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## The Effect of the Care Transitions Intervention on ED Revisits and Outpatient Clinic Follow-Up among Older Adults Who Live Alone

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### ABSTRACT

<b>Introduction</b>	Older adults frequently return to an emergency department (ED) within 30 days of an initial visit. In this study, we examined the effectiveness of an adapted Care Transitions Intervention (CTI) at reducing risk of ED revisits within 30 days for older adults who live alone. We also explored the interaction between receiving help with healthcare needs and receiving the CTI on the risk of 30-day ED revisits.
<b>Methods</b>	We conducted a subgroup analysis of community-dwelling older (age≥60 years) ED patients who reported living alone as part of a randomized controlled trial of CTI effectiveness following discharge home from one of three EDs in two states. The primary outcome (ED revisits within 30 days of discharge) and secondary outcomes (ED revisits within 14 days, outpatient follow-up within 7 and 30 days) were obtained from medical record review and patient surveys. Two-sample t-tests and binomial logistic regression were used to analyze main and interaction effects of the CTI and receiving help with healthcare tasks (self-reported) for each outcome.
<b>Results</b>	For participants living alone, key characteristics did not significantly differ across randomization groups (278 intervention, 281 control). Overall, 196 (35.2%) reported receiving help with healthcare needs. The CTI had no direct effect on risk of ED revisits or outpatient follow-up at any time point. The interaction of the CTI and receiving help with healthcare needs did not affect risk of ED revisits but did significantly impact likelihood of outpatient clinic follow-up within 7 days ( $p=0.01$ ). Of participants who had help with healthcare needs, those who were assigned to the CTI had decreased odds of outpatient clinic follow-up at 7 days (OR: 0.47, 95%CI 0.86-2.18), compared to those not randomized to the CTI condition.
<b>Conclusion</b>	For older adults who live alone being discharged from the ED, assignment to the CTI did not decrease ED revisit risk or increase likelihood of outpatient follow-up. Participants assigned to receive the intervention who reported receiving help with health care needs had a decreased likelihood of outpatient clinic follow-up within 7 days. Further research is needed to explore ways to improve the ED-to-home transition in this population.

### INTRODUCTION

Adults aged 60 years and older accounted for approximately 29.1 million (20%) of ED visits in 2018.<sup>1</sup> Of this population, 19.6 million (68%) were treated and discharged directly from the ED.<sup>1</sup> These individuals are at high risk of experiencing adverse health outcomes following ED care.<sup>2-5</sup> Prior studies demonstrated that within 30 days of discharge, 20-25% of older adults revisited an ED for treatment,

with 42% returning at least once within 90 days.<sup>3,6,7</sup> Suboptimal care transitions following an index ED visit have been associated with increased hospitalization, decreases in outpatient follow-up, medication mismanagement, and even increased mortality.<sup>3,5,8</sup>

Transition interventions have been developed to mitigate these negative health outcomes. Yet, most ED-to-home interventions have not demonstrated significant reductions in ED revisits among older adults.<sup>9</sup> A potential explanation for these results is that applying a care transition intervention to undifferentiated groups of older ED patients may be inappropriate, as the older adult population is heterogeneous in care needs. Although many may be at risk for ED revisits, only certain populations may have modifiable risks.<sup>8,9</sup>

Older adults who live alone comprise one potentially high-risk group who may particularly benefit from a care transition intervention. They are more likely to use the ED for initial care and to revisit the ED following initial care.<sup>3,10,11</sup> This use pattern may stem from a lack of social support, as those who live alone are at heightened risk of being socially isolated,<sup>12,13</sup> which has been shown to be predictive of future ED use and hospital admissions.<sup>13</sup> Conversely, good social support has been shown to be instrumental in managing health care after an ED visit.<sup>14-18</sup>

Previously, we performed a randomized controlled trial testing the effectiveness of the Care Transitions Intervention (CTI) adapted for use in the ED-to-home context within an undifferentiated older adult population.<sup>19,20</sup> Though the CTI did not significantly affect the odds of ED revisits within 30 days for participants, it did increase the odds of outpatient clinic follow-up within 7 days.<sup>20</sup> To our knowledge, no studies have examined the effect of the CTI among older adults who live alone. As such, we performed a subgroup analysis to evaluate the effect of the CTI on ED-to-home transition outcomes of ED revisits and outpatient clinic follow-up (both objective measures of healthcare utilization with strong bodies of evidence)<sup>2,8</sup> among the subgroups of older adults living alone who did and did not require help with healthcare needs. We hypothesized that for individuals who live alone, the CTI would decrease odds of ED revisits within 30 days (primary outcome) and 14 days, as well as increase odds of outpatient follow-up within 7- and 30-days following ED discharge. Further, we hypothesized that those reporting receiving help with healthcare needs assigned to the CTI would have decreased odds of ED revisits and increased odds of outpatient clinic follow-up.

