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# Social Support Networks and Symptom Severity Among Patients with Co-occurring Mental Health and Substance Use Disorders

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# Social Support Networks and Symptom Severity among Patients with Co-Occurring Mental Health and Substance Use Disorders

--Manuscript Draft--

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| **Abstract:** | Patients entering an inpatient psychiatry program (N=406) with co-occurring mental health and substance use disorders reported on their social support networks (source, type) at treatment intake, and completed symptom measures at baseline and 3-, 9-, and 15-month follow-ups (77%). Longitudinal growth models found aspects of participants' support networks were associated with specific symptoms over time. Less family support (i.e., more conflict) was the most consistent predictor of mental health and substance use outcomes and was associated with greater psychiatric, depression, Post Traumatic Stress Disorder (PTSD), and drug use severity. More peer support (via mutual-help involvement) was associated with greater initial improvement in alcohol use severity. Findings suggest that to facilitate the benefits of social support for patients with a dual diagnosis returning to the community, specific components of support should be assessed and considered in the treatment plan, rather than viewing support as a general and undifferentiated factor affecting recovery. |
| **Response to Reviewers:** | RESPONSE TO REVIEWERS<br>COMH-D-18-00014.R1 |

Social Support Networks and Symptom Severity among Patients with Co-Occurring Mental Health and Substance Use Disorders

We thank the editor and reviewer for their feedback and the opportunity to revise our manuscript. Below is a description of the ways in which we responded to the issues raised by the reviewer. Recommendations improved the manuscript and we hope that this version of the manuscript is ready for publication in Community Mental Health Journal.

REVIEWER 1

1. The manuscript (in particular the lit review and discussion) could benefit from a comprehensive review of sentence structure, spelling/typos, and grammar. These issues make some sections of the manuscript challenging to read.

Response: We thank Reviewer 1 for this feedback. We carefully reviewed the entire manuscript and corrected all issues pertaining to sentence structure, spelling/typos, and grammar.

2. Please use person first language throughout the manuscript. In the abstract the authors use the term “psychiatry inpatients” but when describing the sample the authors state “patients entering an inpatient psychiatry program”. The latter is preferred as to not put the diagnosis/hospital stay type before the person.

Response: We appreciate the Reviewer's attention to detail and have ensured the use of person first language throughout the manuscript.

3. Please provide more information about the psychiatry programs from which the sample was drawn. Was the sample representative of the target population? Were their geographic limitations that may have impacted the generalizability of the findings?

Response:  We now provide more information about the psychiatry programs (see “Sample and procedure” section, pp. 3 & 4). We also comment on the sample representativeness and generalizability of the findings in the limitations section.

4. Were patients assigned to the control/intervention groups prior to agreeing to participate in the study?

Response: No, patients were assigned to condition after being consented and completing the baseline assessment; this is a standardized method.

5. What was the method of randomization? Why was this method chosen? Did the study use blinding? If not, how may this have influenced your findings?

Response: The method of randomization was permuted blocking whereby ID numbers, to be given sequentially to participants, were randomly preselected within different sized blocks to be assigned to each condition. This method was chosen to ensure equally sized groups. Research Assistants conducting follow-ups were blinded to participants’ condition assignment so as not to bias findings.

6. Please provide a detailed description of the intervention. Were efforts to increase social support a component of the intervention? It is difficult to interpret the findings when it is unknown if the intervention activities may be confounding study findings.

Response: We have added a description of the intervention (see “Sample and procedure” section, pp. 3 & 4), which was designed to facilitate post-discharge treatment, not social support.

7. How was fidelity to the intervention assessed?

Response: Fidelity was assessed using a protocol checklist during regular supervision that included review of session content and feedback on adherence to the manual.

8. Were their confounders associated with the intervention that may have impacted the

outcome variable? If yes, how were these confounders controlled for in the analysis?

Response: Yes, we considered potential confounders, i.e., controlled for the covariates of age, gender, race, and treatment condition. This information is included in the Analysis Plan section (p. 5).

9. Were there significant differences in mental health / substance use diagnosis between persons responding to the follow up and those who attritted?

Response: No, there were no differences in mental health or substance use diagnoses between persons responding to the follow-up and those who attritted. To note this, we added language to the “Sample and procedure” section (p. 4).

10. Please be specific in your descriptives in relation to drug use disorder. Substance type may have an impact on support availability and support seeking for both abstinence specific social support and familial social support. Further, it is important to note because some substance use disorders are associated with higher rates of stigma which may also influence access to either type of social support.

Response: We now include that drug use disorders were mainly opioids, cocaine, amphetamines, and cannabis (see “Sample and procedure” section, p. 4). In terms of substance type, this study sought generalizability to “real world” inpatient psychiatry settings in which patients have multiple disorders and problems and complex clinical profiles, such that each patient’s combination of mental health and substance use disorders and problems is unique; it would be difficult in this treatment setting to have interventions tailored to each configuration of patient problems. Even in the absence of a drug use disorder, patients may have been using these substances. However, we agree that examination of social support networks among people with different substance use profiles in the context of perceived stigma is an important area for future research.

