

Readmission Patterns and Effectiveness of Transitional Care Among Medicaid Patients With Schizophrenia and Medical Comorbidity

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BACKGROUND Patients with chronic medical and mental health comorbidities are at increased risk of hospital admission, but little is known about their hospital utilization patterns or whether nurse-directed transitional care interventions have any appreciable impact on future hospitalizations.

METHOD Using paid Medicaid claims and a care management database, we examined patterns of hospital utilization for adults with multiple chronic conditions where one of the conditions was schizophrenia. Patients were enrolled in Community Care of North Carolina's medical home program and were discharged from 100 different hospitals throughout the state from July 1, 2010 through June 30, 2011. We examined readmission rates after psychiatric and nonpsychiatric hospital discharges, and we compared patients who received community-based, nurse-directed, transitional care management services to patients who received usual care.

RESULTS A total of 1,717 patients were included in the final analysis. Patients in this study experienced 980 readmissions over the course of 1 year, with 20% of readmissions for a different reason than the primary hospitalization, and 36% of readmissions occurring at a different hospital. Controlling for demographic, clinical, and hospital characteristics, patients receiving transitional care ($n = 1,104$) were as much as 30% less likely to experience a readmission during the year following discharge compared to patients receiving usual care ($n = 613$).

LIMITATIONS This descriptive study reports on a nonrandomized intervention and its impact on service utilization for Medicaid patients with complex illnesses in North Carolina.

CONCLUSIONS Regardless of the reason for hospitalization, patients with chronic medical and psychiatric conditions may benefit from transitional care support that addresses both conditions. This holds true even when the patient is already receiving intensive outpatient psychiatric care.

Patients with psychiatric comorbidities have extremely complex treatment needs, are at increased risk for avoidable hospital admissions and readmissions [1, 2], and contribute disproportionately to overall health care costs. Mental illness comorbidity is associated with health care costs that are 60%–75% higher compared to costs for those without a mental illness, and health care costs are 2–3 times higher for people with both a mental illness and a substance use disorder [3, 4].

These challenges are perhaps most salient when patients are transitioning from an acute inpatient setting to an outpatient service setting. Evidence suggests that care coordination at hospital discharge is critical for patients with psychiatric illnesses [5–7]. However, most studies focus only on addressing psychiatric needs and do not address the complex needs of patients with chronic medical conditions in addition to a psychiatric illness. We hypothesize that reasons for admission and readmission may vary greatly among patients with complex needs and that there may be multiple hospital systems involved.

In the fall of 2008, North Carolina initiated a population-based transitional care support initiative for Medicaid recipients enrolled in the enhanced primary care case management (PCCM) program of Community Care of North

Carolina (CCNC). The initiative utilized community-based infrastructure for allocating care management resources to assure safe transitions from hospital to home, and it coordinated linkage back to the primary care medical home for all patients with complex chronic conditions, including schizophrenia [8]. A previously published study demonstrated that readmission rates for people with chronic medical conditions can be reduced through nurse-directed coordinated transitional care [9]; however, it is unclear whether the effectiveness of transitional care extends to patients with serious mental illnesses such as schizophrenia. Building on the work of a previous study, we aimed to describe the complex patterns of hospital utilization for the subpopulation of patients with both schizophrenia and at least 1 other chronic medical condition and to examine the effectiveness of CCNC's transitional care program for reducing readmissions during the year following discharge.

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Methods

We conducted a retrospective cohort analysis to describe the complex patterns of hospital utilization for patients with both schizophrenia and at least 1 other chronic medical condition and to examine the impact of a nurse-directed transitional care intervention on future hospitalizations. We utilized a 12-month window of hospital discharges, from July 2010 through June 2011, during which CCNC's transitional care program was mature but not at full capacity. Although the questions we sought to answer are potentially relevant to all psychiatric comorbidities, we chose to look specifically at schizophrenia to minimize some of the heterogeneity that would be seen with a broader definition of serious mental illness. We were also specifically interested in examining the complexities of the reasons for readmission, as well as the extent of cross-facility traffic, for patients with complex chronic needs. The study was approved by the institutional review board of the University of North Carolina at Chapel Hill.

