

# Improving Transitions of Care for Veterans Transferred to Tertiary VA Medical Centers

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## Abstract

Veterans are often transferred from “spoke” Veterans Administration (VA) clinics or hospitals to “hub” tertiary VA hospitals for advanced inpatient care, but they face significant barriers to safe transitions home. The Transitions Nurse Program was developed as an intervention to address the unique needs of this population. A difference-in-differences (DiD) analysis was used to compare outcomes between 303 veterans enrolled in this program and veterans transferred from the same spoke sites to a second, similar tertiary VA hub. Veterans enrolled in the program had significantly increased rates of follow-up with their primary care clinic within 14 days of discharge (DiD estimate: 10.43%, 95% confidence interval = 1.20 to 19.66), and a trend toward fewer unplanned 30-day readmissions (DiD estimate: -6.9%, 95% confidence interval = -14.2 to 0.31%,  $P = .06$ ). There were no significant differences in 30-day emergency department visits or costs. Lessons learned from this preliminary intervention can inform implementation at other VA and non-VA sites.

## Keywords

readmission, veteran, rural, hospital discharge

Emerging best practices in improving transitional care and reducing hospital readmissions suggest that interventions should target a high-risk group, comprehensively assess their risk factors for readmission, and intervene both before and after hospital discharge.<sup>1,2</sup> The Veterans Administration (VA) “hub and spoke” structure for inpatient care concentrates advanced services in “hub” urban tertiary VA hospitals. This structure may place veterans who are transferred from “spoke” sites (commonly in rural settings) to “hub” sites for advanced care at higher risk of post-discharge adverse events.<sup>3-5</sup>

Not only are veterans undergoing this transfer vulnerable because of the significant illness that required transfer for tertiary care, but also because of the unique structural barriers imposed by the hub and spoke structure of this care. When our study team interviewed patients and providers at spoke sites, key deficits were found in 3 areas.

First, there were significant communication barriers. Veterans discharged from hub sites to follow-up at spoke primary care clinics frequently had conflicting medication lists, because the 2 “instances” of the VA’s electronic medical record (EMR) often do not sync between hub and spoke sites. This EMR system functions like a hospital system that shares an EMR, in a state with a state-level

health information exchange. The internal EMR to the hospital system is easy to use and pulls in all data from local care provided, but care outside this system is only identifiable using the state-level database, which is more cumbersome to navigate and does not communicate directly with the hospital’s EMR.

In contrast to veterans who receive primary care at urban hub sites, spoke VA primary care providers often were unaware the veteran had been hospitalized or discharged, in part because discharge notifications and the discharge summary did not sync with their local instance of the EMR. These communication barriers often led to veterans not receiving timely follow-up appointments.

Second, veterans felt unprepared if problems arose after discharge, because their spoke site often did not

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know they were discharged, and they had difficulty reaching providers at the hub site, who often had rotated off service.

Third, discharge planning barriers often arose because of unfamiliarity of hub clinicians with resources near the patient's home. Veterans receiving care at spoke sites after discharge reported not receiving promised home care services or home oxygen, because hub providers were unfamiliar with how to engage these resources, often across state lines or in highly rural areas where these resources were less common. Discharge paperwork might instruct a spoke veteran to "follow up with your cardiologist," when the nearest may be hours away. Spoke veterans encountered similar barriers accessing specialized medications at their local pharmacies, resulting in medication gaps that could be life threatening (eg, novel antiplatelet agents after receiving a coronary artery stent).

The Transitions Nurse Program (TNP) was designed as a quality improvement intervention, informed by best practices in reducing readmissions,<sup>6-9</sup> to address these specific barriers spoke veterans face after discharge from a tertiary VA hub site.