11. The description of the mutual self-involvement measure is unclear. Please clarify. Is this a normed measure that has been used for this purpose before? I reviewed the cited Timko article and the measure looks like it is based on the AA Inventory and AA Affiliation Scale. That article also lists a Cronbach’s alpha for the scale. Please list the alpha for your study.

Response: We now state that the measure is based on the AA Inventory and AA Affiliation Scale; we also provide Cronbach’s alpha for the measure (pp. 4 & 5).

12. Please also provide the alpha for the ASI.

Response: Because of the way items are constructed and standardized, it is not common practice to calculate and report the alpha for ASI composites. We followed this practice and therefore do not report an alpha.

13. Please provide validity information for all scales where available.

Response: We have added references for publications that provide validity information for each scale missing that information.

14. Please discuss the implications of using a three item measure for social support in your limitations section.

Response: We added language to the paragraph on limitations acknowledging the use of a 3-item measure and the subsequent effect on reliability.

15. Please spell out PHQ-9/PCL and other acronyms at first use.

Response: All acronyms are now spelled out at first use.

16. Please clarify that your outcome measures relate to symptom severity.

Response: As noted, we now supply references for each outcome measure to support

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| | the measure's validity; that is, that the outcome measures capture symptom severity in the relevant domain.<br><br>17. Please provide more information about your data/models. Was centering used? Did you examine assumptions? Were the data complete? Was there any missingness and if so, how was it addressed?<br><br>Response: Centering was not used in our analysis due to our substantive interest in understanding the difference between 0 and a 1-unit change in the predictor variables, which are already set at true 0. We examined assumptions by maintaining consistency in outcome variables across time, considering both within and between person effects, and confirming that distribution in outcome variables met model assumptions, and we looked at random effects to confirm significance. Based on the use of longitudinal growth modeling, missingness in the outcome variable is acceptable. Missingness may reduce power to find significant differences, when there is a true difference. There was no missingness in the predictor variables.<br><br>18. Please add fit statistics and degrees of freedom to your table for each of the models.<br><br>Response: We now include fit statistics and degrees of freedom in Table 2 for each of the models.<br><br>19. Why were only two figures included instead of growth curves for all five predictor variables?<br><br>Response: There were only two main patterns in the data. Therefore, for parsimony, we only included two models that exemplify these patterns. |

Title Page with ALL Author Contact Information



# Social Support Networks and Symptom Severity among Patients with Co-Occurring Mental Health and Substance Use Disorders

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## Abstract

Patients entering an inpatient psychiatry program (N=406) with co-occurring mental health and substance use disorders reported on their social support networks (source, type) at treatment intake, and completed symptom measures at baseline and 3-, 9-, and 15-month follow-ups (77%). Longitudinal growth models found aspects of participants' support networks were associated with specific symptoms over time. Less family support (i.e., more conflict) was the most consistent predictor of mental health and substance use outcomes and was associated with greater psychiatric, depression, Post Traumatic Stress Disorder (PTSD), and drug use severity. More peer support (via mutual-help involvement) was associated with greater initial improvement in alcohol use severity. Findings suggest that to facilitate the benefits of social support for patients with a dual diagnosis returning to the community, specific components of support should be assessed and considered in the treatment plan, rather than viewing support as a general and undifferentiated factor affecting recovery.


Keywords: *co-occurring disorders, social support networks, symptom severity, recovery*

# Social Support Networks and Symptom Severity among Patients with Co-Occurring Mental Health and Substance Use Disorders

## Introduction

It is common for individuals with a mental health condition to also struggle with substance use, referred to as co-occurring disorders or as dually diagnosed. Approximately 8.4 million adults in the US have co-occurring mental health and substance use disorders (SAMHSA, 2014). In the clinical setting, estimates and severity of co-occurring conditions are even higher than in the general population; for example, 36%-40% of young adults in treatment for substance use or mental health conditions meet dual diagnosis criteria (Moss, Chen, & Yi, 2012; Sheidow, McCart, Zajac, & Davis, 2012). Common mental health conditions co-occurring with alcohol and drug use include depression and Post-Traumatic Stress Disorder (PTSD) (Horsfall, Cleary, Hunt, & Walter, 2004). Individuals with co-occurring disorders have greater self-management and treatment needs and are at greater risk of negative outcomes such as repeated hospitalizations when compared to individuals with only substance use or mental health conditions (Priester et al., 2016; Todd et al., 2004). Social support outside of the treatment program is an important, yet often overlooked, treatment target for people with co-occurring disorders, and knowing more about associations between social support networks and outcomes over time will help with designing clinical interventions to potentially strengthen those social support networks.

