



Published in final edited form as:

*J Nerv Ment Dis.* 2015 January ; 203(1): 65–70. doi:10.1097/NMD.0000000000000224.

## The role of a critical time intervention on the experience of continuity of care among persons with severe mental illness following hospital discharge

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### Abstract

We investigated the impact of Critical Time Intervention (CTI) on self-reported indicators of quality of continuity of care (COC) after discharge from inpatient psychiatric treatment with data from a randomized controlled trial that assessed the effectiveness of the intervention in reducing recurrent homelessness. Post-discharge COC outcome measures among previously homeless persons with severe mental illness randomly assigned to receive usual services only (n=73) or 9-months of CTI in addition to usual services (n=77) were compared. Those assigned to CTI had greater perceived access to care than the usual services group, with this impact extending beyond the point at which the intervention ended. A time-limited care coordination intervention provided immediately following hospital discharge may improve COC, but further studies are needed to substantiate an effect of CTI on long-term continuity outcomes.

### Keywords

schizophrenia; homelessness; continuity of care; Critical Time Intervention

### Introduction

For persons with severe mental illness (SMI), the period following discharge from inpatient psychiatric treatment is frequently a period of significant personal disequilibrium. The nature of many public mental health systems is often fragmented and complex (Smith and Sederer, 2009), and fewer than half the persons with SMI who need ongoing mental health treatment in the United States are connected to routine care (Kreyenbuhl et al., 2009). Disengagement from mental health services and other supports jeopardizes the potential for future community adjustment, and warrants interventions that establish, maintain and strengthen adequate linkages to ongoing care.

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**Conflict of interest:** No conflict of interest declared.

**Disclosures:** This work was supported by grants F31MH082621 and R01MH59716 from the National Institute of Mental Health

Researchers have focused on continuity of care (COC) as a key indicator of quality of care in health services generally (Donaldson, 2001), including in the domain of mental health services (Adair et al., 2003; Melartin et al., 2005) for persons with severe mental illness (Johnson et al., 1997). COC is a complex, multidimensional construct (Bachrach, 1981) that is employed in a variety of ways, with little agreement about which elements are most important (Bruce et al., 2008). It has been viewed as a process measure and an outcome as well as a benchmark of overall quality of care (Christakis, 2003). COC is also an important link to patient clinical and resource utilization outcomes (Van Walraven et al., 2010), including health (Adair et al., 2005), mental health (Greenberg and Rosenheck, 2005) and homelessness (Fortney et al., 2003). A qualitative meta-synthesis on patients' perceptions of continuity of care (Waibel et al., 2012) indicates that there are relatively few studies that employ COC ratings made directly by service recipients with severe mental illness and the association between self-rated continuity and service recipient outcomes during significant service changes has rarely been examined.

Critical Time Intervention (CTI) is a time-limited care coordination model designed to prevent homelessness and other adverse outcomes during such transition periods. While providing emotional and practical support intended to foster individual capacity, CTI aims to build and strengthen long-term ties to formal and informal community care support networks, including connections to treatment providers. The aim of this study is to investigate the impact of CTI on participant self-ratings of COC and examine whether continuity is associated with homelessness and psychiatric re-hospitalization endpoints. We hypothesize that those assigned to the CTI condition would report significantly better continuity of care than would those assigned to treatment as usual, and higher COC rating would yield lower homelessness and psychiatric re-hospitalization.

## Methods

This study is part of our ongoing effort to investigate possible mechanisms through which, in our completed randomized trial, CTI was found to be effective in preventing recurrent homelessness (Herman et al., 2011) and psychiatric re-hospitalization after hospital discharge (Tomita and Herman, 2012). Participants were recruited from transitional residences located on the grounds of two state-operated psychiatric hospitals in the New York City area between 2002 and 2006. Inpatients with difficulty in securing housing arrangements were referred to transitional residences awaiting discharge to the community. They were eligible if they met the following criteria: capacity to provide consent; DSM-IV diagnosis of psychotic disorder; living in a transitional residence between 2002 and 2006; history of homelessness and; plans to reside in New York City after discharge from transitional residences. Those who did not speak sufficient English or did not stay more than three weeknights in the transitional residence were not eligible. All eligible participants were provided with a complete description of the study and written informed consent was obtained. The 150 consenting participants were randomized to either usual services only (USO:  $n = 73$ , 49%) or USO and CTI ( $n = 77$ , 51%). All study procedures were approved by the Columbia University IRB.

