Assessment of Substance Use and Substance-Use Disorders in Schizophrenia

Melanie E. Bennett [1]

Abstract

Assessment of substance use and substance-use disorders in schizophrenia presents unique challenges, but remains an important area for professionals working to understand and treat people with dual disorders. This paper reviews assessment of substance use, substance-use disorders, and related domains in people with schizophrenia. The first section includes a review of issues that make assessment of substance use and substance-use disorders particularly challenging in people with schizophrenia. This is followed by a review of measures that can be used to assess substance use and substance-use disorders in schizophrenia, including the strengths and weaknesses of different measures and information on the reliability and validity of each when available. The review concludes with a discussion of assessment considerations and uses of assessment in clinical practice.

Key Words: Schizophrenia, Substance Use, Substance-Use Disorders, Assessment, Measures

Introduction

Substance-use disorders (SUDs) are highly prevalent in schizophrenia. People with schizophrenia report six times the risk of developing a drug-use disorder as those in the general population, and studies find that between 20 to 65% of schizophrenia patients surveyed in treatment settings experience comorbid SUDs (1-3). People with dual schizophrenia and SUDs experience serious consequences in almost every area of functioning, including more severe symptoms, poorer course of illness, poorer compliance with treatment, greater risk of violence and homelessness, more legal problems, poorer life functioning, and greater risk of physical illness (4). Assessment of substance use and SUDs in schizophrenia presents unique challenges, but remains an important area for professionals who work to understand and treat people with dual disorders. Accurate assessment is crucial to our understanding of changes in use over time, treatment outcome, and how interventions work to decrease substance use. In clinical practice, assessment is an integral part of understanding the needs and complexities of clients with dual disorders, and determining what interventions are required and whether those interventions are of practical benefit. This paper reviews assessment of substance use, SUDs, and related domains in schizophrenia. The first section includes a discussion of issues that make assessment challenging in schizophrenia. This is followed by a review of measures to assess different aspects of substance use and

[1] *Department of Psychiatry, University of Maryland School of Medicine and VA Capital Network Mental Illness Research, Education, and Clinical Center (MIRECC), Baltimore, Maryland*

Address for correspondence: Melanie E. Bennett, PhD, Department of Psychiatry, University of Maryland School of Medicine, Administration Building, 737 West Lombard Street, Baltimore, Maryland 21201

Phone: 410-706-0722; Fax: 410-706-0934; E-mail: mbennett@psych.umaryland.edu

Submitted: February 29, 2008; Revised: January 19, 2009; Accepted: February 2, 2009

SUDs, and the strengths and weaknesses of different measures, in schizophrenia.

Issues in the Assessment of SUDs in Schizophrenia

There are many reasons why assessment of substance use and SUDs can be complex in schizophrenia. This section describes challenges that impact assessment, which must be addressed in order for assessment to be valid and useful.

Measures-Related Issues

Most measures of substance use and problems were designed for primary substance abusers. It is unclear how relevant these measures are to people with schizophrenia. While some studies have found such measures to perform adequately in psychiatric populations (5-8), others have been found to perform less well in dually diagnosed samples (9-13). Measures developed for primary substance abusers may fail to tap domains that are especially relevant (issues related to medications, side effects, psychotic symptoms) (10), or they may not capture patterns of substance use that are most relevant to people with schizophrenia. For example, people with schizophrenia have been found to use lower quantities of drugs, yet experience levels of negative consequences that are comparable to other groups of substance abusers (14, 15). Dixon and colleagues (16) found that relying on formal diagnostic criteria to identify people with serious mental illness (SMI) who would benefit from substance abuse treatment missed a large group who did not have a diagnosis of SUD, but did endorse "recent regular use" (any past period of daily/weekly use + any use in the month before hospitalization) and who may benefit from intervention. In addition, people with schizophrenia can experience deficits in attention, memory, and cognitive processes that may impact their ability to understand measures that were developed for primary substance abusers and to participate in a lengthy assessment battery (21). Some measures utilize complex language, open-ended questions, or shifting time frames that may complicate assessment.

Illness-Related Issues

There are features of schizophrenia that can impact assessment of substance use and SUDs. Symptoms of substance withdrawal can resemble mental illness, making it difficult to determine which symptoms are due to schizophrenia and which are related to SUD (17-19, 89). Symptom overlap—for example, hallucinations can be a part of both schizophrenia and severe alcohol dependence—can also cloud assessment. In addition, a diagnosis of SUD is based on use interfering with activities such as work, relationships, and other pleasurable activities. However, people with schizophrenia can experience negative symptoms such as avolition (an inability to initiate and persist in goal-directed activities) and anergia (low energy level) that can interfere with engagement in activities. It can be difficult to measure the negative impact of substance use in cases where there may be few competing activities to be disrupted. In addition, many people with schizophrenia and SUDs may have used, abused, or been dependent on multiple substances over time, making accurate assessment of SUDs complex.

Accuracy of reporting can also be a factor in assessment with any population of substance users, and those with schizophrenia are no exception. Individuals with schizophrenia and SUDs may experience cognitive and social deficits that can, in some cases, confound their report of information. Shaner and colleagues (88) assessed 165 inpatients with psychotic disorders and cocaine abuse or dependence using structured interviews, urinalysis, hospital records, and interviews with collaterals in order to determine DSM Axis I diagnoses of schizophrenia spectrum disorders; diagnoses were classified as "definitive" or "uncertain." Overall, a definitive diagnosis could not be made for over 80% of cases. Frequent sources of "diagnostic uncertainty" included insufficient periods of abstinence to allow for a nonsubstance-induced diagnosis to be made, poor memory, and inconsistent reporting. Such findings illustrate that, like other groups of substance abusers, those with schizophrenia may provide information on quantity and frequency of substance use that is inaccurate or minimized (22-26), especially if a respondent has much to lose by honestly discussing his substance use, such as housing or other benefits (27). This is especially relevant to those who are more symptomatic, as under reporting of use is correlated with level of symptoms (28). Assessment of substance use and SUDs should be done in an objective and nonjudgmental manner in order to help respondents report accurate information.

Assessor-Related Issues

Assessment is also impacted by the setting in which it occurs. Clinicians in mental health settings may not be trained to assess SUDs, and so may not identify them in people with schizophrenia and other forms of SMI (22, 26, 29, 30). For example, Kirchner and colleagues (31) reviewed records for forty-two people with schizophrenia and SUD in an inpatient setting and found that while 86% met criteria for an alcohol use disorder, most (57%) did not receive a diagnosis at admission and many (45%) did not receive one at discharge. In addition, people with schizophrenia and SUDs can experience numerous points of entry into treatment and receive services from a range of professionals, making it difficult to obtain information on substance use and problems in a standardized way. This is particularly problematic in acute

care settings that do not focus on, and often under diagnose, substance-related problems (32). Ananth and colleagues (33) completed diagnostic interviews for seventy-five people in a state psychiatric hospital; diagnoses were compared to those made at two other time points: in the emergency room prior to admission, and at the hospital following admission. Subjects could receive multiple diagnoses if they were poly drug users. Overall, the emergency room made four diagnoses of any SUD, the state hospital made twenty-nine diagnoses, and the research team made 187 diagnoses of SUDs. These results illustrate that different professionals and settings focus on different information in assessment. Such variability is a barrier to the consistent assessment of SUDs in schizophrenia.

Assessment Domains and Measures

The following section reviews several domains of assessment and describes measures that can be used for each, along with information about the performance of these measures in people with schizophrenia where available. The goal is to provide a selection of measures that could be used by researchers or clinicians in their work with people with schizophrenia. In selecting measures to include, a series of MEDLINE searches was conducted using key words including "schizophrenia," "assessment," "substance use," "measurement," and "severe mental illness." First, studies of measures that are used extensively with primary substance abusers and have been widely applied to assessment in people with schizophrenia were identified. These included several screening and interview measures. Because these measures have the largest research base in schizophrenia, they were included here. Second, studies of less widely used measures that had some data from samples that included people with schizophrenia were identified. Such measures represent attempts to determine if existing measures could be useful with SMI samples and were considered important to work in schizophrenia. Third, studies of measures that were developed specifically for people with schizophrenia or other forms of SMI were included. While this review does not represent a comprehensive list of all measures of substance use, problems, and SUDs that have been developed or that have been studied in samples of people with other forms of SMI, the measures included here were selected either because they have demonstrated utility, or would lend themselves to further use and study in schizophrenia.