The social support network is an important component to consider in the treatment of co-occurring disorders (Drake et al., 2015), and may be broken down into dimensions based on source, such as peers or family, and type, such as general support or specific support for abstinence (Groh, Jason, Davis, Olson, & Ferrari, 2007). Regarding source, for many individuals with co-occurring disorders, peers in mutual-help groups in the community are the prevailing resource for support beyond ongoing treatment (Donovan et al., 2008; Moos, Schaefer, Andrassy, & Moos, 2001; Timko & Sempel, 2004). Research has found that 12-step group involvement, whether substance-focused (e.g., Alcoholics Anonymous) or dual-focused (e.g., Double Trouble in Recovery), is beneficial in reducing both mental health and substance use symptom severity among individuals with a dual diagnosis (Bogenschutz, Rice, Tonigan, Vogel, Nowinski, Hume, & Arenella, 2014; Timko, Cronkite, McKellar, Zemore, & Moos, 2013).

Another potential source for support is the family (Drake et al., 2016; Mueser & Gingerich, 2013). However, co-occurring disorders in a family member frequently create substantial stress for relatives, who often play a critical role in helping patients meet basic needs. When the coping capacity of families is overwhelmed due to

high levels of stress and tension with the patient, they may withdraw their support (Meuser & Gingerich, 2013). Indeed, weak family support increases the adverse impact of substance use on mental health services utilization by patients with co-occurring schizophrenia (Fischer et al., 2008). In addition, family ties may contribute to disorder severity through conflict and abusive interactions as well as recollection of past trauma (Hawkins & Abrams, 2007; Savage & Russell, 2005).

Both general social support, and abstinence-specific support, indicated by regular contact with non-substance users for example, were seen as recovery benchmarks by patients with co-occurring disorders and their treatment providers (Drake et al., 2016). Among individuals in addiction treatment, more general social support from friends predicted less alcohol use at 4-month follow-up (Groh et al., 2007), and more abstinence-specific support predicted less cocaine use at 3-month follow-up (Wasserman et al., 2001). Other research showed that individuals with co-occurring disorders who successfully reduced substance use had increased the amount of time they spent with people who supported their abstinence (Mueser & Gingerich, 2013).

To our knowledge, no study has directly examined associations between specific sources and types of support networks in relation to specific mental health and substance use symptoms over time among patients in an inpatient psychiatry program with co-occurring disorders, who often have particularly impaired social resources and are at clear elevated risk for negative outcomes. To examine how social support networks relate to symptom severity, we analyzed data from patients in an inpatient psychiatry program with co-occurring mental health and substance use disorders at treatment intake and follow-ups that occurred up to 15 months post-discharge. Sources of support examined were mutual-help group peers and the family, and types of support were general and abstinence-specific. Knowing how different aspects of social support networks affect symptomatology in the immediate and longer-term in this population is potentially informative to under-utilized but important components of treatment planning to bolster patients' support to improve outcomes after they return to the community.

## Method

**Sample and procedure.** The sample was 406 patients in inpatient psychiatry. Participants were enrolled in a randomized trial of an intervention intended to facilitate treatment post-discharge (i.e., enhanced versus usual telephone monitoring). The inpatient psychiatry treatment program used a biopsychosocial approach to stabilize patients. Treatment consisted of comprehensive assessment soon after admission, psychopharmacology, and individual and group psychotherapy and behavioral management. The intervention consisted of one in-person

session during hospitalization followed by monitoring over the telephone, which was planned for one phone call per week for three months. Patients were screened in consecutive order by their case manager for eligibility, i.e., having mental health and substance use disorders documented in the medical record, sufficient cognitive functioning to understand study procedures, and access to a telephone when not hospitalized for post-discharge contact. After being introduced to the study, participants signed an informed consent form. Stanford University and the Veterans Affairs Ann Arbor Health Care System Institutional Review Boards approved all study procedures; all authors certify responsibility.

Participants completed baseline and follow-up interviews. At the 3-month follow-up, 10 participants had died or were incarcerated or incapacitated; of the remaining 396, the follow-up rate was 84%. At the 9-month follow-up, 21 participants had died or were incarcerated or incapacitated; of the remaining 385, 76% were followed. At the 15-month follow-up, 20 participants had died or were incarcerated or incapacitated; of the remaining 386, 77% were followed. Baseline comparisons on demographic characteristics of patients followed or not followed at 3, 9, and 15 months post-baseline found that participants responding to the follow-up were older than those lost to follow-up (3 months: M=45.6 (SD=12.4) vs. M=41.9 (SD=14.4), t=2.22, p=.027; 9 months: 46.0 (12.3) vs. 42.1 (13.7), t=2.84, p=.005; 15 months: 46.1 (12.4) vs. 41.4 (13.6), t=3.33, p=.001). There were no differences on gender, race, or clinical diagnoses. At baseline, participants were mainly male (90.0%) and white (63.1%); the overall mean age was 44.9 (SD=12.9). Participants' psychiatric diagnoses were mainly depression (78.1%), PTSD (41.3%) or other anxiety disorder (63.4%), schizophrenia or schizoaffective disorder (29.1%), and bipolar disorder (16.9%). A total of 67% had alcohol use disorders and 53% had drug use disorders (mainly opioids, cocaine, amphetamines, and cannabis). Percentages of psychiatric and substance use disorders add to more than 100% because some participants had more than one of each type of disorder.

