

# Telepsychiatry in the Assessment and Treatment of Schizophrenia

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## Abstract

**Background:** Telehealth technology has become more available to providers as a means of treating chronic diseases. Consideration of the applicability of telehealth technology in the treatment of schizophrenia calls for a review of the evidence base in light of the special needs and challenges in the treatment of this population. Our aims are to assess the types and nature of distant interventions for patients with schizophrenia, either telephone-based, internet-based or video-based telehealth systems. **Methods:** The following databases—MEDLINE, PsycINFO, CINAHL, the Cochrane Library, the Cochrane Database of Systematic Reviews, the Database of Abstracts of Reviews of Effects, and EMBASE—were searched for the following terms alone or in combination with schizophrenia: telepsychiatry or telemedicine or telepsychology or satellite communication or remote communication. Inclusion criteria were: 1) articles dealing with telephone-, internet- or video-based interventions and 2) studies emphasizing development of an intervention, feasibility or clinical trials. Exclusions included were: 1) single case reports and 2) papers not written in English. With our search terms, we retrieved a total of 390 articles, of which 18 unique articles were relevant. **Results:** Based on the limited data available, the use of modalities involving the telephone, internet and videoconferencing appears to be feasible in patients with schizophrenia. In addition, preliminary evidence suggests these modalities appear to improve patient outcomes. **Discussion:** More research is needed. Investigators need to improve existing telehealth systems. In addition, researchers need to focus on developing newer interventions and determining whether these approaches can improve patient outcomes.

**Key Words:** Telepsychiatry, Telephone Intervention, Telecommunication, Schizophrenia, Videoconferencing

## Introduction

The purpose of this article is to review the studies which have examined telepsychiatric approaches in treating people with schizophrenia. We will discuss how this technology

has been used to address the unique challenges associated with treating this population. Overall, telehealth technology has become more interactive, less costly and, importantly, more available to healthcare providers as a means of treating chronic medical diseases (1).

Telepsychiatry includes videoconferencing, land and cellular telephone lines, computer-based internet tools, and in-home telehealth communication systems that can combine the phone with additional devices (2). These enable electronic communication between a patient and a healthcare provider to increase access to medical care. This helps increase access of services to patients in remote areas, to at-risk populations, and provides opportunities to augment mental health services (3, 4).

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Submitted: December 15, 2010; Revised: May 5, 2011;

Accepted: October 12, 2011

The promise of telepsychiatry for reducing barriers to care may be especially important for chronic mental illnesses such as schizophrenia. Schizophrenia is a chronic mental illness which is associated with considerable morbidity and mortality (5). Treatment involves pharmacologic and psychosocial approaches and is often only moderately effective (6, 7). Limitations on access to care among patients with schizophrenia can lead to treatment nonadherence. This often leads to relapse, which in turn, increases the risk for inpatient hospitalization (8, 9). Telehealth communication services may offer one way to improve adherence and to enhance stability of treatment response in order to bridge the current gap in providing adequate care. The long distances required for travelling and associated transportation costs place a burden on families. For example, one study determined that patients with schizophrenia living more remotely to medical centers were more likely to have longer hospital stays than those living closer (10). The authors determined that travel distance accounted for a longer length of stay of an index admission (i.e., a difference of 9.3 days). In another study among veterans presenting for emergency psychiatric care, those with poor geographic accessibility to ambulatory mental health services were also more likely to be hospitalized (8); specifically, individuals living more than 60 miles from the hospital were 4.8 times more likely to be admitted for acute psychiatric treatment than those living within 60 miles. In addition, another limitation for patients with schizophrenia is that services are often only available during business hours; many patients need help outside of working hours.

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The use of computer-based services for people with serious mental disorders has increased (11). Patients with schizophrenia have received less attention in this regard. However, there is already good evidence (12) that these individuals can be recruited into research programs involving information technology. Jones et al. (12) performed a randomized trial of three interventions: 1) a computer intervention for patients combining information from their medical records and general information on schizophrenia; 2) a session with similar information conducted by a community psychiatric nurse; and, 3) a “combination” intervention in which the first and last sessions with patients involved a

nurse and the remainder involved the computer. There were 112 participants with schizophrenia in contact with community services; 67 completed and rates of completion were not different between the three groups. Furthermore, there were no differences between group outcomes assessing psychological status, suggesting that the computer-based intervention was equivalent to that achieved with the clinician. Many patients with schizophrenia may also turn to web-based medical interventions because of the anonymity. It allows them to avoid feeling stigmatized (13). Thus, telepsychiatry may help facilitate the engagement of this patient population for treatment and, likewise, improve adherence (14). High satisfaction with the telepsychiatric approach to care has been noted in patients with schizophrenia (15). Furthermore, surveys revealed that 90% of patients referred for mental health services reported that they would use telepsychiatric services if offered (16). In addition, two-thirds of rural respondents in the U.S. reported a willingness to use telehealth services (17, 18).