Screening

Screening is focused on identifying whether an SUD is likely to be present. Screening instruments are brief and simple to administer. Results of screening generally determine whether a more in-depth assessment is required. Features of some of the most widely used screening measures that have been evaluated in samples that have included people with schizophrenia are presented in Table 1. All provide rapid assessment of problems associated with alcohol use (Michigan Alcoholism Screening Test [MAST] [34], Alcohol Use Disorders Identification Test [AUDIT] [36], CAGE questions [37]) or drug use (Drug Abuse Screening Test [DAST] [35]). Another screen, the Severity of Dependence Scale (SDS) (38), assesses psychological symptoms of substance dependence including feelings of being out of control, difficulty in attempting to not use, and desire to stop. The SDS has been used to screen for problems with a range of illicit drugs in primary substance abusing samples.

Overall, the literature is mixed regarding how well these screening measures perform in people with schizophrenia. Several studies have found that the MAST and the DAST had good psychometric properties in samples of respondents with SMI (24, 39-43, 86). Others have found good reliability and/or validity with the AUDIT (8, 39, 86), CAGE (30, 43, 44), and SDS (45) in people with schizophrenia or other psychotic disorders. There are also studies that find that these measures do not perform well in people with schizophrenia and other forms of SMI (11, 12, 46). Wolford and colleagues (46) suggest that self-report measures, while useful, miss many diagnoses due to their being developed and normed on general population or primary substance abusing samples, with questionable relevance to SMI populations. One potential solution is to develop screening measures specifically for people with SMIs such as schizophrenia. Rosenberg and colleagues developed the Dartmouth Assessment of Lifestyle Instrument (DALI) (47), a screen designed to identify substance use and abuse in people with SMI. The DALI was developed by identifying, via logistic regression in samples of people with psychiatric disorder, the most useful fifteen items for classification from many screening measures developed for primary substance abusers. The DALI can be used in a range of settings by different types of professionals and shows a high degree of classification (47, 48).

Overall, the fact that screening measures are being used and studied in people with dual SUDs and schizophrenia is an important step that will improve assessment for this group of substance abusers. The mixed findings in the literature suggest that these measures can be useful, but that some caution must be taken when applying these measures to schizophrenia samples. In particular, several researchers tested different cutoff scores and encourage those using these measures for clinical use to decide the exact goal of the screening (identifying problem use versus referring for additional assessment), and the balance of sensitivity and specificity desired when selecting the optimal cutoff score (39, 86). In addition, users of these screening measures

Table 1 Studies of the Utility Alcohol and Drug Abuse Screening Measures in Samples that Include Participants with Schizophrenia

Study	Measure(s) Tested	Sample	% with Schizophrenia Diagnosis*	Findings
Toland & Moss, 1989	MAST	60 inpatients: 20 AUD+schizophrenia, 20 AUD only, 20 schizophrenia only	67%	When compared to lab tests, MAST showed good sensitivity (0.80 for MAST, 0.45 for lab test) but low specificity (0.40 for MAST, 1.00 for lab test).
Searles et al., 1990	MAST	70 inpatients	100%	With cutoff score=5: MAST sensitivity=88%, specificity=69%; overall classification accuracy=0.80. MAST differentiated AUD and no-AUD groups.
Smith & Pristach, 1990	SAAST	21 inpatients	100%	All respondents with SAAST scores ≥8 met *DSM* criteria for an alcohol use disorder.
Staley & el-Guebaly, 1990	DAST	250 participants from inpatient day, and outpatient programs	Not provided	DAST discriminated participants with SUDs from others; showed a maximum accuracy of 89%. Sensitivity ranged from 0.96 to 0.82 and specificity ranged from 0.81 to 0.91 at cutoff scores ranging from 5/6 to 10/11.
McHugo et al., 1993	MAST	75 outpatients	100%	The MAST correctly classified 85% of the sample.
Breakey et al., 1998	CAGE, Short MAST	78 psychiatric rehab patients	63%	Short MAST sensitivity=0.82, specificity=0.96; CAGE sensitivity=0.76, specificity=0.80.
Cocco & Carey, 1998	10- and 20-item versions of the DAST	97 outpatients	55%	Both showed good internal consistency (10-item alpha=0.86; 20-item alpha=0.92) and test-retest reliability (10-item ICC=0.71; 20-item ICC=0.78).
Rosenberg et al., 1998	DALI	73 inpatients	44%	DALI correctly classified 85.4% of alcohol use disorders and 89.5% of drug (cannabis or cocaine) use disorders.
Wolford et al., 1999	MAST, CAGE, DAST	320 inpatients	55.7%	Alcohol measures missed 25–40% of diagnoses; showed modest sensitivity. DAST missed 25% of diagnoses.
Dawe et al., 2000	AUDIT	71 patients	100%	Cutoff score of ≥8 showed good internal consistency, sensitivity (87%), and specificity (90%).
Maisto et al., 2000	AUDIT, DAST	162 outpatients	53%	Good sensitivity and specificity for both at a range of cutpoints. Scores identified cases that were AUD- or DUD-positive but were not listed in the medical record.
Teitelbaum & Carey, 2000	MAST, CAGE	71 outpatients, 64 controls	63%	Test-retest for MAST: r=0.95; test-retest for CAGE, r=0.80.
Ford, 2003	DALI	60 inpatients	69%	DALI correctly classified 74% of those with alcohol use disorders and 83% of those with drug use disorders.
Dervaux et al., 2006	CAGE	114 patients	100%	With cutoff=1, sensitivity=0.91 and specificity=0.86. With cutoff ≥2, sensitivity=0.82 and specificity=0.94.
Hides et al., 2007	SDS	153 inpatients	100%	Alpha=0.81. With cutoff ≥2, sensitivity=0.86 and specificity=0.83. With cutoff ≥3, sensitivity=0.80 and specificity=0.86. With cutoff ≥4, sensitivity=0.71 and specificity=0.89. Good concurrent validity.
Cassidy et al., 2008	AUDIT, DAST	88 patients (all 1st episode)	81%	Respondents with AUD had higher AUDIT scores; those with DUD had higher DAST scores. Best cutoffs were AUDIT=10 (sensitivity=85%; specificity=91%) and DAST=3 (sensitivity=85%; specificity=73%).

*Percentage with schizophrenia diagnosis includes diagnoses of both schizophrenia and schizoaffective disorder.

should note that select items may not apply to some people with schizophrenia. For example, items that tap problems with work or spouses due to substance use will not apply to those people with schizophrenia who are not employed or married. In addition, other domains, such as the impact of substance use on mental health symptoms or treatment, may not be captured. The use of measures such as the DALI that have been developed for people with SMI is a promising development that could improve screening in schizophrenia.

Diagnosis of SUD

In some settings, it is necessary to determine whether a formal diagnosis of SUD—abuse or dependence—is met. Features of diagnostic interviews that have been used with people with dual SUDs and SMI are listed in Table 2. Samet, Waxman, Hatzenbuehler, and Hasin (90) review several different structured and semi-structured interviews that can be used to determine a diagnosis of SUD, each with its own areas of focus. When a diagnosis is required, these sorts of interviews, such as the Structured Clinical Interview for DSM-IV (SCID) (49) or the Diagnostic Interview Schedule (50, 51), are a reliable way to gather information. The utility of structured clinical interviews, which are linked to *DSM* criteria, have not been widely studied in schizophrenia. Most of the research to date includes samples of people with SMI and generally the percentage of participants with schizophrenia is not specified. This research is relevant, nonetheless, as the samples were often comprised of people seeking treatment in inpatient settings and likely had some percentage of people with schizophrenia. What little research exists suggests that structured interviews have good reliability for identifying SUDs in psychiatric samples (29, 53).