Thereafter, researchers blind to participants' assignment status followed them over an 18 months post-discharge period. Baseline demographic data, including information about lifetime diagnoses of psychosis and history of substance use or dependence, were collected prior to discharge from the transitional residences, and COC outcomes were assessed following post-hospital discharge. Further details regarding study procedures, including sample retention and attrition data, are described in a previous publication (Herman et al., 2011).

### Interventions

All participants received discharge planning services and referral to standard community-based services, including outpatient psychiatric treatment. Those assigned to CTI received referral to standard community-based services plus nine months of CTI after leaving the transitional residences. CTI services were delivered by social services workers trained in the model, who were supervised by clinical research staff.

The three-phase CTI intervention is described in detail in previous publications (Susser et al., 1997; Herman and Mandiberg, 2010; Herman et al., 2011). Phase 1 consisted of a CTI worker engaging and providing extensive individualized support for participants following discharge from the transitional residence, focusing on areas critical for successful community adjustment. An important objective of the first phase was for the CTI worker to identify, assess, and strengthen both formal (e.g. service providers) and informal (e.g. family and friends) community support networks to ensure that they would endure well after the intervention ended. In Phase 2, the CTI worker continued to provide direct assistance to participants and members of their support network, but the responsibility for long-term support was gradually transitioned to community sources in a planned way. During this phase, participants and members of their support networks were encouraged to address issues on their own, having access to the CTI worker when crises arose. Phase 3 entailed formally terminating the intervention and transferring responsibility to the community resources for their long-term sustainable support.

### Continuity of care process outcome measures

The first process outcome was the *perceived ease of access to care*, which was assessed using four items adapted from a measure developed by Bindman and colleagues (2000). Upon initial hospital discharge, participants were asked to rate, based on a four-point Likert scale, how easy or difficult they perceived it was to get help right away from someone, such as a social worker or case manager, for an emotional problem: during the daytime on weekdays; nights or weekend; not necessarily immediately, over the next few days and; when arranging an appointment to see a psychiatrist immediately or within a few days. The scores for the four questions were summed to create a perceived accessibility score (range: 4–16), with higher scores indicating greater perceived accessibility ( $\alpha = 0.78$ ). Measures of accessibility of care were assessed at six-week interviews over the 18-month follow-up period.

The second process outcome was *stability of patient-service provider relationship*, which was assessed using two measures at nine and 18 months following hospital discharge. Study

participants were asked if there were any changes in service providers and the length of the working relationship with an existing service provider (psychiatrist, case manager, and therapist) during the preceding nine months. An absence self-reported changes and longer relationships indicated stability of relationships.

The third process outcome was *severity of instability patient-service provider relationship*, which was assessed using several measures. At nine and 18 months following hospital discharge, those who experienced any change in service provider were asked about the number of changes (in psychiatrist and case manager/therapist) during the preceding nine months. A higher number of changes reflected greater severity of instability in patient-service provider relationship. Ware and colleagues (2003) developed a set of COC measures for persons with SMI with respect to the quality of the interpersonal interaction between mental health service users and providers. This tool guided the four sub-scales to assess perceived quality of transition care: physician transition (4 items:  $\alpha = 0.96-0.97$ ); case manager/therapist transition (4 items:  $\alpha = 0.92-0.95$ ); inpatient-outpatient transition (5 items:  $\alpha = 0.80$ ) and; housing transition (5 items:  $\alpha = 0.84$ ). The responses were based on 5-point ordinal Likert-scales, with 1 being low and 5 being a high favorable rating. For each sub-scale, scores from the items were summed to create a sub-scale score. Consistent with previous report, scores were re-scaled to range from 0 to 100 for ease of interpretation, with higher scores reflecting higher quality of transition (Chavez et al., 2007). The physician and case manager/therapist transition outcomes were assessed at nine and 18 months after hospital discharge. These two sub-scales assessed the perceived quality of transition support provided by study participant's former psychiatrist or case manager/therapist in an event of separation in working relationship with them. For all COC measures pertaining to case managers, the relationship with the CTI workers was included for the intervention group. The perceived quality of inpatient-outpatient and housing transition at the time of hospital discharge was assessed once at six weeks after hospital discharge. The inpatient-outpatient sub-scale assessed the perceived quality of the transition, while the housing transition sub-scale captured the perceived quality of help offered by the service providers. As the inpatient-outpatient and housing transition measures related only to the period of hospital discharge, they were treated as baseline characteristics, rather than being used as post-discharge continuity outcomes.

