

SBIRT Outcomes in Houston: Final Report on InSight, a Hospital District-Based Program for Patients at Risk for Alcohol or Drug Use Problems

The InSight Project Research Group*

Background: Screening, Brief Intervention, and Referral to Treatment (SBIRT) services have been implemented as the standard of care for patients in the Harris County Hospital District (HCHD). The present analysis addresses alcohol and drug use for patients admitted over a 39-month period from July 1, 2005 through September 30, 2008.

Methods: Patients were screened for alcohol and drug use at medical admission. Those who were positive received further assessment and were transitioned to receive services as appropriate. A sample of consenting patients who were positive and received services was contacted at 6 months for a follow-up interview. Using an intent-to-treat (ITT) protocol, the analysis included all patients who were assigned for follow-up, including those with completed follow-ups as well as those who could not be contacted at follow-up. Patients not contacted at follow-up were assumed to have maintained their baseline drug and alcohol consumption levels.

Results: Of 59,760 patients who were screened by generalists (primarily nurses, physicians, and medical care technicians), 15,241 (26%) were positive and received further assessment and services. The 6-month follow-up interview completion rate was 66%. The ITT sample consisted of all 1,937 patients who were assigned for follow-up. There was an overall reduction in the number of patients reporting any days of heavy drinking from 70% at intake to 37% at 6-month follow-up and a reduction in the mean number of days of heavy drinking from 7.8 days at intake to 4.1 days at follow-up. The number of patients reporting any days of drug use was 82% at intake versus 33% at follow-up, and the mean number of days of drug use declined from 8.3 days at intake to 4.2 days at follow-up.

Conclusions: The results were consistent with but of greater magnitude than most other studies reporting positive outcomes for SBIRT patients. Drug use and heavy alcohol use were found to decrease substantially from admission to follow-up. This finding holds good for all levels of drug or alcohol misuse severity, with the highest severity patients showing the largest decreases. Future studies are needed to control for potential regression to the mean effects and to develop improved understanding of differences in outcomes by race/ethnicity.

Key Words: Screening, Brief Intervention, Treatment, Hospital, Alcohol, Drug.

RECENT MODELS OF behavior change provide practical tools that medical practitioners can use to facilitate positive changes in patient health behaviors. Brief interventions (BIs), short encounters that incorporate feedback, and advice have demonstrated widespread utility (Burke et al., 2004) and have shown to be effective in facilitating long-term behavior change (Fleming et al., 1997; Ollansky et al., 1997).

Support for the efficacy of BIs for patients with alcohol problems has been well established; however, investigation of BIs for patients with drug problems is limited.

Numerous clinical trials have demonstrated that BIs delivered by a physician or other healthcare provider are effective in decreasing alcohol consumption and its consequences. A 2004 meta-analysis of 32 alcohol treatment modalities found

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that brief counseling ranked near the top in 4 categories: (i) total amount of research performed to investigate the modality, (ii) methodological quality of that research, (iii) number of studies showing positive outcomes, and (iv) cost-effectiveness (Burke et al., 2004). Other randomized studies have found that patients who received brief counseling participated more fully in treatment and consumed less alcohol 3 months following that treatment than patients who did not receive the intervention (Dunn, 2003). Additionally, a meta-analysis of more than 34 randomized and controlled alcohol screening and BIs demonstrated a reduction in alcohol use for both treatment seeking and nontreatment seeking populations (Moyer et al., 2002).

Brief interventions have also been utilized to help people with drug use problems related to amphetamines, cocaine, heroin, ecstasy, and cannabis (Baker et al., 2001; Ball et al., 2007; Bernstein et al., 2005; Jungerman et al., 2007; Marsden et al., 2006; McCambrindge and Strang, 2004; Miller et al., 2003). Outcomes have varied considerably depending on drug(s) of choice, program, setting, level of care, and degree of abuse or addiction reported by the individual (Ball et al., 2007). While some studies have resulted in positive intervention effects such as reductions in use (Baker et al., 2001; Jungerman et al., 2007; McCambrindge and Strang, 2004), others have shown no significant effect (Hetteema et al., 2005; Miller et al., 2003).

A recently published analysis (Madras et al., 2009) which presented outcome findings for Screening, BI, and Referral to Treatment (SBIRT) services across 6 sites, funded by the Substance Abuse and Mental Health Services Administration (SAMHSA), found that rates of both drug use and heavy alcohol use declined substantially from baseline admission to 6-month follow-up. One of the sites in the Madras et al. (2009) study is the Houston program described in the present report.

