



Sixth version of the Addiction Severity Index: Assessing sensitivity to therapeutic change and retention predictors¹

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ABSTRACT. The main purpose of this multicenter *ex post facto* prospective study is to examine the psychometric properties of the Addiction Severity Index version 6.0 (ASI-6) in Spanish outpatients and determine the predictor variables of treatment adherence. A total of 186 outpatients with a substance dependence diagnosis (mean age 40 years; 80% male) were assessed with the ASI-6 and Clinical Global Impression

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(CGI). Results revealed a moderate decrease in ASI-6 *recent summary scores (RSSs)* in the *Alcohol* ($t = 4.77$; $p \leq .001$), *Drug* ($t = 2.01$; $p = .035$), *Psychiatric Status* ($t = 5.47$; $p \leq .001$) and *Family/Social Relationships* areas ($t = 3.55$; $p \leq .001$) from baseline to six months. The adjusted odds ratio (OR) related to an increased probability of adherence was 1.23 for the CGI-S score (95% CI 1.10-1.38). On the contrary, lower adherence was predicted by Severity in the *Drug Scale* with an OR of .95 (95% CI .92-.98). The Spanish ASI-6 appears to be a valid instrument that is sensitive to therapeutic change, providing relevant and reliable information not only about severity of addiction but also about substance abuse treatment adherence prediction.

KEYWORDS. Addiction Severity Index. Sensitivity to change. Retention. Prospective *ex post facto* study.

RESUMEN. El principal objetivo de este estudio multicéntrico *expostfacto*, prospectivo de seis meses de duración, fue analizar las propiedades psicométricas de la sexta versión del Índice de Severidad de la Adicción (ASI-6) en pacientes ambulatorios españoles y determinar variables predictoras de la adherencia al tratamiento. Contamos con 186 pacientes ambulatorios con diagnóstico de dependencia de sustancias, con edad media de 40 años, 80% varones, evaluados mediante el ASI-6 e Impresión Clínica Global. Se observa una disminución moderada de las Puntuaciones Observadas Estandarizadas – POEs- en el área *Alcohol* ($t = 4.77$, $p \leq .001$), *Drogas* ($t = 2.01$, $p = .035$), *Estado Psiquiátrico* ($t = 5.47$; $p \leq .001$) y área *Familiar* ($t = 3.55$, $p \leq .001$) en los seis meses de tratamiento. La impresión clínica de gravedad es la variable que mejor predice la adherencia al tratamiento [OR=1.23 (IC del 95%, 1.10 – 1.38)]. Por el contrario, el riesgo de abandono fue predicho por la mayor gravedad en la POE del área *Drogas* [OR=.95 (IC 95%, .92 - .98)]. La versión española del ASI-6 puede ser un instrumento válido y sensible al cambio terapéutico, que proporciona información relevante tanto sobre la gravedad como sobre la predicción de la adherencia al tratamiento.

PALABRAS CLAVE. Índice de gravedad de la adicción. Sensibilidad al cambio. Retención. Estudio prospectivo *ex post facto*.

Clinical instruments should possess accurate and refined psychometric properties in order to evaluate and estimate the efficacy of interventions. Therefore, it is of great importance for an assessment questionnaire to prove both fair sensitivity to change and predictive power of treatment adherence in order to monitor patient progress and yield an optimum intervention algorithm for each client. This need to «assess the effectiveness and generate new evidence» was recently promoted at the World Health Organization Helsinki Ministerial Conference on Mental Health (World Health Organization, 2005).