As with screening measures, diagnostic interviews tailored for dually diagnosed samples are being developed. Hasin and colleagues (54) developed the Psychiatric Research Interview for Substance and Mental Disorders (PRISM), a semi-structured diagnostic interview designed specifically to assess psychiatric disorders in substance abusing populations. The PRISM assesses current and lifetime diagnoses for SUDs, affective disorders, schizophrenia spectrum and other psychotic disorders, anxiety disorders, eating disorders, and some personality disorders, and contains probes that can be followed by unstructured questions from interviewers as needed. The interview begins with the section on SUDs so that a substance-use history can be established before the assessment of psychiatric diagnosis takes place. In this way, the structure of the PRISM alerts interviewers to time periods in which psychiatric symptoms may be substance induced rather than independent diagnoses. Two studies examining the utility of the PRISM have both included dually diagnosed subjects and have found good test-retest and inter-rater reliabilities for SMI diagnoses (54, 55).

Most structured diagnostic interviews are time consuming and require substantial training, and so are likely to be less useful in most community settings. To address these limitations, several authors have developed measures that require less time and training in order to be useful in community mental health settings. McGovern and Morrison (56) developed the Chemical Use, Abuse, and Dependence Scale (CUAD) as a brief measure that can generate SUD diagnoses and be delivered by assessors with minimal training. Two studies of the CUAD in samples of people with psychotic disorders (56, 57) found good agreement between the CUAD, SCID, and other screening measures. Gallagher and colleagues (52) tested a measure called the Comprehensive Addictions and Psychological Evaluation (CAAPE) (87), a brief interview that allows for the assessment of *DSM-IV* criteria with a series of structured, yes/no items. To examine the reliability of the CAAPE, twenty participants with mental illness receiving outpatient mental health treatment (20% with schizophrenia or schizoaffective disorder) completed both the CAAPE and the SCID. Results showed 95% agreement between the CAAPE and the SCID for SUD diagnoses. While these studies included samples with a range of psychiatric disorders, the results suggest these measures may be useful in schizophrenia.

Substance Use, Severity, and Consequences

In many settings that serve people with schizophrenia, it is useful to determine patterns of use and the level of negative consequences that an individual is experiencing due to substance use. Studies that examine methods for assessing use, severity, and consequences in people with schizophrenia are listed in Table 3.

Substance Use and Severity

To determine quantity and frequency of substance use, the easiest strategy is often to ask some simple questions about current and recent substance use in a nonjudgmental manner. Some sample questions are: What drugs do you use? Which drug do you use the most often? How often do you use this drug? When was the last time you used this drug? What is your drinking like? There is evidence that brief questions such as these can reliably assess current substance use in people with SMI (58, 59). A standardized method for assessing recent substance use is the Time-Line Follow-Back method (TLFB) (60), which requires the client to reconstruct his/her substance use on a day-to-day basis using a calendar, and can include assessment of multiple substances for 30- or 90-day time periods. This method allows for a summary of the primary dimensions of substance use: amount, frequency, pattern, and degree of variability. The TLFB has been shown to have good reliability and valid-

Table 2 Studies of Substance Use Disorder Diagnostic Instruments in Samples of Participants with Serious Mental Illness

Study	Measure(s) Tested	Sample	% with Schizophrenia Diagnosis*	Findings
McGovern et al., 1992	CUAD	129 psychiatric inpatients; 348 outpatients at substance abuse treatment program	54% of inpatient sample; not specified for outpatient sample	Test-retest for psychiatric sample (intraclass correlation)=0.95. CUAD diagnosed 39 (31%) SUDs in the sample as compared to 20 (15%) SUDs diagnosed by clinical interviews by psychiatrists. In outpatient sample, CUAD program showed significant correlations with MAST (0.21) and DAST (0.58).
Bryant et al., 1992	SCID	406 inpatients & outpatients + 200 nonpatients	Not specified	Reliabilities (kappas) for SUDs in respondents with current psychiatric disorders were 0.82 for current dependence and 0.75 for substance dependence.
Albanese et al., 1994	SCID	178 inpatients	Not specified	SCID identified more cases of SUD, both alcohol and drug, than either urinalysis or clinical reports.
Appleby et al., 1996	CUAD	100 inpatients	66% with psychotic disorders	Good inter-rater agreement (0.98) for CUAD severity scores. High internal consistencies for alcohol (alpha= 0.96), cocaine (alpha=0.97) and cannabis (alpha=0.95) use scales. High test-retest agreement (kappa=1). CUAD subscales correlated with MAST and DAST.
Hasin et al., 1996	PRISM	172 inpatients & outpatients	Not specified	Test-retest reliabilities (kappas) excellent for current alcohol (0.81) and drug dependence (cannabis=0.80; cocaine=0.92; heroin=0.94); good to excellent for lifetime alcohol (0.69) and drug dependence (cannabis=0.63; cocaine=0.88; heroin=0.95).
Gallagher et al., 2006	SCID, CAAPE	20 outpatients	20%	Agreement for SUD diagnosis between SCID and CAAPE was 95%. The CAAPE identified a greater number of SUDs per person (mean=3.20) than the SCID (mean=1.45).
Hasin et al., 2006	PRISM	285 inpatients & outpatients	Not specified	Test-retest reliabilities (kappas) excellent for current alcohol (0.82) and drug dependence (cannabis=0.73; cocaine=0.90; heroin=0.94); good to excellent for lifetime alcohol (0.80) and drug dependence (cannabis=0.66; cocaine=0.88; heroin=0.90).

*Percentage with schizophrenia diagnosis includes diagnoses of both schizophrenia and schizoaffective disorder.

ity for psychiatric patients with psychotic disorders (61) and for other dually diagnosed samples (62).

Another widely used measure is the Addiction Severity Index (ASI) (63, 64), an interview designed to assess substance use and the severity of addiction-related problems experienced in seven areas: medical, legal, drug abuse, alcohol abuse, employment, family and psychiatric that has been used extensively in substance abuse research. The ASI includes both objective and subjective information and yields both composite scores and problem severity scores in each domain. The utility of the ASI for people with schizophrenia and SUDs is unclear. Some studies suggest that the ASI composite scores perform well in people with SMI (6, 65, 66) and other similarly impaired populations (67). However, there is also evidence that the ASI performs less well in people with SMI (9, 10, 14, 68). It is possible that because the ASI was designed for primary substance abusers, it may not capture the patterns of use and domains of impairment that are most relevant to people with schizophrenia and other forms of SMI. Another interview measure for the assessment of substance use and clinical issues that are relevant to people with SUDs and SMI is the Substance Use Event Survey for Severe Mental Illness (SUESS) (69). The SUESS was designed specifically for people with SMI, and so covers both mental health and substance use domains, taps experiences and domains that are especially relevant in dual disorders, utilizes language that can be easily understood by highly impaired patients, and would be useful to a range of professionals. The format of the SUESS is based on the ASI—it assesses medical issues, alcohol use and treatment issues, drug use and treatment issues, family issues, and psychiatric issues—yet it also includes topics that are relevant to SMI patients, including psychotropic medication use, the experience of medication side effects, and victimization issues. There are also items

that assess a range of inpatient and outpatient services to treat substance use and psychiatric problems. The SUESS has shown good reliability and validity in a preliminary study (69).

Substance-Related Negative Consequences

Screening measures such as the MAST and the DAST provide a brief measure of negative consequences. When a more in-depth assessment is needed, in order to determine patterns of problems or a diagnosis of substance abuse, more extended measures can be used. Most such measures are questionnaires that are brief, targeted, and easy to administer. Few measures of consequences have been studied in samples of people with schizophrenia. The Inventory of Drug Use Consequences (InDUC) (70) is a fifty-item measure of both recent and lifetime substance-related negative consequences in five different domains: 1) Physical ("I have been sick or vomited after drinking/using drugs"); 2) Interpersonal ("My family or friends have worried or complained about my drinking/drug use"); 3) Intrapersonal ("I have felt guilty or ashamed because of my drinking/drug use"); 4) Impulse Control ("I have taken foolish risks when I have been drinking/using other drugs"); and, 5) Social Responsibility ("I have failed to do what is expected of me because of my drinking/drug use"). The InDUC has good reliability in primary substance abusers (70-72). The one study that used the InDUC with an SMI sample (73) reported interesting findings (people with SMI did not report more consequences than primary substance abusers), but did not examine psychometric properties in SMI respondents.

