# Care Management Intervention to Decrease Psychiatric and Substance Use Disorder Readmissions in Medicaid-Enrolled Adults

**Shari L. Hutchison, MS, PMP**
**Jenny V. Flanagan, MA, LPC**
**Irina Karpov, MS**
**Lisa Elliott, LCSW**
**Brandi Holsinger, MSW, LCSW**
**Jamie Edwards, LCSW**
**David Loveland, PhD**

## Abstract

*This study examines the generalizability of a successful care management bridging strategy implemented by a behavioral health managed care organization to reduce readmission in psychiatric and substance use disorder (SUD) populations. The sample included 1724 individuals with a psychiatric or SUD hospitalization or detoxification service within 30-days of a prior SUD or inpatient event; 1243 Medicaid-enrolled adults received the intervention plus usual care, and 481 individuals received only usual care. Results included lower readmission to SUD facilities ($p = .0012$) and reduced odds of readmission among individuals with a SUD event ($OR = 0.49$, $p = .0006$) for the intervention versus the comparison group. Likelihood of readmission was higher for those with dual diagnoses ($OR = 1.72$, $p = .0002$) or in urban settings ($OR = 1.47$, $p = .0010$), with some evidence of the intervention's success in these populations. Care management bridging strategies may be more effective for individuals who utilize SUD services and others who need help navigating complex systems of care.*

Address correspondence to Shari L. Hutchison, MS, PMP, Community Care Behavioral Health Organization, 339 Sixth Avenue, Suite 1300, Pittsburgh, PA 15222, USA. E-mail: hutchisons@ccbh.com.

Jenny V. Flanagan, MA, LPC, Community Care Behavioral Health Organization, Pittsburgh, PA, USA.

Irina Karpov, MS, Community Care Behavioral Health Organization, Pittsburgh, PA, USA.

Lisa Elliott, LCSW, Community Care Behavioral Health Organization, Pittsburgh, PA, USA.

Brandi Holsinger, MSW, LCSW, Community Care Behavioral Health Organization, Pittsburgh, PA, USA.

Jamie Edwards, LCSW, Community Care Behavioral Health Organization, Pittsburgh, PA, USA.

David Loveland, PhD, Community Care Behavioral Health Organization, Pittsburgh, PA, USA.

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## Introduction

Psychiatric rehospitalizations are costly to healthcare systems, may negatively impact an individual's quality of life, and may reduce provider morale. As a result, such readmissions are considered a quality indicator in health care and reform efforts.[1, 2] Individuals funded through Medicaid programs have been shown to have higher behavioral health-related readmissions compared to privately insured or uninsured individuals.[3] In general, a higher proportion of Medicaid-funded individuals report poorer health and more chronic physical and mental health conditions than privately-insured individuals.[4] Thus, reduction of readmissions in Medicaid-funded individuals is a high priority.[5]

About 7.9 million US adults have co-occurring mental health (MH) and substance use disorder (SUD) diagnoses,[6] and as a result, need both MH and SUD systems of care. Monitoring acute readmission (i.e., readmission within 30 days) into both psychiatric and SUD treatment facilities is therefore necessary to provide high quality care to the millions of individuals who utilize both systems. Risk factors for increased readmission include use of alcohol and other substances, presence of co-occurring MH and SUD diagnoses, and prior use of SUD services.[7–12] Prince et al.[11] report that individuals with drug and alcohol abuse diagnoses have a 58 and 46% greater risk, respectively, of rehospitalization within 3 months, compared with those with a MH disorder with no co-occurring SUD. Another study reports individuals with co-occurring disorders have higher rehospitalization rates than those with MH only diagnoses as well as SUD only, indicating a 26% 30-day all-cause readmission rate for those with dual diagnoses compared to patients with a principal diagnosis of alcohol-related disorder (18%) or substance-related disorder (15%).[8] In another study with Medicaid-insured adults, prior utilization of SUD service was associated with a 58% greater risk for readmission within 30 days.[7] An increased risk for readmission may be due to factors associated with a Medicaid population such as medical comorbidity,[10] shorter hospital stays,[7] or homelessness,[14] or may be due to inadequate discharge planning including lack of patient education, poor access to follow up care after discharge, or poor medication reconciliation. [13]