Several differences in the present analysis distinguish it from the Madras and colleagues (2009) article. First, the Madras article uses data for patients enrolled from the inception of data collection (early 2004) through August 1, 2007. This time period excludes the final year of project implementation and includes the initial start-up phase of the project when interventions were still maturing and undergoing changes of methods and personnel. The authors of the present analysis observed that the project interventions were immature and not ready to be evaluated for the initial 15 months, when the staff had not yet been fully trained and a fidelity monitoring and coaching system not yet fully implemented. The present analysis therefore excludes the initial developmental period and includes only the final 3 years of the project (July 1, 2005 through September 30, 2008). Second, the Madras analysis only considered a dichotomous measure of change, use versus nonuse. The present report provides a more sensitive analysis in terms of changes in mean days of use. Third, the present report examined the relationship between level of severity of drug or alcohol misuse and changes in consumption over time. Finally, the current study

examines differences in outcomes between patients receiving SBIRT services at hospitals versus community health clinics.

A number of BIs reported in the literature have been based on motivational interviewing (MI), a patient-centered approach that facilitates behavior change by drawing on the patient's internal resources as well as the healthcare provider's expertise (Miller and Rollnick, 2002). Previous research has demonstrated that healthcare personnel can be effectively trained to use these interventions (Nieman et al., 2005; Rollnick et al., 1999; Velasquez et al., 2005), and the success of the interventions has been demonstrated in a number of medical settings (D'Onofrio and Degutis, 2002). Brief Motivational Interventions (BMIs) are designed to assist patients in recognizing and changing behaviors that may pose significant risks to their health. These sessions typically last 10 to 15 min and have 4 main components: (i) establishing rapport, (ii) raising the subject of concern about alcohol or drug consumption, (iii) providing feedback on the patient's drinking or drug use levels and the effects of alcohol or drug misuse, and (iv) enhancing motivation to change drinking or drug use behaviors and discussing a plan of action. This approach emphasizes collaboration and respect for patients and patient choice. During the intervention, after patients are encouraged to explore the benefits and risks of alcohol or drug use (through a brief "decisional balance" exercise), they discuss with their healthcare provider goals and possible strategies for changing their use of alcohol or drugs depending on their readiness to change. BMI is suitable for populations of different ethnic or cultural backgrounds, as this client-centered approach attends to and incorporates the individual and cultural perspectives of each patient served. With funding from SAMHSA's Center for Substance Abuse Treatment (CSAT), a consortium of agencies, as reflected in the Acknowledgements section of this paper, developed a program to implement SBIRT practices in the Harris County Hospital District (HCHD), the fourth largest public healthcare system in the country, located in the Houston, Texas metropolitan area. The SBIRT program, named InSight, utilized a public health approach to integrate prevention, early intervention based on BMI practices, and treatment services for alcohol and drugs in a number of settings, including primary care, emergency and trauma centers, and other community health centers. HCHD provided a unique opportunity to demonstrate the feasibility and value of implementing SBIRT services in a large, urban, publicly funded healthcare system.

In 2004, the program was initiated as part of the adult standard of care for routine patient encounters at multiple HCHD locations. Service locations included the HCHD Emergency Center at Ben Taub General Hospital (BTGH) (a Level I Trauma Center), the Emergency Center at Lyndon Baines Johnson General Hospital (a Level III Trauma Center), inpatient and outpatient Internal Medicine services at BTGH, and 3 Community Health Program centers.

This study analyzed data from the InSight program to examine changes in adult patients' self-reported 30-day

measures of heavy alcohol use and other drug use from intake to 6-month follow-up.

MATERIALS AND METHODS

Procedure

Screening was conducted during routine patient encounters by generalist healthcare providers (physicians, nurses, nurse practitioners, and physician assistants) and HCHD staff (patient care technicians). Consent for substance-related intervention and treatment was included in the consent for routine adult medical care, and participation was entirely voluntary.

Screening comprised 3 questions to determine need for further assessment. Adult patients were asked the following questions: (i) do you smoke or use tobacco products; (ii) when was the last time you had more than 4 drinks in 1 day; and (iii) do you use marijuana, cocaine, or other drugs? An affirmative answer to the tobacco and/or drug use questions and/or an answer indicating the patient had more than 4 drinks in 1 day during the past 3 months were considered positive generalist screens. Patients who screened positive were then referred to trained InSight specialists for further assessments of alcohol use severity via the Alcohol Use Disorders Identifications Test (AUDIT) (Babor et al., 1992) and drug use severity via the Drug Abuse Screening Test (DAST-10) (Maisto et al., 2000) to determine level of severity.