Another measure of consequences, the Problems Assessment for Substance Using Psychiatric Patients (PASUPP) (74), is a fifty-four item measure of negative consequences that was developed for people with SMI. The authors included items from well-known measures of consequences, and supplemented these with items developed via focus groups of people with dual disorders and a literature review that identified additional domains (such as medication noncompliance, sexual abuse, problems with money management). Items are asked for recent and lifetime time frames. In an initial study of reliability and validity, Carey and colleagues found good internal consistency and moderate correlations with other measures of substance abuse problem severity (74). Given the impact of substance use and SUDs in schizophrenia, further testing of measures of negative consequences in this population of substance abusers is needed.

Validation of Self Reports of Substance Abuse

Accurate assessment can be difficult in any group of people with SUDs, who may have many reasons to minimize or misrepresent the quantity and frequency of their substance use. Assessment in people with schizophrenia and SUDs presents a similar challenge. Whether due to cognitive factors that are inherent to schizophrenia or a more deliberate misrepresentation to avoid sanctions, there are many reasons why people with schizophrenia may inaccurately report substance use. It is likely that there will always be some degree of under reporting in an assessment that relies on self-report measures (40). There are several ways to enhance the validity of self reports of substance use. Studies that have examined these strategies in schizophrenia are listed in Table 4.

Biological Tests of Drug Use

Laboratory and urine tests are available to assess recent drug use. Most drugs of abuse stay in the system for only one to three days, so that a negative test cannot be taken to mean no recent use. However, such tests can identify use in people who would minimize use on self-report measures, and so can be useful as an enhancement to self-report measures in many groups of substance abusers including those with schizophrenia. Hair analysis has a longer window for detection of drug use (three months) and so can be useful in situations in which detection of longer term use is needed. While there is a literature on the validity of biological tests in primary substance abusers (89), research on the utility of such tests in schizophrenia samples is less prevalent. The studies that have been done have supported the use of urinalysis and hair analysis in schizophrenia (75-77). In treatment settings, respondents may be more likely to report recent drug use if they know that a urinalysis will be positive for drugs. While laboratory tests can identify people with recent drug use, they cannot provide information on the consequences of use that is needed to determine if abuse or dependence is present. In addition, some laboratory tests are less useful for detecting alcohol use, and may be too costly for clinical settings to do repeatedly.

Collateral Reports

Information from collaterals such as family members or treatment professionals can also be used to validate self reports. Reports from case managers and other treatment professionals can serve as a useful source to corroborate a respondent's self report of substance use and abuse (78-80), and have been found to be more sensitive in identifying substance use and disorders (91). Counselors and case managers often have in-depth knowledge of clients and their substance use that can be helpful when used to supplement self report (81). Drake, Mueser, and McHugo (82) developed two scales for use with clinicians working with people with SMI: the Clinician Rating Scale for Alcohol (AUS) and the Clinician Rating Scale for Drug Use (DUS). Both involve

Table 3 Studies of the Utility of Measures of Substance Use Patterns and Consequences in Samples that Include Participants with Schizophrenia

Study	Measure(s) Tested	Sample	% with Schizophrenia Diagnosis*	Findings
Hodgins & el-Guebaly, 1992	ASI	152 respondents at an outpatient dual diagnosis clinic	19%	Internal consistency reliabilites (alphas) ranged from 0.48–0.88 for composite scores. Inter-rater reliability correlations (ICCs) ranged from 0.57–0.94 for composite scores, 0.30–0.96 for interviewer severity ratings.
Lehman et al., 1996	ASI	435 inpatients	26.4%	ASI missed approximately 20% of cases SUD identified through structured diagnostic interview.
Appleby et al., 1997	ASI	100 public psychiatric patients	66% with psychotic disorders	Inter-rater reliabilities for most subscales were moderate to high. Good internal consistency for composite scores. Problem severity scores showed good sensitivity.
Carey et al., 1997	ASI	97 psychiatric outpatients	53%	Internal consistencies (alphas) of composite scores ranged from 0.46–0.85 for full sample. Inter-rater agreement (ICCs) for composite scores ranged from 0.52 (legal) to 0.99 (employment). Drug composite score showed good discriminant and concurrent validity.
Zanis et al., 1997	ASI	62 outpatients	90%	ASI was difficult for many respondents to understand and showed low test-retest reliabilities in several domains.
Carey et al., 2004	TLFB	132 outpatients with lifetime history of SUD	52%	Good to high reliability test-retest reliability for both the 30- (0.73 to 1.00) and 90-day (0.77 to 1.00) time periods.
Carey et al., 2004	PASUPP	239 people in psychiatric treatment (92% outpatients)	38%	Internal consistency (alpha)=0.97. Correlational analyses provided preliminary for convergent and discriminant validity.
Currie et al., 2004	ASI	1,082 outpatients at a dual diagnosis treatment program	5% with psychotic disorders	Factor analyses found that some ASI scoring methods are better than others for SMI respondents.
Bennett et al., 2006	SUESS	605 outpatients	Not specified	Internal consistencies (alphas) generally moderate across domains; test-retest reliabilities were high. 84% agreement between SUESS and urinalysis for current drug use.
DeMarce et al., 2007	TLFB	150 participants in residential treatment for SUDs, 77 of these with dual psychiatric diagnoses	9.3% of total sample; 18% of comorbid sample	For comorbid sample, 90% agreement with ASI and 90% agreement with collateral report for alcohol abstinence; 87% agreement with ASI and 77% with collateral report for drug abstinence. Significant correlations with ASI (0.78) and collateral report (0.52) for number of drinking days.
Gonzalez et al., 2007	InDUC	88 with SMI; 42 SUD only	75% of those with SMI	Did not examine the psychometric properties of the InDUC

*Percentage with schizophrenia diagnosis includes diagnoses of both schizophrenia and schizoaffective disorder.

rating clients on five-point scales ranging from abstinent to dependence with institutionalization. Both scales were developed based on DSM criteria for SUDs and were found to have good reliability in classifying people with SMI based on substance use severity (82). While collateral reports can be useful, information from relatives can contain biases due to relatives' attributions and feelings about a client's illness and substance use.

Combining Methods

Assessment in schizophrenia is likely to be most valid when it combines methods. Work with primary substance abusers suggests that biological and psychosocial measures have their own strengths and weaknesses, and that using both types together yields the most accurate assessment (106). While an assessment must be tailored to the needs of the individual or program conducting it, there is evidence that a combination of self report, biological, and collateral information can identify the greatest number of cases of SUDs. Use of multiple sources can help clarify respondent report, encourage truthfulness, or provide additional information that a respondent may be unable or unwilling to disclose. Several studies have found that people with SMI disclose more information about their substance use when assessment includes a urine test or collateral report (79). For example, in their study of methods of assessment, Swartz and colleagues (77) found that combining information from interviews, urinalysis, and hair analysis yielded a higher rate of recent substance use than using either method on its own. Breakey and colleagues (30) examined the sensitivity and specificity of screening measures in addition to the clinical opinions of therapists and counselors concerning the presence or absence of alcohol use disorders in a sample of psychosocial rehabilitation participants with SMI (63% schizophrenia). They found that the addition of brief screening measures such as the MAST or the CAGE improved clinicians' ability to identify alcohol use disorders.

Improving the Reliability and Validity of Assessment

There are many strategies for improving assessment in schizophrenia. To begin with, there are test administration procedures that are commonly used in research with people with SMI that can improve assessment, such as administering paper-and-pencil measures as interviews (to accommodate individuals who cannot read or who have vision problems), paraphrasing content if a respondent appears confused over the meaning of a question, and probing for comprehension when a response appears inconsistent or random. Use of such techniques requires some training to ensure that assessors probe and paraphrase questions without biasing responses (no leading questions; no implying that particular answers are wrong). Carey and Correia (81) list several other strategies, including ensuring that respondents are not intoxicated and are stable psychiatrically. In addition, training mental health professionals to recognize SUDs would improve assessment in schizophrenia. Clinicians and case managers often have long-standing relationships with their SMI clients, and have built rapport over a long period of time. Studies find that when mental health staffs are trained to recognize SUDs, they are good at assessing use and associated problems, and often have access to detailed information to assist them (22). Finally, most of the measures reviewed here are designed to be used cross-sectionally. However, people with schizophrenia tend to cycle in and out of use, heavy use, and abuse; thus, measurement at one point may not accurately reflect use over time. Some have suggested that assessment be a longitudinal process, with assessments tapping shorter time frames done repeatedly, to more accurately capture patterns of substance use in people with schizophrenia (22, 32, 81, 83).