**Measures**

Social support measures at baseline were mutual-help group involvement, family conflict, general social support, and abstinence-specific support. Adapted from similar measures (Humphreys, Kaskutas, & Weisner, 1998; Tonigan, Connors, & Miller, 1996), mutual-help involvement was the count, out of 14, of 12-step practices the patient had used in the past year (e.g., called a 12-step group member for help; see Timko, Sutkowi, Makin-Byrd, & Moos, 2011); higher scores indicate more support from mutual-help group peers (at baseline, M=4.1, SD=4.3; alpha=.87). Family conflict was the Addiction Severity Index's (ASI) composite capturing the patient's conflicts and

serious problems with family members, and being troubled by these problems over the past month (McLellan, Cacciola, Alterman, Rikoon, & Carise, 2006; Thylstrup, Bloomfield, & Hesse, 2018). Scores range from 0-1 such that lower scores indicate less family conflict and more family support (M=.34, SD=.22). General social support was a subscale of the Basic Need Satisfaction Scale (Gagne, 2003). Patients indicated the extent to which three statements (e.g., I consider the people I regularly interact with to be my friends) "are true for you" on a 1 (strongly disagree) to 5 (strongly agree) scale, and responses were averaged. Higher scores indicate more general social support (M=3.8, SD=.8; alpha=.70). Abstinence-specific support was assessed with the sum of 10 items (e.g., helped you handle a bad situation without using alcohol or drugs) from the Social Influences on Abstinence and Drug Use measure (Wasserman et al., 2001) on which patients rated how often they had received each supportive behavior (1=not at all, 5=very often) from people they spent time with over the past 30 days. Higher scores indicate more encouragement and support to maintain abstinence from substance use (M=21.9, SD=9.7; alpha=.93).

Outcome measures assessed at baseline and follow-ups were general psychiatric, depression, PTSD, alcohol use, and drug use severity. Psychiatric severity (at baseline, M=.52, SD=.24), alcohol use severity (at baseline, M=.21, SD=.27), and drug use severity (at baseline, M=.58, SD=.09) were each measured with the corresponding ASI composite, with scores ranging from 0 to 1, and 1 indicating greater severity in the past 30 days. Depression severity was assessed with the Patient Health Questionnaire-9 (PHQ-9; (Kroenke, Spitzer, & Williams, 2001), which sums nine items (0=not at all, 3=nearly every day) with regard to the past two weeks; at baseline, M=12.7, SD=7.4; alpha=.89. PTSD severity was assessed with the Post Traumatic Stress Disorder Checklist (PCL; Blevins, Weathers, Davis, Witte, & Domino, 2015), which sums responses regarding 17 symptoms in the past month (1=not at all, 5=extremely; M=48.3, SD=19.4; alpha=.95). Higher PHQ-9 and PCL scores indicate more severe depression and PTSD symptoms, respectively.

**Analysis Plan**

First, we used Pearson bivariate correlations to examine associations between social support networks and mental health and substance use severity at baseline. Next, we conducted a series of five longitudinal growth models that tested associations between social support network source and type and the longitudinal course of symptom severity. Participants' longitudinal course at baseline and 3-, 9-, and 15-month follow-ups was modeled separately for each of five outcomes: Psychiatric Severity (Model 1), Depression Severity (Model 2), PTSD Severity (Model 3), Alcohol Use Severity (Model 4), and Drug Use Severity (Model 5).

Initially, we constructed base unconditional growth models whereby each participant was nested within him or herself over time, and confirmed that (a) significant variation existed between patients to predict differences associated with social support network characteristics, and (b) a curvilinear growth model was appropriate for all five models. The curvilinear model was achieved by entering a variable for time and another variable for the quadratic of time. We assumed that residual errors would be correlated within participants and when more proximal in time (i.e., not random); therefore we applied an autoregressive covariance structure to correct level 1 standard errors for these assumptions. Curvilinear models with this covariance structure led to superior model fit statistics in all models.

We then adjusted our base models by entering all predictor variables (i.e., all four sources or types of social support networks measured at baseline), demographic characteristics (i.e., gender, age, race), and treatment condition to which patients were assigned in the randomized trial. Treatment condition was not significant and removed from the models. For each source or type of social support network that significantly predicted a difference in an outcome variable at baseline, we tested whether that predictor also significantly predicted the trajectory of change in an outcome variable, or the amount that trajectory curved, over time. This was done by testing interactions between social support network predictors and two variables for time (i.e., linear and quadratic). Associations were considered significant at the $p<.05$ level. Analyses were conducted using IBM SPSS version 21.0.

**Results**

Pearson bivariate correlations among social network and severity outcome measures at baseline were in the expected directions and generally moderate in size (see Table 1). However, as would be expected, Psychiatric, Depression, and PTSD severity were more highly, and positively, correlated.