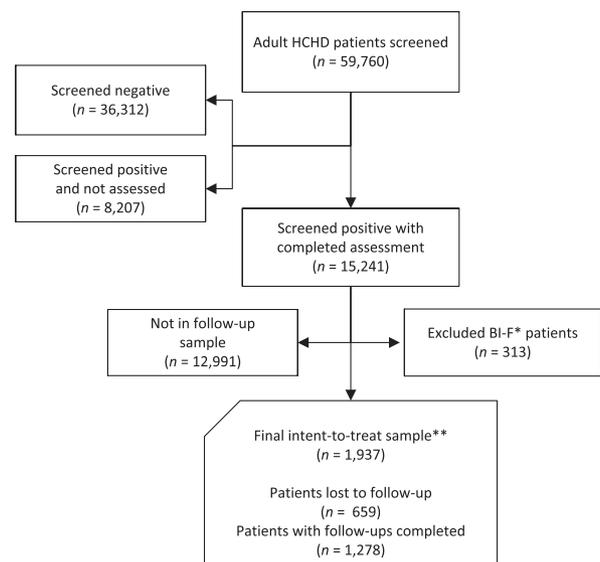
In addition to identifying the level of drug or alcohol problem severity, the AUDIT and DAST-10 scores were used along with other clinically relevant information collected during the InSight assessment to determine the recommended service type. All patients who scored above 7 on the AUDIT or above 0 on the DAST-10 were considered to have a high enough level of severity to warrant further services. For purposes of the present analysis, severity levels are labeled *low*, *medium*, or *high*, corresponding to diagnostic impressions of problematic/at risk use, abuse, and dependence, respectively. The definitions of levels and their corresponding service types are as follows: (i) low severity patients as indicated by an AUDIT score of 8 to 15 or a DAST-10 score of 1 to 2 were offered BI; (ii) medium severity patients as identified by an AUDIT score of 16 to 19 or a DAST-10 score of 3 to 8 were offered Brief Treatment; and (iii) high severity patients as indicated by an AUDIT score of over 20 or a DAST-10 score greater than 8 were offered a Referral to Specialty Treatment. Patients who completed the InSight assessment were offered the most intensive level of services for which they qualified. If a patient did not accept the highest level of recommended services, he or she was offered a lower level of service. As the assessment itself included a BI, each patient who completed an assessment was considered to have received a BI at a minimum.

To conduct the assessment, intervention, and follow-up, InSight specialists used a BMI approach, for which they were extensively trained and coached by expert BMI trainers. InSight specialists received comprehensive training in MI which included an initial intensive 2-day introductory training on MI principles and strategies followed by Standardized Patient Training (SPT), an advanced training technique that provided trainees opportunities to practice their MI skills in "real life" settings with trained actors as clients. During SPT, the trainees moved through a series of scripted mock sessions that were directly observed by an expert coach. The coach provided real time feedback to the trainees who had the opportunity to immediately incorporate the feedback and practice targeted techniques in subsequent mock sessions. In addition, expert MI coaches' reviews of audio-taped sessions provided standardized coding, evaluation, and monthly feedback to the specialists to ensure the ongoing fidelity of the interventions. Based on the taped sessions, competency ratings using standardized MI coding techniques and expert coach assessment were assigned to InSight Specialists on a quarterly basis.

InSight specialists asked patients during intake whether they would consent to be interviewed at 6 months following intake. For those who agreed to participate, locator information was collected and the information was verified by an InSight staff member within 21 days of intake. In order to be included in the follow-up sample, the locator information had to include at least 2 verifiable phone numbers and 1 verifiable address. Patients received \$5 through the mail as compensation for providing information at verification. They were informed that follow-up would occur between 5 and 8 months after intake and that they would receive telephone and mail contacts before then to stay in contact so they could be located for the follow-up interview. Follow-up was conducted predominantly by phone or, for those who could not be contacted by phone, with in-person interviews. At completion, patients were compensated for their time with \$20. Patients remained eligible for normal HCHD clinical services at all times throughout the follow-up process, whether or not they consented, withdrew consent, or were lost to follow-up. The Institutional Review Boards at the Baylor College of Medicine and the University of Texas at Austin approved the study protocol.