## METHODS

We performed a subgroup analysis of participants who reported living alone from a single-blind randomized controlled trial (clinicaltrials.gov: NCT02520661) testing the effectiveness of an adapted CTI to improve the ED-to-home transition for community-dwelling older adults. Full details for the parent study have been published.<sup>7,19,20</sup> This study was approved by the Institutional Review Boards at the University of Wisconsin-Madison and University of Rochester with written informed consent.

### *Setting and Participants*

In the parent study, we recruited older adult patients who were discharged from one of three participating university hospital EDs in Madison, Wisconsin and Rochester, New York. To be considered eligible, participants had to be aged  $\geq 60$  years, be community-dwelling (i.e., did not live in a skilled or assisted care facility), reside in Dane County, WI or Monroe County, NY, have a primary care provider affiliated with either university health system, have a working telephone, and be discharged within 24 hours of ED arrival. They also had to have decisional capacity to consent or have a legally authorized representative to provide informed consent. For this analysis, participants also had to report living alone. This was determined during the initial ED visit by asking the participants “who do you live with?”. Answers were aggregated to form the binary of “living alone” and “not living alone”, and those in the “living alone” category were included.

Patients were excluded if they did not speak English as coaching services were only offered in English. Visual or hearing-impairment after correction also led to exclusion due to the nature of the coaching activities. Patients were also excluded if they had previously participated in the study, did not have a permanent residence, or were currently enrolled in a care management program, a care transitions program, or hospice services. Participants who presented to the ED with a primary behavioral health complaint or were assigned an Emergency Severity Index category of 1 were also excluded.

### ***Study Procedures***

During their initial ED visits, eligible ED patients were consented and randomly assigned to the control (usual care) or intervention group (adapted CTI). Usual care consisted of physicians or advanced practice providers delivering verbal and written discharge instructions, with ED nurses reinforcing this information. During the index ED visit, all participants completed verbal surveys and assessments to capture demographic information, cognitive performance, and psychosocial factors. If needed, legally authorized representatives could assist in completing certain survey measures. Researchers also conducted phone surveys approximately 4 and 30 days after ED discharge to collect outcomes and perform certain assessments, as previously published.<sup>19</sup> Research staff performed medical record reviews to gather additional information, using established best practices.<sup>21</sup> Data were collected from January 2016 through July 2019.

### ***Intervention Description***

Subjects in the intervention group received an adapted version of the CTI delivered by trained community paramedic coaches (details previously published),<sup>7,22</sup> consisting of an in-home coaching visit 24-72 hours after ED discharge and up to three follow-up phone calls over the next four weeks. No care transitions coaching occurred in the ED.

During these follow-up visits, paramedics used coaching strategies, including motivational interviewing, to help participants understand the CTI's four main self-management components ("pillars"): outpatient follow-up, medication self-management, knowledge of red flag symptoms, and keeping a personal health record. Knowledge of red flag symptoms was defined as knowledge about any symptoms provided on the ED discharge instructions that would indicate the need for rapid medical evaluation.<sup>19,22</sup> A personal health record documents the patient's active health issues/needs and the patient's questions regarding their health.<sup>22</sup> As per CTI guidelines, community paramedic coaches did not directly deliver medical or social services to participants.

### ***Measures***

***Help with Health Care Needs:*** At the time of the initial ED visit, participants were asked "who helps you with your health care needs?" Answer options included "family", "friends", "aide paid privately or by insurance", "others", "no one", "I do not know", and "no answer". Responses were dichotomized into "Receives help" and "Does not receive help", with non-answers ("I do not know" and "no answer") being classified as "missing responses". We did not differentiate between paid and non-paid help as we had a small population and specifying payment in caregiving conceptions have been previously tied to issues of underreporting.<sup>23,24</sup>