A series of five longitudinal growth models tested associations between the sources and types of social support and the longitudinal course of each of the five mental health and substance use severity outcomes. Base unconditional growth models revealed that the average trajectory on all severity outcomes followed a similar pattern. That is, the significant and negative coefficients associated with Time (per month) in Table 2 indicate that mental health and substance use severity decreased initially after baseline on all outcomes. The amount that mental health and substance use severity decreased became less pronounced (i.e., “curved”) as more time passed after baseline. Severity reached its lowest levels on all outcomes at 9-month follow up, and, on average, severity began to increase again on all outcomes from the 9-month to the 15-month follow up. This curve in how severity changed

over time is indicated by the significant, positive coefficients for $Time^2$ in all growth models (Table 2). We also tested for interactions among each social support network source and type with time in each model. Only mutual-help involvement and family conflict demonstrated a significant interaction with time, as reflected in Table 2.

**Psychiatric severity.** As seen in Table 2, older age was associated with less psychiatric symptom severity. Adjusting for demographics, higher family conflict was associated with more psychiatric severity across baseline and follow-ups (Table 2). However, no source or type of social support, including family conflict, predicted a difference in the amount of initial decrease in psychiatric severity a participant experienced from baseline to 9 months, nor the amount of curve leading to an increase in severity from the 9-month to the 15-month follow-up. In other words, while all participants experienced an initial decrease in psychiatric severity followed by a subsequent increase, higher family conflict, but no other social support variable, predicted a consistently higher level of psychiatric severity across follow-ups. Mutual-help involvement, general support, and abstinence support were not associated with baseline or longitudinal psychiatric severity.

**Depression severity.** Women were more depressed than men (Table 2). Adjusting for demographics, higher family conflict was associated with more severe depression symptoms across baseline and follow-ups, whereas higher general support was associated with less severe depression across assessments (Table 2). No source or type of social support predicted a difference in the amount of initial decrease in depression symptoms a participant experienced from baseline to 9 months, nor the amount of curve leading to an increase in symptom severity from the 9-month to the 15-month follow-up. Mutual-help involvement and abstinence support were not significantly associated with baseline or longitudinal depression severity.

**PTSD severity.** Women and older patients had less PTSD symptom severity. Adjusting for demographics, higher family conflict and abstinence-specific support were associated with more severe PTSD symptoms at baseline, whereas higher general support was associated with less severe PTSD symptoms at baseline (Table 2). No source or type of social support predicted a difference in the amount of initial decrease in PTSD symptoms a participant experienced from baseline to 9 months, nor the amount of curve leading to an increase in symptom severity from the 9-month to the 15-month follow-up. Mutual-help involvement was not significantly associated with baseline or longitudinal PTSD severity.

**Alcohol use severity.** Older age was associated with greater alcohol use severity. In addition, after adjusting for demographics, higher mutual-help group involvement at baseline was associated with more severe

alcohol use at baseline. However, after a more substantial decrease in alcohol use severity from baseline to 9 months, higher mutual-help group involvement was also associated with less of an increase in alcohol use severity during the 9-month to 15-month follow-up, when compared to patients without mutual-help group involvement at baseline (Table 2; see Figure 1). Family conflict, general support, and abstinence support were not significantly associated with baseline levels or longitudinal differences in change on alcohol use severity.

**Drug Use Severity.** Participants who were male, younger, and not white had more severe drug use (Table 2). Adjusting for demographics, higher family conflict and abstinence support were associated with more drug use severity at baseline, whereas higher general support was associated with lower drug use severity at baseline (Table 2). Of these three aspects of social support, only family conflict was also significantly associated with a different trajectory of change in drug use severity over time (Table 2, Interactions). Specifically, higher levels of family conflict at baseline were associated with a larger decrease in drug use severity from baseline to 9-month follow up, and, subsequently, slightly less of an increase in severity from the 9-month to the 15-month follow-up (Figure 2). Mutual-help involvement was not a significant predictor of baseline or longitudinal drug use severity.

## Discussion

The findings indicate that among patients in inpatient psychiatry with co-occurring mental health and substance use disorders, certain social support network sources and types are associated with mental health and substance use symptom severity over time, from treatment intake to 15 months later. Results indicate that the amount of initial decrease, and subsequent increase, in alcohol use severity was associated with social support from mutual-help groups. In addition, the fluctuation over time in drug use severity was associated with more conflict with family members. These findings present both expected and unexpected associations of social support network sources and types with mental health and substance use severity.

Family conflict was the most consistent predictor of mental health and substance use outcomes. Specifically, more family conflict was associated with greater psychiatric, depression, PTSD, and drug use severity, but not alcohol use severity, at treatment intake and across follow-ups. Families of individuals with a co-occurring disorder often experience heightened levels of conflict, volatility in roles and functions, and poor communication (Hawkins & Abrams, 2007; Straussner & Fewell, 2011). Such an environment may fail to effectively or consistently provide support for individuals in treatment for co-occurring disorders or after they are discharged to community settings. There may also be a bi-directional effect occurring with family interaction in which the co-occurring

disorder contributes to a potentially adverse environment and the adverse environment exacerbates the co-occurring disorder. As such, it is important during treatment to examine relationship history to determine the extent of family conflict and what impact that has on the individual with the co-occurring condition. Furthermore, effective in-treatment experiences may be reversed if the patient resumes living among and interacting with a negative social support network (Gil-Rivas, Prause, & Grella, 2009). Post-discharge, practitioners may continue monitoring the patient's family communication climate in order to minimize negative interactions and promote connections that reinforce positive relational experiences.