Study Population and Sampling

Figure 1 is a Consolidated Standards of Reporting Trials (CONSORT) chart depicting the relationship of the study sample to the total population of HCHD patients. Although InSight began providing services in April 2004, major changes in the SAMHSA Government Performance and Results Act's data collection protocol and InSight assessment instruments were implemented in July 2005, and consistent data were only available from that point forward. The present analysis is limited to unduplicated adult patients served between July 1, 2005 and September 30, 2008 at HCHD locations where InSight was implemented during this time. Patients who were under 18 or screened positive only on the tobacco question were excluded from the study and the chart. During the study period, generalists screened 59,760 patients. Sixty-one percent (36,312) screened



* BI-F refers to patients identified as "false-positive" assessments as indicated by their AUDIT and DAST-10 scores. 304 were identified with an additional 9 cases included because they could not be verified as valid cases.
** The intent-to-treat sample included patients meeting the sample criteria with completed follow ups as well as patients lost to follow up. Those lost to follow up were conceptualized as patients having no change in their use behaviors from the point of intake to follow up.

Fig. 1. CONSORT chart showing the study sample in relation to the total population of Harris County Hospital District patients admitted to participating facilities between July 1, 2005 and September 30, 2008. CONSORT, Consolidated Standards of Reporting Trials.

negative and were therefore not included in the follow-up study. Of the 39% (23,448) who screened positive and received a referral to an InSight specialist for additional assessment, 65% (15,241) received an assessment and 35% (8,207) did not. Reasons for not receiving an assessment included inability to locate the referred patient, the patient being unable to participate in the assessment due to his or her medical condition, and the patient refusing to participate. The follow-up sample was generated by 2 sampling protocols during different time periods. Prior to April 1, 2006, all patients who screened positive and consented were targeted for follow-up. After that date, in order to focus budgetary resources for improvement of the follow-up contact rate, SAMHSA approved a protocol revision in which the follow-up group was limited to a 20% sample randomly selected from consenting patients with verifiable contact information. As both protocols sampled the total patient population and gave each patient an equal chance of selection, the investigators decided to combine these samples to learn as much as possible from patients seen during this extended period of time. For patients sampled under one of these 2 protocols, 1,937 unique patient follow-ups were attempted. Of these, 1,278 were completed and 659 were lost to follow-up, resulting in a follow-up rate of 66%. There were 304 patients in the follow-up sample who were positive on the 3 questions but who did not show a score on either AUDIT or DAST-10. These patients were labeled as BI false-positive and were not included in the data set. Nine additional patients for whom data were missing or incomplete were also excluded from the sample. The 1,937 patients in the follow-up sample were included in the intent-to-treat (ITT) analyses using baseline data to impute follow-up scores for patients who could not be reached for follow-up.

Measures

Outcomes. Two dependent variables were measured at both admission and 6-month follow-up: self-reported number of days during the past 30 days in which heavy drinking occurred (5 or more on one occasion) and self-reported number of days in which other drugs (e.g., marijuana, cocaine) were used. The AUDIT and DAST-10 scores were used to identify patients for each analysis. The AUDIT and DAST-10 scores were not used as outcome measures because the 12-month time frame for intake and 6-month follow-up measures would have overlapped.

Alcohol Use Disorders Identifications Test. The psychometric properties of the AUDIT have been reported in many studies. A meta-analysis by Shields and Caruso (2003) reported that across 24 samples the median internal consistency reliability was 0.81 with a range of 0.59 to 0.91. An analysis by Gordon and colleagues (2001) of a primary care population estimated the sensitivity of the AUDIT for identifying hazardous drinkers was 76% using a cut point of 8 or higher with a specificity of 92%. The hazardous drinking criterion in the Gordon study was over 15 drinks weekly for men and over 11 drinks for women.

Drug Abuse Screening Test-10. The DAST-10 interpretation ranges are 1 to 2, indicating a low level; 3 to 5, a moderate level; 6 to 8, a substantial level; and 9 to 10, a severe level of drug-related problems. In the present study, the middle 2 ranges were combined so that scores of 3 to 8 were identified as moderate. Maisto and colleagues (2000) found the overall predictive accuracy of the DAST-10 to be equal to or better than 70% using a DSM-IV diagnosis of drug abuse disorder as a criterion measure when using a DAST-10 cut point of 3. Bohn and colleagues (1991) study on the validity of the DAST-10 correctly classified >93% of patients (using a threshold score >3) when compared with either Structured Clinical Interview for DSM-IV Disorders or clinical diagnosis of lifetime substance use disorder among a sample of inpatient substance abusers.

Analyses

Initial analyses compared demographic characteristics of patients in the follow-up sample with patients who were not in the follow-up sample. Chi-squared tests were used to determine if there were statistically significant differences in demographic characteristics based on follow-up status. A separate analysis examined the demographic characteristics of patients in the follow-up sample who had successful 6-month follow-up interviews compared with those who were lost to follow-up.

