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Symptoms of Depression, Positive Symptoms of Psychosis, and Suicidal Ideation Among Adults Diagnosed With Schizophrenia Within the Clinical Antipsychotic Trials of Intervention Effectiveness

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Abstract

Suicide is among leading causes of death for adults diagnosed with schizophrenia. While symptoms of depression are consistently supported factors involved in suicidal ideation, findings on the role of positive symptoms of psychosis have been mixed with limited understandings of risk. Accordingly, this study aimed to identify the pathways of influence between symptoms of depression, positive symptoms of psychosis (i.e. hallucinations and delusions), and suicidal ideation. Data were obtained from the Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE; n = 1,460). Suicidal ideation and symptoms of depression were measured by the Calgary Depression Scale (CDRS) and hallucinations and delusions by the Positive and Negative Syndrome Scale (PANSS). The data were analyzed using Structural Equation Modeling (SEM). As symptoms of depression and positive symptoms of psychosis independently increased, on average there were associated increases in suicidal ideation. The present study provides support for the relationship between positive symptoms of psychosis, specifically hallucinations and delusions, and suicidal ideation. Future prospective longitudinal study designs are needed to further increase understandings of the roles that hallucinations, delusions, and additional symptoms of schizophrenia play in both suicidal ideation and attempt to ultimately inform evidence-based interventions aiming to reduce suicidal death.

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Data used in the preparation of this article were obtained from the limited access datasets distributed from the NIH-sponsored “Clinical Antipsychotic Trials of Intervention Effectiveness in Schizophrenia” (CATIE-Sz). This was a multisite, clinical trial of persons with schizophrenia comparing the effectiveness of randomly assigned medication treatment The CATIE project was carried out by principal investigators from the University of North Carolina, Duke University, Columbia University, the University of Southern California, the University of Rochester, and Yale University along with program staff of the Division of Interventions and Services Research, National Institutes of Mental Health (NIMH), and investigators from each of the 57 research sites in the United States.

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This manuscript reflects the views of the authors and may not reflect the opinions or views of the CATIE-Sz Study Investigators or NIMH.

Keywords

CATIE; depression; psychosis; suicide

INTRODUCTION

Schizophrenia is a chronic and severe mental illness affecting roughly 26 million people and impacting 1% of the global population (Lora et al., 2012). For individuals diagnosed with schizophrenia, suicide is currently among the leading causes of death (Lambert & Naber, 2012; Tarrier et al., 2013) with risk estimates being over eight times greater than among the general population (American Psychiatric Association, 2003). Epidemiologic data suggests that 40–50% of individuals diagnosed with schizophrenia experience suicidal thoughts (Simms, McCormack, Anderson, & Mulholland, 2007), 20–50% of which make suicide attempts (Pompili et al., 2007) and 4–13% end life by suicide (Simms et al., 2007). The high suicide rates among adults diagnosed with schizophrenia have received much attention in the literature (McGirr & Turecki, 2008; Pompili et al., 2007; Tarrier et al., 2013), yet, evidence-based treatments are lacking and suicide among adults diagnosed with schizophrenia continues to be a major public health problem.

Data consistently support that a history of suicidal behaviors (i.e., ideation and/or attempt) is the strongest predictor for future suicidal behaviors (Goldsmith, Pellmar, Kleinman, & Bunney, 2002; Joiner et al., 2005; Nock, Borges, & Ono, 2012). In addition, having a family history of suicide attempt and completion have been shown to put an individual at increased risk for suicidal behaviors, with theorized mechanisms relating to social learning (Hawton, Sutton, Haw, Sinclair, & Deeks, 2005; Montross, Zisook, & Kasckow, 2005; Radomsky, Haas, Mann, & Sweeney, 1999; Siris, 2001). Demographic characteristics consistently associated with suicidal ideation and attempts include race/ethnicity, gender, education, and poverty level. More specifically, data indicate that risk is increased when an individual is single, male, white, unemployed, and has a higher level of education. In addition to demographic characteristics, individuals who are impulsive, noncompliant with treatment recommendations, have greater insight, experience severe symptoms, and incurred a recent loss have increased risk for engagement in suicidal behaviors (Hawton et al., 2005; Lambert & Naber, 2012; Montross et al., 2005; Pompili et al., 2007; Radomsky et al., 1999; Tarrier et al., 2013). However, aside from the factors listed above, the leading psychiatric research on risk for suicide among adults diagnosed with schizophrenia focus on symptoms of depression.