Individuals with MH and SUD disorders may benefit from timely aftercare following hospitalization or detoxification (detox) because continuum of care has been shown to be associated with readmission and length of time between inpatient events.[15–17] Several case management or bridging interventions designed to improve transitions from hospital to community have been shown to be effective. Critical Time Intervention (CTI)[18–20] has been found to be effective in linking individuals to outpatient treatment[21] and preventing psychiatric rehospitalization.[22] Successful strategies common to CTI and other bridging interventions include communication of discharge plans between inpatient and outpatient staff, assessment of needs at discharge, medication reconciliation, psychoeducation on living skills, post-discharge telephone or in-person follow-up, peer support, starting outpatient programs before discharge, and increased family involvement.[18, 22–25] Similar bridging strategies have been found to improve successful rates of transition between acute, short-term SUD treatment and outpatient care including involvement of patients' families, assistance with transportation, connection to other resources, ongoing care coordination, and use of motivational treatment engagement and incentives.[26–30]

Based on these successful strategies, Community Care Behavioral Health Organization of the UPMC Insurance Services Division, a non-profit behavioral health managed care organization (BHMCO) in Pennsylvania, developed a recovery-focused intervention in which BHMCO Care Managers facilitate access to needed services and resources during the transition from inpatient care to aftercare. This care management intervention, described below, was initially implemented to serve an urban population and was shown to be associated with lower readmission rate and decreased risk for readmission for this population.[31]

The care management bridging strategy was expanded from a single urban area to rural areas of Pennsylvania and from a psychiatric population to a SUD population. This expansion allows

assessment of the generalizability of the intervention into these populations. Rural settings are typically associated with decreased access to psychiatric care compared to urban settings. According to a 2018 report from the Health Resources and Services Administration, Pennsylvania has 25 geographic high needs areas for mental health, and 23 of these areas are rural counties or located within rural counties.[32] The expansion brought the bridging strategy to several rural areas and was based almost entirely on the original protocol, given that this protocol had already been shown to be effective.

The expanded intervention occurred as part of a larger, three-year quality improvement effort organized by the Pennsylvania Office of Mental Health and Substance Abuse Services. All activities were approved as quality improvement by the University of Pittsburgh Medical Center Total Quality Council. The hypotheses were that the intervention would be associated with reduced readmission and would demonstrate greater effectiveness in populations known to have higher risk of readmission, particularly SUD service users and those with dual diagnoses.

## Method

### Sample

Individuals were eligible for the care management intervention if they were Medicaid-eligible adults enrolled in the HealthChoices program in a contracted area of the BHMCO, ages 18–64 years with a readmission to a psychiatric facility, inpatient SUD facility, or residential detox service within 30 days of a prior admission. This readmission was verified through claims data to be a psychiatric hospitalization, SUD hospitalization, or residential detox service but did not have to be the same type of event as the original admission. Seventy-six provider facilities were included across the state varying in size, academic/community affiliation, and county oversight. The readmission was flagged as the index readmission that identified an individual as being eligible for the care management intervention. A population with multiple prior inpatient and detox services was used because inpatient utilization is a predictor of readmission[9, 10, 33] and therefore may be used to identify those at highest risk for readmission and thus most likely to benefit from intervention. Detox was included with other inpatient services because multiple, consecutive episodes of detox service is poor continuum of care and indicate a population that may benefit from intervention. Individuals with a readmission that were already linked to enhanced or intensive case management, assertive community treatment, or other acute service coordination were not eligible to receive the intervention. The study sample included 1724 individuals with a readmission event between February 1, 2015 and December 31, 2016; 1243 individuals received the intervention and 481 individuals did not receive the intervention. Individuals who did not receive the intervention served as the comparison, non-intervention group. Comparison group members met eligibility criteria but did not receive the intervention for the following reasons: 38% early discharge, 17% left against medical advice/early discharge, 15% symptom related, 12% other reasons (e.g., not on unit, unit locked), 8% discharged before meeting with a Care Manager, 5% refusal, 2% active withdraw, 1% medical transfer, and < 1% seclusion.