***Intervention Outcomes:*** The primary outcome measure was whether an ED revisit occurred within 30 days of ED discharge. Secondly, we assessed ED revisits within 14 days as well as outpatient follow-up within 7 and 30 days of ED discharge. Follow-up with outpatient clinicians could include offices visits, telephone calls for medical care, and online patient portal messaging (video telehealth visits were not available at the time of the study). We excluded previously scheduled procedures, lab testing, and imaging, clinic-generated messages not requiring a patient response, and any communication that did

not include the patient. ED revisits and outpatient follow-up were selected as study outcome measures as these are the most commonly used outcome assessments of care transition interventions.<sup>2,3,8,9,25</sup>

**Covariates:** We measured demographic and health characteristics previously associated with significantly higher ED revisit rates<sup>26-30</sup> to consider as potential covariates in our analysis. Variables assessed using self-reported survey questions included depression (Patient Health Questionnaire-9),<sup>31</sup> anxiety (General Anxiety Disorder-2),<sup>32</sup> limitations in activities of daily living,<sup>33</sup> and health literacy.<sup>34</sup> Each was treated as a binary characteristic using standard thresholds. Age and number of comorbid conditions, consistent with the Charlson Comorbidity Index,<sup>35</sup> were abstracted from medical chart review and treated as continuous.

### Statistical Analysis

Analyses were performed using R, version 4.1.3 for Windows (The R Foundation, Vienna, AT). Prior to model fitting, we tested for significant differences among covariates using Pearson chi-squared and two-sample t-tests between the intervention and control groups in this subpopulation. We also did a comparison of the receiving help and not receiving help groups to assess for significant differences among covariates using Pearson chi-square and two-sample t-tests. We found no differences at a level of  $p < 0.10$  and therefore did not include additional covariates in the models. All analyses were conducted as intention-to-treat.

We performed a binomial logistic regression of having help, intervention assignment, and their interaction on each outcome variable of interest. We used estimated marginal means (EMMs) in R to estimate marginal odds ratios for having help, comparing treatment and control.<sup>36</sup> We defined p-values of less than 0.05 to be statistically significant and report all regression outcomes as adjusted odds ratios (AORs) with 95% confidence intervals (CIs).

## RESULTS

Of the 1756 participants in the parent study, 559 lived alone at the time of their ED visit (281 control, 278 intervention). Characteristics were similar across randomized groups (Table 1). Of the 559 participants who lived alone, 196 reported receiving help with healthcare. Two participants did not respond to the question and were dropped from analysis. Participants who received help were significantly older, *Mean* [SD]= 76.93 [10.06] years and had worse self-reported health status compared to individuals who did not receive help (Table 1).

**Table 1:** Population Characteristics<sup>a</sup>

Characteristic	Overall (N=559)	Control Group (n=281)	Intervention Group (n=278)	Not Receiving Help (n = 361) <sup>b</sup>	Receiving Help (n = 196) <sup>b</sup>
Age (M [SD])	74.3 (9.2)	73.9 (9.2)	74.8 (9.3)	72.9 (8.4)***	76.9 (10.1)***
Sex=Male (%)	168 (30.1)	82 (29.2)	86 (30.9)	107 (29.6)	60 (30.6)
Race=Non-White (%)	49 (8.8)	24 (8.6)	25 (9.0)	33 (9.2)	16 (8.2)
Ethnicity=Hispanic (%)	7 (1.3)	4 (1.4)	3 (1.1)	4 (1.1)	3 (1.5)
Education=Some College or Less (%)	241 (43.1)	121 (43.1)	120 (43.2)	150 (41.6)	89 (45.4)
Number of Charlson Comorbidities (M [SD])	3.0 (1.7)	3.1 (1.7)	3.0 (1.7)	2.9 (1.7)*	3.3 (1.6)*
Limited in 1+ ADLs (%)	231 (41.3)	113 (40.2)	118 (42.4)	126 (34.9)***	103 (52.6)***
BOMC Score (M [SD])	2.98 (4.0)	2.94 (4.0)	3.01 (3.9)	2.7 (3.7)	3.4 (4.4)