Our aims are to first assess the nature of distant interventions for patients with schizophrenia using telephone-based telehealth systems. Secondly, we will assess telehealth systems utilizing internet-based systems and then systems based on videoconferencing. Furthermore, as we discuss each of these modalities, we will examine studies which focus on intervention development, feasibility and clinical trials outcomes.

## Methods

In order to gather literature on this topic, we searched a variety of databases from January 1960 up to September 2010. These databases included MEDLINE, PsycINFO, CINAHL, the Cochrane library, the Cochrane Database of Systematic Reviews, the Database of Abstracts of Reviews of Effects, and EMBASE. We performed searches combining the term schizophrenia with each of the following terms: telepsychiatry or telemedicine or telepsychology or telemedicine or satellite communication or remote communication or by searching each term individually.

The following inclusion/exclusion criteria were used. Studies were selected for review if they: 1) included the use of telepsychiatric interventions with the eventual goal of providing access to care in remotely located individuals; 2) dealt with either telephone-based and/or internet-based interventions as well as videoconferencing technology; and, 3) were studies in which data extracted emphasized the development of an intervention, feasibility or were clinical trials. If a study was reported in more than one article, data were extracted from the most recent report. Exclusions were: 1) studies that were only single case reports and 2) papers not written in English.

Two of the authors (CA and JK) examined the list of 390 manuscripts which were obtained. Each of these two authors independently coded each article from the list to determine if it was appropriate. The codes generated were based on classifying articles into the following categories: 1) telephone-; 2) internet-; or, 3) video-based technology. Each of these three codes was then further broken into subcodes based on the type of study: 1) intervention development; 2) feasibility trial; or, 3) clinical trial. If articles did not fit any of the categories, then they were assigned the code of: 4) not relevant.

At the end of the analysis, the inter-rater reliability was high, with a Kappa value of 0.93. Finally, the two authors met one more time to resolve any discrepancies with regards to which papers should be included. During this meeting, the decision was made to include eighteen articles dealing with patients with schizophrenia or schizoaffective disorder as the basis of this review.

## Results

We describe below what is known about the use of telephone-, internet- and video-based modalities for treating patients with schizophrenia. We found six articles describing six studies utilizing telephone-based approaches. We found six articles describing five internet-based studies and six articles describing six video-based modalities for treating patients with schizophrenia.

### **Telephone-Based Interventions for Patients with Schizophrenia**

Below we summarize studies which involve telephone-based interventions. In 2001, Beebe (19) performed a pilot study with 37 participants to evaluate the effectiveness of a telephone intervention (TIPS), which focused on problem solving, coping alternatives and providing reminders so clients remember to use alternative coping strategies. Participants either received TIPS or “treatment as usual,” which consisted of routine community-based care, as well as informational phone calls at weeks 6 and 12. The experimental TIPS group received three months of a weekly telephone intervention along with routine community-based care. Patients in the experimental group spent more time in the community and had fewer re-hospitalizations; however, this result was not statistically significant. The authors noted the following limitations: 1) possible bias toward higher functioning participants with more stable living situations and 2) potential problem with generalizability, i.e., the research nurse who performed the trial had a Master’s degree with 17 years’ experience.

A subsequent study ( $n=20$ ) by Beebe and Tian (20) examined whether the use of TIPS would establish better

patient-clinician rapport. The outcome measured was degree of verbal responsiveness. The experimental group attended two face-to-face meetings with the TIPS provider prior to six weekly TIPS phone sessions; controls received only six weekly TIPS phone calls. The experimental group conversed significantly longer during the first three weeks and was twice as likely to make a “feelings statement” during calls. Thus, this trial established the importance of augmenting face-to-face patient-clinician interaction with telephone-based telepsychiatric approaches. Limitations to the study included potential participant self-selection bias and potential problems with external validity (19).