In contrast to other findings for family conflict, higher levels of family conflict at treatment intake were associated with a larger decrease in drug use severity from baseline to the 9-month follow up, and subsequently, slightly less of an increase in severity from the 9-month to the 15-month follow-up. One possible reason for this positive association between more family conflict and a sharper decrease in drug use severity is that the conflict is directed at the patient's drug use. Conflict is not necessarily negative if it is approached constructively (Gross & Guerrero, 2000). Possibly, as family members address drug use, they in turn convey concern and care for the patient. Therefore, family members of individuals with co-occurring mental health and drug use disorders should be taught how to express their concerns about drug use constructively rather than confrontationally or avoiding the topic altogether.

General social support was associated with less depression, PTSD, and drug use severity at intake to treatment and across follow-ups. The measure of general support considers the sense of connection and membership an individual has towards a group (Van den Broeck, Vansteenkiste, De Witte, Soenens, & Lens, 2010). Our findings for general support suggest that perceptions of belongingness help to mitigate mental health and drug use severity among patients with co-occurring disorders, from the time of a hospitalization through reintroduction to the community. Therefore, treatment plans that incorporate strategies to enhance community connections, such as early introductions to community partners, shared living environments, and peer counseling programs may demonstrate significant benefits in reducing symptom severity for individuals with a co-occurring mental health and substance use disorder.

Unexpectedly, we found that more abstinence support was associated with greater PTSD and drug use severity at treatment intake and across follow-ups. One possible reason for this finding is that drug use, especially marijuana use, may be the primary mechanism for coping with PTSD (Grant, Pedersen, & Neighbors, 2016) such

that without substance use, PTSD experiences might become more unmanageable. As a result, abstinence support may be seen as unnecessary or inconvenient. Practitioners may want to help people supporting PTSD patients with co-occurring substance use disorders refrain from advising abstinence in a manner perceived as pressure to eliminate a main coping resource.

Finally, the present study found that mutual-help group involvement was associated with alcohol use severity over time. On one hand, more mutual-help group involvement was associated with more severe alcohol use over time. This implies that those most in need of alcohol-related help were utilizing this support resource. However, we also found that more mutual-help involvement was associated with increases in alcohol-severity improvement, and decreases in alcohol-severity worsening, which presents additional confirmation for the benefits of community 12-step group participation for patients with co-occurring disorders (Timko et al., 2013). Though participation in mutual-help groups did not predict improved mental health outcomes, there may be an associated benefit given that alcohol use can exacerbate mental health severity such as depressive symptoms (Conner, Sorensen, & Leonard, 2005; Dennhardt & Murphy, 2011). In other words, by addressing alcohol use behaviors individuals may also be improving mental health symptom severity. Because our findings suggest that mutual-help group involvement is the sole social support source associated with alcohol use over time, practitioners should consider recommending mutual-help group involvement among patients with co-occurring conditions (Donovan & Floyd, 2008; Timko, Sutkowi, Cronkite, Makin-Byrd, & Moos, 2011).

There are several limitations of this study. Despite the use of longitudinal growth modeling, we are unable to claim causation between social support networks and severity outcomes. Model fit was acceptable across all models, but model fit improved in only two of the 5 models. We maintained these models because of the theoretical assumptions between support source and type and symptom severity. In addition, our findings rely on self-report data. Data collection from additional sources, such as treatment providers, family members, and peers would help to address this limitation. Patients were mainly male and all were initially treated in one health care system, the Veterans Health Administration, before being discharged to the community; thus, findings need replication with other groups of individuals experiencing co-occurring disorders. Military involvement and gender may impact social support network ties as well as type and severity of co-occurring disorders. We also recognize the potential limitations in reliability and validity when using a 3-item measure for general social support. However, given the specificity of the construct being measured and the threshold of 3-items for efficiently measuring reliability (Hair et

al., 2010), the measure was deemed acceptable. Finally, although the methods were intended to ensure the representativeness of the sample for the target population (e.g., patients were screened for eligibility in consecutive order), our reliance on a sample in two geographic locations rather than a nationally representative sample may limit generalizability of the findings.

**Conclusions**

Our study suggests that each of the four sources and types of social support networks is associated with mental health and substance use symptom severity among individuals with co-occurring disorders in the immediate period of hospitalization and the longer-term community setting. Findings inform important components of treatment planning that aim to bolster patients' social support networks and, in turn, improve outcomes. The results shed light on the importance of considering not only symptomatology, but also the psychosocial context of these complex patients. That is, practitioners should consider the existing support networks of the patient, how the existing supports may be helping or harming symptoms, and enhance patient skills and strategies for managing family, peer, and other social relationships when patients are living in the community. Exercises in communication competence, emotional intelligence, and resilience may further help patients to better navigate their relational environments.