The outcomes analyses focused on changes in past 30-day self-reported heavy alcohol use or any drug use. As the study design utilized a single group pre-post test design and had a moderate follow-up response rate (66%), we employed an ITT analysis that included those patients who were lost to follow-up to avoid a potential selection effect due to differential attrition (Brown et al., 2008). The missing 6-month follow-up responses were imputed using the last value carried forward (LVCF) method which replaced the missing follow-up response with the intake response. This method provides a conservative estimate of change as all cases with missing follow-ups are treated as treatment failures. The total sample for change analysis was 1,937 patients (1,278 with completed follow-up responses and 659 with LVCF values imputed for follow-up). However, not all individuals were included in each analysis; alcohol and drug analyses were conducted separately for individuals with (a) an alcohol use problem determined by AUDIT score whether low, medium, or high severity ($n = 1,336$); and (b) a drug use problem determined by the DAST-10, whether low, medium, or high severity ($n = 1,171$). These groups were not mutually exclusive; 570 participants had problems with both alcohol and drugs. Therefore, an additional predictor was included for the alcohol and drug groups that represented misuse of alcohol and drugs in combination. The interaction between this predictor and the pre-post time variable provided a direct statistical test of whether the 6-month change differed between single substance (alcohol only or drugs only) and dual substance (alcohol and drugs) misusers. The demographic characteristics of the alcohol-only, drugs-only, and combined alcohol and drug use groups were also compared.

Patients' number of past-month heavy drinking days (5 or more drinks per sitting) or drug use days was examined in 2 ways. A repeated-measures mixed-model binary logistic regression was used to test for change in the conditional odds of patients reporting any days versus no days of heavy alcohol use and any days versus no days of drug use during the 30 days prior to intake and the 30 days prior to follow-up. Second, a repeated-measures mixed model, Poisson regression model was used to test whether there was a mean change in the actual number of days that patients reported heavy alcohol or drug use for those patients reporting greater than 0 days use at intake. All analyses accounted for potential nonindependence in patient scores due to receiving InSight services at a specific location within HCHD and for repeated-measures within person. If either random effect (site or patient) could not be estimated or was estimated at zero, it was removed from the model.

RESULTS

Demographic Characteristics

The sample of patients who comprise the follow-up sample (ITT) was compared with patients receiving services but who were not selected for follow-up. Twenty-eight percent (547) of the follow-up sample and 27% (3,203) of those not selected for follow-up were referred to treatment. Both groups were similar at intake in gender, age, race/ethnicity, and severity of substance use, but those in the follow-up sample were more

likely than those not in the follow-up sample to have received their intake in a community health center (14% vs. 3%, $p < 0.001$) rather than in a hospital.

Among those selected for follow-up, 66% were successfully contacted while 34% were lost to follow-up. Those lost to follow-up were similar to those successfully followed up in gender and race/ethnicity, but were on average younger (90% vs. 85% were less than 55 years old, $p < 0.05$), more severely impaired (36% vs. 24%, $p < 0.0001$), and more likely to have received their intake in a hospital emergency department (44% vs. 38%, $p < 0.05$). Those patients lost to follow-up were also more likely to have been rated at intake as high severity users (36% vs. 24%, $p < 0.0001$). Among the ITT sample, Table 1 shows the demographic characteristics of those who misused alcohol only, those who misused drugs only, and those who misused both substances.

The 3 groups were significantly different in gender, age, race/ethnicity, intake site, and severity of substance use at intake. Among the 3 groups, the alcohol-only group had the highest proportion of males, Hispanics, and individuals over age 55. The drug-only group had the highest percentage of women (although all groups were predominantly male) and was more likely than the other 2 groups to be African

American. The alcohol-and-drug misuse group had the highest proportion of high-severity users. There was a small but statistically significant difference among the groups in intake site, with those in the alcohol-and-drug group most likely to have received an intake through a hospital emergency room.

Among the drug- or drug-and-alcohol misusers, 45% had used marijuana in the past month, 44% had used cocaine, 9% had used benzodiazepines, 6% had used opiates (excluding heroin), 5% had used hallucinogens, 3% had used heroin, 3% had used amphetamine-type substances, and 3% had used tranquilizers or sedatives. The mean number of different types of drugs (excluding alcohol) used was 1.5.

ITT Results by Research Question

Past 30 Days Heavy Drinking (5 or more drinks).

Did InSight patients' self-reported number of days of heavy drinking (5 or more drinks on one occasion) in the past 30 days change from intake to 6-month follow-up? If so, did this change vary depending on level of severity, concurrent use of drugs, age, gender, and race/ethnicity?