Setting

Seventy percent of North Carolina Medicaid recipients were enrolled in CCNC during the study period. CCNC is an enhanced PCCM managed care model that links recipients to a primary care medical home in 1 of 14 nonprofit, physician-led regional networks that coordinate care management and quality improvement activities [10, 11]. North Carolina Medicaid supports network activities through care management fees ranging from \$3.72 to \$13.72 per member per month. Both medical and behavioral health services are reimbursed on a fee-for-service basis, with the exception of a capitated behavioral health pilot program operating in 5 counties.

During the study period, Medicaid behavioral health services were provided by a wide range of largely nonprofit local providers with the oversight of a contracted utilization review company and public local management entities (LMEs), which were responsible for developing the network, conducting quality improvement activities, overseeing providers in the community, and identifying gaps in service. Each CCNC network had a behavioral health coordinator and a consulting psychiatrist who served as resources to care managers, supported primary care practices in managing less severe behavioral health conditions, and facilitated the referral of unstable patients to specialty behavioral health providers with oversight by the LMEs.

Data Sources Used in the Analysis

Demographic data (age, sex, race, ethnicity, language, county of residence, and CCNC enrollment status) came from the North Carolina Medicaid eligibility and enrollment files. Hospitalization service dates, diagnostic related groups (DRGs), discharge disposition, substance abuse diagnoses, and assertive community treatment (ACT) services were identified from paid Medicaid claims. Care manager assess-

ments and interventions were documented in CCNC's care management information system in structured data fields according to standardized documentation requirements.

Patients were categorized by disease burden with the categorical and hierarchical Clinical Risk Group (CRG) methodology developed by 3M Health Information Services [12]. Based on diagnoses and procedure information in paid claims from July 1, 2010 through June 30, 2011, each CCNC beneficiary was assigned to 1 of 1,075 CRGs with others of similar disease burden and severity. Each CCNC beneficiary was then assigned a CRG risk score that reflected average total costs of care within that CRG relative to the CCNC population as a whole. CRGs can be combined into 44 Aggregated Clinical Risk Groups, which classify patients according to number and severity of acute and chronic conditions.

Participants

North Carolina Medicaid beneficiaries age 18 years or older were included in the analysis if they had a diagnosis of schizophrenia or schizoaffective disorder (295.xx) on any paid claim during the study period and their Aggregated Clinical Risk Group classification indicated the presence of multiple or catastrophic chronic conditions (including significant chronic disease in multiple organ systems, levels 1-6; dominant chronic disease in 3 or more organ systems, levels 1-6; or catastrophic conditions, levels 1-6). Examples of significant/dominant chronic conditions include diabetes, hypertension, chronic obstructive pulmonary disease (COPD), or congestive heart failure; examples of catastrophic conditions include HIV, history of major organ transplantation, or need for dialysis or a mechanical ventilator. Patients were included in the study if they were discharged alive, to their home (without home health services), from an in-state general hospital (including general hospitals with a psychiatric unit) during the period July 1, 2010 through June 30, 2011 and they were enrolled in a CCNC primary care medical home at the time of discharge or within 30 days after discharge. Thus, both transitional care and usual care patients were enrolled with a CCNC primary care medical home and had full eligibility for services covered under North Carolina Medicaid.

The first qualifying discharge for each patient was chosen for inclusion in the analyses. Hospitalizations with a DRG related to obstetrical, newborn, malignancy, burn, or trauma conditions did not qualify as an index admission or readmission because such admissions are frequently planned or unavoidable. Patients dually eligible for Medicare at any point during the study, and patients residing in 1 of the 5 counties participating in the behavioral health capitation pilot program were excluded from the analysis due to incomplete availability of claims data.

Cohort Assignment

Patients were retrospectively assigned to the transitional care cohort if a CCNC care manager completed any screen-

ing, assessment, or intervention for that patient between the date of hospital admission and 30 days post-discharge. Individuals readmitted within 30 days of discharge were considered transitional care patients if any care management activity occurred prior to readmission. Following an intent-to-treat design, all patients who were screened by a care manager were included in the transitional care cohort, even if the care manager decided to defer or was unable to contact the patient, or if the patient refused services. The usual care cohort consisted of patients who did not receive any screening, assessment, or intervention by a CCNC care manager from the time they were admitted until the end of their Medicaid eligibility or the end of the study period. Patients were excluded from the analysis if they did not receive a care management activity within 30 days of discharge but did receive care management during the subsequent 12 months.