### Procedure

The bridging strategy was conducted by Care Managers of the BHMCO within their provider network in Pennsylvania and is described below and in further detail elsewhere.[31] Trained Care Managers identify potential participants through an algorithm and daily report of individuals with readmission events within 30 days of a prior admission and conduct a 15–30 min onsite interview with those identified. The intervention is designed to build rapport between the Care Manager and the individual prior to discharge. The intervention focuses on social determinants that may impact hospitalization and quality of life. Additionally, the Care Manager facilitates connection to needed

resources and services with the individual's current community-based treatment team. The face-to-face interview consists of eight topic areas: (1) reasons for the current readmission, (2) barriers to increasing community tenure, (3) strategies for overcoming these barriers, (4) plans for discharge, (5) strategies for accessing and using medications, (6) components and use of a recovery/crisis plan, (7) factors that may help to keep the individual safe, and (8) needs during inpatient stay that may assist with a transition to the community.

The intervention group received the recovery-focused interview plus usual care, while the comparison group received usual care. Usual care included discharge planning by hospital or residential staff with referrals to behavioral health services, such as drug and alcohol rehabilitation, outpatient mental health, care management supports, and appropriate community-based services (e.g., housing). In the comparison condition, Care Managers did not meet with individuals during the readmission but did help to facilitate appropriate aftercare and referrals.

## Measures

### *Socio-demographic characteristics and behavioral health service utilization*

Socio-demographic variables were obtained from Medicaid administrative data provided by the Pennsylvania Department of Human Services. Behavioral health service utilization data were obtained from the BHMCO's paid claims data. Socio-demographic variables included gender, race/ethnicity, and age. Additional variables of interest included presence or absence of housing or legal issues and medication adherence status; these data were obtained from the BHMCO care management administrative data, which had been collected during prior hospitalizations.

### *Readmission outcome*

Readmission was determined from paid behavioral health service claims. Individuals were identified as readmitted if a psychiatric hospitalization, SUD hospitalization, or detox service (hospital or residential) occurred within 30 days of the index readmission that triggered the intervention. Those without a psychiatric or SUD hospitalization were labeled as not readmitted, forming a dichotomous outcome variable. The first index readmission for individuals with multiple 30-day readmissions during the evaluation period was selected so that each unique individual was represented in the data analyses only once.

## Statistical analysis

Socio-demographic characteristics were first explored using chi-square tests to discern any between-group differences (intervention versus comparison). Additionally, chi-square tests were utilized to compare characteristics between those readmitted and those not readmitted. Next, logistic regression was performed using the dichotomous variable of readmission (yes/no) as the outcome and group (intervention versus comparison) as the independent variable, controlling for variables that had significant between-group differences for those readmitted versus not readmitted. Because the care management intervention was recently expanded to SUD facilities, individuals with only psychiatric utilization were separated from those using SUD facilities with or without psychiatric utilization to discern effectiveness of the expanded intervention. The Hosmer-Lemeshow (H-L) test statistic was utilized as a goodness-of-fit test, while the Likelihood Ratio, Score, and Wald tests were examined to evaluate the model.[34] A non-significant H-L test provides evidence that the model fits the data appropriately; while significant Likelihood Ratio, Score, and Wald tests indicate that the model with covariates is more appropriate than the null (intercept only) model.[35] Two additional measures of fit, Cox and Snell $R^2$ and the Nagelkerke $R^2$ were produced as

complementary measures to the model fit tests.[36, 37] The $c$ statistic measure of association was assessed to determine the degree to which predicted probabilities agreed with actual outcomes. A $c$ statistic of one represents perfect model discrimination. Parameter estimates with standard errors, Wald chi-square test statistics, and odds ratios with 95% Wald confidence intervals were examined and interpreted. Statistical tests were performed using a significance level of $\alpha < 05$. All analyses were performed using SAS® 9.3 software.[38]

## Results

### Intervention responses

During the intervention, the most commonly reported reasons for readmission were substance use/relapse (47%), mental health symptoms (37%), and issues around medications (20%) or housing (18%). The majority of respondents reported having a discharge plan from the prior readmission (77%) and understanding that discharge plan (96%); however, a large portion developed their discharge plan without the support of family or others in their social network (57%). A moderate portion (27%) of individuals reported not taking their prescribed medications. The most commonly reported reasons for medication nonadherence included choice and interference with active substance use. Over half (58%) of respondents with a scheduled aftercare appointment reported not attending that appointment. Most commonly cited reasons for nonattendance were readmission (22%) and relapse (11%) before the appointment, or personal choice (8%). Finally, over half (59%) of respondents reported having a recovery plan before readmission.