## Methods

### Patients

Eligible participants were veterans referred from a spoke site in Veterans Integrated Service Network (VISN) 19 to the Denver VA for inpatient medical care between October 1, 2014, and July 15, 2016, who then returned to their spoke site for ongoing care. VISN 19 is one of the largest geographic VISNs in the country, serving largely rural areas including Montana, Wyoming, Utah, and Colorado. The study team identified all spoke sites that did not share the same EMR "instance" as Denver, including Helena, Montana; Cheyenne and Sheridan, Wyoming; and Grand Junction, Colorado. On average, 61% of veterans treated at these sites are considered "rural" or "highly rural" using Rural-Urban Commuting Area codes (range 34% to 83%). Veterans treated on another inpatient service (eg, surgery, psychiatry) were excluded, as were those discharged to a post-acute care facility or home with hospice. The medical service at the Denver VA treats all medical diagnoses on the medical ward and open intensive care unit (ICU); ICU patients were eligible once they had transferred to the medical floor.

### Setting

The Denver VA Medical Center and Salt Lake City (SLC) VA Medical Center are the 2 tertiary VA facilities in VISN 19. These medical centers each provide tertiary-level inpatient medical, surgical, and psychiatric care to

approximately 5000 veterans annually. Spoke VA facilities and clinics in VISN 19 can transfer patients to Denver or SLC; bed availability at the tertiary site determines ultimate treatment location.

### Intervention

TNP is a nurse-led intervention in Denver that includes pre- and postdischarge components. A full-time Transitions Nurse enrolled eligible veterans during their admission to the tertiary VA, preparing them for discharge through teach-back of key self-care issues (eg, medication reconciliation and teaching, self-care activities, concerning signs or symptoms to watch for).<sup>10,11</sup> As a part of this discharge teaching, the Transitions Nurse identified parts of the postdischarge plan that might be infeasible or challenging, and anticipated these problems through discussion with the patient, inpatient team, and primary care team. For example, if the patient had home health care ordered for a wound but lived many miles from an urban center, the Transitions Nurse would help identify what home health care services in this area were available prior to discharge. Similarly, if the patient was going to be discharged on a specialized medication, the nurse would verify with the patient's preferred pharmacy that the medication would be in stock by the time of patient discharge.

The Transitions Nurse obtained a follow-up appointment at the spoke primary care site within 14 days of discharge and communicated directly with that primary care team both in real time (via telephone or secure instant messaging) and through a novel inter-facility communication to provide a structured discharge summary directly into the local "instance" of the EMR. This structured summary included the physician-created discharge summary, addended with specific postdischarge needs and follow-up plans for each patient. This inter-facility communication also allowed the Transitions Nurse to create a "View Alert" in the EMR for the patient's primary care physician and nurse, notifying them of the patient's impending discharge.

Finally, the Transitions Nurse called the patient within 48 to 72 hours of discharge to assess symptoms, repeat medication reconciliation, verify planned follow-up attendance, and continue education on self-management. The Transitions Nurse remained a point of contact for the patient and for the spoke primary care team until the first postdischarge follow-up appointment.

### Statistical Analysis

The study team used national VA data obtained from the Corporate Data Warehouse (including fee-basis files, which capture veteran use of non-VA facilities for which

the VA is the payer) to ascertain the outcomes. The primary outcomes were the rate of completed follow-up appointments within 14 days of discharge and the rate of unplanned readmissions (VA or non-VA) within 30 days of discharge. Medicare's methodology for excluding planned readmissions was used; as a result, observation stays were excluded.<sup>12</sup> Secondary outcomes included emergency department (ED) visits and mean total costs within 30 days of discharge related to ED and hospital utilization for those patients who incurred any cost to the VA within 30 days.

Randomization of patients or facilities was not permitted for this quality improvement intervention, so the study team performed a difference-in-differences (DiD) analysis comparing outcomes for spoke Veterans enrolled in TNP to those transferred from the same spoke sites who were hospitalized on the medicine service at the SLC VA during the same time period. This was a visit-level analysis comparing preintervention outcomes at both sites (October 1, 2012, to June 30, 2014) to postintervention outcomes (October 1, 2014, to July 15, 2016). The postintervention time period included the TNP in Denver, but no similar program existed at the SLC VA. The time from June to October 2014 consisted of start-up and piloting the intervention before the official start on October 1. All visits during these time periods were included, meaning that patients could have multiple visits counted. The only exception was in the intervention cohort in Denver, for which visits were only counted once the patient was enrolled in the TNP in order to evaluate the value of the TNP.