Beebe et al. (21) then examined the influence of TIPS on medication adherence in outpatients with schizophrenia: 29 participants were randomly assigned for three months to four groups: 1) weekly TIPS+psychiatric medication monitoring; 2) “treatment as usual (TAU)”+psychiatric medication monitoring; 3) weekly TIPS+nonpsychiatric medication monitoring; and, 4) TAU+nonpsychiatric medication monitoring. TAU consisted of medication management, physician visits and Community Mental Health Center care. Monthly medication adherence was assessed by blinded research assistants performing pill counts. There were significantly higher rates of psychiatric medication adherence rates for patients who received TIPS. The authors acknowledged the following limitations: 1) possible measurement bias due to clinicians’ rating adherence, which in the past has been shown to overestimate adherence (22); 2) not all clinician raters were blind to treatment; and, 3) the fact that pill counts provide no guarantee that medications were actually ingested (22).

Frangou et al. (23) evaluated medication adherence over eight weeks with 108 patients with schizophrenia randomized into three groups and monitored medication adherence in three ways: 1) with a group with self-reported medication use; 2) with a group which used pill counts; and, 3) with a telemonitoring group using an electronic medication dispenser, @HOME, which recorded the frequency with which participants accessed their medications. The @HOME dispenser sent out alerts if patients accessed their medications less than 50% of the expected amount each week; clinicians could discuss these irregularities with patients during appointments (23).

Mean adherence ratings—Clinical Global Impression Scale scores and Positive and Negative Syndrome Scale scores—in the experimental group were significantly improved in the group with @HOME. In addition, the group that received @HOME exhibited significant reductions in emergency room visits and medical appointments. The @HOME system was accepted well by patients, caregivers and healthcare professionals (23). Limitations included: 1)

short study duration (eight weeks) and 2) potential selection bias since 40% of the participants declined to sign consent. In addition, it was noted that the use of the @HOME device did not guarantee patients will take their pills after opening the containers.

Salzer et al. (24) studied a Telephone Medication Management (TMM) intervention aimed to enhance the treatment of patients with schizophrenia: 32 participants were randomized to the TMM or control group. The TMM group received weekly intervention phone calls over a year, which provided verbal reinforcement for “positive self-care behaviors” such as medication adherence, treatment-related discussions and assistance with problem-solving strategies. There were more improvements in insight and staff relationships within the TMM group but no significant differences in treatment adherence between the groups (24).

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Spaniel et al. (25) developed an Information Technology Aided Relapse Prevention Programme in Schizophrenia (ITAREPS) with a mobile phone-based telemedicine system to monitor early warning signs of psychosis. The purpose was to detect psychotic symptom worsening early in the course in order to prevent hospitalizations. A web-based interface provided the clinician with a longitudinal analysis of patients’ symptoms. In a preliminary analysis of 45 patients with psychosis, there was a significant 60% decrease in hospitalizations one year after enrollment compared to one year prior to enrollment. Variables which influenced hospitalizations with ITAREPS included medication adherence, adherence to the ITAREPS paradigm and having a family member involved in the intervention. Limitations to the study included: 1) absence of a control group and 2) lack of documentation regarding the manner in which physicians intervened, including whether a change in antipsychotic dose or type was made.

### **Internet-Based Telepsychiatric Approaches for Patients with Schizophrenia**

Koivunen et al. (26) reported on an interactive, multi-service, on-line portal application called Mieli.net designed to help support patients with schizophrenia spectrum disor-

ders as well as hospital staff nurses caring for these patients. The content and the structure of the portal were designed based on a needs analysis of both patients and staff. For nurses, the portal was designed for educational purposes; the authors intended that patients use it on their own or in collaboration with a nurse. For patients, multimedia material included text, voices, figures and photos, and the content included: 1) evidence-based information explaining the nature and treatment of severe mental illnesses; 2) information on social supports available in Finland; 3) information about patients’ rights; and, 4) a channel for peer support, including a discussion and chat room and open internet diary. Also included was an eSupport tool to facilitate dialogue between patients and staff. In addition, nurses could separately use the portal to update their knowledge of how to treat patients with schizophrenia spectrum psychoses.

A preliminary evaluation of the site involved nurse interviews (n=114) in two Finnish psychiatric hospitals, which included queries about the functionality, content and benefits of the portal. Nurses stated the portal was user friendly and that the content was understandable. Nursing concerns included what effects the system would have on patient care, whether the system would improve nursing staff and patient interaction, and whether the system could work in routine clinical practice. The investigators reported the following limitations: 1) only 50% of the nurses responded and 2) some questions may have been difficult because technical jargon was used.