Once it was empirically established that the majority of individuals who completed suicide had suffered from psychiatric illness at time of death (Andreasen & Black, 2006; Harris & Barraclough, 1997; Kaplan & Harrow, 1996; Montross et al., 2005; National Institute of Mental Health, 2010), a shift occurred in theoretical perspectives of suicide to focus more on psychiatric symptoms and psychological mechanisms as opposed to biological factors. Prevalence rates suggest 22–75% of adults diagnosed with schizophrenia experience symptoms of depression (Birchwood & Jackson, 2001), with consistent empirical support for low mood and hopelessness as risk factors for suicide (Montross et al., 2005; Roy, 1982;

Saarinen, Lehtonen, & Lonnqvist, 1999; Stephens, Richard, & McHugh, 1999; Tarrier et al., 2013; Walsh et al., 2001).

Pertaining to low mood is the Cognitive Theory principle that an individual's behavior and affect are largely shaped by the meaning he or she ascribes to environmental events and stimuli (Beck, 1967; Wenzel, Brown, & Beck, 2009). More specifically, an individual's emotions are informed by the way in which a situation is perceived, interpreted, and implicated. In turn, emotional and behavioral reactions will further develop the individual's thoughts, images, interpretations, and judgments of the situation (i.e., cognitive processes). This results in a feedback loop between cognitions and emotions, potentially worsening mood involving negative thoughts, emotions, and maladaptive reactionary behaviors that may result in suicidal ideation and attempt (Wenzel et al., 2009).

While symptoms of depression have been consistently supported in the literature to be risk factors for suicide, research on the role that positive symptoms of psychosis play have been mixed (Taylor et al., 2010). Hallucinations and delusions, from a perspective of Beck's Cognitive Theory of Suicide, may serve as an event or experience to which an individual ascribes meaning, leading to the experience of negative emotional and behavioral reactions such as low mood, hopelessness, or suicidal thoughts and behaviors (Chadwick & Birchwood, 1994; Iqbal & Birchwood, 2006). The specific experience of command auditory hallucinations may serve as a potential mechanism in the relationship between hallucinations and suicide (Kjelby et al., 2015). On average, up to 70% of adults diagnosed with schizophrenia experience auditory hallucinations (Simms et al., 2007), of which 18–50% report hallucinations to be command in nature (Harkavy-Friedman et al., 2003; Zisook, Byrd, Kuck, & Jeste, 1995). Further, several studies have found command auditory hallucinations to involve suicidal content for some adults, with rates of command compliance ranging from 40–88% (American Psychiatric Association, 2003; Hersh & Borum, 1998; Junginger, 1990; Rogers, Gillis, Turner, & Frise-Smith, 1990). While command auditory hallucinations may play a role in suicide risk for some individuals, it is evident that there is a lack of statistical support and future research is needed to examine these relationships among varying populations of adults with schizophrenia.

Despite the epidemiologic data above, few studies have found relationships between positive symptoms of psychosis and suicide. The few with supportive findings found delusions (mostly paranoia) and auditory hallucinations to be associated with increased suicidal behaviors (Hor & Taylor, 2010; Kaplan & Harrow, 1996, 1999; Siris, 2001). The dominant focus on symptoms of depression and lack of consensus and understanding about the role of positive symptoms of psychosis in suicide risk highlight the need for continued research efforts to clarify the interplay between these factors (Taylor et al., 2010).

Due to the high rates of suicide and limited understanding of risk among adults diagnosed with schizophrenia, there is a need for research to increase understanding of suicide risk as a first step towards ultimately contributing to the future development of prevention-focused intervention efforts (American Psychiatric Association, 2003). Thus, the aim of this study is to identify the potential pathways of influence between symptoms of depression, positive symptoms of psychosis (i.e., hallucinations and delusions), and suicidal ideation among a

population of adults. It is hypothesized that as depression, hallucinations, and delusions independently increase, on average, there will be associated increases in suicidal ideation.