During the time frame of this study, far more patients were discharged every day than the transitional care program could handle. Networks aimed to assess as many hospitalized enrollees as possible, with priority given to those in the aged, blind, or disabled eligibility category. Care managers screened patients through review of Medicaid claims history and hospital records, discussion with the hospital care team, and interviews with the patient or caregivers, as available. CCNC care managers were expected to use professional judgment to determine the frequency and duration of interventions, according to individual patient need, so higher-risk individuals were likely to receive longer and more intensive support following discharge. Further details about patient selection and the delivered intervention are published elsewhere [8, 9].

Statistical Analysis

The primary study outcome was time to readmission, defined as the first admission date following initial discharge, excluding transfers or same-day readmissions. We followed patients for up to 12 months post-discharge, observing readmission claims through September 30, 2011 and paid as of January 1, 2012. All patients remained in the analysis until readmission or until censored due to either death or a gap in Medicaid eligibility greater than 2 months. We calculated 12-month readmission survival estimates for transitional care and usual care patients, and we tested the statistical significance of group differences with the Wilcoxon-Gehan statistic. These analyses were conducted separately for psychiatric and nonpsychiatric index hospitalizations.

ACT is an intensive and highly integrated model of outpatient treatment for patients with serious mental illness who are at particularly high risk of psychiatric hospitalization [13]. As patients eligible for ACT services were expected to have the highest risk of hospitalization, and evidence-based ACT services can reduce readmissions [14], we conducted a subanalysis limited to patients in both the transitional care and usual care groups receiving ACT services at the time of

the index hospitalization to evaluate the incremental impact of transitional care services for these high-risk patients already receiving intensive outpatient treatment.

We then applied a Cox proportional hazards [15] regression model to identify demographic, clinical, and hospital characteristics associated with a decreased risk of readmission, and we estimated the effect of transitional care while controlling for these characteristics. Because we only had Medicaid claims data for patients in the usual care group, predictors in the model were limited to variables reliably available through claims. Model variables included age, sex, race (white, African American, American Indian, Asian, or other), ethnicity (Hispanic or other), language (English, Spanish, or other), CRG risk score (relative clinical burden), and presence of a substance abuse or dependence diagnosis on any claim within the study period. As an additional indicator of severity of psychiatric care needs and readmission risk, we included a dichotomous variable indicating receipt of ACT services at any time during 3 years spanning the study period (July 1, 2009 through June 30, 2012). Characteristics of the index hospitalization were also considered; these factors included whether it was a psychiatric hospitaliza-

TABLE 1.
Sample Characteristics

	Transitional care		Usual care	
N	n = 1,104		n = 613	
Patient characteristics				
Mean age (SD)	43.3*	(12.5)	40.0	(12.2)
Female	649	58.8%	346	56.4%
Race				
African American	499	45.2%	309	50.4%
American Indian	34	3.1%	21	3.4%
Asian	5	0.5%	5	0.8%
White	534	48.4%	267	43.6%
Other/mixed	1	0.1%	0	0.0%
Unknown	31	2.8%	11	1.8%
Hispanic ethnicity	20	1.8%	14	2.3%
Language				
English	1,097	99.4%	608	99.2%
Spanish	5	0.5%	4	0.7%
Other	2	0.2%	1	0.2%
Residence in county with population of at least 100,000 people	737*	66.8%	325	53.0%
Clinical characteristics				
Mean (SD) CRG risk score (relative clinical burden)	7.8	(4.5)	7.6	(4.4)
Substance abuse diagnosis	489	44.3%	286	46.7%
ACT service recipient	241*	21.8%	104	17.0%
On an ACT team at discharge	101*	9.1%	35	5.7%
Initial hospitalization characteristics				
Psychiatric hospitalization	477*	43.2%	386	63.0%
Hospital size				
Fewer than 100 beds	83	7.5%	106	17.3%
100-499 beds	584	52.9%	357	58.2%
500 or more beds	437*	39.6%	150	24.5%

*Statistically significant group difference at the $P < .05$ level. Note. ACT, Assertive community treatment; CRG, Clinical Risk Group; SD, standard deviation.