### Readmission

Table 1 reports the frequencies of the socio-demographic and behavioral health service utilization variables for the comparison and intervention groups. Both the intervention and comparison groups were primarily composed of European Americans (77%) between the ages of 26 and 45 years old with presence of co-occurring MH and SUD (74%). There were slightly fewer males in the intervention group than the comparison group (60 versus 65%, $p = .0482$). A higher proportion of individuals in the intervention group had housing issues (18 versus 1%, $p < .0001$) and legal issues (5 versus < 1%, $p < .0001$), and reported medication adherence (49 versus 1%, $p < .0001$). A greater percentage of individuals in the intervention group utilized halfway house SUD services (15 versus 10%, $p = .0046$) but a lower percentage of intervention group members used crisis services (35% versus 41%, $p = .0320$).

In total, there were 417 readmissions within 30 days of the index readmission that triggered the care management intervention involving 405 individuals, as shown in Table 2. Lower rates of readmission to inpatient SUD or detox facilities were observed for the intervention group versus the comparison group (4 versus 7%, $p = .0012$). Follow-up rates to outpatient SUD facilities were higher in the intervention group versus the comparison group at both 7 days (20 versus 14%, $p = .0026$) and 30 days (32 versus 25%, $p = .0045$). There were no differences in readmission rates to MH facilities or follow-up rates to outpatient MH facilities between the intervention and comparison groups.

In Table 3, the characteristics of the readmitted ($n = 405$) sample were compared to those without a readmission ($n = 1319$), regardless of intervention or comparison group. In the non-readmitted group compared to the readmitted group, there were fewer males (60 versus 66%, $p = .0175$), fewer individuals with dual MH and SUD diagnoses (72 versus 81%, $p = .0001$), and fewer participants reporting living in an urban area (36 versus 46%, $p = .0003$). These factors were included in the logistic regression model. Medication adherence, housing issues, and legal issues were equally represented in the readmitted and non-readmitted groups. Rates of prior service utilization were lower in the non-readmitted group for case management, outpatient MH, inpatient MH, and

**Table 1**
Differences between comparison and intervention (interview) groups

| Variable | Comparison ($n = 481$) | Intervention ($n = 1243$) | Total ($n = 1724$) | $p$ value |
|---|---|---|---|---|
| Gender (male) | 312 (64.86%) | 742 (59.69%) | 1054 (61.14%) | .0482* |
| Race (European American) | 373 (77.55%) | 955 (76.83%) | 1328 (77.03%) | .7511 |
| Age group | | | | |
| Less than 26 years | 103 (21.41%) | 217 (17.46%) | 320 (18.56%) | .2232 |
| 26–35 years | 170 (35.34%) | 434 (34.92%) | 604 (35.03%) | |
| 36–45 years | 92 (19.13%) | 263 (21.16%) | 355 (20.59%) | |
| > 45 years | 116 (24.12%) | 329 (26.47%) | 445 (25.81%) | |
| Housing problems (yes) | 4 (0.83%) | 221 (17.78%) | 225 (13.05%) | < .0001* |
| Legal problems (yes) | 1 (0.21%) | 62 (4.99%) | 63 (3.65%) | < .0001* |
| Urban are (yes) | 177 (36.80%) | 487 (39.18%) | 664 (38.52%) | .3622 |
| Medication adherence (yes) | 6 (1.25%) | 607 (48.83%) | 613 (35.56%) | < .0001* |
| % with dual diagnosis | 352 (73.18%) | 927 (74.58%) | 1279 (74.19%) | .5522 |
| BH services (180 days prior intervention) | | | | |
| ACT | 12 (2.49%) | 36 (2.90%) | 48 (2.78%) | .6496 |
| CM | 79 (16.42%) | 251 (20.19%) | 330 (19.14%) | .0744 |
| Crisis | 195 (40.54%) | 435 (35.00%) | 630 (36.54%) | .0320* |
| OSUD | 167 (34.72%) | 461 (37.09%) | 628 (36.43%) | .3594 |
| OMH | 377 (78.38%) | 948 (76.27%) | 1325 (76.86%) | .3512 |
| IMH | 346 (71.93%) | 901 (72.49%) | 1247 (72.33%) | .8181 |
| Inpatient SUD (detox) | 31 (6.44%) | 81 (6.52%) | 112 (6.50%) | .9569 |
| Inpatient SUD (rehab) | 1 (0.21%) | 4 (0.32%) | 5 (0.29%) | .6933 |
| Non Hospital SUD (detox) | 122 (25.36%) | 349 (28.08%) | 471 (27.32%) | .2568 |
| Non hospital SUD (rehab) | 95 (19.75%) | 255 (20.51%) | 350 (20.30%) | .7234 |
| Non hospital SUD halfway house | 46 (9.56%) | 183 (14.72%) | 229 (13.28%) | .0046* |