The same investigators (27) identified further barriers and facilitators with the system. Data collected from nurses determined potential barriers to implementation such as: 1) lack of computers; 2) nurses’ negative attitudes toward computer use; and, 3) lack of education. Important facilitators included: 1) appropriate technological resources and 2) easy access to the internet. The authors stated that limitations of this follow-up study included: 1) answers at times being too general and/or too abstract; 2) at times, it was not possible to clarify the meaning of individual nurse’s answers; and, 3) problems with external validity since nonparticipating nurses appeared to be less motivated to use information technology.

Farrell et al. (28) described a web-based portal developed for staff and consumers within a community mental health clinic setting. User-testing methods were conducted in an iterative manner with nine participants ready for discharge from a state psychiatric facility. The portal developed through the study had a functional web page with communication, education and support features. Future plans were to evaluate portal acceptability among the community mental health population and to determine if the portal improves treatment adherence and consumer satisfaction.

A trial by Rotondi et al. (29, 30) utilized a web-based intervention for patients with schizophrenia and their support person(s) called “The Schizophrenia Guide.” This program provided patients and families access to psychoeducational materials as well as supportive and therapeutic services. Thirty participants with schizophrenia or schizoaffective disorder were randomly assigned for three months to a “treatment as usual” group or a telepsychiatry group which had access to the web-based intervention. The website provided online therapy groups, a question/answer section, a list of community activities, news items related to mental health issues and educational reading materials.

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*At study end, the ROTONDI telehealth group reported that there was significantly less perceived stress and significantly improved perceptions of social support.*

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The usage of the web site was more frequent in the initial months and then dropped significantly by month 3 for all groups except for the on-line therapy groups and the question/answer section of the site. At study end, the telehealth group reported that there was significantly less perceived stress and significantly improved perceptions of social support. Limitations of the study included small sample size and limited duration of follow-up. Secondly, although the system was designed to be feasible for those with potential cognitive deficits, patients’ cognitive deficits could still have placed a limitation on their ability to purchase and set up the equipment. In addition, with this type of intervention, therapists must contend with the geographic restrictions of licenses to practice. Furthermore, although the study had built-in security measures in place, such approaches may not always succeed.

Recently, Glynn et al. (31) evaluated the feasibility of an online, multifamily group program designed for relatives of persons with schizophrenia. Study outcomes included the Brief Psychiatric Rating Scale and subscales of the Brief Symptom Inventory, which assessed somatic concerns and anxiety/depression. Participants (n=26) in the intervention were compared to archival data from individuals receiving usual care (n=16). The majority of participants attended more than half the core online support sessions. In addition, they exhibited high levels of satisfaction. However, there appeared to be little impact of online participation on the clinical status of persons with schizophrenia or on relatives’ distress, although there was a trend for fewer hospitalizations in the online group. Study limitations included the fact that symptom exacerbation was not required prior to entry.

Although this did broaden the participant pool, it made it more difficult to compare their results to more positive findings reported from other studies involving face-to-face multifamily groups (32). In addition, raters were not blind to treatment condition.

### ***Telepsychiatric Approaches for Patients with Schizophrenia Using Videoconferencing***

Studies which have examined videoconferencing in patients with schizophrenia are summarized below. Research overall suggests that videoconferencing is a reliable and feasible method of assessing patients with psychiatric illness (33); however, most of these studies are limited in having small numbers of participants. In the 1970’s, Dwyer and colleagues (34) used a microwave bidirectional television to provide a range of services which included diagnostic interviews, pharmacotherapy, crisis management, as well as long-term therapy for patients with psychoses and personality disorders. Many patients reported feeling more comfortable communicating with the psychiatrist via the television rather than face-to-face (34, 35). The authors considered this to be “an enormous leap forward in carrying psychiatric help to the population” (34). However, they also point out that a limitation of this approach was that issues of privacy had not been well defined.

Three additional studies have evaluated the reliability and acceptability of videoconferencing in patients with schizophrenia. Zarate et al. (36) and Yoshino et al. (37) examined whether video assessments are as reliable as live interviews and, furthermore, whether the quality of assessment using a lower transmission rate is as reliable as one that utilizes a higher transmission rate for assessment. In the study by Zarate et al. (36), the investigators randomized patients into three groups: 1) those receiving video assessments via an ISDN transmission rate at 128 kilobits per second (kbps) (lower bandwidth); 2) those receiving transmission rates at 384 kbps (higher bandwidth); or, 3) those assessed via face-to-face interviews. All three transmission rates had adequate reliability in assessing the global severity and positive symptoms of schizophrenia when using the Brief Psychiatric Rating Scale, the Scale for the Assessment of Negative Symptoms and the Scale for the Assessment of Positive Symptoms. Assessing negative symptoms at a lower bandwidth was less reliable. Another limitation of this study was the small sample size (n=45) in each group. In addition, the diagnoses of the study patients have already been established prior to assessment; thus, the findings may not be applicable to patients whose diagnoses have not yet been established.

