# Computer-Assisted Self-Assessment in Persons With Severe Mental Illness

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***Background:*** It has been difficult to improve care for severe mental illness (SMI) in usual care settings because clinical information is not reliably and efficiently managed. Methods are needed for efficiently collecting this information to evaluate and improve health care quality. Audio computer-assisted self-interviewing (ACASI) can facilitate this data collection and has improved outcomes for a number of disorders, suggesting the need to test its accuracy and reliability in people with SMI.

***Method:*** Ninety patients with DSM-IV schizophrenia or schizoaffective disorder (N = 45) or bipolar disorder (N = 45) recruited between Oct. 15, 2002, and July 1, 2003, were randomly assigned to 1 of 2 study groups and completed 2 standardized symptom surveys (Revised Behavior and Symptom Identification Scale and the symptom severity scale of the Schizophrenia Outcomes Module 2) 20 minutes apart in a crossover study design. Half of the patients first completed the scales via an in-person interview, and the other half first completed the scales via an ACASI survey self-administered through an Internet browser using a touchscreen developed to meet the cognitive needs of people with SMI. We evaluated attitudes toward ACASI, understanding of the ACASI survey, internal consistency, correlations between the ACASI and interview modes, concurrent validity, and a possible administration mode bias.

***Results:*** All ACASI and in-person interview scales had similar internal reliability, high correlations (r = 0.78–1.00), and mean scores similar enough as not to be different at $p < .05$. A large majority rated the ACASI survey as easier, more enjoyable, more preferable if monthly completion of a survey were required, and more private, and 97% to 99% perfectly answered questions about how to use it.

***Conclusion:*** ACASI data collection is reliable among people with bipolar disorder and schizophrenia and could be a valuable tool to improve their care.

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Usual care for those with severe mental illnesses (SMIs) such as schizophrenia is often poor,[1–4] and the lack of detailed and consistent assessments of the clinical progress of these patients is a major barrier to improved mental health treatment.[5] Given the challenges of SMI, including increased risk for human immunodeficiency virus,[6–9] sexual victimization,[10–17] substance abuse, homelessness, and severe medical conditions,[18,19] patients require ongoing oversight of their symptoms and medication side effects to obtain positive outcomes. However, in usual care settings, patient medical records contain little useful information, and routine clinical data collection is often minimal.[20] Therefore, developing "patient-specific clinical information" is critical to improving the care of SMIs, as called for in the Institute of Medicine's report *Crossing the Quality Chasm*.[21] Although widely acknowledged as important, routine patient assessments have proven costly and difficult to integrate into standard care.[5] To further this goal, the present study examined whether the cognitive problems associated with SMI would be a barrier to using a low-cost computerized self-assessment system in which patients provide clinical information electronically.

Usual care settings face several challenges that make it difficult for providers to access timely clinical information and apply the most appropriate evidence-based treatments, resulting in low adherence to treatment guidelines[3,22–31] and suboptimal outcomes.[32] Usual care settings are often underfunded, fragmented,[33] and poorly coordinated with medical, entitlement, and insurance systems.[22] Providers often do not possess the training or competen-



  

cies necessary to provide high-quality care consistent with evidence-based treatment guidelines.[3] Additionally, medical records, the central repositories of patient-specific clinical information, are often illegible, incomplete, difficult to assess in more than one location, insecure from unauthorized users, and poorly organized, making it difficult for providers to accurately assess quality or outcomes.[34–36] Finally, mental health clinics often do not routinely conduct comprehensive and standardized assessments, instead only infrequently (e.g., every 6 months) gathering the most basic outcome data (e.g., Global Assessment of Functioning score). Collecting these data with paper-based self-report measures, such as the Behavior and Symptom Identification Scale (BASIS-32), can improve usual care by facilitating monitoring of outcomes[37,38] and increasing patients' involvement in treatment.[39] Failing to collect these data creates a situation of great risk for these patients, as providers need to have accurate and up-to-date information about their clinical status to yield the best outcomes.