Since 1979, the Addiction Severity Index –ASI- (McLellan, Alterman, Cacciola, Metzger, and O'Brien, 1992; McLellan, Luborsky, Woody, and O'Brien, 1980) has become one of the most relevant instruments for substance use disorders in both clinical and research settings; in all its versions and in different contexts: prisons, outpatient, residential or substitutive methadone therapy (Alterman, Cacciola, Dugosh, Ivey, and

Coviello, 2010; Cacciola, Alterman, McLellan, Lin, and Lynch, 2007; Cacciola, Dugosh, and Camilleri, 2009; Casares-López *et al.*, 2010; McLellan, Cacciola, Alterman, Rikoon, and Carise, 2006). This structured interview was designed to provide basic information on various areas of patients' lives and to monitor clinical changes and treatment outcomes. Specifically, ASI-6 focuses on patient functioning in seven problem areas commonly involved in substance use disorders (SUDs), including medical status, employment, drug and alcohol use, illegal activity, family/social relationships (problems with children, family/social support and problems), and psychiatric status. The sixth version of the ASI was recently adapted into Spanish, and although it has demonstrated acceptable psychometric properties for use in clinical practice and it has sensitivity to change over time, in other words, the degree to which it reflects client variations that occur due to therapy has yet to be explored (Díaz-Mesa *et al.*, 2010). Concomitantly, duration of treatment adherence is one of the most important predictors of successful outcomes in rehabilitation programs (Hill and Lambert, 2004). However, dropout rates are exponential, ranging between 60 and 80% of patients in residential and outpatient settings (Guy, 1976; Hill and Lambert, 2004). The literature on this issue is still equivocal, as a wide variety of potential predictors have been proposed including demographics, dual diagnosis, personality disorders, treatment history, antisocial behaviors, and drug use severity. The ASI-6 provides relevant information about a number of individual variables that may have a role in adherence (*i.e.*, age of first use and onset of abuse, existence of trauma and sequelae).

Within this research context, the main objectives of this quasi experimental study, subtype pretest-posttest and with one group (Carretero-Dios and Pérez, 2007; Montero and León, 2007; Ramos-Álvarez, Moreno-Fernández, Valdés-Conroy, and Catena, 2008) are: a) to characterize the addiction severity pattern over 6 months of standard outpatient treatment; b) to explore potential baseline differences by adherence, and finally; c) to identify patient characteristics that may predict retention.

Method

This is a naturalistic, multicentre, 6-month follow-up study conducted in Spain. It was approved by the Ethics Committee for Clinical Research of the Asturias Central University Hospital and is in accordance with the 1975 Declaration of Helsinki, as revised in 1983. Prior to the enrolment, all patients gave their written informed consent to participate in the study.

Participants

The initial sample consisted of 186 patients who presented with SUD and received treatment at any of the eight treatment centers participating in the study. Retention rate at six months was 53.76 % ($n = 100$). Inclusion criteria were as follows: 1) age ≥ 18 years; 2) primary diagnosis of SUD according to the ICD-10 diagnostic criteria; 3) patients initiating or changing drug treatment because of lack of efficacy; and 4) written informed consent.

Eighty percent of patients were male, had a mean age of 40.49 years, and were never married (40.3%). Almost half of the participants had less than elementary education (48.9%) and 43.0% of the sample worked full time at baseline. About 7% had a physical and 6% a psychological disability. Pattern of use was mainly alcohol abuse (54.3%), followed by cocaine (19.9%), heroin (16.7%), and cannabis abuse (6.5%), although results suggest that many substances are used simultaneously on a regular basis. Moreover, each individual had received a mean of 3.3 ($SD = 2.99$) substance abuse treatments. More than one-third of patients had ever been incarcerated, mostly for property crimes (37%) or drug charges (11.1%), and 11.3% were presently awaiting sentencing.

Instruments

- The ASI-6 is the latest version of the Addiction Severity Index tool (Cacciola, Alterman, Habing and McLellan, *in press*; McLellan *et al.*, 1980). The ASI is the most widely used assessment tool in the addiction field. The sixth version contains 257 items grouped into eight sections. The first two areas include general information and the next six areas measure the severity of problems at the time of the interview. The instrument assesses problem severity by calculating recent summary scores (RSSs) ranging from 0 (*no problem*) to 1 (*extreme severity*) in each of the domains.
- One hundred eighteen ASI-6 recent status items were subjected to nonparametric item response theory (NIRT) analyses followed by confirmatory factor analysis (CFA) (Cacciola *et al.*, *in press*). One summary scale was derived from each of six areas (medical, employment/economic, alcohol, drug, legal, and psychiatric) and 3 RSSs were derived from the family/social area (family children, family/social-support, and family/social problems); and finally, there were six secondary scales relating to family, marital and social life, higher scores mean more severity in the area. The degree of the internal consistency of the RSSs ranged between .47 and .95; and for test-retest reliability, the values were acceptable, varying from .36 to 1, being the average time between interviews 21.8 days ($SD = 12.6$; Díaz-Mesa *et al.*, 2010). These measures are expressed as T-scores with a mean of 50 and a standard deviation of 10 based on the distribution of scores obtained by Cacciola *et al.* (*in press*) with an urban substance abuse patient sample in the United States.
- The Clinical Global Impression scale (CGI; Guy, 1976) is a descriptive scale that provides a global rating of illness severity and improvement. The CGI-Severity and CGI-Change scores are rated on a 7-point scale, higher scores mean worse status. The Clinical Global Impression Scale is established as a core metric in psychiatric research.