Assessment Considerations

The inclusion of assessment of substance use and SUDs in mental health service settings would help many people with schizophrenia get the comprehensive care they need. Several authors (84, 85) suggest ways to use assessment in clinical practice. This section reviews issues that impact assessment of substance use and SUDs in schizophrenia, and provides ways to incorporate assessment into mental health treatment planning.

Impact of Symptoms and Setting on Assessment

People with schizophrenia may seek assistance for substance use and SUDs in many different settings and may receive services from a range of professionals. At this point, the literature has not widely addressed the issue of whether use of assessment measures is impacted by the recency of psychiatric symptoms (acute versus stable) and type of setting (inpatient versus outpatient). Teitelbaum and Carey (43) found that acute psychological distress did not influence test-retest reliability of alcohol screening measures in psychiatric outpatients. The studies reviewed here have included inpatients and outpatients from treatment settings focused on psychiatric care, substance abuse treatment, and treatment for dual psychiatric and SUDs, suggesting that findings are applicable to people seeking treatment for a range of problems of varying severities. Carey (84) reviewed several factors that may impact reporting during assessment of substance use and SUDs in psychiatric disorders, including intoxication, acute symptom exacerbation, psychosis, mania, and being in crisis. In general, if people experiencing acute psychiatric symptoms have difficulty answering questions accurately, assessment of substance use and SUDs should wait until a period of relative stabilization has been achieved. In the studies reviewed above, many that included people in inpatient settings waited for several days before conducting assessments in order to allow individuals' symptoms to stabilize. This is an especially important issue in cases in which substance use may be contributing to psy-

Table 4 Studies Examining Methods of Validation of Self Reports of Substance Use in Samples that Include Participants with Schizophrenia

Study	Measure(s) Tested	Sample	% with Schizophrenia Diagnosis*	Findings
Wilkins et al., 1991	Self-reports, clinician interview, urinalysis	56 psychiatric inpatients	44.6%	43% of those with positive urinalysis had denied recent drug use on both self-reports and face-to-face interviews (50% of respondents with schizophrenia denied recent use on self-report measures).
McPhillips et al., 1997	Self-reports, collaterals, urinalysis, hair analysis	39 people in the community	100%	Hair analysis detected greater recent (last 3 months) use of amphetamine and cocaine/crack than self or collateral report. Self and collateral reports were similar for drugs; collaterals reported more alcohol use than respondents.
Swartz et al., 2003	Diagnostic interviews, hair analysis, urinalysis	203	100%	Hair analysis showed that 31% of the sample had engaged in recent drug use (cocaine, marijuana, opiates, phencyclidine) as opposed to 16.3% via self report and 12.4% with a positive urinalysis.
Barry et al., 1995	Diagnostic interview, case manager reports	253 outpatients	77%	Good agreement between client and case manager reports of alcohol and drug use and problems.
Carey et al., 1996	Clinician rating scales for alcohol and drug problems	116 outpatients	66.7%	Clinician ratings were comparable to research measures (TLFB, ASI, SCID) in identifying respondents with alcohol and drug problems.
Carey & Simons, 2000	Collateral reports	92 outpatients	49%	Respondent and collateral reports for alcohol, cocaine, marijuana, and combination showed high agreement (percent agreement ranged from 81.6%–94.4%) and kappas (ranging from 0.26–0.54) were significant.
Drake et al., 1990	Clinical & research interviews, case manager ratings	79	100%	Case manager ratings showed high sensitivity and specificity for current (sensitivity=94.7%, specificity=100%) and lifetime (sensitivity=84.2%, specificity=100%) alcohol use. These ratings outperformed standard screening.

*Percentage with schizophrenia diagnosis includes diagnoses of both schizophrenia and schizoaffective disorder.

chiatric symptoms, such as in cases of acute substance intoxication and withdrawal, and there is evidence that even in samples with acute psychiatric symptoms, these distinctions can be made reliably (92). While to date there is no evidence that measures of substance use and SUDs perform differently in more symptomatic respondents or in more restrictive settings, assessment is likely more valid when respondents are not acutely symptomatic.

Impact of Background Characteristics on Performance of Assessment Measures

Little is known about how assessment of substance use and SUDs in schizophrenia is impacted by characteristics such as gender, age, and ethnicity. However, there are several reasons to think that assessment should take such factors into account. First, substance use patterns are impacted by these characteristics in people with primary SUDs. Women and men have been found to have different patterns of etiology of SUDs. Women develop dependence later in life but experience more severe problems over a briefer period of time; women with SUDs are also more likely to experience comorbid mental illness than men (103). Similarly, there is evidence that patterns of, and reasons for, drug use may differ by ethnicity (104). Second, the presentation and course of schizophrenia is impacted by these variables. Women with schizophrenia generally show later age of onset, less severe symptoms, fewer hospitalizations, and better functioning (102). Age, ethnicity, and culture can impact the onset and

course of schizophrenia as well (102). Third, there is evidence that these characteristics may impact substance use and SUDs in schizophrenia. Gearon and colleagues (99) compared men and women with SMI (44% with schizophrenia or schizoaffective diagnosis) and found differences in reasons for use and means of access to drugs. Other work suggests that women with schizophrenia and SUDs appear more like men in terms of their symptoms and functioning, with drug use eliminating any advantage women experience in terms of less debilitating symptoms and better functioning (100). Women with schizophrenia and SUDs have been found to experience high rates of trauma and PTSD (101), which may impact substance use and have implications for assessment. For example, a screening measure may not include an item on the impact of drug use on symptoms of trauma, but it could be such an item that is most relevant to women with dual schizophrenia and drug dependence.

Research on measures in primary substance abusers suggests that reliability and validity may be influenced by gender, age, and ethnicity. For example, in a study of the test-retest reliability of the AUDIT in a large general population sample, Selin (94) found better reliability among men than women. Others (95, 96) have suggested that sensitivity and specificity on the AUDIT is improved for women with a lower cutoff score (of 6) than what has been found to be optimal for men (cutoff of 8). Studies in emergency rooms have found that measures perform differently in people of different ethnicities and regions of the country (97). One study administered the Alcohol Dependence Scale (105) to people in treatment for primary alcohol use disorders in the United States and Russia and found comparable reliabilities and factor structures. While little such work has been done in people with schizophrenia or other forms of SMI, some findings are relevant (66, 93). Hodgins and el-Guebaly (66) examined the reliability of the ASI in people with SMI (19% with schizophrenia diagnosis) and found comparable reliabilities for composite scores for men and women. In a study of test-retest reliability of measures in a sample of homeless persons with SUDs (percentage with schizophrenia not specified), Drake and colleagues (93) found that female gender and younger age were related to better reliability. More work is needed to determine how measures and their interpretation need to be adjusted for subgroups of people with schizophrenia and SUDs.

Use of Assessment in Clinical Practice

There are many ways to incorporate assessment of substance use and SUDs into clinical practice. Several reviews of assessment in primary SUDs provide good examples of how to incorporate assessment into a range of settings (107-110). Others have reviewed ways to add assessment to mental health services for people with SMI (32, 81, 84). Importantly, use of some of the measures reviewed here can provide information that can be useful to clinicians and programs on many levels.