Health Literacy =Inadequate (%)	83 (14.9)	43 (15.4)	40 (14.4)	42 (11.6)**	41 (21.1)**
GAD-2=Anxiety Disorder (%)	118 (21.1)	64 (22.9)	54 (19.4)	71 (19.7)	47 (24.1)
GAD-2 (M [SD])	1.43 (1.67)	1.50 (1.66)	1.35 (1.68)	1.37 (1.67)	1.54 (1.67)
PHQ-9=Moderate to Severe (%)	75 (13.4)	37 (13.2)	38 (13.7)	42 (11.6)	33 (16.9)
PHQ-9 (M [SD])	4.54 (4.36)	4.47 (4.06)	4.60 (4.65)	4.14 (4.09)**	5.27 (4.77)**
SF-12: Self-Rated Overall Health Fair-Poor (%)	122 (21.9)	63 (22.5)	59 (21.4)	65 (18.1)**	57 (29.4)**
Years Spent with PCP=<5 (%)	225 (40.8)	116 (41.6)	109 (39.9)	142 (39.9)	82 (42.3)
Count on Care Team=Hardly at All-Moderately (%)	89 (16.4)	44 (16.2)	45 (16.6)	58 (16.5)	31 (16.5)
Any Hospitalization in 30 Days Prior to Index ED Visit (%)	28 (5.0)	10 (3.6)	18 (6.5)	14 (3.9)	14 (7.1)
ED Visits in 30 Days Prior to Index ED Visit (M [SD])	0.1 (0.4)	0.1 (0.4)	0.2 (0.4)	0.1 (0.4)	0.1 (0.4)

<sup>a</sup>Abbreviations: ADLs, Activities of Daily Living; BOMC, Blessed Orientation Memory Concentration; GAD-2, Generalized Anxiety Disorder 2-item; PHQ-9, Patient Health Questionnaire-9; SF-12, 12-item Short Form Survey; PCP, Primary Care Provider; ED, Emergency Department; \* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

<sup>b</sup> $N = 557$  due to missing responses.

Using bivariate analysis, we found no significant differences in ED revisits within 14 or 30 days, or outpatient follow-up within 7 or 30 days, between the control and intervention groups of participants living alone at time of the ED visit. Similarly, there were no significant differences in ED revisits within 14 and 30 days, or outpatient follow-up within 7 and 30 days, between participants who reported receiving help with healthcare and those who did not receive help (Table 2).

**Table 2: Outcomes Comparison (Bivariate Analyses)<sup>a</sup>**

Characteristic	Overall (N=559)	Control Group (n=281)	Intervention Group (n=278)	Not Receiving Help (n = 361) <sup>b</sup>	Receiving Help (n = 196) <sup>b</sup>
Any ED Follow-Up at 14d (%)	52 (9.4)	26 (9.4)	26 (9.4)	31 (8.6)	21 (10.8)
Any ED Follow-Up at 30d (%)	76 (13.7)	36 (12.9)	40 (14.4)	42 (11.7)	33 (17.0)
Any Outpatient Follow-Up 7d - Yes (%)	410 (73.3)	207 (73.7)	203 (73.0)	261 (72.3)	147 (75.0)
Any Outpatient Follow-Up 30d - Yes (%)	495 (88.6)	247 (87.9)	248 (89.2)	314 (87.0)	179 (91.3)

<sup>a</sup>Abbreviations: d, days; ED, Emergency Department

<sup>b</sup> $N = 557$  due to missing responses.

Using a generalized logistic regression analysis, we found that the CTI was not associated with a significant change in the odds of ED revisits within 14 or 30 days (Table 3). Similarly, it was not associated with a significant change in odds of outpatient follow-up within 7 or 30 days (Table 3).

**Table 3: Effect of the Care Transitions Intervention<sup>a</sup>**

Outcome	Model	Odds Ratio	95% Confidence Interval
ED Revisit	ED revisit within 14 days	1.00	0.56-1.77
	ED revisit within 30 days	1.14	0.70-1.84
Outpatient Clinic Follow-up	Outpatient clinic follow-up within 7 days	0.97	0.65-1.41
	Outpatient clinic follow-up within 30 days	1.14	0.68-1.92

<sup>a</sup>Abbreviations: ED, Emergency Department

We next assessed whether the impact of CTI differed for those who received help with their health care needs. We found no significant impact on ED revisits at 14 or 30 days or outpatient clinic follow-up in 30 days, but we did find a significant difference for outpatient clinic follow-up in 7 days ( $p=0.01$ ). Specifically, the likelihood of having outpatient clinic follow-up within 7 days for those receiving help with healthcare needs was smaller for those assigned to the CTI as compared to those in the control group (OR 0.47; 95% CI: 0.24-0.92) (Table 4).