TABLE 2.
Unadjusted Rates of Hospital Readmission, by Reason for Index Hospitalization and Transitional Care Support^a

	Psychiatric index hospitalization		Nonpsychiatric index hospitalization		All hospitalizations		Total
	UC	TC	UC	TC	UC	TC	
	n = 386	n = 477	n = 227	n = 627	n = 613	n = 1,104	N = 1,717
Psychiatric readmission within 30 days	75 (19.4%)	55 (11.5%)	11 (4.8%)	22 (3.5%)	86 (14.0%)	77 (7.0%)	163 (9.5%)
Nonpsychiatric readmission within 30 days	23 (6.0%)	14 (2.9%)	50 (22.0%)	89 (14.2%)	73 (11.9%)	103 (9.3%)	176 (10.3%)
Any readmission within 30 days	98 (25.4%)	69 (14.5%)	61 (26.9%)	111 (17.7%)	159 (25.9%)	180 (16.3%)	339 (19.7%)
Psychiatric readmission within 90 days	137 (35.5%)	113 (23.7%)	19 (8.4%)	43 (6.9%)	156 (25.4%)	156 (14.1%)	312 (18.2%)
Nonpsychiatric readmission within 90 days	32 (8.3%)	28 (5.9%)	82 (36.1%)	175 (27.9%)	114 (18.6%)	203 (18.4%)	317 (18.5%)
Any readmission within 90 days	169 (43.8%)	141 (29.6%)	101 (44.5%)	218 (34.8%)	270 (44.0%)	359 (32.5%)	629 (36.6%)
Psychiatric readmission within 1 year	199 (51.6%)	197 (41.3%)	26 (11.5%)	76 (12.1%)	225 (36.7%)	273 (24.7%)	498 (29.0%)
Nonpsychiatric readmission within 1 year	41 (10.6%)	54 (11.3%)	113 (49.8%)	274 (43.7%)	154 (25.1%)	328 (29.7%)	482 (28.1%)
Any readmission within 1 year	240 (62.2%)	251 (52.6%)	139 (61.2%)	350 (55.8%)	379 (61.8%)	601 (54.4%)	980 (57.1%)

^aThese percentages do not adjust for censored cases.
 Note. TC, transitional care; UC, usual care.

tion (as indicated by an inpatient claim DRG of 876-887; coded as yes/no) and hospital size (less than 100 beds, 100-499 beds, or 500 or more beds). Age and CRG risk score were both entered as continuous variables; all other variables were categorical. All analyses were conducted in SPSS version 12.0.

Results

Patient Characteristics

A total of 1,717 Medicaid recipients met the study's inclusion criteria. Study patients were hospitalized in 100 different North Carolina hospitals. Forty-seven percent of the DRGs were for psychosis; 4% were for drug overdose; 2% each were for chest pain, COPD, diabetes, esophagitis, septicemia, and seizures; and 1% each were for depression, cellulitis, renal failure, pneumonia, syncope, pulmonary edema, and major joint replacement. All other DRGs occurred at a frequency of less than 0.5%. Study patients resided in 89 of North Carolina's 100 counties, and they were thinly distributed across 562 primary care medical homes. Forty-five percent of primary care practices were serving only 1 patient in the study, and less than 16% of practices were serving 5 or more patients in this study.

A total of 1,104 patients (64%) received transitional care assessment or intervention by a CCNC care manager. Substance abuse/dependence diagnosis, sex, race, ethnicity, language distributions, and overall clinical risk burden were similar for the transitional care cohort and for those who received usual care (n = 613; see Table 1). Transitional care patients were older than patients in the usual care cohort (mean age, 43.3 years versus 40.0 years), more

likely to reside in an urban county (66.8% versus 53.0%), more likely to have received ACT during the 3-year period described above (21.8% versus 17.0%), and more likely to be served by an ACT team at the time of the index hospital discharge (9.1% versus 5.7%). Initial hospitalization characteristics also differed between the 2 groups. Most notably, transitional care patients were less likely to have had a psychiatric index hospitalization (43.2% versus 63.0%) and were more likely to have been discharged from a hospital with 500 or more beds (39.6% versus 24.5%).

Readmissions

Unadjusted rates of hospital readmission are shown in Table 2. Across both groups, there were a total of 980 readmissions within 1 year of the index hospitalization: 498 for psychiatric treatment and 482 for nonpsychiatric treatment. For 19% of readmissions after a psychiatric index hospitalization, the reason for readmission was nonpsychiatric. Conversely, for 21% of readmissions after a nonpsychiatric index hospitalization, the reason for readmission was psychiatric. Importantly, 348 (36%) of readmissions were to a different hospital than the index hospitalization. Patients with a psychiatric index hospitalization were more likely to experience a readmission to a different hospital than were those with a nonpsychiatric index hospitalization (41% versus 30%; chi-square = 11.72; $P < .001$).