The unadjusted regression equation for the DiD calculation was

$$Y_{st} = \beta_0 + \beta_1 * t + \beta_2 * s + \beta_3 * t * s + \varepsilon_{st}$$

where  $t = 0$  for preintervention time period and  $t = 1$  for postintervention time period,  $s = 0$  for SLC and  $s = 1$  for Denver,  $\beta_0$  is the intercept that is equivalent to the outcome value for SLC at  $t = 0$ ,  $\beta_1$  represents the difference in the outcome between time periods for SLC,  $\beta_2$  represents the difference in the outcome between Denver and SLC at  $t = 0$ ,  $\beta_3$  is the interaction term representing the DiD estimate for the intervention effect,  $Y_{st}$  is the estimate of the outcome,  $Y$ , for the cohort related to values of  $s$  and  $t$ , and  $\varepsilon_{st}$  is the random error term.

The study team then adjusted for age, sex, and comorbidities (each of the 31 incorporated in the Elixhauser comorbidity score), and incorporated a patient-level random effect to account for repeated measures. The adjusted equation was

$$Y_{st} = \beta_0 + \beta_1 * t + \beta_2 * s + \beta_3 * t * s + \beta_4 * count + \mu_i + \varepsilon_{st} [+ZX_{st}]$$

where  $count$  is a visit-level variable of the visit number for that patient in the time period,  $\mu_i$  is a patient-level random effect to account for correlation among visits of the same patient, and  $ZX$  are adjustment covariates.

Several sensitivity analyses also were conducted. First, the study team allowed only one index admission per patient rather than allowing multiple admissions. Second, instead of using a linear regression for the DiD model, the team instead used a modified Poisson regression capturing outcomes as discrete episodes rather than as a continuous outcome and allowing reporting of risk ratios. Third, the team compared a matched cohort of veterans who received primary care in Denver (local veterans) who were hospitalized during the same time period as TNP to those enrolled in TNP. Because a DiD approach was infeasible for this comparison, the team instead compared outcomes using exact McNemar's test for matched pairs for categorical variables and a paired  $t$  test for continuous variables. This intervention and its evaluation were designated as quality improvement activities by the Colorado Multiple Institutional Review Board.

## Results

A total of 303 veterans were enrolled in TNP during the study period. Demographic characteristics were typical of a hospitalized veteran cohort: veterans were almost exclusively male with a median age of 66 and high levels of comorbidity (Table 1). Veterans receiving the intervention had an average of 5.7 contacts with the Transitions Nurse, who spent an average of 21.8 minutes (range 5-105 minutes) pre-discharge and 12.0 minutes (range 2-38 minutes) during the postdischarge telephone call with each veteran. If problems were discovered during the call, this required an additional 15.3 minutes on average (range 3-90 minutes).

In the primary analysis, enrolled veterans were significantly more likely to have a follow-up visit within 14 days of discharge (DiD estimate: 10.43%, 95% confidence interval = 1.20 to 19.66). There was a trend toward reductions in unplanned 30-day readmissions (-6.94%; 95% confidence interval = -14.18% to 0.31%). There were no significant differences in ED visits or mean costs (Table 2, Figures 1 and 2). Sensitivity analyses demonstrated similar results, with significant differences in postdischarge follow-up and trends toward reductions in 30-day readmissions. (Results of the sensitivity analyses are presented in the Supplemental Appendix, available with the online article.)