Chae and colleagues (38) examined two groups of participants—either face-to-face or via a videoconferencing system which transmitted at a rate of 33 kbps—with the Brief Psychiatric Rating Scale. Assessment of negative symptoms at

the lower bandwidth was less reliable, while the assessment of positive symptoms was more reliable at the lower bandwidth. Participants in both studies rated the video interview favorably in all bandwidth groups and actually preferred the videoconference approach. The study's limitations included: 1) a small sample size; 2) the potential influence of the Hawthorne effect; and, 3) lack of data assessing the degree of clinicians' acceptance. However, the study results suggest that videoconferencing approaches for clinical psychiatric care appear to be helpful (36, 37).

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*Participants in the Chae et al. study rated the video interview favorably in all bandwidth groups and actually preferred the videoconference approach.*

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Yoshino et al. (37) similarly assessed the reliability of remote video psychiatric interviews conducted through the internet using narrow (128 kbps) and broad bandwidths (2 megabits/second). Controls included face-to-face interviews. Outcome measures included the Brief Psychiatric Rating Scale. Inter-rater reliability was significantly lower in the narrow bandwidth group than in the broad bandwidth group. The authors also noted that they could not exclude the possibility that the inter-rater reliability values obtained for total and positive symptoms scores of subjects in the broadband condition were inflated given that the broadband group had more severe psychopathology.

Yaylor (39) evaluated the quality of psychiatric care using an interactive television intervention (IATV) for patients with a variety of diagnoses including schizophrenia and used a low bandwidth rate of 128 kbps. Global Assessment of Functioning Scale scores of the IATV patients were compared with those assessed face-to-face and no significant differences were observed between the two groups; thus, the authors concluded that IATV was an "acceptable and efficient" method of treatment for the patients with schizophrenia. The authors also stated that study limitations included: 1) a small sample size (n=49); 2) the fact that the Global Assessment of Functioning Scale is a limited assessment tool; and, 3) the authors did not state what proportion of patients in their sample had a diagnosis of schizophrenia.

Shen et al. (40) performed a study examining inter-rater reliability in a multi-center trial environment with a centralized group of skilled raters linked to the study sites through videoconferencing. Patient participants (n=313) from 32 sites were randomly assigned to six weeks of treatment with one of two different doses of olanzapine or placebo and evaluated with the Positive and Negative Syndrome Scale. The mean

change in Positive and Negative Syndrome Scale scores was significantly greater with olanzapine than with placebo, and internal consistency was high throughout the study. The results suggest that hospitalized patients with schizophrenia are willing and able to participate in clinical trials via remote interviews conducted via videoconference.

## Discussion/Recommendations

From the literature we reviewed, we have determined that there are a limited number of studies to date which utilize telehealth technology using telephone-, internet- or video-based modalities. However, all of these studies show initial promise as useful approaches toward augmenting the clinical care of this patient population. Most progress has been made with telephone-based interventions. The telephone- and internet-based approaches have demonstrated success in showing that this approach appears to be feasible. In addition, these initial studies have demonstrated that both telephone- and internet-based approaches appear to improve outcomes.

With the various telephone interventions we reviewed, improvements in the following outcomes were demonstrated: patient-staff communication, medication adherence, insight, psychopathologic symptoms, visits to the emergency room and hospitalization rates (19, 20, 23-25). In their review, Leach and Christensen (41) were also optimistic about the role of telephone intervention for the care of patients with schizophrenia. These authors stressed the need for more studies to reproduce and extend what has been demonstrated, especially since the current studies utilized small sample sizes.

With internet-based interventions, most work has focused on discussing the development of various systems or has mostly focused on establishing feasibility. In addition, Rontondi et al. (29, 30) demonstrated that with a web-based intervention there are improved outcomes, i.e., improvements in levels of perceived stress and in perceptions of social support. Like the studies focusing on internet-based interventions, most of the articles we found which discussed video-based interventions have focused primarily on feasibility and on system development.