### Data Analyses

The baseline demographic characteristics were compared between the USO and CTI groups at the point of hospital discharge using chi-square and *t*-tests. The perceived quality of transition between inpatient and outpatient services and transition to housing at the point of hospital discharge were compared using Wilcoxon rank-sum test, as an alternative to *t*-test, due to non-normal distribution.

The perceived ease of access to care was analyzed by comparing median group ratings between USO and CTI at the nine-month (first seven 6-weekly intervals average rating) and 18-month follow-up (last six 6-weekly intervals average rating). Due to the extensive number of observations available, multilevel mixed-effects linear regression was used to assess the impact of assignment to CTI on change in perceived ease of access to care over

the course of the 18-month follow-up, adjusting for demographic measures, psychiatric diagnosis and substance use prior to hospital admission. The process outcome measure in service provider change was assessed by comparing the proportion of study participants in the USO and CTI groups who experienced a change in the type of service provider during the nine and 18-month follow-up period using chi-square. A baseline demographic characteristics comparison between those who did and did not experience change in service provider at 9-month was also assessed. The length of working relationship, number of changes in service provider, and perceived quality of transition care (physician and case manager transition) were assessed by comparing the median group ratings between USO and CTI at nine and 18-month follow-up using Wilcoxon rank-sum test. The assessment of the number of changes in service provider and the perceived quality of transition care rating were only applicable to study participants who experienced service provider change. This necessitated subpopulation analyses based on a non-parametric method, namely quintile regression model (Koenker and Bassett, 1978) with bootstrap methods to assess the association between assignment to intervention controlling for gender, age and substance use history at nine and 18-month follow-up.

Lastly, we correlated the above 9-month COC measures with homelessness and psychiatric re-hospitalization outcomes. As reported in our previous publications from this trial, we found that assignment to CTI was associated with a reduced prevalence of both homelessness (OR=0.22, 95% CI: 0.06–0.88) and psychiatric re-hospitalization (OR= 0.11, 95% CI: 0.01–0.96) during the last three follow-up intervals (Herman et al., 2011; Tomita et al., 2012). In the present analysis, the severity of outcomes was assessed by capturing the number of incidence episodes of homelessness and psychiatric re-hospitalization during the last three follow-up intervals; these ranged from 0 (no episode during the three intervals) to three (at least an episode per interval for all three intervals). Analyses were conducted using either Spearman's rank or point-biserial method, depending on whether COC measures were continuous or dichotomous. STATA Version 12 (StataCorp, 2011) was used for all analyses.

## Results

Full details of the baseline demographic characteristics of the 150 study participants are presented elsewhere (Herman et al., 2011). Briefly, approximately three quarters of the sample were male ( $n = 107, 71\%$ ) and most were African-American ( $n = 93, 62\%$ ), with the mean age being 38 years. Lifetime diagnosis of schizophrenia ( $n = 92, 61\%$ ) and schizoaffective disorder ( $n = 52, 35\%$ ) were the most common psychiatric disorders, and almost all the participants ( $n=135, 95\%$ ) had a diagnosis of either lifetime substance use or dependence. There were no significant baseline demographic differences between the CTI and USO groups. The transition sub-scales scores ranged from 0–100, and there was no significant group difference in the perceived quality of inpatient-outpatient (USO = 66.7 vs. CTI = 70.8,  $p = 0.51$ ) and housing transition median scores (USO = 58.3 vs. CTI = 58.3,  $p = 0.59$ ) at the point of hospital discharge.