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Table 1

*Bivariate Correlations of Observed Measures at Baseline*

| | V1 | V2 | V3 | V4 | V5 | V6 | V7 | V8 | V9 |
|---|---|---|---|---|---|---|---|---|---|
| V1: Mutual-help Involvement | -- | | | | | | | | |
| V2: Family Conflict | .10*** | -- | | | | | | | |
| V3: General Support | .02 | .04 | -- | | | | | | |
| V4: Abstinence Support | .32*** | .04 | .18*** | -- | | | | | |
| V5: Alcohol Use Severity | .10*** | -.02 | -.03 | .04 | -- | | | | |
| V6: Drug Use Severity | .05 | .12*** | -.04 | .08** | .19*** | -- | | | |
| V7: Psychiatric Severity | -.02 | .10*** | -.06* | -.02 | .24*** | .28*** | -- | | |
| V8: Depression Severity | .04 | .11*** | -.12*** | .00 | .30*** | .30*** | .67*** | -- | |
| V9: PTSD Severity | .04 | .14*** | -.05 | .07* | .22*** | .19*** | .58*** | .68*** | -- |

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2

*Unstandardized Regression Coefficients from Five Longitudinal Growth Models Predicting each of Five Severity Outcomes*

| | Psychiatric | (df) | Depression | (df) | PTSD | (df) | Alcohol Use | (df) | Drug Use | (df) |
|---|---|---|---|---|---|---|---|---|---|---|
| Unconditional | | | | | | | | | | |
| Intercept | .64*** | | 15.78*** | | 53.70*** | | .33*** | | .10*** | |
| Time (per month) | -.04*** | | -1.13*** | | -1.99*** | | -.04*** | | -.02*** | |
| Time$^2$ | .00*** | | .05*** | | .09*** | | .00*** | | .00*** | |
| Fit Statistics (BIC)* | -332.08 | | 8397.34 | | 9839.46 | | -70.35 | | -2640.72 | |
| Conditional | | | | | | | | | | |
| Intercept | .76*** | 486.13 | 21.73*** | 464.35 | 64.78*** | 417.78 | .25*** | 434.21 | .11*** | 402.15 |
| Time (per month) | -.04*** | 1007.90 | -1.16*** | 957.97 | -1.99*** | 792.87 | -.04*** | 1012.39 | -.01*** | 1040.57 |
| Time$^2$ | .00*** | 884.48 | .05*** | 837.75 | .09*** | 699.96 | .00*** | 832.45 | .00*** | 792.42 |
| Fit Statistics (BIC)* | -272.77 | | 8126.86 | | 9510.81 | | 46.32 | | -2420.02 | |
| Demographics | | | | | | | | | | |
| Gender | -.05 | 439.10 | -2.38** | 421.72 | -3.67 | 389.00 | -.00 | 385.68 | .03* | 347.64 |
| Age | -.00* | 481.32 | -.02 | 462.19 | -.18** | 417.64 | .00* | 424.56 | -.00*** | 384.30 |
| Race | .03 | 462.97 | -.07 | 444.30 | 1.55 | 406.02 | .02 | 406.99 | .02* | 367.64 |
| Social Support Source and Type | | | | | | | | | | |
| Mutual-Help Involvement | -.00 | 463.66 | .06 | 444.45 | .13 | 406.41 | .01*** | 654.20 | .00 | 368.82 |
| Family Conflict | .10** | 469.11 | 3.51** | 450.66 | 10.10** | 406.97 | -.03 | 412.96 | .08*** | 636.58 |
| General Support | -.09 | 472.12 | -1.24*** | 450.74 | -2.23* | 416.51 | -.01 | 415.66 | -.01* | 376.06 |
| Abstinence Support | .00 | 467.48 | .024 | 444.87 | .19* | 401.61 | .00 | 411.95 | .00* | 372.76 |
| Interactions of Support with Time | | | | | | | | | | |
| Mutual-Help x Time | .93 | 1216.36 | .50 | 1206.61 | .53 | 1109.56 | -.00* | 1212.55 | .43 | 1206.19 |
| Family Conflict x Time | .26 | 1014.01 | .24 | 966.02 | .61 | 794.93 | .55 | 1210.94 | -.01* | 1204.94 |

*BIC represents the Bayesian Information Criterion.

*Note:* Cell entries in the unconditional models represent estimates of both within and between-person fixed effects on that variable, time, and time squared. Cell entries in the conditional models represent within and between-person effects based on all variables. Interactions of Support with Time represents change over time based on social support source or type.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 1.