Time to Readmission

Patients receiving transitional care had a significantly lower readmission rate, regardless of whether the index hospitalization was for a medical or a psychiatric reason

(see Figure 1). After a nonpsychiatric index hospitalization, 18% of transitional care patients were readmitted within 30 days, compared to 27% of usual care patients. This difference was sustained throughout the year following discharge, with 35%, 47%, and 63% of those in the transitional care group readmitted within 3, 6, and 12 months, respectively, compared to 45%, 56%, and 68% for those in the usual care group (Wilcoxon-Gehan statistic = 8.02; $P < .01$). Findings were similar after a psychiatric index hospitalization; readmissions occurred in 14%, 30%, 41%, and 64% of the transitional care group at 1, 3, 6, and 12 months, respectively, compared to 25%, 44%, 58%, and 70% for the usual care group (Wilcoxon-Gehan statistic = 24.69; $P < .0001$).

In multivariate analysis, African American race was the only demographic characteristic associated with decreased risk of readmission (see Table 3). Substance abuse diagnosis and higher CRG risk score were associated with an increased risk of readmission. As expected, having been eligible for ACT in the past 3 years was associated with the highest risk of readmission. When controlling for these variables, recipients of CCNC transitional care were significantly less likely to be readmitted, with a 30.1% relative reduction in readmission ($HR_{TC} = 0.70$; CI, 0.61–0.80).

Because patients who were readmitted soon after discharge would have had less opportunity to be in the transitional care group prior to being readmitted, we conducted a sensitivity analysis removing patients in both groups who were readmitted within 7 days of discharge. Transitional care remained statistically significantly associated with a reduced risk of readmission (full model not shown;

$HR_{TC} = 0.75$; CI, 0.65–0.87).

ACT Subgroup Analysis

Between-group differences in readmission rates were even greater among the 136 patients receiving ACT services at the time of discharge. Specifically, readmission rates were 16%, 31%, 41%, and 67% for the transitional care group at 1, 3, 6, and 12 months, respectively, compared to 43%, 60%, 70%, and 81% for the usual care group (Wilcoxon-Gehan statistic = 14.03; $P < .001$; see Figure 2). Furthermore, when limiting the Cox regression analyses to patients on an ACT team at discharge, those receiving transitional care continued to be statistically significantly less likely to be readmitted (full model not shown; $HR_{TC} = 0.52$; CI, 0.30–0.92).

Discussion

Patients with complex medical and psychiatric comorbidities face substantial challenges in navigating the transition from hospital to home, increasing their risk of recurrent hospitalizations and escalating health care costs. In this statewide sample of Medicaid recipients with schizophrenia and a medical comorbidity, almost 70% of patients experienced another hospital admission within 1 year after discharge, alternating between a psychiatric and medical hospitalization DRG in 20% of cases, and changing hospitals in 36% of cases.

Transitional care support was associated with a significant decrease in the risk of hospital readmission for this population, including for patients who were already receiving intensive outpatient support under the ACT program. After