METHODS

Data were obtained from the Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE), a National Institute of Mental Health (NIMH) study of a sample of adults diagnosed with schizophrenia (n = 1,460). The CATIE is a longitudinal randomized controlled trial that compared the effectiveness and tolerability of typical and atypical antipsychotic medications between 2001 and 2004 (Stroup et al., 2003). Participants were recruited from 57 clinical sites across the United States and completed screening before enrollment in the study. All participants were adults (i.e., 18–65 years of age), resided in the United States, deemed appropriate for treatment with oral medication according to own judgment in consultation with treating physician, and met diagnostic criteria for schizophrenia based upon the DSM-IV using the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-P) (Stroup & Lieberman, 2010).

Participants who met criteria for enrollment after screening were given a baseline assessment by a trained clinician (i.e., nurse, social worker, psychologist, or physician) and randomized to medication in Phase 1 (perphenazine, olanzapine, quetiapine, risperidone, or ziprasidone). Participants who had tardive dyskinesia were re-randomized to olanzapine, quetiapine, risperidone, or ziprasidone, and those who failed perphenazine were re-randomized to olanzapine, quetiapine, or risperidone. Participants who discontinued medication in Phase 1 due to efficacy or tolerability failure were re-randomized to an alternative medication in Phase 2, Those who discontinued medication in Phase 2 were followed in an open-label treatment in which participants could choose their medication for Phase 3. Those who did not fail their randomized treatment remained on the same medication for the full 18-month study period (Stroup et al., 2003).

While the primary outcome of the CATIE trial was treatment discontinuation from an antipsychotic regimen (Stroup & Lieberman, 2010; Stroup et al., 2003), detailed clinical data including psychiatric symptoms and suicidal ideation were assessed for and documented after baseline at multiple time points (Stroup et al., 2009). The first author applied for and was granted access to the NIMH CATIE data-set for research purposes; all data files are de-identified and protected electronically with a password.

Measurement

Consistent with the Centers for Disease Control (CDC) definitions (Crosby, Ortega, & Melanson, 2011), suicidal ideation was defined in the dataset as thoughts of engaging in suicidal behavior with or without a definitive plan but with no evidence of current suicidal behavior (Witt, Hawton, & Fazel, 2014). The outcome variable of suicidal ideation was based on an item from the Calgary Depression Scale (CDRS; Addington, Addington, & Schissel, 1990; Addington, Addington, & Maticka-Tyndale, 1993). The item assessed the degree to which participants experienced the following in the past week: “Have you ever felt that life wasn’t worth living? Did you ever feel like ending it all? What did you think you might do? Did you actually try?” The CDRS was administered by a trained clinician at each

assessment visit after baseline and the suicide item was originally coded as absent, mild, moderate, and severe. A positive rating of suicidal ideation was indicated by a score of mild or moderate (Addington et al., 1990; Witt et al., 2014), and was subsequently recoded as yes or no to experiencing suicidal ideation in the past week. The suicidal ideation dichotomous variable at each time point after baseline was then recalculated into a count variable to represent the number of suicide ideation incidents after baseline and allow for the dynamics between individuals who experienced ideation once versus multiple times to be explored (count ranged from 0 to 8).

Symptoms of depression were measured at baseline by the Calgary Depression Scale (CDRS; Addington et al., 1990), minus the suicide ideation item. The CDRS is a widely used well-validated scale to assess severity of depressive symptoms in individuals diagnosed with schizophrenia (Addington et al., 1990; Addington et al., 1993). The final scale had 8 items reflecting depression, hopelessness, self-depreciation, guilty ideas of reference, pathological guilt, morning depression, early wakening, and observed depression. Response categories were coded as absent, mild, moderate, and severe. The total score ranged from 1 to 36, with higher scores indicating greater presence and severity of symptoms of depression. Reliability analyses of the single suicide item indicated minimal change in the estimated reliability of the scale (original alpha = .826 and revised scale alpha = .817).