Procedure

The administration of the questionnaires was conducted in a personal interview in the clinical setting by clinical staff. Patient characteristics were assessed at treatment baseline using the Addiction Severity Index sixth version (ASI-6) and the Clinical Global

Impression scale-Severity (CGI-S); initial assessment takes approximately one hour. Evaluation of addiction severity at the six-month follow-up, in approximately 50 minutes, included the ASI-6-FU (Addiction Severity Index Follow Up version) and the CGI improvement/change scale (CGI-C and CGI-S).

Data analysis

First, the relationship between different variables and the addiction severity profile were calculated using contingency tables, χ^2 coefficient and the Pearson correlation (R), as well as a Student's t-test and analysis of variance in each case. Second, sensitivity to therapeutic change was measured using a paired Student's t-test and interclass correlation coefficient (ICC) between baseline and six-month variables to determine the stability of scores. Third, in order to determine which variables predicted adherence or drop-out, a binary logistic regression analysis was carried out. Adherence to treatment was entered as a dependent variable, while the predictors were demographic characteristics, history of drug use, illegal activities, and RSSs of the ASI-6 at baseline. Several variables were coded as Dummy variables. Existence of interactions between key variables was analyzed before submitting the final model. Statistical analysis was performed with the Statistical Package for Social Sciences SPSS v.17.

Results

Changes in the addiction severity profile

As shown in Table 1, the most impaired primary area is the *Alcohol Use*; and the family areas present also difficulties. We present means, standard deviations and ranges, for understanding the different values of every scale. The correlations between the ASI-6 and the CGI rated from .00 to .08 for the primary scales and from .31 to .62 for the secondary scales.

TABLE 1. Addiction Severity Profile and psychosocial functioning ($N = 186$).

<i>Severity measurements</i>	<i>M (SD)</i>	<i>Ranges</i>
CGI-S	4.35 (1.13)	0-8
ASI-6 Primary scales		
Medical	44.42 (9.46)	29-78
Employment	37.09 (12.85)	21-53
Alcohol	53.57 (9.13)	38-77
Drug	40.97 (11.09)	31-77
Legal	47.08 (3.48)	46-79
Family Child	49.82 (5.06)	48-79
Family Social Support	45.10 (12.20)	27-73
Family Social Problem	47.87 (9.08)	36-78
Psychiatric	45.85 (8.94)	31-79
ASI-6 Secondary Scales		

TABLE 1. Addiction Severity Profile and psychosocial functioning ($N = 186$) (*cont.*).

<i>Severity measurements</i>	<i>M (SD)</i>	<i>Ranges</i>
Family/Social Partner Support	43.10 (11.36)	32-57
Family/Social Partner Problems	50.24 (7.29)	45-67
Family/Social Friends Support	48.22 (9.46)	37-59
Family/Social Friends Problems	48.89 (6.35)	46-70
Family/Social Adult Relatives Support	48.98 (9.11)	41-68
Family/Social Adult Relatives Problems	50.02 (7.48)	44-67

Determining sensitivity of the ASI-6 to therapeutic change

Table 2 below reflects the mean addiction severity scores in the adherent patient group as well as mean differences in the pre- and post-intervention measurements. Six of the total primary scales met the criterion for change sensitivity by demonstrating a decrease in severity after treatment. Nevertheless, only four of these nine scales fulfilled a second criterion of significance (*Alcohol, Drug, Psychiatric, and Family/Social Adult Relatives Problems*).