*ACT*, Assertive Community Treatment; *CM*, Case Management; *OSUD*, outpatient substance use disorder; *OMH*, outpatient mental health; *IMH*, Inpatient Mental Health
*Significant $p$ value

inpatient SUD detox and rehabilitation service. A higher proportion of those in the non-readmitted group compared to those readmitted utilized residential SUD detox.

The logistic regression model contained the following variables: intervention group (yes/no), male gender (yes/no), dual diagnosis (yes/no), and urban location (yes/no). Because the intervention was expanded from MH facilities to include a SUD population, two levels were added to the model—utilization of SUD facilities with or without MH facilities (yes/no) and utilization of only MH facilities (yes/no). The H-L goodness-of-fit test was not significant ($p = .99$), indicating that the model fit was appropriate for the data. Additionally, the Likelihood Ratio, Score, and Wald tests were significant ($p < .001$), which revealed that the model containing the covariates was superior to the null model. As shown in Table 4, the intervention was significantly associated with readmission for individuals utilizing SUD with or without MH facilities. Within this group, those who received the care management intervention were about half as likely to be readmitted, compared to those who did not receive the intervention (OR = 0.487, CI = 0.323–0.734, $p = .0006$). No association was observed between the intervention and readmission for those utilizing only MH facilities. The odds of readmission

**Table 2**
Readmission and follow-up outcomes

| Variable | Comparison ($n = 481$) | Intervention ($n = 1243$) | Total ($n = 1724$) | $p$ value |
|---|---|---|---|---|
| Readmission** | | | | |
| IMH within 30 days | 97 (20.17%) | 240 (19.31%) | 337 (19.55%) | .6869 |
| SUD (hospital or detox) within 30 days | 35 (7.28%) | 45 (3.62%) | 80 (4.64%) | .0012* |
| Follow-up** | | | | |
| OMH within 7 days | 109 (22.66%) | 277 (22.28%) | 386 (22.39%) | .8665 |
| OMH within 30 days | 191 (39.71%) | 502 (40.39%) | 693 (40.20%) | .7970 |
| Rehab/Partial/HH/OSUD within 7 days | 68 (14.14%) | 254 (20.43%) | 322 (18.68%) | .0026* |
| Rehab/Partial/HH/OSUD within 30 days | 120 (24.95%) | 397 (31.94%) | 517 (29.99%) | .0045* |

*IMH*, Inpatient Mental Health; *SUD*, Substance Use Disorder; *OMH*, outpatient mental health; *OSUD*, outpatient substance use disorder; *HH*, Halfway House
*Significant $p$ value
**Readmission/follow-up from the end of the interview admission

for those with a dual diagnosis were 1.7 times higher than for those with MH or SUD only diagnoses (OR = 1.721, CI = 1.291–2.294, $p = .0002$). The odds of readmission for those in an urban area were 1.5 times higher for than for those from a rural area (OR = 1.470, CI = 1.167–1.850, $p = .0010$). After controlling for other factors, male gender was not found to be associated with readmission.

In previous analyses,[31] the care management intervention was associated with significantly reduced risk of MH readmissions. To investigate this discrepancy in significance for MH readmission between the previous and the current study, 30-day readmission rates were calculated for the portion of the providers representing only the two urban facilities of the previous study. For these two facilities, readmission rates in the present study for individuals receiving the intervention were lower than readmission rates in the comparison group (28 versus 39%). These results are comparable to those of the previously published report (28 versus 36%).[31] Since it was hypothesized that the intervention would show impact on outcomes for individuals with dual diagnoses, readmission rates for the 1279 individuals with dual diagnoses were compared between groups. Among participants with dual diagnoses, the readmission rate was 24% for those receiving the intervention and 29% for those in the comparison group.