## Discussion

TNP resulted in a significant increase in timely postdischarge follow-up and may reduce unplanned 30-day

**Table 1.** Characteristics of Intervention and Control Visits.<sup>a</sup>

Characteristics	SLC Pre-TNP Period (N =287)	SLC Post-TNP Period (N =362)	Denver Pre-TNP Period (N =733)	Denver Post-TNP Period (N = 347)
Age, years, median (SD)	65 (10.8)	66 (9.6)	65 (11.4)	66 (10.7)
Male (%)	93.1	95.3	97.0	95.7
Elixhauser mean score (SD)	2.4 (1.8)	2.8 (1.8)	3.2 (1.6)	3.5 (1.6)
Components of Elixhauser score (%)				
Heart failure	10.2	23.1	16.7	22.8
Cardiac arrhythmia	20.8	36.1	30.3	32.7
Valvular disease	3.7	5.1	6.4	6.3
Pulmonary circulation disorders	3.7	3.1	6.4	9.9
Peripheral vascular disease	3.2	9.0	9.1	19.1
Hypertension, uncomplicated	28.7	39.2	50.2	53.1
Hypertension, complicated	10.7	7.1	10.3	12.9
Paralysis	0.5	0.4	0.9	0
Neurological disorders	5.1	5.1	4.5	3.6
COPD	17.6	21.6	29.2	27.4
Diabetes, uncomplicated	18.5	22.0	26.5	29.4
Diabetes, complicated	1.4	4.7	4.5	7.6
Hypothyroidism	8.8	8.6	12.3	9.6
Renal failure	13.4	11.4	13.0	14.5
Liver disease	10.7	7.8	8.4	8.9
Peptic ulcer disease	0.9	0.8	0.2	1.0
HIV/AIDS	0.5	0	0.4	0.3
Lymphoma	2.3	1.2	2.7	1.3
Metastatic cancer	2.3	2.8	4.3	3.6
Tumor, nonmetastatic	13.0	11.4	10.5	10.6
Rheumatoid arthritis	1.4	2.0	2.7	1.3
Coagulopathy	5.1	3.5	5.0	4.3
Obesity	2.8	3.9	4.8	5.9
Weight loss	2.3	4.3	3.4	2.6
Fluid and electrolyte disorders	23.2	13.3	18.5	20.1
Blood loss anemia	1.4	0	0.5	0
Deficiency anemia	1.4	2.0	3.4	5.6
Alcohol abuse	7.4	7.5	11.2	9.9
Drug abuse	1.4	3.9	4.6	3.6
Psychoses	0.9	0.8	1.4	1.3
Depression	18.1	17.7	19.6	17.8

Abbreviations: COPD, chronic obstructive pulmonary disease; SD, standard deviation; SLC, Salt Lake City; TNP, Transitions Nurse Program.

<sup>a</sup>N = number of visits meeting criteria during the time period of interest. Individual components of Elixhauser score were separately included in the model and reported here.

readmissions in spoke veterans transferred to hub VA hospitals. This is an important finding for a large population of vulnerable veterans. More than 3 million veterans live in rural communities and use the VA for health care, almost exclusively at what would be considered spoke sites.<sup>13</sup> These predominantly rural veterans are commonly hospitalized at tertiary VA sites. For example, just 28 hub VA facilities account for 60% of all rural veteran hospitalizations in the United States annually (VA Office of Rural Health internal data). These initial positive results provide insights into the value of the program and how it might be modified to maximize its impact.

Although a 7% absolute (and 63% relative) reduction in readmissions is striking in this DiD analysis, the program may benefit in the future from enrolling an even higher risk cohort. The postintervention unadjusted readmission rate in Denver was 9.6%, suggesting that a “floor” effect may have been encountered. Although this is likely an underestimate given the inability to assess readmissions the VA did not pay for, it is far lower than national readmission rates or the rate of readmission in the intervention groups of similar readmission reduction programs. Expanding enrollment criteria for TNP to include other inpatient populations (eg, postsurgical patients) may allow