Already, computer systems such as electronic medical records,[40] computerized reminder systems,[41] and computerized physician order entry systems[42] are improving care by making it more efficient, accurate, and evidence-based. As another type of computer aid, computer-assisted self-interviewing (CASI) may be particularly well suited to reduce the barriers to routine data collection and improve care for those with SMI.[43] For example, although highly trained clinical staff such as psychiatrists and psychologists may not have the time to conduct ongoing assessments, there are a variety of self-administered survey instruments available that patients could complete electronically.

Computer-assisted self-interviewing offers several benefits compared with the use of trained interviewers. It is significantly less expensive than face-to-face interviewing, telephoning, and mailing questionnaires, eliminating manual data collection and entry.[44] CASI can be more standardized than trained research interviewers,[45] allows respondents to pace themselves, and reduces literacy concerns when the visual prompts are presented with corresponding audio (audio CASI [ACASI]). CASI has also been shown to greatly reduce social desirability bias compared with face-to-face interviewing across many different domains,[44,46–51] actually enhancing the reporting of sensitive information such as high-risk drug and sexual practices.[45,52–54] Finally, electronic surveys are programmable so that only relevant questions are asked, further reducing data errors. Systems that have incorporated some type of CASI protocol have improved care for those with a variety of chronic diseases, including hypertension,[55] obesity and renal disease,[56] high cholesterol,[57] diabetes,[58] and asthma.[59] In mental health, a system targeting patients on lithium treatment[60] has also met with some success.

Of course, the reliability of electronic surveys compared with their paper-and-pencil and interviewer-administered counterparts must be addressed. Paper-and-pencil and Web-based survey methods have yielded comparable results across many domains[61–72]; however, fewer studies have directly compared the responses to Web-based surveys (primarily a visual format) with responses to interviewer-administered surveys (primarily an auditory format). One study of drug users found that ACASI yielded reliable drug use and sexual behavior data comparable to those of face-to-face interviews.[73] Another study, unpublished, found that the results from Web-based surveys were similar to those from phone interviews when all of the items' response choices had anchors.[74]

While reliability remains an issue in general, it is even more so for patients with SMI. Persons with SMI have cognitive deficits in a variety of domains including volitional attention and vigilance, working and episodic memory, and executive functioning.[75–77] Although it has been shown that those with SMI can be reliably and validly assessed with self-report measures,[78,79] patients' cognitive deficits are strongly related to clinical outcomes,[77] and it is unclear whether they can complete surveys using ACASI reliably without a great deal of assistance (therefore limiting some of the potential benefits). In addition, the ACASI literature did not include persons with SMI, did not assess any type of health problem including psychiatric symptoms or functioning, or did not utilize a randomized crossover design in which surveys using ACASI and traditional formats were administered to the same respondents (preventing the direct assessment of reliability between the 2 administration modes).

Our study examined first whether those with SMI can navigate a Web-based ACASI survey with minimal assistance and second whether the ACASI instrument yields results similar to those of more traditional assessments performed by trained interviewers. We used data from standardized symptom and functioning measures: the Revised BASIS (BASIS-R)[80] and the symptom severity scale of the Veterans Affairs (VA) Schizophrenia Outcomes Module 2 (SCHIZOM2),[78] administered to a sample of patients with schizophrenia, schizoaffective disorder, or bipolar disorder. This study used a randomized crossover design to compare research participants' data from 2 administrations of the same survey: once through a face-to-face research interview by a trained assessor and once through a Web-based ACASI survey using a touchscreen monitor. Successful Web-based ACASI could provide a mechanism for routinely collecting patient information that is feasible for use in typical, busy mental health clinics, thereby improving care.