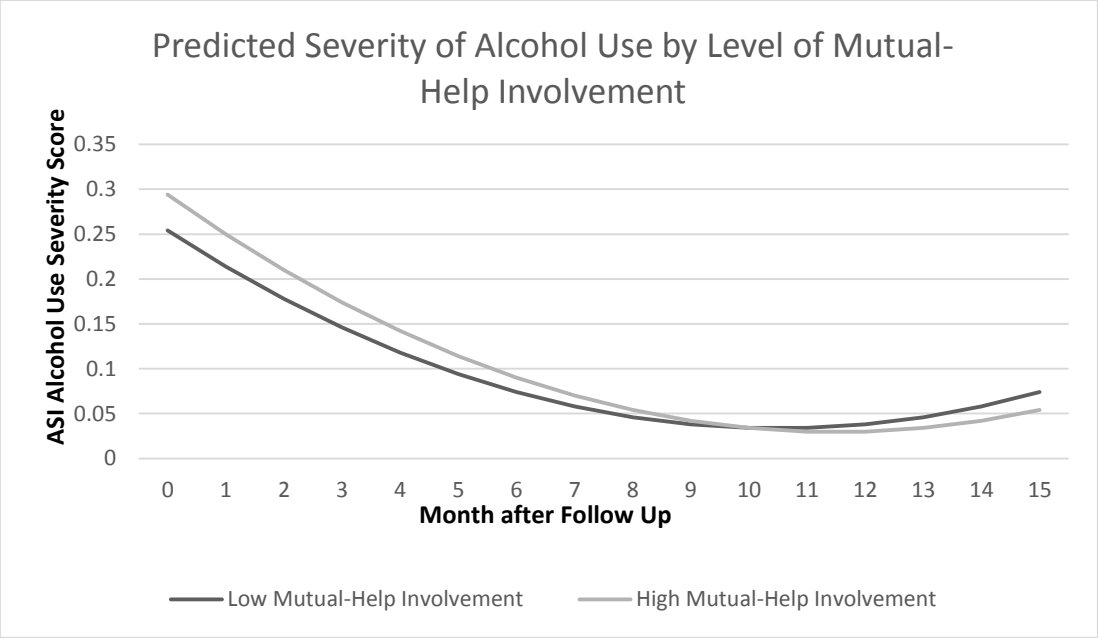
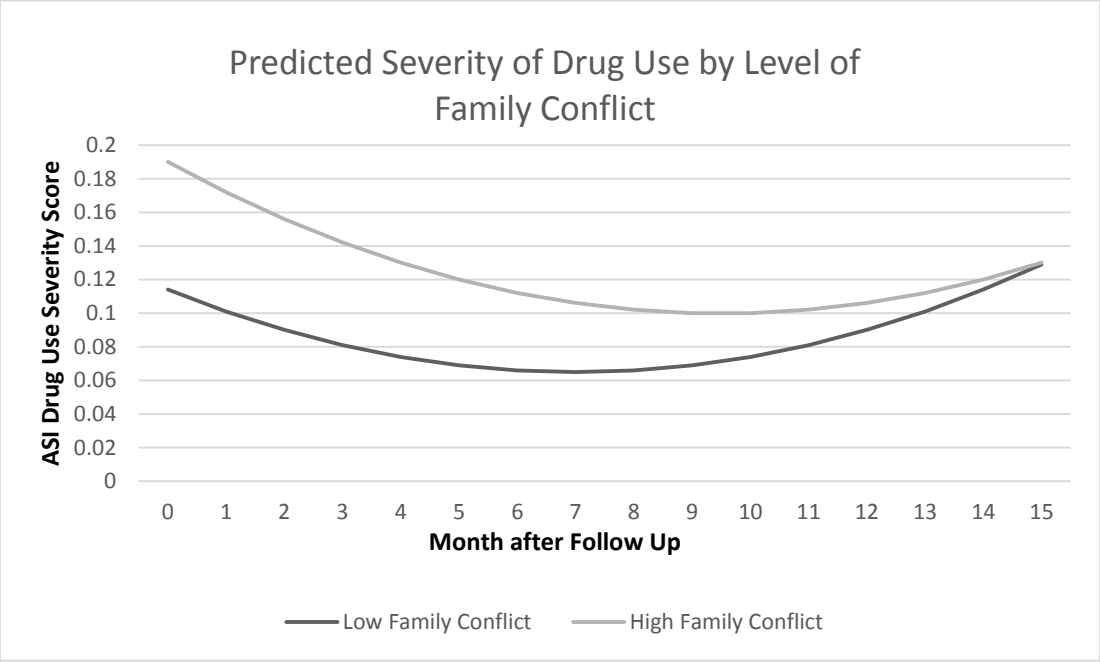

Predicted Severity of Alcohol Use by Level of Mutual-Help Involvement
ASI Alcohol Use Severity Score
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Month after Follow Up
Low Mutual-Help Involvement
High Mutual-Help Involvement

Figure 2.


Predicted Severity of Drug Use by Level of Family Conflict
ASI Drug Use Severity Score
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Month after Follow Up
Low Family Conflict
High Family Conflict