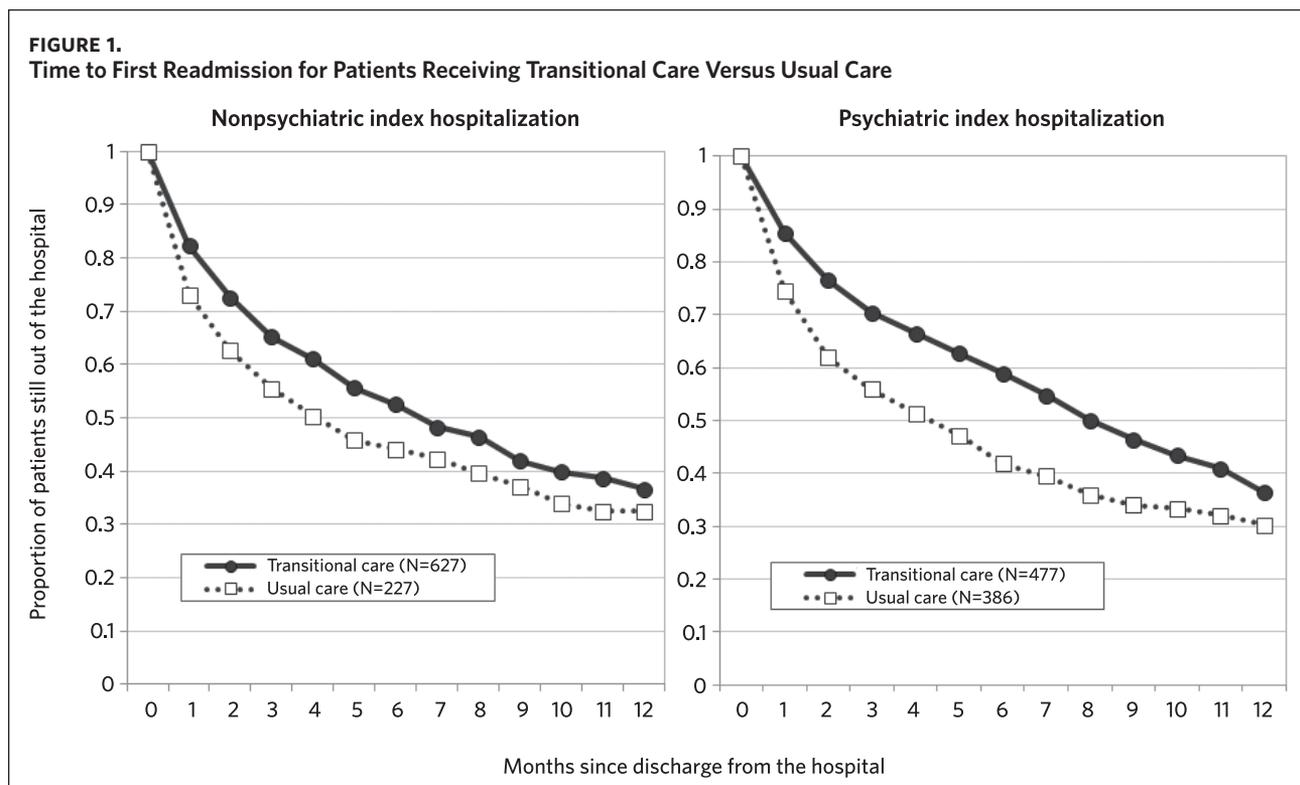


TABLE 3.
Cox Regression Model Estimating the Impact of Transitional Care on Readmission Rates

Variables	P-value	Hazard ratio	Hazard ratio 95% CI	
			Lower limit	Upper limit
Age	.13	1.00	1.00	1.01
Female	.28	1.08	0.94	1.23
Race (reference = white)	.006			
African American	< .001	0.77	0.67	0.88
American Indian	.54	0.89	0.62	1.28
Asian	.80	0.91	0.43	1.92
Other/mixed	.92	1.11	0.15	7.97
Unknown	.48	1.16	0.77	1.76
Hispanic	.44	1.22	0.74	2.01
Language (reference = English)	.94			
Spanish	.91	0.95	0.39	2.32
Other	.74	0.78	0.19	3.22
County size	.89	0.99	0.86	1.14
CRG risk score	< .001	1.06	1.06	1.07
Substance abuse diagnosis	< .001	1.35	1.19	1.54
Index hospitalization for psychiatric treatment	.84	1.01	0.88	1.17
Hospital size (reference < 100 beds)	.36			
100-499 beds	.94	1.01	0.81	1.25
More than 500 beds	.43	0.91	0.71	1.15
ACT service recipient	< .001	1.42	1.21	1.67
Transitional care	< .001	0.70	0.61	0.80

Note. ACT, Assertive community treatment; CRG, Clinical Risk Group.

controlling for demographic and clinical factors, patients were 30% less likely to experience a readmission during the year following discharge compared to clinically similar patients who received usual care. This study adds to a growing body of evidence showing the effectiveness of care coordination interventions to improve hospital transitions for patients at high risk for readmission [16-18]. Indeed, the risk reduction benefit observed for this study population was similar or slightly greater in magnitude than that observed in our prior examination of CCNC transitional care effectiveness, which assessed a more general North Carolina Medicaid population with complex chronic conditions [9].