## Discussion

In the current investigation, a BHMCO care management bridging strategy was associated with higher utilization of follow-up SUD service (outpatient SUD and/or rehabilitation) and lower rates of readmission to SUD facilities. Also, those individuals who received the intervention and who utilized SUD inpatient and detox facilities, alone or in addition to psychiatric inpatient facilities, had significantly lower risk for readmission than those who did not receive the intervention. This pattern was not observed for individuals utilizing only MH services. The findings of the current study highlight possible differences between the MH and SUD systems in their ability to address access, need, social determinants related to readmission, and motivation for continued treatment. As such, the care management bridging strategy assessed here may be more effective in one system

**Table 3**
Comparison between readmitted and not readmitted

| Variable | Not readmitted ($n = 1319$) | Readmitted ($n = 405$) | Total ($n = 1724$) | $p$ value |
|---|---|---|---|---|
| Gender (male) | 786 (59.59%) | 268 (66.17%) | 1054 (61.14%) | .0175* |
| Race (European American) | 1021 (77.41%) | 307 (75.80%) | 1328 (77.03%) | .5019 |
| Age group | | | | .5700 |
| Less than 26 years | 248 (18.80%) | 72 (17.78%) | 320 (18.56%) | |
| 26–35 years | 463 (35.10%) | 141 (34.81%) | 604 (35.03%) | |
| 36–45 years | 262 (19.86%) | 93 (22.96%) | 355 (20.59%) | |
| > 45 years | 346 (26.23%) | 99 (24.44%) | 445 (25.81%) | |
| Housing problems (yes) | 164 (12.43%) | 61 (15.06%) | 225 (13.05%) | .1697 |
| Legal problems (yes) | 50 (3.79%) | 13 (3.21%) | 63 (3.65%) | .5858 |
| Medication adherence (yes) | 459 (34.80%) | 154 (38.02%) | 613 (35.56%) | .2356 |
| Urban area (yes) | 477 (36.16%) | 187 (46.17%) | 664 (38.52%) | .0003* |
| % with dual diagnosis | 949 (71.95%) | 330 (81.48%) | 1279 (74.19%) | .0001* |
| BH services (180 days prior intervention) | | | | |
| ACT | 32 (2.43%) | 16 (3.95%) | 48 (2.78%) | .1029 |
| CM | 236 (17.89%) | 94 (23.21%) | 330 (19.14%) | .0173* |
| Crisis | 467 (35.41%) | 163 (40.25%) | 630 (36.54%) | .0768 |
| OSUD | 488 (37.00%) | 140 (34.57%) | 628 (36.43%) | .3741 |
| OMH | 988 (74.91%) | 337 (83.21%) | 1325 (76.86%) | .0005* |
| IMH | 927 (70.28%) | 320 (79.01%) | 1247 (72.33%) | .0006* |
| Inpatient SUD (detox) | 77 (5.84%) | 35 (8.64%) | 112 (6.50%) | .0452* |
| Inpatient SUD (rehab) | 1 (0.08%) | 4 (0.99%) | 5 (0.29%) | .0028* |
| Non-hospital SUD (detox) | 390 (29.57%) | 81 (20.00%) | 471 (27.32%) | .0002* |
| Non-hospital SUD (rehab) | 270 (20.47%) | 80 (19.75%) | 350 (20.30%) | .7537 |
| Non-hospital SUD (HH) | 171 (12.96%) | 58 (14.32%) | 229 (13.28%) | .4817 |

Readmitted are unique individuals with psychiatric hospital or substance use disorder hospital/residential detox if hospital rehab within 30 days from interview admission
*ACT*, Assertive Community Treatment; *CM*, Case Management; *OSUD*, outpatient substance use disorder; *OMH*, outpatient mental health; *IMH*, Inpatient Mental Health; *HH*, Halfway House
*Significant $p$ value

versus the other. Also, the lower readmission rates observed when examining only those in urban populations and only dually diagnosed individuals—despite increased risk of readmission for these groups—support the use of care management bridging strategies for these populations.

It is likely that the care management bridging strategy has its greatest potential to improve continuum of care and linkage to community services where insufficiencies exist; however, it is not clear if this is due to care management intervention on system factors[7, 13] or patient characteristics.[8, 10, 11, 14] As reported by Raven and colleagues, brief inpatient SUD or detox services may not provide enough time for adequate discharge and long-term care planning for this population;[14] thus, care management intervention may help to fill gaps. Care managers may also be helpful in addressing complex chronic conditions, possessing knowledge of services and resources, and finding ways to build rapport with individuals to support change in attitudes around continuing care. Additional research is needed to determine the factors addressed by the bridging strategies that are most successful.