Intake provides the first opportunity for assessment. The addition of a brief screen at intake is an efficient way to determine whether further intervention is needed. Screens can also be a useful way of bringing up the topic of substance use with a client who may be reluctant to discuss it. For example, items on the MAST list many ways in which drinking can cause problems for an individual. Presentation of these items in an objective and nonjudgmental way can provide an opportunity for a clinician to open up a discussion of drinking and its impact. Assessment can also be used in treatment formulation and ongoing monitoring. An in-depth assessment of substance use patterns using measures such as the TLFB can help a clinician to determine if problematic use should be included as part of a client's treatment plan, and can help a clinician understand patterns of use (constant use versus weekday use versus weekend use; increased use only when money is available) that may impact treatment. In addition, use of interviews such as the ASI and SUESS or questionnaires such as the InDUC can help a clinician understand the domains that are most affected by drug use. Where more time is available or substance use seems severe enough to reach the level of an SUD, a diagnostic interview can help a clinician more precisely define a client's SUD symptom profile and level of severity. Regular assessment of substance use and consequences also can help document if improvements are being realized or if additional intervention is needed. Finally, assessment is integral to determining if programming is effective in reducing substance use and its impact on schizophrenia. Assessment can help programs determine the numbers of clients who require treatment for SUDs, track progress, identify areas in which further staff training is needed, and determine whether program goals have been met.

Future Directions

Assessment of substance use and SUDs in schizophrenia is critically important. The current state of the literature (small sample sizes, differing methodologies, and samples with people with a range of diagnoses) makes it difficult to determine if measures that have been developed with primary substance abusers are psychometrically sound in people with schizophrenia. More work with larger and well-defined samples is needed. There are now several measures that have been designed for people with SMI that show promise; more research is needed to establish these measures as reliable and valid in schizophrenia. Future research should evaluate assessment batteries of different lengths and content to

determine which combinations of measures and length of time between assessments can best evaluate the full picture of substance use and SUDs in schizophrenia. In addition, research on strategies for administering measures to improve the reliability and validity of assessments would help to create a menu of assessment techniques that, if disseminated, could improve the quality of information collected through the assessment of substance use and SUDs. Finally, research can examine the benefits to clinical practice and treatment outcome of incorporating assessment of substance use and SUDs as part of mental health treatment. Such research would help to connect the domains of assessment and treatment in a way that would benefit people with schizophrenia.

References

1. Kessler RC, McGonagle KA, Zhao S, Nelson CB, Hughes M, Eshleman S, et al. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. Results from the National Comorbidity Survey. Arch Gen Psychiatry 1994;51(1):8-19.
2. Mueser KT, Bennett ME, Kushner MG. Epidemiology of substance abuse among persons with chronic mental disorders. In: Lehman A, Dixon L, editors. Substance abuse disorders among persons with chronic mental illness. New York: Harwood Academic Publishers; 1995.
3. Regier DA, Farmer ME, Rae DS, Locke BZ, Keith SJ, Judd LL, et al. Comorbidity of mental disorders with alcohol and other drug abuse. JAMA 1990;264(19):2511-2518.
4. Bennett ME, Gjonbalaj S. The problem of dual diagnosis. In: Hersen M, Turner S, Beidel D, editors. Adult psychopathology and diagnosis, fifth edition. New York: John Wiley & Sons; 2007.
5. Appleby L, Dyson V, Altman E, McGovern MP, Luchins DJ. Utility of the chemical use, abuse, and dependence scale in screening patients with severe mental illness. Psychiatr Serv 1996;47(6):647-649.
6. Appleby L, Dyson V, Altman E, Luchins DJ. Assessing substance use in multiproblem patients: reliability and validity of the Addiction Severity Index in a mental hospital population. J Nerv Ment Dis 1997;185(3):159-165.
7. Cocco KM, Carey KB. Psychometric properties of the Drug Abuse Screening Test in psychiatric outpatients. Psychological Assessment 1998;10(4):408-414.
8. Dawe S, Seinen A, Kavanagh D. An examination of the utility of the AUDIT in people with schizophrenia. J Stud Alcohol 2000;61(5):744-750.
9. Carey KB, Cocco KM, Correia CJ. Reliability and validity of the Addiction Severity Index among outpatients with severe mental illness. Psychological Assessment 1997;9(4):422-428.
10. Corse SJ, Zanis D, Herschinger NB. The use of the Addiction Severity Index with persons with severe mental illness. Psychiatric Rehabilitation Journal 1995;19(1):9-18.
11. Hedlund JL, Vieweg BW. The Michigan Alcoholism Screening Test (MAST): a comprehensive review. Journal of Operational Psychiatry 1984;15:55-65.
12. Toland AM, Moss HB. Identification of the alcoholic schizophrenic: use of clinical laboratory tests and the MAST. J Stud Alcohol 1989;50(1):49-53.
13. Zanis DA, McLellan AT, Corse S. Is the Addiction Severity Index a reliable and valid instrument among clients with severe and persistent mental illness and substance abuse disorders? Community Ment Health J 1997;33(3):213-227.
14. Lehman AF, Myers CP, Dixon LB, Johnson JL. Detection of substance use disorders among psychiatric inpatients. J Nerv Ment Dis 1996;184(4):228-233.
15. Mueser KT, Yarnold PR, Levinson DF, Singh H, Bellack AS, Kee K, et al. Prevalence of substance abuse in schizophrenia: demographic and clinical correlates. Schizophr Bull 1990;16(1):31-56.
16. Dixon L, Dibietz E, Myers P, Conley R, Medoff D, Lehman AF. Comparison of DSM-III-R diagnoses and a brief interview for substance use among state hospital patients. Hosp Community Psychiatry 1993;44(8):748-752.
17. Schuckit MA. Alcoholism and other psychiatric disorders. Hosp Community Psychiatry 1983;34(11):1022-1027.
18. Schuckit MA, Monteiro MG. Alcoholism, anxiety, and depression. Br J Addict 1988;83(12):1373-1380.
19. Turner WM, Tsuang MT. Impact of substance abuse on the course and outcome of schizophrenia. Schizophr Bull 1990;16(1):87-95.
20. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. Washington, DC, American Psychiatric Association, 1994.
21. Barbee JG, Clark PD, Crapanzano MS, Heintz GC, Kehoe CE. Alcohol and substance abuse among schizophrenic patients presenting to an emergency psychiatric service. J Nerv Ment Dis 1989;177(7):400-407.
22. Drake RE, Osher FC, Noordsy DL, Hurlburt SC, Teague GB, Beaudett MS. Diagnosis of alcohol use disorders in schizophrenia. Schizophr Bull 1990;169(1):57-67.
23. Shaner A, Khalsa ME, Roberts L, Wilkins J, Anglin D, Hsieh SC. Unrecognized cocaine use among schizophrenic patients. Am J Psychiatry 1993;150(5):758-762.
24. Smith CM, Pristach CA. Utility of the Self-Administered Alcoholism Screening Test (SAAST) in schizophrenia patients. Alcohol Clin Exp Res 1990;14(5):690-694.
25. Stone AM, Greenstein RA, Gamble G, McLellan AT. Cocaine use by schizophrenic outpatients who receive depot neuroleptic medication. Hosp Community Psychiatry 1993;44(2):176-177.
26. Wilkins JN, Shaner AL, Patterson M, Setoda D, Gorelick D. Discrepancies between patient report, clinical assessment, and urine analysis in psychiatric patients during inpatient admission. Psychopharmacol Bull 1991;27(2):149-154.
27. Ridgely MS, Goldman HH, Willenbring M. Barriers to the care of persons with dual diagnoses: organizational and financing issues. Schizophr Bull 1990;16(1):123-132.
28. Goldfinger SM, Schutt RK, Seidman LJ, Turner WM, Penk WE, Tolomiczenko GS. Self-report and observer measures of substance abuse among homeless mentally ill persons in the cross-section and over time. J Nerv Ment Dis 1996;184(11):667-672.
29. Albanese MJ, Bartel RL, Bruno RF, Morgenbesser MW, Schatzberg AF. Comparison of measures used to determine substance abuse in an inpatient psychiatric sample. Am J Psychiatry 1994;151(7):1077-1078.
30. Breakey WR, Calabrese L, Rosenblatt A, Crum RM. Detecting alcohol use disorders in the severely mentally ill. Community Ment Health J 1998;34(2):165-174.
31. Kirchner JE, Owen RR, Nordquist C, Fischer EP. Diagnosis and management of substance use disorders among inpatients with schizophrenia. Psychiatr Serv 1998;49(1):82-85.
32. Drake RE, Alterman AI, Rosenberg SR. Detection of substance use disorders in severely mentally ill patients. Community Ment Health J 1993;29(2):175-192.
33. Ananth J, Vandewater S, Kamal M, Brodsky A, Gamal R, Miller M. Missed diagnosis of substance abuse in psychiatric patients. Hosp Community Psychiatry 1989;40(3):297-299.
34. Selzer ML. The Michigan alcoholism screening test: the quest for a new diagnostic instrument. Am J Psychiatry 1971;127(12):1653-1658.
35. Skinner H. The drug abuse screening test. Addict Behav 1982;7(4):363-371.
36. Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption--II. Addiction 1993;88(6):791-804.
37. Mayfield D, McLeod G, Hall P. The CAGE questionnaire: validation of a new alcoholism instrument. Am J Psychiatry 1974;131(10):1121-1123.
38. Gossop M, Darke S, Griffiths P, Hando J, Powis B, Hall W, et al. The Severity of Dependence Scale (SDS): psychometric properties of the SDS in English

and Australian samples of heroin, cocaine and amphetamine users. Addiction 1995;90(5):607–614.