Two positive symptoms of psychosis were of interest in the current study: hallucinations and delusions. Two items of the Positive and Negative Syndrome Scale (PANSS; Kay, Fiszbein, & Opler, 1987) were used at baseline to independently measure hallucinations and delusions among the sample. Widely used in clinical studies of psychosis with strong reliability and validity, the PANSS is clinician administered and contains 30 items assessing symptoms including positive, negative, and general psychopathology. Two items from the PANSS represented separate indicators of hallucinations and delusions. The hallucination item assessed for the verbal report or behavior indicating perceptions that are not generated by external stimuli (i.e., auditory, visual, olfactory, or somatic hallucinations) and the delusion item for beliefs that are unfounded and idiosyncratic. Each variable was coded as absent, minimal, mild, moderate, moderately severe, severe, or extreme. Preliminary analyses indicated minimal cases for the extreme category, so the categories of severe and extreme were collapsed into one entitled “severe” to provide more stability.

Quantitative Modeling and Data Analysis

The data were analyzed using Structural Equation Modeling (SEM) with Mplus 7 using a robust (Huber-White) maximum likelihood algorithm to deal with nonnormalty and variance heterogeneity. Missing data were treated using Full Information Maximum Likelihood (FIML) methods. For multi-item measures, coefficients alphas/composite reliabilities and factor structures were evaluated using confirmatory factor analyses. As measurement error may bias some parameter estimates, analytic strategies were undertaken to explicitly model measurement error (see below in results section). The fit of the SEM model was evaluated using both global (chi square, CFI, standardized RMR, RMSEA) and focused (standardized residuals and modification indices) fit indices. The following covariates were included for the endogenous variables: race/ethnicity, gender, age, public health insurance status (as a

proxy for socioeconomic status), history of suicide attempt, duration of participation, and randomized treatment condition at baseline/phase 1. In addition, potential moderating effects of treatment condition, race/ethnicity, age, and gender were modeled.

RESULTS

All demographic characteristics at baseline are presented in Table 1. Of the 1,460 participants in the sample, the mean age was 40.6 and 1080 (74%) were male and 380 (26%) were female. The majority of the sample identified as White/Caucasian (60%) and non-Hispanic/Latino (88%). Eighty-eight percent were unmarried, 74% completed high school, and 92% did not work full time. Seven hundred forty-five (51%) reported having public health insurance and the mean duration of illness as measured by the number of years between the first antipsychotic was taken until randomization into the CATIE was 14.4 (±10.70).

At baseline, the majority of participants experienced hallucinations (76%) and delusions (85%), and scored absent (50.2%) or mild (42.0) on the modified 8-item Calgary Depression Scale (CDRS). Clinical characteristics are presented in Table 2. As for treatment condition at baseline/Phase 1, 19% were randomized to Olanzapine, 18% to Perphenazine, 19% to Quetiapine, 19% to Risperidone, and 11% to Ziprasidone. Of the 1,460 participants, 1.3% reported having a history of suicide attempt within the 6 months prior to baseline assessment and 405 (28%) participants experienced suicidal ideation post-baseline. Of participants who experienced suicidal ideation during the CATIE study time period, 17% reported thoughts of suicide only at one time-point after baseline and 13% reported thoughts of suicide at more than one time-point after baseline. There were no significant differences in severity of hallucinations and delusions independently for participants who experienced ideation once versus multiple times after baseline.

Both hallucinations and delusions distinctly predicted suicidal ideation independent of depression but not when entered jointly in the same linear equation. Thus, a latent variable model was created to represent the common variance of hallucinations and delusions (represented as a latent positive symptom of psychosis variable with hallucinations and delusions as indicators) predicting suicide ideation in addition to depression and the covariates. Although the outcome is technically a count variable, none of the traditional count regression models were appropriate given the response distribution. We therefore used robust latent linear regression as an estimation strategy. The global fit indices all pointed towards good model fit (Chi square of 7.52 with df = 8 yielded p-value < 0.482; CFI = 1.000, 1.000, RMSEA = 0.000, p-value for close fit = 1.000, standardized RMR = 0.007). Examination of focused fit indices (standardized residuals and modification indices) revealed no theoretically meaningful points of stress on the model.