**Table 4**

Logistic regression results with the effects of group and intervention for odds of readmission

| Variable | OR | 95% CI | *p* value |
|---|---|---|---|
| Intervention (yes versus no) | | | |
| SUD/SUD with MH | 0.487 | 0.323–0.734 | .0006* |
| MH only | 1.098 | 0.804–1.500 | .5549 |
| Gender (male) | 1.257 | 0.988–1.598 | .0623 |
| Dual diagnosis | 1.721 | 1.291–2.294 | .0002* |
| Urban area | 1.470 | 1.167–1.850 | .0010* |
| | $\chi^2$ | | *p* value |
| Likelihood ratio test | 65.2329 | | < .001 |
| Score test | 62.6027 | | < .001 |
| Wald test | 60.3187 | | < .001 |
| Hosmer-Lemeshow test | 2.6455 | | .99 |

Cox and Snell $R^2 = 0.03$; Nagelkerke $R^2 = 0.06$, $c$ statistic = 0.61;
*SUD*, Substance Use Disorder; *MH*, Mental Health

In the present study, increased likelihood for readmission in those with a dual diagnosis and those from an urban location is not surprising because these factors reflect increased access to behavioral health facilities (urban area and dual diagnosis) and illness severity and complexity (dual diagnosis). These findings are consistent with other studies showing dual diagnosis[9, 10, 12] and urban location[10] as predictors for readmission.

The current intervention focused on assessment and facilitation of access to needed resources and services. The null findings for association between readmission and several social determinants, namely housing and legal issues, should be interpreted cautiously. These measures were not reported at the index readmission for many individuals, and thus the data may not have reflected participants' current circumstances. It may also be that social determinants that impact readmission, namely housing issues and homelessness, are confounded with SUD or dual diagnoses[14] as well as urban environment, as individuals with housing issues may migrate to urban areas for needed resources.

Reported rates of engagement in continuing care often indicate that individuals do not receive care in the initial weeks or months following their discharge. In the present study, many individuals with a readmission had several poor indicators of continuum of care: Only 70% of individuals indicated having an aftercare appointment, and 58% of those reported not attending that appointment, and 22% because they had already been readmitted. Also, 84% of respondents indicated being prescribed medication with 27% admitting not taking medication as prescribed. During the care management intervention, issues around medications were among the most commonly reported reasons for readmission. Finally, a fairly low number of respondents admitted to having a crisis or recovery plan. This plan may prevent readmission and help individuals remain in the community. Therefore, interventions that connect individuals with supports before discharge and address medication and other issues in a timely manner should have a positive impact on community tenure in this population.

### Limitations

The care management intervention occurred as part of operations of the BHMCO and not as a research study. As a result, the design did not include randomization, and the number of observed variables was limited. While few differences were found between individuals receiving the

intervention and those not receiving it, reasons for not receiving the intervention (e.g., higher level of symptoms, early discharge or discharge against medical advice), point to individual characteristics that may have differed between the groups in ways not measured by the present study, potentially contributing to differences in risk for readmission. Attempts were made to improve the evaluation of the care management intervention with the inclusion of several clinical and social determinants—housing issues, legal issues, and medication adherence. These factors were not found to be associated with readmission; however, as these data were collected as part of care management facilitation and not for the primary purpose of assessing individuals' characteristics to support the evaluation, cautious interpretation of these findings is warranted. Future research should address these design and measurement limitations, which may help to further elucidate the effectiveness of the care management bridging strategy.

## Implications for Behavioral Health

The current findings have implications for helping individuals with MH and SUD diagnoses navigate the behavioral health system and for appropriately targeting intensive practices to individuals at the highest risk for readmission. Care management approaches and other transitional methods to improve readmission and follow-up must be sensitive to the routine utilization of both MH and SUD systems of care by the large number of individuals at high risk for readmission. Behavioral health practice and policy may benefit from further study of the relationships between care access, motivation to continue care, and impact of interventions to reduce readmissions.

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## Compliance with Ethical Standards

*Conflict of Interest* The authors declare that they have no conflict of interest.

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