### Perceived ease of access to care process

The results of the nine and 18-month COC assessments following hospital discharge are summarized in Table 1, with no difference in the mean and median COC ratings in perceived ease of access to care between the two groups. The adjusted mixed-effects regression indicated that assignment to CTI was associated with higher perceived ease of access to care over the course of the 18-month follow-up ( $\beta = 0.73$ ,  $z = 2.45$ ,  $p = 0.02$ ). No other covariates were significant over time.

### Stability of patient-service provider relationship

The proportion of study participants who experienced a change in their case manager/therapist was significantly lower in the CTI than the USO group at the nine month assessment (USO = 41% vs. CTI = 23%,  $\chi^2 = 4.0$ ,  $p = 0.05$ ), but not at 18-months. There was no significant difference in the proportion of study participants who experienced a change in their psychiatrists neither at either time point, nor in any of the baseline demographic characteristics between those who did and did not experience a change in service provider at nine months. The Wilcoxon rank-sum test indicated that the median lengths of working relationships with the same psychiatrist ( $p = 0.05$ ) and case manager ( $p = 0.05$ ) were significantly higher for those assigned to CTI than the USO group at nine months (but not at 18 months) based on a statistically different distribution and ranking of the outcome. No significant differences were detected in the length of relationship with the therapist/counselor at either observation point.

### Severity of instability patient-service provider relationship

The participants assigned to CTI had a significantly lower median number of changes in their case manager/therapist at 18-months (USO = 2 vs. CTI = 1,  $z = 2.5$ ,  $p = 0.01$ ), but not at nine months, based on the Wilcoxon rank-sum test. There was no significant difference between the groups in the number of changes in psychiatrist at either assessment point (Table 1), and no differences in the number of changes in psychiatrist or case manager/therapist at either assessment point based on adjusted quintile regression.

The perceived physician and case manager transition ratings were below 50 for both groups at nine and 18 months. Analysis comparing median scores between USO and CTI using the Wilcoxon rank-sum test showed no significant difference between groups in the physician and case manager transition scores at either assessment points. The adjusted quintile regression analyses indicated that those assigned to CTI as a group had more favorable physician transition sub-scale ratings than did the USO group at the nine month assessment ( $\beta = 37.5$ ,  $t = 2.33$ ,  $p = 0.03$ ), reflecting a more positive perception of dealing with changes in their treating psychiatrist. There was no significant difference between the groups in this outcome at 18-months. In addition, there was no significant difference on ratings of the case manager/therapist transition sub-scale at the nine or 18-month assessment.

### Association between COC and clinical outcomes

The correlations between COC and endpoint homelessness and psychiatric re-hospitalization are presented in Table 2. On one hand, improved perceptions of access to care ( $r = -0.26$ ,  $p$



0.01) and a longer working relationship with the same case manager ( $r = -0.28, p = 0.01$ ) were associated with lower risk of homelessness. On the other hand, change in case manager ( $r = 0.21, p = 0.03$ ) was also associated with higher homelessness risk. Change in psychiatrist ( $r = 0.32, p = 0.01$ ) and case manager ( $r = 0.27, p = 0.01$ ) were both associated with higher risk of psychiatric re-hospitalization, while a longer working relationship with the same psychiatrist ( $r = -0.31, p = 0.01$ ) and case manager ( $r = -0.30, p = 0.01$ ), as well as a more positive perception of psychiatrist ( $r = -0.43, p = 0.01$ ) and case manager transition ( $r = -0.38, p = 0.04$ ), were associated with lower risk of psychiatric re-hospitalization.