Coefficient estimates were derived in a way that permitted parameter estimation adjusted for measure unreliability. This involved creating a latent variable for the modified 8-item depression scale (CDRS) with a fixed factor loading of 1.0 and then constraining the random measurement error associated with the indicator to a non-zero value reflecting the unreliability of the measure (Joreskog & Sorbom, 1996). Since the variance of the modified

CDRS was .396 and the coefficient alpha was .82, the standardized disturbance term for the depression variable was fixed at .07.

The main effects model that focused on the common variance of hallucinations and delusions was predictive of suicidal ideation over and above symptoms of depression. Figure 1 presents the unstandardized parameter estimates for the structural model and standardized parameter estimates for the measurement model, with margins of error in parentheses. Both path coefficients for positive symptoms (latent) and depression (latent) were statistically significant ($p < .05$). For every one-unit increase in positive symptoms of psychosis (i.e., hallucinations and delusions), suicidal ideation was found to increase, on average, by .024 units ($p < 0.05$) holding race/ethnicity, gender, age, public health insurance status, history of suicide attempt, duration of participation, randomized treatment condition at baseline/phase 1, and symptoms of depression constant. For every one-unit increase in symptoms of depression, suicidal ideation was found, on average, to increase by .038 units ($p < 0.05$) holding race/ethnicity, gender, age, public health insurance status, history of suicide attempt, duration of participation, randomized treatment condition at baseline/phase 1, and positive symptoms of psychosis (i.e., hallucinations and delusions) constant. Symptoms of depression, hallucinations, and delusions accounted for approximately 18% of the variance in suicidal ideation holding all covariates constant.

The potential moderators of age, gender, race/ethnicity, and treatment condition were tested using Marsh, Wen, and Hau's (2014) strategy and resulted in no significant interaction effects.

Supplemental Analyses

In addition to examining the relationships between symptoms of depression, hallucinations, delusions, and suicidal ideation as a count variable, suicidal ideation was also examined as a dichotomous variable to model individuals who did and did not think about suicide using a modified linear probability model with robust estimation (Angrist & Pischke, 2009). The global fit indices all pointed towards good model fit (Chi square of 7.516 with df = 8 yielded p-value < 0.482; CFI = 1.000, RMSEA = 0.000, p-value for close fit = 1.000, standardized RMR = 0.007). Examination of focused fit indices (standardized residuals and modification indices) revealed no theoretically meaningful points of stress on the model. The latent variable model that focused on the common variance of hallucinations and delusions was predictive of suicidal ideation over and above symptoms of depression. Both path coefficients for positive symptoms (latent) and depression (latent) were statistically significant ($p < .05$).

For every one-unit increase in positive symptoms of psychosis (i.e., hallucinations and delusions), suicidal ideation was found to increase, on average, by .024 units ($p < 0.05$) holding race/ethnicity, gender, age, public health insurance status, history of suicide attempt, and randomized treatment condition at baseline/phase 1 constant. In other words, for every one-unit increase in positive symptoms of psychosis there was, on average, an associated 2.4% increase in suicidal ideation holding all other variables constant. For every one-unit increase in symptoms of depression, suicidal ideation was found, on average, to increase by .038 units ($p < 0.05$) holding race/ethnicity, gender, age, public health insurance status,

history of suicide attempt, and randomized treatment condition at baseline/phase 1 constant. In other words, for every one-unit increase in symptoms of depression there was, on average, an associated 4% increase in suicidal ideation holding all other variables constant. Symptoms of depression, hallucinations, and delusions accounted for approximately 18% of the variance in suicidal ideation.

Second, confirmatory factor analysis (CFA) was preformed to assess the factor structure of the modified 8-item CDRS. Initially, examination of focused fit indices (standardized residuals and modification indices) revealed several large modification indices, indicating the presence of points of stress on the model. As a result, adjustments were made to correlate the error of several factor loadings, which led to good focused fit indices with no theoretically meaningful points of stress. In addition, the global fit indices all pointed towards good model fit (Chi square of 7.924 with df = 12 yielded p-value < 0.791; CFI = 1.000, RMSEA = 0.000, p-value for close fit = 1.000, standardized RMR = 0.009). All items loaded significantly onto their respective factor, with loadings ranging from 0.40 to 0.74. Given the correlated errors were small and the sizeable loadings, treating them as fundamentally unidimensional seemed reasonable.