TABLE 2. Changes in Recent Summary Scores (RSSs) and Clinical Global Impression at six months of treatment ($N = 100$).

<i>ASI-6 Scales</i>	<i>Baseline M (SD)</i>	<i>Follow-up M (SD)</i>	<i>t</i>	<i>p</i>
Medical	44.45 (9.15)	42.98 (8.20)	1.24	.14
Employment	38.53 (13.15)	38.36 (13.06)	.145	.88
Alcohol	54.35 (9.69)	49.48 (7.60)	4.80	≤ .001
Drug	38.42 (10.04)	36.60 (9.64)	2.14	.03
Legal	46.69 (2.99)	46.04 (2.35)	1.65	.10
Problems with Children	50.00 (5.55)	54.35 (9.75)	.00	1.00
Family/Social Support	45.96 (11.97)	46.23 (12.02)	-.244	.80
Family/Social Problems	46.68 (8.49)	43.69 (6.72)	3.60	≤ .001
Psychiatric	46.16 (8.73)	41.48 (8.54)	5.10	< .001
Clinical Global Impression CGI-C	4.46 (.97)	3.08 (1.34)	9.61	< .001

Note: The number of subjects in the follow-up varies in each of the ASI-6 scale.

This positive progression is also found as assessed by the CGI-C, which means some improvement in the dependency syndrome. Over six months, there was a statistically significant decrease from a state of moderate-marked dependence (moderately ill, score = 4.46) to slight dependence (mildly ill = 3.08). *Family/Social Partner Problems* RSS was the secondary area with the best outcome ($t = 2.61$; $p = .01$). Regarding primary scales, RSSs for *Drug, Family Child, Psychiatric status, Employment, Family/ Social*

Support, and *Family/Social Problems* show strong temporal stability at six months of follow-up (those with higher baseline scores also rated higher on follow-ups). *Alcohol* and *Medical* RSSs show moderate and positive correlations, while *Legal* RSS does not correlate with follow-up at six months (see Table 3). Secondary scales show high positive correlations in *Family/Social Partner Support* and *Family/Social Friends Support* scales. However, the rest of the secondary scales had positive but moderate correlations.

TABLE 3. Intraclass Correlations Coefficients between baseline Recent Summary Scores and six months follow-up RSSs and Pearson Correlation (*R*) between RSSs and CGI-S.

		<i>Pretest</i>	%	<i>Posttest</i>	%
SA	No SP	0	0	4	30.8
	SP	5	38.5	6	46.2
	Generalized SP	8	61.5	3	23.1
TA	No SP	0	0	0	0
	SP	4	50	6	75
	Generalized SP	4	50	2	25

* $p < .05$, ** $p < .01$

Predictors of adherence/dropout

Adherence in the first six months was mainly related to age, severity and drug abuse and baseline CGI-S. The CGI-S for those who stay in treatment is much higher than those who drop out and the ASI-6 *Drug* scale is also significantly worse. The *Family/Social Support* scale seems to play an important role (see Table 4).

TABLE 4. Significant Differences at baseline between adherent patients and Non-adherent patients (length of stay ≥ 6 months).

<i>Variables</i>	<i>Adherent patients</i> (<i>n</i> = 100)	<i>Non-adherent patients</i> (<i>n</i> = 86)	<i>t</i> - χ^2	<i>p</i>
Age (<i>M, SD</i>)	42.81 (11.28)	37.81 (10.77)	-3.07	.002
CGI-S (<i>M, SD</i>)	4.05 (2.49)	.93 (5.83)	-4.85	.001
Drug RSS (<i>M, SD</i>)	39.00 (10.64)	43.31 (11.26)	2.40	.01
Family/Social Adult Relatives Support RSS (<i>M, SD</i>)	50.43 (9.53)	47.38 (8.37)	-2.30	.02

TABLE 4. Significant Differences at baseline between adherent patients and Non-adherent patients (length of stay ≥ 6 months) (*cont.*).