**Table 2.** Outcomes of the Transitions Nurse Program Intervention.<sup>a</sup>

Characteristics	Denver	SLC	DiD Estimate (95% CI)	P Value
Follow-up completed within 14 days (%)				
Unadjusted			10.1 (1.2, 19.0)	.03
Pre intervention	73.3	65.5		
Post intervention	83.6	65.8		
Adjusted			10.4 (1.2, 19.7)	.03
Pre intervention	72.7	67.4		
Post intervention	81.9	66.3		
Hospital readmission within 30 days (%)				
Unadjusted			-9.3 (-16.6, -2.1)	.01
Pre intervention	18.1	15.3		
Post intervention	9.2	15.8		
Adjusted			-6.9 (-14.2, 0.3)	.06
Pre intervention	11.6	8.6		
Post intervention	5.2	9.1		
ED visits within 30 days (%)				
Unadjusted			2.6 (-6.3, 11.4)	.57
Pre intervention	25.2	30.7		
Post intervention	23.9	26.8		
Adjusted			5.1 (-3.9, 14.2)	.26
Pre intervention	21.2	26.2		
Post intervention	22.6	22.4		
Mean cost of ED visits and readmissions (\$)				
Unadjusted			-7243 (-14 996, 510)	.07
Pre intervention	13 006	11 132		
Post intervention	8897	14 267		
Adjusted			-2408 (-10 206, 5389)	.54
Pre intervention	11 758	12 331		
Post intervention	10 397	13 378		

Abbreviations: DiD, difference-in-difference estimate; ED, emergency department; SLC, Salt Lake City.

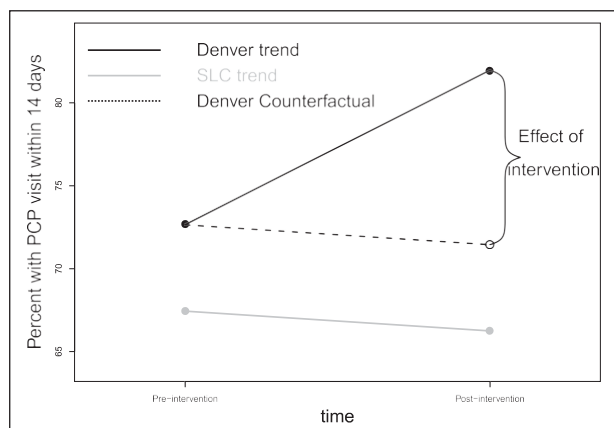
<sup>a</sup>Adjusted comparisons are adjusted for covariates and repeated measures. Costs are only for those who incurred any costs related to utilization in the 30-day postdischarge period.

capture of a higher risk cohort and better evaluation of the relative value of the program. It is not clear why enrolled veterans had fewer 30-day readmissions with similar ED utilization; review of individual ED visits and readmissions may provide further insights.

For example, readmission rates in the Coordinated-Transitional Care (C-TraC) Program, a successful nurse-led transitional care intervention developed at the Madison VA, were much higher (23% intervention, 34% control) than in the present study.<sup>7,14</sup> Although both C-TraC and TNP were informed by best practices in improving transitional care (identifying a high-risk cohort, using a nurse-led “bridging” intervention informed by Coleman’s Four Pillars<sup>15</sup>) in the VA system, they were developed and implemented entirely independently because they target the needs of different subsets

of high-risk patients. C-TraC is a successful geriatric intervention established to meet the needs of elderly veterans who reside outside the reach of a traditional home visit. For example, eligibility criteria require cognitive impairment such as dementia or delirium, or older age (>65 years), and either living alone or being recently hospitalized. TNP instead targets the needs of predominantly rural veterans referred to tertiary hub sites for care regardless of age, home supports, or cognitive impairment. C-TraC does not explicitly include components designed to address difficulties in information transfer, such as conflicting medication lists, notification of primary care physicians of admission, or postdischarge needs in low-resource areas, which are particular problems for spoke veterans. In C-TraC, the nurse is an expert in geriatric care; in TNP, the nurse is an expert in the resources