The following analyses were conducted using patients whose AUDIT scores put them in the low, medium, and high severity groups, including the alcohol-only risk group and the alcohol + drugs risk group ($n = 1,336$). The initial descriptive analysis of the distribution of days where 5 or more drinks were taken on one occasion in the past 30 days showed that nearly half of patients (49.9%) reported 0 days of heavy drinking at intake. As the AUDIT assessment used a 12-month retrospective period, patients could report 0 days of heavy drinking at intake for the past 30 days and still be identified on the AUDIT as having a low, medium, or high level of severity. The distributions suggested that there were 2 patterns of change in the sample; reduction in number of days, and complete stoppage of heavy drinking.

Any Heavy Drinking. An initial repeated-measures mixed-model logistic regression model tested whether age, gender, race/ethnicity, level of severity, concurrent use of drugs, and time (intake to 6-month follow-up) predicted any day(s) of heavy drinking versus no days of heavy drinking. The time result showed that there was an overall reduction in the percent of patients with any days of heavy drinking (70% at intake vs. 37% at 6-month follow-up) [$F(1,2629) = 240.5$, $p < 0.001$].

A second model included interactions that tested whether there was differential change by age, race/ethnicity, gender, and level of severity. The statistically significant interactions were between level of severity and time [$F(2,2620) = 4.8$, $p < 0.001$] and concurrent alcohol and drug use and time [$F(1,2620) = 4.4$, $p < 0.001$]. Table 2 shows the probability of any heavy drinking at each time point by level of severity at intake. Patients with high severity at intake showed the largest reduction relative to patients with lower levels of

Table 1. Demographic Characteristics of Alcohol Only, Drug Only, and Alcohol + Drug Misusers

	Alcohol only (%) ($n = 766$)	Drug only (%) ($n = 601$)	Alcohol + Drug (%) ($n = 570$)	Chi-squared p -value
Gender				
Male	79.9	58.9	70.9	<0.001
Female	20.1	41.1	29.1	
Age (years)				
18 to 21	2.0	6.0	6.4	<0.001
22 to 25	5.9	10.4	10.3	
26 to 54	72.4	74.4	74.7	
55+	19.7	9.2	8.7	
Race/ethnicity				
White non-Hispanic	20.4	25.5	25.0	<0.001
African American	25.7	55.8	41.0	
Hispanic	51.6	14.7	31.5	
Other/mixed	2.4	4.0	2.6	
Intake site				
Hospital emergency department	36.8	39.4	44.4	<0.05
Hospital inpatient	34.2	36.9	31.8	
Hospital outpatient	12.1	11.3	11.8	
Community Health Center	16.8	12.3	12.1	

AUDIT, Alcohol Use Disorders Identifications Test; DAST, Drug Abuse Screening Test.

Substance misuse is defined as AUDIT score >7 or DAST-10 score >0 .

Missing data were excluded from each cross-tab. The number of missing cases was 0 for gender, 16 for age, 4 for race/ethnicity, and 0 for intake site.

Significance tests for gender, age (5 or more drinks on one occasion), and race/ethnicity are based on the Cochran–Mantel–Haenszel General Association statistic and control for potential clustering by intake site. Significance tests for intake site are based on the chi-squared statistic.

Table 2. Interaction Between Time and Level of Severity for Days of Heavy Drinking Outcomes

Outcome by level of severity	Intake mean	Follow-up mean	p-Value	Effect size ^a
Probability of any days heavy drinking				
Low	0.57	0.29	<0.001	0.31 ^b
Medium	0.70	0.35	<0.001	0.23
High	0.84	0.45	<0.001	0.15
Days of heavy drinking (5+ drinks)				
Low	5.0	2.2	<0.001	0.46
Medium	7.8	3.8	<0.001	0.51
High	13.2	6.6	<0.001	0.41

^aEffect size for probability of any day heavy drinking is an odds ratio while the effect size for the days of heavy drinking represents Cohen's *D* which expresses the difference in terms of SD.

^bOdds ratios <1 indicate a reduction in the probability of any days of heavy drinking.

severity. In addition, patients with concurrent use of alcohol and drugs showed a smaller decrease (−31.1%) compared with the decrease of those with alcohol use only (−40.1%).