<i>Variables</i>	<i>Adherent patients (n = 100)</i>	<i>Non-adherent patients (n = 86)</i>	<i>t - χ^2</i>	<i>p</i>
Marital status (<i>F, %</i>)				
Married	29 (29.0)	27 (31.4)	11.73	.03
Cohabiting	15 (15.0)	10 (11.6)		
Widowed	1 (1.0)	3 (3.5)		
Divorced	11 (11.0)	2 (2.3)		
Separated	0 (10.0)	3 (3.5)		
Never married	34 (34.0)	41 (47.7)		
Main problem substance (<i>F, %</i>)				
Alcohol	37 (43.0)	64 (64.0)	29.76	.004
Marijuana	10 (11.6)	2 (2.0)		
Sedatives	1 (1.2)	0		
Cocaine	25 (29.1)	12 (12.0)		
Heroin	12 (14.0)	19 (19.0)		
Methadone	1 (1.2)	1 (1.0)		
Other	0	2 (2.0)		
No Homelessness	47 (54.7)	71 (71.0)	7.61	.02

The dependent variable is dichotomous and has two levels: (1) continue treatment (or adherence) (code 1) and (0) drop out of treatment (no adherence) (code 2). We decided to introduce into the regression equation variables that had been predictive in the literature, specifically socio-demographic data (age, marital status –dummy variable–, years of education, level of employment, current or past homelessness), primary derived recent summary scales (representing severity in important areas of life of the person: medical, psychological, social, family, work and legal), variables related to drug use (age at onset of drug use, years of drug use, route of administration –dummy–) and criminal variables (types of offenses –dummy–, age at first arrest). The reasons for the inclusion of some of these variables is that these factors are influential on the course of the patient's life and habits of consumption that do not appear in the drugs / alcohol and legal RSSs, as detailed below (see Table 5).

TABLE 5. Items that form part of the calculation of the ASI-6 Primary Recent Summary Scales: Drug and Alcohol RSSs.

<i>Drug/ Alcohol</i>
Cumulative number of days of use for nine drugs/alcohol - past 30 days
Cumulative number of days of use of six prescribed drugs - past 30 days
Days of use of drugs or abuse of prescribed medication
Days of at least 5 (men)/4 (women) drinks; When was the last drink?
When last used drugs or abused prescribed medications?
Money spent on drugs/alcohol?
Withdrawal sickness
Trouble controlling, cutting back, or quitting drugs/drinking
Various problems because of drug use/drinking
Days bothered by craving or urges to drink/use drugs
Days with the above or any other difficulties
Rating of trouble/bother by drug problems/alcohol problems
Rating of importance of treatment for drug/alcohol use
<i>Legal</i>
Illegal income past 30 days
Days sold or manufactured drugs in the past 30 days
Days robbed anyone
Days stolen anything, destroyed property, etc.
Days done anything else illegal
Days done anything illegal

Next we conducted a logistic regression analysis. Criteria categories included in the categorical independent variables are indicated, as well as the adjusted odds ratio (OR) results and a 95% confidence index for each variable. The results of the binary logistic regression analyses revealed that the only two factors significantly associated with lack of adherence to outpatient treatment were the Clinical Global Impression- Severity and the RSSs for *Drug Use* scale. This model explains 24% of the variance (Nagelkerke's $R^2 = .239$). The adjusted odds ratio related to an increased probability of adherence was 1.23 for higher CGI-S score (95% CI 1.10-1.38). On the contrary, higher risk of drop out was predicted by higher score in the *Drug* RSS with an OR of .95 (95% CI .92-.98). In summary, older age, less drug severity, more family social support, and higher CGI severity were associated with adherence.

Discussion

The main goal of this study was to check the adequate psychometric performance, in terms of convergent-discriminant validity and sensitivity to change. The convergent-discriminant validity evidence in this study, the correlations between the primary and secondary scales of the ASI-6 and the Clinic Global Impression score were low, with values from .01 to .26. In our study, the correlations were from .00 to .08 and from .31 to .62 (primary and secondary ASI -6, respectively).