## METHOD

### Participants

Ninety-one patients were recruited between Oct. 15, 2002, and July 1, 2003, from the schizophrenia and bipolar

  

outpatient clinics of the Greater Los Angeles (California) VA Healthcare System. Patients were eligible if they were adults (18 years or older) with a clinical diagnosis (DSM-IV criteria) in their medical records of schizophrenia, schizoaffective disorder, or bipolar disorder and were active outpatients (were participating in outpatient treatment as intended) at the time of the study. Co-occurring disorders did not exclude participation. One patient was too symptomatic to complete the assessment, yielding an analysis sample of 90 participants, 45 with schizophrenia or schizoaffective disorder and 45 with bipolar disorder. The racial/ethnic makeup of this sample was 41% (N = 37) African American, 1% (N = 1) Asian, 4% (N = 4) Latino, 2% (N = 2) Native American, 47% (N = 42) white, and 4% (N = 4) other. Consistent with a veteran population, most patients (93% [N = 84]) were male. The mean age was 47.34 years (SD = 9.32) with a range of 25 to 69 years.

**Figure 1. Sample Question From the Patient Assessment System With a Response Chosen**


## Procedures

To recruit patients, clinic staff and managers were made aware of the study through presentations at team meetings, direct mailings to staff, and advertisements posted at the 2 clinics. Clinic staff informed eligible patients about the project during regularly scheduled services, and patients also self-referred. We estimate that we invited about 360 patients to participate and that about 25% accepted. After the referral, the study's research interviewer met with the patients to describe the study, obtain their written consent, and administer the 2 surveys. While the consent process fully described what would be required, patients were not told that the purpose of the study was to determine the reliability of the measures. The order of the surveys was established prior to data collection to be alternating so that the first patient would complete the Web-based ACASI survey first, the second would complete the face-to-face survey first, and so on. This counterbalancing ensured that an equal number of patients were assigned to both administration orders at random.

As a distracter task between the 2 survey administrations, patients were shown 20 minutes of videos involving lighthearted action-adventure stories that were engaging yet unrelated to the assessments. Finally, a brief interview was conducted after the surveys were completed to assess the patients' attitudes toward the Web-based ACASI survey, what they did and did not like, how it compared to the face-to-face survey, and their comprehension about how to use it. The respondents' involvement lasted about 1 hour, and each received a small stipend for their participation. The Greater Los Angeles VA Institutional Review Board approved the study.

***Patient Assessment System.*** Patients completed the Web-based ACASI survey, called the Patient Assessment System (PAS), within the Internet Explorer Web browser (Microsoft, Redmond, Wash.) on a computer with a touchscreen monitor. The PAS was programmed using active server pages and was housed on a Windows 2000 Professional server (Microsoft, Redmond, Wash.), and all exchanges between the browser and the server were secured with 128-bit Secure Sockets Layer (SSL) encryption, the standard in electronic commerce applications. In the PAS, survey questions appear on the monitor screen, 1 question per screen, and are also read aloud by a recorded voice. Corresponding answer choices are presented as a series of buttons, drawn to resemble physical buttons, and can be pressed with one's finger. These choices were also accompanied by graphical depictions to aid the respondent (Figure 1). Touching a "next" button is then required in order to move to the subsequent question. Respondents have the option of skipping the question without answering ("skip" button) or going back to a previous question to change their initial responses ("back" button). Respondents can answer the questions as quickly as they are able (i.e., before the recorded voice finishes). Conversely, the PAS prompts respondents verbally if they take no action after 60 seconds. If the respondent fails to take any action after 2 minutes, the PAS then provides the respondent with the option of ending the survey. All instructions on how to use the PAS are provided in a short introduction played for each patient online on the monitor prior to starting. Every subsequent screen has a help button that repeats these instructions when pressed. The PAS has internal logic, asking only relevant questions (e.g., side effects questions are skipped if the respondent answers "no" to a question about currently taking psychiatric medications) and reducing potential respondent errors (e.g., respondents are prompted to change their response if they enter the current date as their date of birth). All responses to the PAS were recorded in a secure Microsoft Access (Microsoft, Redmond, Wash.) database.