Lastly, the main effects suicide ideation as a count model was evaluated for potential clustering effects by clinic site as 57 clinics across the United States participated in the CATIE. The interclass correlation was relatively small (.05), thus the model was run both with and without adjustments. The relationship between suicidal ideation and depression remained significant in the adjusted model ($p < 0.05$). However, the relationship between suicidal ideation and the latent positive symptoms variable was barely non-significant in the adjusted model ($p = .066$) as compared to the unadjusted model ($p < 0.05$).

CONCLUSION

As a result of the high rates of suicide, limited understandings of risk, and absence of effective evidence-based interventions, there is urgency for research to increase understanding of suicide risk as a first step towards ultimately contributing to the future development of prevention-focused intervention efforts. The present study examined specific pathways of influence between symptoms of depression, positive symptoms of psychosis (i.e., hallucinations and delusions), and suicidal ideation among a population of adults involved in the NIMH CATIE study. Findings indicated that symptoms of depression and positive symptoms of psychosis (i.e., hallucinations and delusions) independently predicted suicidal ideation, supporting the hypothesis that hallucinations, delusions, and symptoms of depression would independently predict suicidal ideation within the CATIE sample. As anticipated, findings demonstrated that as positive symptoms of psychosis (hallucination and delusions) and symptoms of depression increase, on average there is an associated increase in suicidal ideation.

White it has been consistently demonstrated in the literature to date that symptoms of depression predict suicidal ideation, the present study provides support for the relationship between positive symptoms of psychosis, specifically hallucinations and delusions, and suicidal ideation. These findings point towards the implication that positive symptoms of

psychosis (i.e., hallucinations and delusions) play a significant role in suicidal ideation and the subsequent risk for engaging in suicidal behaviors beyond that of depression and cannot be ignored. Thus, is important that positive symptoms of psychosis are targeted and addressed in treatment in addition to symptoms of psychosis among this specific population.

It is also important to consider the role of illness awareness in suicide risk in regards to antipsychotic medications. Research demonstrates that increased illness awareness in schizophrenia relates to greater risk for engagement in suicidal behaviors (Pompili et al., 2004; Spiebl, Hübner-Liebermann, & Cording, 2002). Atypical antipsychotics have been shown to improve cognitive functioning, which may subsequently reduce symptoms of depression, such as hopelessness (Pompili et al., 2004). Hopelessness has been identified as a potential mechanism in the relationship between awareness and suicide, with greater awareness of illness and greater fears of deterioration potentially leading to feelings that the future is negative and life is not worth living (Spiebl et al., 2002). While antipsychotic medications have the potential to yield improvements in depressive symptoms, there is also the potential for sudden increases in illness awareness by more than 25% to heighten risk for suicide. As a result, it is recommended for individuals taking atypical antipsychotics to be followed closely by a treating physician in conjunction with a psychotherapist to identify and manage any sudden increases in illness awareness (Pompili et al., 2004; Turkington, Kingdon, & Turner, 2002). Future research should continue to examine and clarify the relationships between antipsychotic use, illness awareness, symptoms of depression, and suicide among adults diagnosed with schizophrenia.

The present study's findings must be considered in regard to several potential limitations: measurement constraints, use of an RCT to examine suicidal ideation, and attrition. First, since the CATIE study was not conducted to address the aims of the present study, there are some constraints in the dataset pertaining to measurement that would otherwise be modified in a primary data study. Specifically, there was no data for suicide attempt history beyond 6 months prior to baseline assessment and modifications had to be made to the Calgary Depression Scale (CDRS) as a result of the post-baseline suicidal ideation item needed within the scale to measure the outcome. Fortunately, reliability analyses indicated minimal change from this removal (original alpha = .826 and revised scale alpha = .817) and confirmatory factor analysis indicated all items were functioning well together.