39. Maisto SA, Carey MP, Carey KB, Gordon CM, Gleason JR. Use of the AUDIT and the DAST-10 to identify alcohol and drug use disorders among adults with a severe and persistent mental illness. Psychol Assess 2000;12(2):186-192.

40. McHugo GJ, Paskus TS, Drake RE. Detection of alcoholism in schizophrenia using the MAST. Alcohol Clin Exp Res 1993;17(1):187-191.

41. Searles JS, Alterman AI, Purtill JJ. The detection of alcoholism in hospitalized schizophrenics: a comparison of the MAST and the MAC. Alcohol Clin Exp Res 1990;14(4):557-560.

42. Staley D, el-Guebaly N. Psychometric properties of the Drug Abuse Screening Test in a psychiatric patient population. Addict Behav 1990;15(3):257-264.

43. Teitelbaum LM, Carey KB. Temporal stability of alcohol screening measures in a psychiatric setting. Psychol Addict Behav 2000;14(4):401-404.

44. Dervaux A, Baylé FJ, Laqueille X, Bourdel MC, Leborgne M, Olie JP, et al. Validity of the CAGE questionnaire in schizophrenic patients with alcohol abuse and dependence. Schizophr Res 2006;81(2-3):151-155.

45. Hides L, Dawe S, Young RM, Kavanagh DJ. The reliability and validity of the Severity of Dependence Scale for detecting cannabis dependence in psychosis. Addiction 2007;102(1):35-40.

46. Wolford GL, Rosenberg SD, Drake RE, Mueser KT, Oxman TE, Hoffman D, et al. Evaluation of methods for detecting substance use disorder in persons with severe mental illness. Psychology of Addictive Behaviors 1999;13(4):313-326.

47. Rosenberg SD, Drake RE, Wolford GL, Mueser KT, Oxman TE, Vidaver RM, et al. Dartmouth Assessment of Lifestyle Instrument (DALI): a substance use disorder screen for people with severe mental illness. Am J Psychiatry 1998;155(2):232-238.

48. Ford P. An evaluation of the Dartmouth Assessment of Lifestyle Inventory and the Leeds Dependence Questionnaire for use among detained psychiatric inpatients. Addiction 2003;98(1):111-118.

49. Spitzer RL, Williams JBW, First M. Structured Clinical Interview for DSM-IV Patient Version. Washington DC: American Psychiatric Press, Inc; 1996.

50. Robins LN, Wing J, Wittchen HU, Helzer JE, Babor TF, Burke J, et al. The Composite Diagnostic Interview. An epidemiologic instrument suitable for use in conjunction with different diagnostic systems and in different cultures. Arch Gen Psychiatry 1988;45(12):1069-1077.

51. Goethe JW, Fischer EH. Validity of the diagnostic interview schedule for detecting alcoholism in psychiatric inpatients. Am J Drug Alcohol Abuse 1995;21(4):565-571.

52. Gallagher SM, Penn PE, Brooks AJ, Feldman J. Comparing the CAAPE, a new assessment tool for co-occurring disorders, with the SCID. Psychiatr Rehabil J 2006;30(1):63-65.

53. Bryant KJ, Rounsaville B, Spitzer RL, Williams JBW. Reliability of dual diagnosis. Substance dependence and psychiatric disorders. J Nerv Ment Dis 1992;180(4):251-257.

54. Hasin DS, Trautman KD, Miele GM, Samet S, Smith M, Endicott J. Psychiatric Research Interview for Substance and Mental Disorders (PRISM): reliability for substance abusers. Am J Psychiatry 1996;153(9):1195-1201.

55. Hasin D, Samet S, Nunes E, Meydan J, Matseoane K, Waxman R. Diagnosis of comorbid psychiatric disorders in substance users assessed with the Psychiatric Research Interview for Substance and Mental Disorders for DSM-IV. Am J Psychiatry 2006;163(4):689-696.

56. McGovern MP, Morrison DH. The Chemical Use, Abuse, and Dependence Scale (CUAD). Rationale, reliability, and validity. J Subst Abuse Treat 1992;9(1):27-38.

57. Appleby L, Dyson V, Altman E, McGovern MP, Luchins DJ. Utility of the Chemical Use, Abuse, and Dependence Scale in screening patients with severe mental illness. Psychiatr Serv 1996;47(6):647-649.

58. O'Hare T, Cutler J, Sherrer MV, McCall TM, Dominique KN, Garlick K. Co-occurring psychosocial distress and substance abuse in community clients: initial validity and reliability of self-report measures. Community Ment Health J 2001;37(6):481-487.

59. O'Hare T, Bennett P, Leduc D. Reliability of self-reports of alcohol use by community clients. Hosp Community Psychiatry 1991;42(4):406-408.

60. Sobell LC, Sobell MB. Timeline follow-back: a technique for assessing self-reported alcohol consumption. In: Litten RZ, Allen JP, editors. Measuring alcohol consumption: psychosocial and biochemical methods. Totowa (NJ): Humana Press; 1992.

61. Carey KB, Carey MP, Maisto SA, Henson JM. Temporal stability of the timeline followback interview for alcohol and drug use with psychiatric patients. J Stud Alcohol 2004;65(6):774-781.

62. DeMarce JM, Burden JL, Lash SJ, Stephens RS, Grambow SC. Convergent validity of the Timeline Followback for persons with comorbid psychiatric disorders engaged in residential substance use treatment. Addict Behav 2007;32(8):1582-1592.

63. McLellan AT, Kushner H, Metzger D, Peters R, Smith I, Grissom G, et al. The fifth edition of the Addiction Severity Index. J Subst Abuse Treat 1992;9(3):199-213.

64. McLellan AT, Luborsky L, Woody GE, O'Brien CP. An improved diagnostic evaluation instrument for substance abuse patients. The Addiction Severity Index. J Nerv Ment Dis 1980;168(1):26-33.

65. Currie SR, el-Guebaly N, Coulson R, Hodgins D, Mansley C. Factor validation of the addiction severity index scale structure in persons with concurrent disorders. Psychol Assess 2004;16(3):326-329.

66. Hodgins DC, el-Guebaly N. More data on the Addiction Severity Index. Reliability and validity with the mentally ill substance abuser. J Nerv Ment Dis 1992;180(3):197-201.

67. Zanis DA, McLellan AT, Cnaan RA, Randall M. Reliability and validity of the Addiction Severity Index with a homeless sample. J Subst Abuse Treat 1994;11(6):541-548.

68. Zanis DA, McLellan AT, Corse S. Is the Addiction Severity Index a reliable and valid assessment instrument among clients with severe and persistent mental illness and substance abuse disorders? Community Ment Health J 1997;33(3):213-227.

69. Bennett ME, Bellack AS, Gearon JS. Development of a comprehensive measure to assess clinical issues in dual diagnosis patients: the Substance Use Event Survey for Severe Mental Illness. Addict Behav 2006;31(12):2249-2267.

70. Tonigan JS, Miller WR. The inventory of drug use consequences (InDUC): test-retest stability and sensitivity to detect change. Psychol Addict Behav 2002;16(2):165-168.

71. Blanchard KA, Morgenstern J, Morgan TJ, Labouvie EW, Bux DA. Assessing consequences of substance use: psychometric properties of the inventory of drug use consequences. Psychol Addict Behav 2003;17(4):328-331.