The design of the PAS is based on an emerging literature[81,82] examining how to design Web-based surveys to reduce measurement error and maintain consistency with current self-administered or interviewer-assisted measures. For example, the PAS (1) uses color properly to maintain proper figure/ground consistency, (2) uses straightforward and comprehensive instructions, (3) uses response choices that are equidistantly spaced in a vertical line, (4) uses buttons to allow the user to skip questions, (5) minimizes the use of complicated drop-down boxes or menus (there are none in the PAS), and (6) minimizes the number of steps required to move to the next question (1 is required in the PAS). In addition, given literacy concerns with the SMI population and that some studies have shown that adding audio to visually presented questions improves accuracy,[83,84] audio accompanies all questions and response choices. Many of the features of the PAS, such as the audio component, the internal logic, the graphical depictions of the answer choices, and the prompting when no response is made, were specifically designed to assist those with cognitive impairments associated with SMI.

***Face-to-face interview.*** The face-to-face interview consisted of the research interviewer reading each question aloud and the patient responding by choosing one of the structured response choices printed on a set of cards. The response choices on the cards used the same graphics as the response choices in the PAS.

### Measures

***Behavior and Symptom Identification Scale.*** A brief yet comprehensive instrument, the BASIS-32 assesses a wide range of serious psychiatric symptoms and problems. It is valid and reliable in both inpatient and outpatient settings in populations with SMI.[37,38,85] The questions in the PAS are from the BASIS-R, the recently revised version.[80] The BASIS-R scales, slightly revised from the original, are self-harm (2 items), interpersonal relationships (5 items), depression/functioning (6 items), psychosis (6 items), emotional lability (3 items), and substance abuse (4 items). All items have 5 response options ranging from 0 to 4. The response anchors vary by scale and include "none of the time" to "all of the time" (interpersonal relationships, depression/functioning), "never" to "always" (emotional lability, psychosis, self-harm, substance abuse), and "no difficulty" to "extreme difficulty" (depression/functioning). Scale scores for each of the 6 subscales were computed as the mean of the non-missing scale items.

***Symptom severity.*** The 19-item symptom severity scale assesses psychosis, paranoia, and depression and is from the VA's SCHIZOM2,[78] which is based on the Brief Symptom Inventory (BSI).[86–88] All items have 4 response options ranging from not at all (1) to a great deal (4). Scale scores were computed as the mean of the non-missing scale items. The revised SCHIZOM was developed with 246 veteran and non-veteran inpatients and outpatients with SMI and showed that the symptom severity scale had excellent internal consistency ($\alpha = .91$), stability (test-retest, $r = 0.86$), sensitivity to change, and concurrent validity (Pearson $r = 0.59$ and 0.51 with the Brief Psychiatric Rating Scale [BPRS] and Positive and Negative Syndrome Scale, respectively).

***Usability measures.*** We assessed instrument usability in several ways, including objective measures such as duration of assessment, number of questions skipped, and subjects' comprehension of the 5 buttons of the PAS (assessed through questioning by the interviewer and rated as either incorrect = 0 or correct = 1) and subjective measures such as users' preference for computer versus interviewer administration in terms of ease of use, enjoyment, preference if hypothetically asked to complete it monthly, and privacy. All of these measures except the duration and number of skipped items were assessed with open-ended questions developed specifically for this study and administered in the brief interview that followed the administration of the 2 surveys.

### Data Analyses

The analyses were designed to assess the internal reliability and concurrent validity of the PAS-administered scales, as well as to test for any response biases relative to a conventional interviewer-administered version of the same scales. The internal reliability of the instrument was assessed separately for each of the 6 subscales of the BASIS-R (self-harm, interpersonal relationships, depression/functioning, psychosis, emotional lability, and substance abuse) and the BSI-derived measure of overall symptom severity. This assessment was performed by computing the Cronbach alpha for each of the 2 administration methods in each of the 2 patient samples (schizophrenia or bipolar). Concurrent validity was assessed for each of the subscales using the correlation between the interviewer-administered and the ACASI version of the instrument in each of the patient samples.

In addition to demonstrating that these measures are highly correlated, it is important to demonstrate that they are measured on the same scale, i.e., that the ACASI administration does not lead to the underreporting or overreporting of particular symptoms. We tested for these types of response biases using a 2 (administration method) $\times$ 2 (counterbalanced order) $\times$ 2 (schizophrenic vs. bipolar diagnosis) analysis of variance conducted on each subscale. We were interested in the main effects of administration method and any interactions between administration method and participant diagnosis.