Second, it has been suggested that antipsychotic effectiveness trials among individuals diagnosed with schizophrenia are less likely to recruit individuals reporting suicidal ideation and/or plans for attempt (Gilbody, Wahlbeck, & Adams, 2002). This is likely due to the fact that some studies may exclude individuals at risk for suicide and/or individuals at risk for suicide may be less interested in participating in a drug study. As a result, it is important to consider this limitation may impact external validity and the ability to generalize findings to all adults diagnosed with schizophrenia in the United States. The researchers who designed the CATIE methodology used wide inclusion criteria and minimal exclusion criteria in comparison to many other drug trials with the aim to recruit and enroll a sample of participants that were diverse in many areas, including suicidal ideation (Stroup et al., 2003).

Lastly, it is important to note that about 50% of participants in the CATIE withdrew before the completion of all 18 months of assessment. As a result, suicidal ideation was examined as a function of month discontinued to find no noteworthy trends and adjustments for completion status did not affect the associations between suicidal ideation, positive symptoms of psychosis, and depression. Further, it has been demonstrated that withdraw before study completion was similar between treatment conditions within the CATIE study (Rosenheck & Leslie, 2010).

In sum, suicide among adults diagnosed with schizophrenia is a major public health problem in the United States. It is important to further understand the factors involved in suicide risk as a step towards developing theoretically driven and empirically supported prevention-focused interventions tailored to this vulnerable population. The findings of the current study support the recommendation for clinicians to evaluate for and treat both symptoms of depression and positive symptoms of psychosis as they both associate with suicidal ideation independently and over and above one another. Future research including prospective longitudinal study designs are needed to further increase understandings of the roles that hallucinations, delusions, and additional symptoms of schizophrenia play in both suicidal ideation and attempt to ultimately inform evidence-based interventions aiming to reduce suicidal death.

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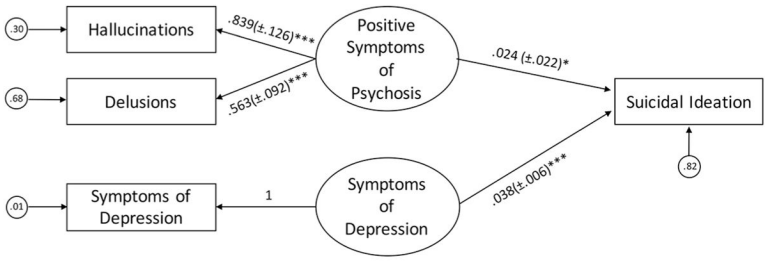

FIGURE 1.

Unstandardized parameter estimates for the structural model and standardized parameter estimates for the measurement model, with margins of error in parentheses.

TABLE 1

Demographic Characteristics of the CATIE Sample at Baseline

	n	%
Age (M)	1460	40.55
Gender		
Male	1080	74
Female	380	26
Race		
Black	513	35.1
White	874	59.9
American Indian or Alaska native	8	0.5
Asian	33	2.3
Two or more races	26	1.8
Ethnicity		
Hispanic	170	11.6
Not Hispanic	1290	88.4
Marital status		
Married	167	11.4
Not Married	1293	88.6
Education		
Completed HS	1086	74.4
Did not complete HS	374	25.6
Employment		
Full time	97	6.6
Not full time	1338	91.6
Public insurance status		
Have	745	51.0
Don’t have	690	47.3

TABLE 2

Clinical Characteristics of the CATIE Sample

	n	%
Symptoms of depression[1] (M ±SD)	1449	3.77 ± 3.59
Positive symptoms[1]		
Hallucinations (M ±SD)	1448	3.18 ± 1.56
Delusions (M ±SD)	1448	3.33 ± 1.45
Suicidal ideation[2]		
Yes	405	27.7
No	1055	72.3
Count of suicidal ideation[2]		
0	1017	69.7
1	254	17.4
2	96	6.6
3	41	2.8
4	18	1.2
5	18	1.2
6	3	0.2
7	2	0.1
8	1	0.1
History of suicide attempt[3]		
Yes	19	1.3
No	582	39.9
Treatment randomization[1]		
Olanzapine	270	18.5
Perphenazine	261	17.9
Quetiapine	270	18.5
Risperidone	275	18.8
Ziprasidone	153	10.5

Note. SD = standard deviation.

[1] At baseline.

[2] Post-baseline.

[3] Suicide attempt made in the 6 months prior to randomization at baseline.