Díaz-Mesa *et al.* (2010) found low correlation between the scales of the ASI-6 and the score on the ICG-G. We should note that the ICG is a subjective assessment tool, and the clinician takes into account a number of parameters not previously defined, focusing mainly on aspects of physical and mental health. This has influence on the low validity and underlines the importance of using instruments that previously defined the dimensions for adequately assess the severity of addiction. Regarding the discriminant validity, it appears that the instrument is a good tool for grading the following primary scales: *Employment, Drug and Alcohol, Family Social Support, Family and Social Problems, and Psychiatric area.*

At the six-month follow-up, the Spanish version of the ASI-6 found the existence of statistically significant changes in many domains related to the patient's life compared to the baseline assessment. The primary areas show a statistically significant reduction in severity at six months of treatment (*Alcohol, Drug, Mental Health, and Family/Social Partner problems*), and in all areas evaluated patients improved after treatment. For secondary areas, treatment effect was particularly positive in the domain of *Family/Social Partner Problems*. Paradoxically, although more than 80% of the sample were men, the severity of problems with children increased on follow-up scores. This suggests that patients who spend more time at home as part of a stimulus control intervention, and therefore they can realize in the difficulties in dealing with their own children. These problems could have existed previously, masked by the use of drugs. It is important to note that client-perceived social and family support explained a significant proportion of the variance in treatment adherence, in keeping with other studies (Soyez, De Leon, Broekaert, and Rosseel, 2006).

Data show that there was a substantial decline in substance use (both alcohol and other drugs) during treatment as reflected in the *Alcohol and Drug* RSSs. This is logic, both, drug and alcohol severity, decreased in the time period of six months, but the relatively low temporal stability for alcohol, reflects the fact that the majority of patients were alcohol abusers and the treatment did have effect on alcohol severity. Other studies (Chutuape, Jasinski, Fingerhood, and Stitzer, 2001) have noticed therapeutic changes in the same direction, such as a 50% reduction in heroin from pre- to post-detoxification; these findings are repeated with cocaine and alcohol. Investigating short-term outcomes of a three-day medical detox, 166 heroin abusers completed the Addiction Severity Index during detoxification, and at 1, 3, and 6 months after detoxification. These outcomes demonstrate that brief inpatient detoxification is followed by reduced drug use over several months and is accompanied by substantial treatment-seeking behavior. Across the post-detoxification interviews, mean days of reported heroin use ranged from 11 to 14; 21–30% of patients reported no heroin use, whereas 25–36% reported almost daily use. Reported use of cocaine and alcohol showed similar reductions from pre- to post-detoxification (verified through urine tests).

Other authors (Hubbard, Craddock, and Anderson, 2003) describe the long-term outcomes of drug treatment in terms of cocaine use and other areas of the individual's life, such as employment status and legal situation. The 5-year follow-up of 1393 subjects shows a significant reduction in cocaine use compared with the pre-treatment year, associated mainly with long-term treatment (in particular, six months or more in

long-term residential program and outpatient drug-free program). Furthermore, reductions in illegal activity and increases in full-time employment were associated with treatment stays of six months or longer in long-term residential programs. In our study, we found improvements at six months in substance use and a small decrease in the severity of employment situation, but no change in the legal domain. The nonexistence of changes in the legal area may be due to the prevalence of alcohol-dependent patients in the sample. Alcohol use is more integrated into Spanish society, and people are not stigmatized or marginalized for it. Another explanation is that individuals with antisocial personalities and criminal behavior receive inpatient treatment with greater control and therefore are not represented in this outpatient treatment.

Improvement in mental health is demonstrated by a moderate decrease of five points in psychopathology area scores. This is also consistent with other studies (Gossop, Marsden, and Stewart, 2006), in which 662 drug-dependent adults treated with methadone experienced a reduction in their psychiatric symptom scores at one-month and six-month follow-up. Of importance is the fact that mitigation of psychopathology is positively related to treatment adherence. High dropout rates from treatment programs is one of the most serious problems in the field of drug addiction, with an average rate of early attrition of 55% (Gainey, Wells, Hawkins, and Catalano, 2003). Often, the consequences of dropping out are negative impact on areas of the subject's life and relapse into drug abuse. Moreover, this has been pointed out as a key factor limiting the effectiveness of treatment (Carroll, 1997; Onken, Blaine, and Boren, 1997).