## RESULTS

A preliminary analysis of the BASIS-R substance abuse scale data indicated a low rate of recent substance

  

**Table 1. Internal Consistency and Concurrent Validity of PAS Scales by Participant Diagnosis and Administration Method**

| PAS Scale | Internal Consistency (Cronbach alpha) ACASI | Internal Consistency (Cronbach alpha) Interviewer | ACASI-Interviewer Correlation |
|---|---|---|---|
| Schizophrenia sample (N = 45) | | | |
| SCHIZOM2 | .91 | .90 | 0.89 |
| BASIS-R | | | |
| Depression/functioning | .87 | .84 | 0.87 |
| Interpersonal relationships | .71 | .75 | 0.87 |
| Self-harm | .94 | .84 | 0.78 |
| Psychosis | .57 | .68 | 0.89 |
| Emotional lability | .73 | .67 | 0.78 |
| Average across scales | .76 | .76 | 0.84 |
| Bipolar sample (N = 45) | | | |
| SCHIZOM2 | .93 | .93 | 0.99 |
| BASIS-R | | | |
| Depression/functioning | .89 | .89 | 0.98 |
| Interpersonal relationships | .76 | .80 | 0.95 |
| Self-harm | .85 | .85 | 1.00 |
| Psychosis | .76 | .75 | 0.97 |
| Emotional lability | .82 | .86 | 0.95 |
| Average across scales | .82 | .83 | 0.97 |

Abbreviations: ACASI = audio computer-assisted self-interviewing, BASIS-R = Revised Behavior and Symptom Identification Scale, PAS = Patient Assessment System, SCHIZOM2 = Schizophrenia Outcomes Module 2.

**Table 2. Scores and Effect Sizes for PAS Scales by Participant Diagnosis and Administration Method**

| PAS Scale | Mean Score ACASI | Mean Score Interviewer | Effect Size (Cohen's d) |
|---|---|---|---|
| Schizophrenia sample (N = 45) | | | |
| SCHIZOM2 | 2.01 | 2.03 | –.03 |
| BASIS-R | | | |
| Depression/functioning | 1.60 | 1.52 | .09 |
| Interpersonal relationships | 2.00 | 1.99 | .01 |
| Self-harm | 0.43 | 0.38 | .08 |
| Psychosis | 1.68 | 1.61 | .09 |
| Emotional lability | 1.71 | 1.82 | –.11 |
| Bipolar sample (N = 45) | | | |
| SCHIZOM2 | 1.81 | 1.81 | .01 |
| BASIS-R | | | |
| Depression/functioning | 1.79 | 1.76 | .03 |
| Interpersonal relationships | 1.98 | 1.97 | .02 |
| Self-harm | 0.43 | 0.43 | .00 |
| Psychosis | 0.82 | 0.79 | .03 |
| Emotional lability | 1.76 | 1.77 | –.01 |

Abbreviations: ACASI = audio computer-assisted self-interviewing, BASIS-R = Revised Behavior and Symptom Identification Scale, PAS = Patient Assessment System, SCHIZOM2 = Schizophrenia Outcomes Module 2.

use in this sample. Only 7 of the schizophrenic participants and 10 of the bipolar participants acknowledged any substance use in the past week. A brief inspection of the medical records revealed that 40 patients had a history of substance abuse. Since several were receiving treatment, it is possible that this scale was accurate. Regardless, with this small number of substance users, we were unable to accurately assess the performance of the substance abuse subscale and did not include this subscale in the analyses presented.

### Internal Consistency

The internal consistency of the BASIS-R subscales and the SCHIZOM2 was relatively high across both samples and all subscales. Among those with schizophrenia, the mean internal consistency across all the scales was .76 for both ACASI and interviewer methods. Among those with bipolar disorder, the mean internal consistency across all the scales was .82 and .83 for the ACASI and interviewer methods, respectively. Not surprisingly, there was a tendency for slightly lower reliability within the sample of those with schizophrenia; however, all scales showed adequate reliability. More importantly, the degree of internal consistency did not vary systematically as a function of the administration method (Table 1).