## Discussion

Our findings indicate that assignment to CTI was associated with a more favorable assessment of continuity across several domains, particularly during the first nine months. While improved COC ratings were observed in some measures over 18 months, these impacts were more limited. Several nine-month COC measures were significantly correlated with lower risk of homelessness and psychiatric re-hospitalization at the study's endpoint, suggesting that some of the impact of CTI on reducing recurrent homelessness and psychiatric re-hospitalization risk may be mediated by improved continuity. It is also notable that the correlations between continuity indicators of care by the treating psychiatrist and reduced re-hospitalization risk, although moderate in magnitude, were the strongest we observed. These findings support the importance of continuous engagement with various mental health services and other supports, and suggest that a time-limited intervention provided at the point of hospital discharge may help improve some dimensions of post-discharge COC for persons with SMI and histories of homelessness. These results are consistent with two other published studies that examined the impact of CTI in promoting COC after institutional discharge (Dixon et al., 2009; Jarrett et al., 2012), both of which found that those assigned to CTI yielded better results in short-term continuity.

The study has several implications for improving service delivery in this context. We found that the perceived quality of transition from inpatient to outpatient care was modest in both conditions, and the perceived quality of help offered by service providers focused on housing was low for both groups. This reinforces the need to improve the quality of support provided relating to housing needs at discharge for this high-risk population. This is consistent with the results of a recent qualitative study by Manuel and colleagues that identified the need for orientation to neighborhood and residence as one of the most important enabling factors for successful community integration among formerly homeless women awaiting hospital discharge (2012).

The results also indicate that perceived quality of transition in the event of separation from their service providers was a major challenge for both groups. While there is little evidence that ongoing contact with the same provider will necessarily translate into a strengthened therapeutic relationship (Freeman and Hjortdahl, 1997), low continuity ratings related to provider transitions is a particularly alarming issue, suggesting potential barriers to timely communication and accurate information sharing between them. This can lead to loss of knowledge about individual needs, values and preferences, accompanied by the potential breakdown of an effective working alliance between the consumer and providers.

There were several limitations to the study, the first being the sample size, particularly with respect to the analysis of post-discharge transition sub-scales, which were applied only to the approximately one quarter of participants who reported changes in service providers during the course of the study. This limitation precluded us from employing structural equation modeling, a method better suited to formally investigating the role of COC in mediating the relationship between CTI and key outcomes such as homelessness and psychiatric re-hospitalization. A second limitation is the lack of caregivers' perspective on COC. While our study was unusual in utilizing measures of continuity as reported by service recipients themselves, we cannot ignore the important role that caregivers play in promoting COC post-psychiatric hospital discharge, particularly in areas such as information flow (Freeman et al., 2007), where data relevant to a patient's care is presented to both the caregiver and patient. Future research should incorporate service recipient and caregiver perspectives on COC. Lastly, it is important to note that ratings of case manager COC referred to both CTI and non-CTI workers. Although this limitation is not relevant to the interpretation of the 18-month result (since the CTI intervention was provided for a maximum of nine months), our finding that higher COC ratings related to the length of working relationship with a case manager in the CTI group at nine months may be at least partially explained by the presence of the CTI worker.

## Conclusion

Overall, our results support the idea that a time-limited care coordination intervention provided at the point of hospital discharge is an effective strategy to enhance some domains of continuity of care among persons with SMI following hospital discharge, particularly over the short-term. As the evidence base for CTI continues to develop (Herman, 2014), further research is needed to assess its impact over longer follow-up periods, and to more definitively examine whether CTI's impact on reducing risk for post-discharge homelessness and re-hospitalization is mediated by improvements in particular domains of continuity of care.

## Acknowledgments

This work was supported by grants F31MH082621 (PI: Tomita) and R01MH59716 (PI: Herman) from the National Institute of Mental Health.

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**Table 1**

Continuity of care outcomes after psychiatric hospital discharge.