Moderate evidence has been collected to describe predictors of client adherence. Sayre *et al.* (2002) conducted an evaluation of 165 individuals seeking treatment for cocaine dependence. Treatment dropouts were more likely to be divorced, have fewer years of education, have poorer family/social functioning, and to be female. However, those participants with higher education levels and those with poorer psychiatric functioning tended to stay in treatment longer. Though we have considered these variables in our study, the only coincident factor is marital status. Some studies have shown that demographic variables are not strong predictors of retention (Carroll, Rounsaville, and Gawin, 1991; Gainey *et al.*, 1993), but it is also true that others have found the opposite (Agosti, Nunes, Stewart, and Quitkin, 1991; Kleinman *et al.*, 1992).

Although some studies found that males are more likely than females to drop out of treatment (Onken *et al.*, 1997), other studies have found the contrary (Carroll, 1997; Sayre *et al.*, 2002); and many other studies have failed to find gender to be a significant predictor of treatment outcome (Carroll *et al.*, 1991; Gossop *et al.*, 2006; Onken *et al.*, 1997). Race has also been one of the hypotheses (McCaul, Svikis, and Moore, 2001; Mertens and Weisner, 2000), but there are no conclusive data, in any case, all the patients interviewed were Caucasian. Some authors (Onken *et al.*, 1997) have identified lower attrition rates in ethnic minorities with higher education, and others (Manu, Burlinson, and Kranzler, 1994; Means *et al.*, 1989) regardless of race or ethnicity, dropped out prematurely but this was better explained by lower educational level. In our study, none of the socio-demographic variables has demonstrated a predictive power with regard to treatment adherence. It is true that people who have lived in poverty in the past are more likely to remain in treatment, and this may be related to family support

and marital status, which may play an important role in establishing healthy functional relationships, along with employment (Means *et al.*, 1989; McCaul *et al.*, 2001; Mertens and Weisner, 2000). Data from previous studies already showed that in adolescence, more time spent in leisure activities were related to greater involvement in substance use, and there is a protection effect of family and school self-esteem on substance use (Ciairano, Bosma, Miceli, and Settanni, 2008; Jiménez, Musitu, and Murgui, 2008).

Drug and alcohol use at the time of seeking treatment as well as the severity of drug use have also been hypothesized as predictive variables. Patients with drug use disorder were presumed to have poorer treatment participation and worse retention than those patients with an alcohol use disorder. But subsequent studies have found no consistent results (McCaul *et al.*, 2001; Mertens and Weisner, 2000). Interestingly, several reports indicate that cocaine use at baseline is an important predictor of outcomes for inpatient and outpatient treatment programs (Alterman, McKay, Mulvaney, and McLellan, 1996; Alterman *et al.*, 1997; Rhoades, Creson, Elk, Schmitz, and Grabowski, 1998). These results suggest that inability to establish abstinence before treatment is more likely to occur among those with more severe addiction. Data from our study suggest that those using opiates and heroin longer and using methadone for fewer years are more likely to remain in treatment. Other researchers have examined predictors of participation and retention in a hospital-based outpatient treatment setting (McCaul *et al.*, 2001). They assessed the severity of addiction of 268 patients with the ASI at baseline and found that the status of substance use did not predict treatment participation or retention, whereas race, gender, and employment composite scores were significant predictors.

Limitations of this study include external validity of results as data are limited to public health system patients. Also, female or young users may not have been well represented in the sample; this also applies to individuals with a worse severity profile in the legal area, as many such people are incarcerated. The impossibility of having a random group and the composition of the sample by patients initiating or changing drug treatment may be a methodological limitation, but it reflects the everyday clinical reality. However, this study has important implications for future development of substance abuse treatment services and yields a trend to elucidate and examine potential variables that will improve our accuracy in recruiting subjects, achieve higher rates of adherence, and personalize each type of treatment for each individual needs.

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