### Concurrent Validity

Correlations between the ACASI and interviewer-administered versions of the PAS subscales (see Table 1) reflect the test-retest reliability of the PAS instrument across the study interval, as well as any changes in responding due to the administration method. These correlations were very high within the bipolar sample (mean r = 0.97), indicating that the scales measured the same constructs under both administration methods. The correlations were somewhat lower in the sample of patients with schizophrenia, although still high (mean r = 0.84). Those subscales with lower internal consistency tended to have lower correlations across administration methods, indicating a general tendency for those with schizophrenia to respond with somewhat greater variability both within and across administration methods. The current sample size provided good precision for estimates of correlation coefficients within each group, e.g., a sample size of 45 and observed correlation of 0.9 had a 95% confidence interval from 0.80 to 0.94.

### Bias

Comparisons of the mean scores on each subscale across administration methods and participant diagnosis (controlling for order of administration) yielded no significant main effects for method of administration or any method-by-diagnosis interactions. A significant main effect of diagnosis occurred for only 1 subscale, the BASIS-R psychosis scale, with participants who had a diagnosis of schizophrenia displaying more severe psychotic symptoms than those with a bipolar diagnosis (Table 2), $F = 21.45$, $df = 1,86$; $p < .001$. This lack of significant bias does not appear to be due to a lack of power. A retrospective power analysis indicated minimum detectable differences for method of administration main effect that ranged from 0.07 to 0.09 scale points across the 6 subscales; these differences correspond to Cohen's d values from .08 to .13, indicating power to detect very small effects.

### Usability

Measures of usability provided additional support for the ACASI instrument. The length of time required to complete the interviews did not vary as a function of administration method, with mean administration times of 14.9 and 14.5 minutes for the interviewer and ACASI administration methods, respectively, $F = 0.34$, $df = 1,86$; $p > .10$. When asked, participants tended to prefer ACASI administration: 86% (N = 77) chose ACASI as the method that was "easier to take," 87% (N = 78) liked it more, 84% (N = 76) preferred it if they hypothetically "had to take this survey every month as a part of their treatment," and 60% (N = 54) said it was "more private." When asked to describe the functions of each of the 5 buttons used during the computer administration, 96% (N = 86) of subjects correctly described all 5 functions, including 98% (N = 88) who knew the function of the "help" button. Participants asked to skip some questions in each method of administration; however, across 90 participants, a total of 23 individual items were skipped during the interviewer administration, while 14 were skipped during ACASI administration.

Participants' open-ended responses broadly corresponded with these quantitative usability results. When asked to justify their preferences, those who preferred the ACASI administration frequently mentioned the following positives: "Can go at your own pace," "Can both see and hear questions," and "Can take the survey more independently." The minority who preferred the interviewer administration mentioned the following positives: it was "more personal," it "gave a chance to discuss/clarify questions," and the subjects "enjoy talking to people."

## DISCUSSION

The current study shows that an ACASI administration of standardized assessment tools can provide important clinical information with a level of accuracy and usability that is equivalent to that of conventional interviewer-administered instruments. Specifically, (1) the ACASI instrument maintains the high reliability of the original scales, (2) it shows very high concurrent validity, (3) there is no evidence of systematic bias between interviewer and ACASI administrations, and (4) patients prefer to complete the instruments in the ACASI format. These findings are consistent with the broader literature investigating ACASI-administered surveys discussed earlier in the article. The suitability of the computer-based administration was clear for those with both schizophrenia and bipolar disorder. The current study goes beyond most other demonstrations of ACASI by directly addressing concerns about the usability of this technology in a population with SMI.