Future studies should also examine the influence of variables known to be important in facilitating patient-clinician communication. For instance, with psychotic patients the following factors have been shown to enhance the therapeutic relationship: having more severe symptoms, having more social relationships, being employed, and congruence of gender, age and ethnicity between patient and clinician (42-45). With telehealth systems, demographic variables such as age, gender, race, education level, and employment status could initially be examined to determine whether they influence patient-clinician communication. In addition,

the influence of other factors should be explored, such as diagnostic status (i.e., schizophrenia vs. schizoaffective disorder), symptom severity and family involvement. Elucidating these factors could help investigators better determine how to better adapt telehealth interventions toward specific populations.

### **Economic Issues**

An important issue facing administrators involved in treating patients using telepsychiatry is how to more efficiently and effectively utilize this technology to improve patient care and outcomes (46-48). It will be important to determine whether the use of telepsychiatry in patients with schizophrenia is cost-effective. Clearly, future studies need to address this. One study which used videoconferencing in an adult and child outpatient mental health population suggested that cost savings are favorable (46), although the estimates in this study failed to incorporate costs for the maintenance and upgrading of equipment. Indeed, the initial costs in capital expenditures needed for telepsychiatry may be high, but the use of the equipment over time is likely to lead to cost savings (18). Furthermore, rapid advancements in digital equipment, computer software, hardware, network reliability, speed, and security will likely reduce the “up-front” costs of telepsychiatry in the future.

The issue of reimbursement for telepsychiatric services is important. Hilty et al. (49) examined reimbursement receipts and insurance coverage during a one-year period for a rural telepsychiatric service in California. This program was funded from a grant from the California Telemedicine and e-Health Center. The services provided included psychiatric evaluation, psychotherapy and medication management; the authors examined actual versus projected reimbursements. Total billed consultations provided by the primary payer included Medi-Cal (37%), third-party payers (26%), Medicare (24%), and those of indigent individuals (12%). In many situations, costs needed to be divided among payers. Many patients who had a third-party payer had to incur the actual costs themselves. Psychiatrists evaluated more of the patients who had Medi-Cal or Medicare. There was a marked disparity in the timeliness of the processing of Medi-Cal payments and this was also a problem for total consultations billed under insurance type. The authors stated that the trends they observed were of concern, and that one of the most serious issues was the marked number of indigent, Medi-Cal only, or Medi-Cal/Medicare recipients who were evaluated by psychiatrists. This creates a financial risk since there does not appear to be any mechanism available to improve the patient pool or to negotiate and secure contractual rates prior to visits.

Medicare legislation over the past fifteen years has started to incorporate more of telemedicine (50, 51). In addition,

some state Medicaid programs incorporate telepsychiatric approaches for treatment (49). Another potential source for reimbursement could include county mental health systems (49). They have not provided payment for telepsychiatric services since they try to minimize costs; in addition, the services are provided by someone else outside of their own medical care system, making payments for these services harder to justify. Clearly, new approaches are necessary to overcome these financial barriers. In addition, significant changes in legislation are also needed.

### **Conclusions**

More work is needed to expand our research knowledge with regards to the ways telepsychiatry can be effectively used to augment care in patients with schizophrenia. Future studies should examine the influence of variables known to be important in facilitating patient-clinician communication. These variables include demographics, diagnostic status (i.e., schizophrenia vs. schizoaffective disorder), symptom severity, family involvement and the availability of technology. Initial progress with the use of telephone-, video- and internet-based modalities has been made, although the pace has been slow. Research findings to date also indicate that the use of telepsychiatry can be reliable and favorable for both patients and clinicians. Initial results suggest that these modalities are likely to improve patient outcomes.

More well-controlled interventions are needed to confirm whether psychopathologic outcomes can improve in those modalities in which this has not been well examined (i.e., with videoconferencing). Furthermore, other important outcomes besides psychopathology need to be examined, such as recovery and suicidal behavior in those at risk for suicide. Future research also needs to focus on two important aspects of system development: 1) at the level of the patient and 2) at the level of the healthcare system. At the patient level, studies need to focus on optimizing patient usability and acceptability. Through well-designed quality improvement initiatives, telepsychiatric systems can be improved and refined in order to provide better healthcare for patients with schizophrenia.

### **Acknowledgments**

This study was supported by a VISN 4 CPPF, VA HSRD PPO 10-249-2 and the VISN 4 MIRECC (authors JK, GH). Also author CA was supported by NIMH T32 MH15169.

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