**Table 4:** Effects of the Care Transitions Intervention for Participants Receiving Help with Healthcare Needs<sup>a</sup>

Outcome	Model	Odds Ratio	95% Confidence Interval
ED Revisit	ED revisits within 14 days	0.62	0.25 – 1.54
	ED revisits within 30 days	1.21	0.57 - 2.59
Outpatient Clinic Follow-up	Outpatient clinic follow-up within 7 days	0.47*	0.24 – 0.92
	Outpatient clinic follow-up within 30 days	0.60	0.21 – 1.70

<sup>a</sup>Abbreviations: ED, Emergency Department, \* $p<.05$

## DISCUSSION

In this study, we examined whether a high-risk group of older adults, specifically those living alone, would benefit from the addition of the adapted CTI after ED discharge. We found that the CTI was not associated with the likelihood of 14- or 30-day ED revisits or a change in likelihood of 7- or 30-day outpatient clinic follow-up among this population of individuals who lived alone. We further hypothesized that those living alone and already receiving help with healthcare needs would benefit most from CTI given the higher comorbidity burden and worse overall health in this subgroup (Table 1). Our analyses did not support this hypothesis. In fact, interaction effects demonstrated that the CTI was associated with significantly lower odds of outpatient clinic follow-up within 7 days.

The lack of effect of the CTI for improving outcome factors of the ED-to-home transition among vulnerable individuals who live alone was unexpected, as the CTI has proven effective for hospitalized older adults being discharged home and with a variety of other hospital populations (i.e., pediatrics, patients with caregivers, and patients with dementia).<sup>37-41</sup> However, older adults who live alone are heterogeneous in their health, care needs, physical function, cognitive function, and social behavior.<sup>42-45</sup> In this analysis sample (older adults who live alone), there was much variability in participant's age, deficiencies in activities of daily living, and performance on testing for anxiety, depression, and cognition within both treatment conditions. This range in characteristics is not surprising. Although living alone

is a risk factor for social isolation, and social isolation increases the risk for ED revisits,<sup>42,43</sup> living alone could also reflect independence and high functional status in terms of physicality and cognition.<sup>42</sup>

Regarding the interaction of healthcare help and CTI, it is unclear why the odds of outpatient clinic follow-up would have decreased in this subpopulation, especially as outpatient follow-up is one of the core pillars emphasized by the CTI.<sup>38</sup> It is possible that the addition of CTI coaching to the support received for health care at home created an increased sense of self-confidence in health management, but a false sense of reassurance that all medical support needed had been received.<sup>46,47</sup> The CTI was never intended to be substitutive of outpatient follow-up, but rather to complement and enhance patient activation and self-management in this area.

Assuming our findings are valid, they raise some interesting and potentially critical questions. Improved continuity of care from inpatient to outpatient settings in other studies has been shown to decrease the risk of rehospitalization.<sup>16,48</sup> Specifically, follow-up within 7 days after hospital admissions has been shown to meaningfully reduce readmission risk.<sup>16</sup> As outpatient follow-up results in improved health outcomes like lowered mortality risk,<sup>49</sup> an unanticipated reduction in outpatient clinic follow-up for those receiving external healthcare help and the adapted CTI intervention reflects a need for further qualitative and quantitative research to understand whether any unmeasured characteristics (contributing to population heterogeneity) influenced these particular healthcare outcomes. Further, future studies should assess the risk of hospital admission for participants who opt to rely on the CTI and help with healthcare for care continuity rather than traditional outpatient clinic follow-up.

### ***Study Limitations***

This study has several limitations that must be acknowledged. First, this is a secondary analysis of existing data that was not pre-planned nor equally split in terms of receiving external health care help. As such, any findings need to be considered preliminary and needing confirmation. Additionally, the parent study did not collect information related to perceived need for help with healthcare activities, duration of healthcare help, and other similar domains with the level of granularity needed to fully assess these relationships. Health care needs were also not defined in detail when participants were asked who helps them with health care needs. This could mean participants may have interpreted the question and type of health care needs in various ways, leading to potential response discrepancies. Future studies could account for this by specifying health self-management issues within the context of the question. Finally, this study took place in two mid-sized cities and included a well-educated population, limiting generalizability of our findings.

### **CONCLUSION**

We found that the CTI was associated with no significant change in likelihood of ED revisits or outpatient clinic follow-up for community-dwelling older adults living alone. For those who lived alone and received help, the CTI had no significant impact on likelihood of ED revisits but did was associated with a lower likelihood of outpatient clinic follow-up within 7 days. Further research is necessary to confirm our findings and to better understand the effect of the CTI on improving ED to home transitions for older adults.

### **KEYWORDS**

older adults, outpatient follow-up, care transitions, care transitions intervention, living alone

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## CONFLICTS OF INTEREST

The authors report no conflicts of interest.

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