Mean Days of Heavy Drinking. A repeated-measures mixed-model Poisson regression was used to examine change in days of heavy drinking for those patients in the alcohol risk group who reported at least 1 day of heavy drinking in the 30 days prior to intake (*n* = 1,171). In addition, a second model tested whether age, gender, race/ethnicity, level of severity, other drug use, and time (intake to 6-month follow-up) predicted change in days of heavy drinking. In the first model without interactions, the time result showed that there was an overall reduction in the mean number of days of heavy drinking (7.8 days at intake vs. 4.1 days at 6-month follow-up) [*F*(1,1797) = 1655.7, *p* < 0.001]. The key interactions in the second model tested whether there was differential change by age, race/ethnicity, gender, and level of severity. There were statistically significant interactions between time and level of severity [*F*(2,1788) = 5.3, *p* < 0.01]; time and use of other drugs [*F*(1,1788) = 14.9, *p* < 0.001]; time and gender [*F*(1,1788) = 36.9, *p* < 0.001]; and time and race/ethnicity [*F*(3,1788) = 36.9, *p* < 0.001]. Patients at a high level of severity showed larger reductions relative to patients with lower levels of severity (see Table 2). The interaction between time and combined substance use versus alcohol only showed that patients reporting alcohol only misuse showed larger changes (−4.42 days) relative to patients reporting combined use (−3.93 days). The time by gender interaction showed that women reported greater decreases (−4.48 days) compared with men (−3.80 days). The interaction between time and race/ethnicity showed that patients with Anglo (−5.19 days) and African American (−5.23) backgrounds showed greater reductions relative to patients with Hispanic (−2.99 days) or other/mixed (−3.57 days) backgrounds. This was predominantly due to Anglos and African-Americans having higher mean days of heavy drinking at intake.

Past 30 Days Drug Use

Did InSight patients' self-reported number of days of drug use in the past 30 days change from intake to 6-month follow-up? Did this change vary depending on level of severity, concurrent use of alcohol, age, gender, and race/ethnicity?

The following analyses were conducted using patients with DAST-10 scores in the low, medium, and high severity ranges, including the drug-only risk group and the drugs-plus-alcohol risk group (*n* = 1,171). As with the alcohol risk group, initial descriptive analysis of the distribution of days using drugs in the past 30 days showed a high percentage of patients (49.9%) with zero use days at intake. The same analysis strategy used for days of heavy drinking, repeated-measures mixed-model logistic regression, was implemented.

Any Drug Use. A repeated-measures logistic regression tested whether age, gender, race/ethnicity, level of risk, concurrent alcohol use, and time (intake to 6-month follow-up) predicted any days of drug use versus no days of drug use. The time result showed that there was an overall reduction in the number of patients reporting any days of drug use (82% at intake vs. 33% at 6-month follow-up) [*F*(1,2306) = 428.6, *p* < 0.001]. The interactions between time and level of severity, concurrent drug and alcohol use, race/ethnicity, age, and gender were statistically insignificant.

Mean Days of Drug Use. A repeated-measures mixed-model Poisson regression was used to examine change in days of drug use for those patients who reported at least 1 day of drug use in the 30 days prior to intake (*n* = 923). In addition, a second model tested whether age, gender, race/ethnicity, level of severity, concurrent use of alcohol, and time (intake to 6-month follow-up) predicted additional change in days of drug use. The time result showed that there was an overall reduction in the number of patients reporting any days of drug use (8.3 days at intake vs. 4.2 days at 6-month follow-up) [*F*(1,1825) = 1871.6, *p* < 0.001].

The key interactions in the second model tested whether there was differential change by age, race/ethnicity, gender, site, and level of severity. There were statistically significant interactions between time and level of severity [*F*(2,1826) = 4.3, *p* < 0.001]; time and gender [*F*(1,1826) = 35.3, *p* < 0.001]; and time and age [*F*(1,1826) = 45.7, *p* < 0.001]. Table 3 shows patients' mean days of drug use at each time point by level of severity at intake. Patients at high severity levels showed larger reductions relative to patients with lower severity levels.

The gender-by-time interaction reflected the fact that female patients (7.89 to 0.81) showed larger reductions relative to males (6.82 to 1.03). The age-by-time interaction showed a strong negative relationship between age and number of days drinking at intake (Pearson *r* = −0.19) versus a weaker negative relationship at follow-up (Pearson *r* = −0.06).

Table 3. Interaction Between Time and Level of Severity for Days of Mean Days of Drug Use

Outcome by level of severity	Intake mean	Follow-up mean	<i>p</i> -Value	Effect size ^a
Days of drug use				Cohen's <i>D</i>
Low	4.8	2.3	<0.001	0.41
Medium	8.7	4.2	<0.001	0.38
High	14.0	7.4	<0.001	0.34

^aThe effect size for the days of drug use represents Cohen's *D* which expresses the difference in terms of SD.

