, domestic abuse), criminality, mental health, and social service utilization (21). Future research should address the predictability of such additional outcomes.

Third, the study was limited to one program site, one population of alcoholics, and one approach to substance abuse treatment.

Fourth, outcomes were not measured beyond 12-months postadmission, which is longer than most studies, but less than the 2 or 3 years of several other recent studies (4,22).

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