	9-Month Outcome Assessment										18-Month Outcome Assessment																										
	USO					CTI					Group comparison					USO					CTI					Group comparison											
	n	M	Mdn	P <sub>75</sub>	P <sub>25</sub>	n	M	Mdn	P <sub>75</sub>	P <sub>25</sub>	n	M	Mdn	P <sub>75</sub>	P <sub>25</sub>	n	M	Mdn	P <sub>75</sub>	P <sub>25</sub>	n	M	Mdn	P <sub>75</sub>	P <sub>25</sub>	n	M	Mdn	P <sub>75</sub>	P <sub>25</sub>	$\chi^2, z$	<i>P</i>					
Perceived ease of access <sup>‡</sup> :	63	12.3	12.3	14.5	10.5	67	12.6	12.6	15	11	0.45	50	11.9	12	14.2	10.3	57	12.8	12.8	14	11.33	z = -1.4	0.16														
Change in provider (%):																																					
in psychiatrist	24	44%				18	30%				0.13	19	40%				21	40%																			
in case manager/therapist	22	41%				14	23%				0.046	22	50%				23	46%																			
Length of relationship (months):																																					
with same psychiatrist	49	6.9	9	9	2	49	8.0	9	9	4	0.05	42	12.0	12	18	2	48	14.4	18	18	6	z = -1.6	0.11														
with same case manager	41	7.5	9	9	2	50	10.0	9	9	9	0.02	39	11.2	8	18	2	47	11.4	8	18	3	z = -0.7	0.51														
with same therapist/counselor	19	7.1	9	9	4	25	10.0	9	9	2	0.66	20	10.7	10.5	18	3	21	14.1	14	18	3	z = -0.1	0.96														
Number of changes <sup>†</sup> :																																					
in psychiatrist	20	2.8	2	5	1	17	2.7	2	3	2	0.87	19	2.8	2	5	1	21	1.8	1	2	1	z = 1.8	0.07														
in case manager/therapist	15	2.8	2	4	1	14	3.1	3	4	1	0.66	20	2.4	2	3	1	23	1.5	1	1	1	z = 2.5	0.01														
Transition ratings <sup>‡</sup> :																																					
in psychiatrist	20	37.1	14.6	79	0	16	43.2	39.6	67	20.9	0.44*	17	28.3	16.7	50	0	18	41.3	39.6	75	8	z = -1.00	0.32														
in case manager/therapist	18	31.8	28.1	63	0	14	39.4	45.8	58.3	0	0.55	18	40.3	37.5	75	0	22	40.4	41.7	69	6	z = -0.2	0.84														

<sup>†</sup> Analyses conducted when there are change in service provider which explains smaller sample sub-population. Significance of adjusted quintile regression analyses

\* *P* 0.05.

<sup>‡</sup> Higher rating is better COC

**Table 2**

Correlation matrix between 9-month COC and clinical outcomes

	Homelessness in last 3 intervals (0-3)			Re-hospitalization in last 3 intervals (0-3)		
	n	correlation	p	n	correlation	p
Perceived access to care <sup>†</sup> (4-16)	110	-0.26	<0.01	110	0.01	0.91
Presence of change <sup>*</sup>						
with psychiatrist	108	0.05	0.63	108	0.32	<0.01
with case manager	108	0.21	0.03	108	0.27	<0.01
Length of working relationship (in months)						
with same psychiatrist	102	-0.08	0.43	102	-0.31	<0.01
with same case manager	86	-0.28	<0.01	86	-0.30	<0.01
with same therapist/counselor	43	0.05	0.77	43	-0.08	0.63
Number of changes <sup>†</sup> (0-6 or more)						
in psychiatrist	35	0.16	0.36	35	-0.01	0.98
in case manager	27	-0.14	0.50	27	0.09	0.65
Transition rating <sup>†,‡</sup> (0-100)						
in psychiatrists	34	0.06	0.72	34	-0.43	0.01
in case manager	30	0.01	0.98	30	-0.38	0.04

<sup>†</sup> Analyses conducted when there are change in service provider.

<sup>‡</sup> Higher rating is better COC

\* Based on point biserial correlation using linear regression when the outcome variable is dichotomous and COC in continuous format