72. Gillaspy JA, Campbell TC. Reliability and validity of scores from the inventory of drug use consequences. Journal of Addictions & Offender Counseling 2006;27:17-27.

73. Gonzalez VM, Bradizza CM, Vincent PC, Stasiewicz PR, Pass ND. Do individuals with severe mental illness experience greater alcohol problems? A test of the supersensitivity hypothesis. Add Behav 2007;32(3):477-490.

74. Carey KB, Roberts LJ, Kivlahan DR, Carey MP, Neal DJ. Problems assessment for substance using psychiatric patients: development and initial psychometric evaluation. Drug Alcohol Depend 2004;75(1):67-77.

75. Wilkins JN, Shaner AL, Patterson M, Setoda D, Gorelick D. Discrepancies between patient report, clinical assessment, and urine analysis in psychiatric patients during inpatient admission. Psychopharmacol Bull 1991;27(2):149-154.

76. McPhillips MA, Kelly FJ, Barnes TR, Duke PJ, Gene-Cos N, Clark K. Detecting comorbid substance misuse among people with schizophrenia in the community: a study comparing the results of questionnaires with analysis of hair and urine. Schizophr Res 1997;25(2):141-148.

77. Swartz MS, Swanson JW, Hannon MJ. Detection of illicit substance use among persons with schizophrenia by radioimmunoassay of hair. Psychiatr Serv 2003;54(6):891–895.

78. Barry KL, Fleming MF, Greenley J, Widlak P, Kropp S, McKee D. Assessment of alcohol and other drug disorders in the seriously mentally ill. Schizophr Bull 1995;21(2):313-321.

79. Carey KB, Simons J. Utility of collateral information in assessing substance use among psychiatric outpatients. J Subst Abuse 2000;11(2):139-147.

80. Carey KB, Cocco KM, Simons JS. Concurrent validity of clinicians' ratings of

substance abuse among psychiatric outpatients. Psychiatr Serv 1996;47(8):842-847.

81. Carey KB, Correia CJ. Severe mental illness and addictions: assessment considerations. Addict Behav 1998;23(6):735-748.
82. Drake RE, Mueser KT, McHugo GJ. Clinician rating scales: Alcohol Use Scale (AUS), Drug Use Scale (DUS) and Substance Abuse Treatment Scale (SATS). In: Sederer L, Dickey B, editors. Outcomes assessment in clinical practice. Baltimore (MD): Williams and Wilkins; 1996. p. 113-116.
83. Drake RE, Wallach MA. Substance abuse among the chronically mentally ill. Hosp Community Psychiatry 1989;40(10):1041-1046.
84. Carey KB. Clinically useful assessments: substance use and comorbid psychiatric disorders. Behav Res Ther 2002;40(11):1345-1361.
85. Drake RE, Mercer-McFadden C. Assessment of substance use among persons with chronic mental illness. In: Lehman AF, Dixon LB, et al., editors. Double jeopardy: chronic mental illness and substance use disorders, Volume 3. Longhorne (PA): Harwood Academic Publishers; 1995.
86. Cassidy CM, Schmitz N, Malla A. Validation of the alcohol use disorders identification test and the drug abuse screening test in first episode psychosis. Can J Psychiatry 2008;53(1):26-33.
87. Hoffmann NG. CAAPE (Comprehensive Addictions and Psychological Evaluation) Manual. Smithfield (RI): Evince Clinical Assessments; 2000.
88. Shaner A, Roberts LJ, Eckman TA, Racenstein JM, Ticker DE, Tsuang JW, et al. Sources of diagnostic uncertainty for chronically psychotic cocaine abusers. Psychiatr Serv 1998;49(5):684-690.
89. Lennox R, Dennis ML, Scott CK, Funk R. Combining psychometric and biometric measures of substance use. Drug Alcohol Depend 2006;83(2):95-103.
90. Samet S, Waxman R, Hatzenbuehler M, Hasin D. Assessing addiction: concepts and instruments. Addict Sci Clin Pract 2007;4(1):19-31.
91. Drake RE, Osher FC, Noordsy DL, Hurlburt SC, Teague GB, Beaudett MS. Diagnosis of alcohol use disorders in schizophrenia. Schizophr Bull 1990;16(1):57-67.
92. Reis RK, Demirsoy A, Russo JE, Barret J, Roy-Byrne PP. Reliability and clinical utility of DSM-IV substance-induced psychiatric disorders in acute psychiatric inpatients. American Journal on Addictions 2001;10(4):308-318.
93. Drake RE, McHugo GJ, Biesanz JC. The test-retest reliability of standardized instruments among homeless persons with substance use disorders. J Stud Alcohol 1995;56(2):161-167.
94. Selin KH. Test-retest reliability of the Alcohol Use Disorders Identification Test in a general population sample. Alcohol Clin Exp Res 2003;27(9):1428-1435.
95. Cherpitel CJ. Analysis of cut points for screening instruments for alcohol problems in the emergency room. J Stud Alcohol 1995;56(6):695-700.
96. Reinert DF, Allen JP. The Alcohol Use Disorders Identification Test: a review of recent research. Alcohol Clin Exp Res 2002;26(2):272-279.
97. Cherpitel CJ. Comparison of screening instruments for alcohol problems in black and white emergency room patients from two regions of the country. Alcohol Clin Exp Res 1997;21(8):1391-1397.
98. Maisto SA, Conners GJ, Allen JP. Contrasting self-report screens for alcohol problems: a review. Alcohol Clin Exp Res 1995;19(6):1510-1516.
99. Gearon JS, Nidecker M, Bellack A, Bennett M. Gender differences in drug use behavior in people with serious mental illness. Am J Addict 2003;12(3):229-241.
100. Gearon JS, Bellack AS. Sex differences in illness presentation, course, and level of functioning in substance-abusing schizophrenia patients. Schizophr Res 2000;43(1):65-70.
101. Gearon JS, Kaltman SI, Brown C, Bellack AS. Traumatic life events and PTSD among women with substance use disorders and schizophrenia. Psychiatr Serv 2003;54(4):523-528.
102. Combs DR, Mueser KT. Schizophrenia. In: Hersen M, Turner SM, Beidel DC, editors. Adult psychopathology and diagnosis, fifth edition. Hoboken (NJ): John Wiley & Sons; 2007.
103. Daughters SB, Bornovalova MA, Correia CJ, Lejuez CW. Psychoactive substance use disorders: drugs. In: Hersen M, Turner SM, Beidel DC, editors. Adult psychopathology and diagnosis, fifth edition. Hoboken (NJ): John Wiley & Sons; 2007.
104. Roberts A. Psychiatric comorbidity in white and African-American illicit substance abusers: evidence for differential etiology. Clin Psychol Rev 2000;20(5):667-677.
105. Allen JP, Fertig JB, Towle LH, Altshuler VB, Vrublevsky AG, Valentik YV, et al. Psychometric properties of the Alcohol Dependence Scale among United States and Russian clinical samples. Int J Addict 1994;29(1):71-87.
106. Lennox R, Dennis ML, Scott CK, Funk R. Combining psychometric and biometric measures of substance use. Drug Alcohol Depend 2006;83(2):95-103.
107. Cherpitel CJ. Screening for alcohol problems in the emergency room: a rapid alcohol problems screen. Drug Alcohol Depend 1995;40(2):133-137.
108. U.S. Preventative Services Task Force. The guide to clinical preventive services: recommendations of the U.S. Preventive Services Task Force. Washington (DC): Department of Health and Human Services; 2008.
109. Cooney NL, Zweben A, Fleming MF. Screening for alcohol problems and at-risk drinking in health-care settings. In: Hester RK, Miller WR, editors. Handbook of alcoholism treatment approaches: effective alternatives, second edition. Needham Heights (MA): Allyn & Bacon; 1995.
110. Miller WR, Westerberg VS, Waldron HB. Evaluating alcohol problems in adults and adolescents. In: Hester RK, Miller WR, editors. Handbook of alcoholism treatment approaches: effective alternatives, second edition. Needham Heights (MA): Allyn & Bacon; 1995.