The PAS was evaluated among a patient population that had symptom levels comparable to those of other patient populations assessed with these instruments. For example, mean scores from the BASIS-R field trial of outpatients (N = 3222)[80]—depression/functioning = 1.83, interpersonal relationships = 1.48, self-harm = 0.49, psychosis = 0.52, and emotional lability = 1.96—are similar to those from the present study for the bipolar sample on every scale and for the schizophrenia sample on all scales except psychosis. The schizophrenia sample in the present study reported more severe psychosis than the sample in the BASIS-R field trial. The sample from the SCHIZOM2 trial[78] (N = 246) comprised VA and non-VA inpatients and outpatients and had symptom levels similar to those of the sample in the present study (mean SCHIZOM2 score = 2.02). Regarding the comparability of the demographic composition, the SCHIZOM2 trial sample was similar to the sample in the present study, as they were all diagnosed with schizophrenia and had a mean age of 43.9 years (SD = 10), and most were male (75%) and African American (50%) or white (48%). The sample in the present study had a greater representation of minorities (e.g., 41% vs. 12% were African American) and a smaller representation of women (7% vs. 56%).

Given the results of our study and other studies, computer-based tracking of symptoms over the course of treatment has the potential to improve the quality and use of clinical information[89] and offers several benefits to mental health treatment providers and to researchers. First, this method does not require trained or clinical personnel to administer, analyze, summarize, or report the assessments. These processes can be fully automated, conceivably producing tables or graphs that track the trajectory of individual symptoms over time, compare individuals' results to established norms, or quantify changes in symptoms coincident with changes in treatment. This information can then guide decisions about treatment intensity and medication dosage, as well as alert the clinician to new symptoms or problems that develop after the initial assessment. The ability to use computer-based assessment may also benefit the research community. These data might enable investigations of therapeutic effectiveness and medication side effects in usual care settings that are currently cost prohibitive, highlighting promising new methods and improving the match between patients and treatments. Broad dissemination of this type of assessment could also facilitate a more accurate depiction of the quality of care for those with SMI.

Incorporation into clinical practice will be less difficult because the resources and space required for actual clinical use, while not formally evaluated as part of this study, are minimal. The primary cost is the resources needed to develop the computer self-assessment, although this was accomplished with a part-time programmer in a few months. The only other costs are for the computer hardware (the cost of a CPU, touchscreen monitor, keyboard, and mouse was about $2000) and some staff time to both

  

assist the patients with learning how to use the computer self-assessment and then view the results. A private space would be needed for a computer workstation to protect confidentiality; however, less space could be used if patients wore headphones during self-administration of the survey.

While the results of the current study support the suitability of ACASI for assessments in an SMI population, certain limitations should be noted. First, our results may not adequately represent the administration problems that would be encountered by individuals with more severe symptoms. It is possible that there are individuals whose symptoms would interfere with any standardized assessment tool and who can be accurately assessed only with a clinical interview. Based on experience with use of this instrument and similar in-person surveys in people with SMI, this proportion of patients is most likely very small. Additional research is needed to determine the type and severity of symptoms that will interfere with ACASI-administered instruments. Second, our results are limited by the nature of our sampling methods. In particular, the sample included only patients who agreed to participate in this study; these individuals may be more compliant than a sample of the SMI who are minimally connected with providers. Additionally, research is needed to replicate our findings in a sample with significant numbers of female patients. Finally, given the short duration between each patient's 2 survey administrations, it is possible that the answers provided during the second administration were based in part on the memories of the first, thereby artificially inflating the correlations between administration modes. However, given that there were nearly 50 questions, all with multiple response choices, this possibility seems unlikely.

## CONCLUSIONS

The current study demonstrates the feasibility of implementing computer-based symptom monitoring in a seriously mentally ill population. A computerized self-administered battery had very similar psychometric properties to the traditional face-to-face administered version, and patients generally preferred computerized self-administration. While only trained personnel can gather certain information such as the severity of delusions and level of disorganization using tools such as the BPRS, the ability to administer detailed and standardized assessments of symptoms and functioning in a cost-effective manner may greatly facilitate quality improvement and research.

*Drug name:* lithium (Eskalith, Lithobid, and others).

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