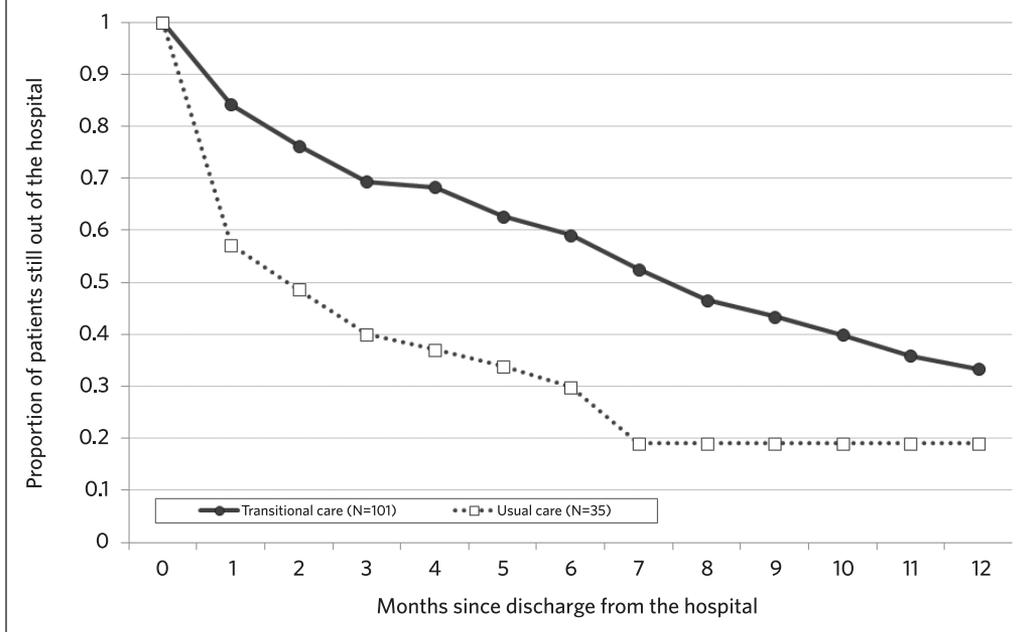
CCNC's transitional care model emphasizes the care manager's role in "connecting the dots" across fragmented systems of care, and it shares a number of core features described by other successful transitional care models [19-21]. Additional features of the CCNC program may be particularly well suited to addressing the transitional care needs of the population studied here. By providing an intermediary, accountable structure between the financing agency (Medicaid) and health care providers, CCNC is able to distribute multidisciplinary care management resources among otherwise unaffiliated health care providers according to the needs of the patient, within the local context of available resources.

This shared infrastructure is essential with respect to overcoming siloes of communication across the behavioral health and physical health care systems, which often face

barriers to sharing real-time information [22, 23]. Our finding that patients were less likely to receive transitional care services after a psychiatric discharge suggests residual barriers to timely identification of these patients for care management services. Now, with strong evidence that such patients are at very high risk for readmission for both psychiatric and medical conditions, these barriers must be overcome so that patients can benefit from transitional care management. Even in cases where the patient may already be intensely managed, such as by an ACT team, there was still a measurable benefit associated with transitional care management.

As with any quasi-experimental study, potential biases may limit these conclusions. This study examined a period when the transitional care program was still evolving and potentially being implemented in slightly different ways across the state. Examination of implementation fidelity and effectiveness of individual components of the transitional care intervention were beyond the scope of this study. Additionally, this was an observational study, and observed associations between transitional care and readmission rates do not establish a causal relationship. Because patients were not randomly assigned to receive transitional care, it is possible that we were unable to account for important unobserved differences between the intervention and comparison groups. Notably, we adopted the most conservative approach possible by using an intent-to-treat model, which included all patients who were screened by a care manager

FIGURE 2.
Impact of Transitional Care on Readmission Rates for Patients on an Assertive Community Treatment (ACT) Team



in the intervention group, even if they did not engage in the intervention. In order to avoid bias related to patient access to primary care, we excluded patients who were not enrolled in a primary care medical home. This may limit generalizability of findings to settings without the robust primary care medical home infrastructure that CCNC has established in North Carolina.

Conclusions

As quality improvement activities to reduce hospital readmissions proliferate throughout the country, our findings suggest that transitional care programs should be sure to address the needs of patients being discharged following a psychiatric hospitalization, those with severe mental illness complicating a general hospital discharge, and those who are already being served by intensive outpatient behavioral health care management programs. **NCMJ**

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