DISCUSSION

This study examined patient outcomes within a public healthcare system in which SBIRT was adopted as standard practice for all patients. While the efficacy of screening and BI has been established in a number of studies, the present study found that patient outcomes in the “real world” setting of one of the largest and busiest hospital districts in the United States were consistent with those found in more controlled studies. The magnitude of positive outcomes found in this analysis was larger than has been typically reported in major randomized controlled trials of SBIRT programs to date. A recent World Health Organization (2008) study reported that over 60% of BI recipients reduced substance use; however, the magnitude of change (23% reduction in mean alcohol involvement scores and 9% reduction in mean illicit substance involvement scores using the Alcohol, Smoking, and Substance Involvement Screening Test) was substantially smaller than reported here. However, the changes from admission to follow-up in the present study are similar to those reported in the Madras and colleagues (2009) analysis, which found that at 6-month follow-up the rates of use across sites were 67.7% lower for illicit drugs and 38.6% lower for heavy alcohol usage. The current study also examined whether patient improvements varied by level of severity, gender, race/ethnicity, and age characteristics that may inform service delivery design. This is also one of the first studies to examine the potential impact of screening and BI on illicit drug use.

The differences between patients who were contacted at follow-up and those who were not found at follow-up could have influenced the findings. Patients who could not be contacted were younger, had more severe substance use problems, and were more likely to have been served in a hospital setting rather than a community center.

A strength of this study is the large general patient population with diverse ethnic and cultural backgrounds and a variety of medical needs. InSight services were integrated into the routine activities of the participating hospitals and community clinics. Despite the complexities of the environments, fidelity to the MI-based screening and brief intervention protocol was closely monitored, as demonstrated by the expert coach reviews of monthly session tapes and the coding process. Specialists received ongoing evaluation and supervision to maintain the integrity of the interventions, including the MI components.

The ITT findings indicated that the InSight patients experienced significant changes in a number of drinking and drug use outcomes. Significant decreases were found in mean heavy drinking days and mean days of drug use from intake to 6 months for each level of substance use severity. Similarly, a significant decrease was found in the number of patients reporting any days of heavy drinking or any days of drug use from intake to 6 months for each level of severity. The greatest mean decreases for both alcohol use and drug use were found among patients with the greatest problem severity at intake. There were notable race/ethnicity differences in heavy drinking and drug use at admission, but these differences disappeared at follow-up as all groups converged to a very low number of days used. Significant change occurred among all race/ethnicity groups. Patients with a high level of severity showed the biggest mean reduction. This could be due to a regression-to-the-mean effect in which those patients reporting the greatest use at intake may be more likely to report lower scores at follow-up; however, Cohen's *D* standardized effect sizes showed similar results across levels of severity due to the high variability in scores at intake and 6 months.

Although the implementation of the protocol as a standard of care for a major urban hospital district is a strength, it also brings limitations. While the investigators would have preferred to keep all variables constant for the sake of the study, the realities of the settings and the evolution of the program's methods and procedures to meet the needs of these settings resulted in some early shifts in the study design, as described in Materials and Methods.

The shift in follow-up protocol during the study period is one such limitation. The result of this shift was that the follow-up population represented 2 sampling protocols, one in which all eligible patients were selected and another in which a randomly generated sample was selected. As both protocols were designed to represent the total patient population, the investigators combined the samples from these 2 time periods in order to learn as much as possible from all patients seen.

Without a control group, the extent to which patients may have improved without SBIRT services is unknown. It is possible that at the point of admission to the hospital, these patients had an unusually high level of drug and health problems which would have reverted to normal levels after their hospital stay.

Test reactivity is another factor which may have influenced results. The completion of an extensive questionnaire about alcohol, drug use, and other behaviors may have affected subsequent behavior, even without the receipt of any other services. In other words, the data collection itself, rather than the BI or treatment, may have initiated the changes among patients. Another factor to consider is that admission drug use reporting at intake was obtained in person, whereas follow-up reporting was carried out by telephone. It may be that some patients were less likely at follow-up to report illicit drug use over the telephone from their home. In this case, follow-up reports of substance use numbers may be artificially low. The lack of biochemical validation of use is also a limitation.

CONCLUSION

Positive patient outcomes were reported on all outcomes. That is, for measurements first taken at the point of hospital or clinic intake, subsequent measurements at 6 months revealed fewer days of heavy use of alcohol and fewer days of illicit drug use. The alcohol and drug outcomes were consistent with a positive effect of SBIRT services and supported the hospital district's goals for improvements in patient functioning and well-being.

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