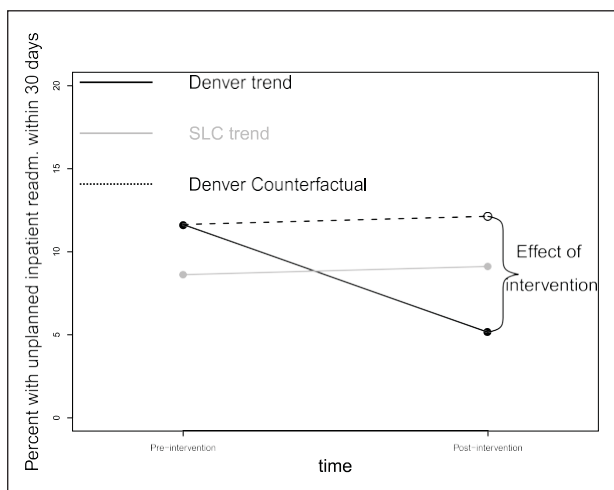




**Figure 1.** Difference-in-differences evaluation of primary care follow-up.

Changes over time in patients with follow-up within 14 days of discharge with their primary care clinic are displayed.

Abbreviations: PCP, primary care physician; SLC, Salt Lake City.



**Figure 2.** Difference-in-differences evaluation of hospital readmissions.

Changes over time in the percentage of patients with a 30-day unplanned hospital readmission are displayed.

Abbreviations: readm., readmission; SLC, Salt Lake City.

available in rural areas served by spoke sites. The study team is unaware of other transitional care programs that serve the explicit needs of rural populations.

Expanding to a higher risk cohort also may be associated with more significant cost savings. The apparent lack of cost savings despite reductions in readmissions is an important cautionary note for other similar programs, which tend to report projected savings by multiplying an absolute readmission reduction by a mean cost per hospital admission.<sup>7</sup> Using this approach, the savings in the present study would appear to be (303 patients \* 0.0694 reduction in readmissions \* \$10397.31 mean cost of hospitalization) = \$218 636—more than offsetting the cost of

the Transitions Nurse. The lack of significant differences in costs could be explained by patients having longer lengths of stay or more complex readmissions when readmitted, or there could be a lack of power to detect an effect given relatively small sample size and significant heterogeneity in postdischarge costs. In other successful readmission reduction programs, reductions in costs were only seen later in the clinical course.<sup>15</sup> It is plausible that the increase in postdischarge follow-up seen in the present study was linked to reductions in 30-day readmissions as has been seen in other studies.<sup>16,17</sup>

These results should be interpreted in the context of the data available. Although the study team matched on several significant characteristics linked to readmission risk,<sup>18</sup> there may have been unmeasured confounders, such as functional status, that contributed to the results.<sup>19</sup> The team was unable to capture postdischarge utilization outside of the VA system unless the VA was a payer for this care. The intervention was conducted at a single center and may not be generalizable. Strengths of this evaluation include use of robust adjustment and methods for DiD comparisons with a very similar hub VA receiving patients from the same spoke sites, identification of utilization and costs at both VA and non-VA sites, and use of a standard algorithm for excluding planned readmissions.

TNP may be applicable to other VA and non-VA facilities that provide care to rural patients, given that they often face common barriers to a safe discharge. Achieving adequate information exchange, dealing with conflicting medication lists, providing postdischarge monitoring of symptoms, and arranging adequate postdischarge follow-up are key to a high-quality transition of care but are difficult to achieve for rural patients hospitalized at tertiary facilities.<sup>6</sup> In fact, barriers to adequate discharge planning and obtaining timely, appropriate referrals exist in many hospital systems wherein health information is not easily shared.<sup>20,21</sup> However, hospitals increasingly face incentives to coordinate this care in an era of readmission penalties and bundled payments, including postdischarge costs and outcomes.<sup>22,23</sup>

Although a dedicated Transitions Nurse may entail significant up-front cost, it is clear that multicomponent “bridging” interventions have the greatest efficacy, and those that are nurse led have been most effective in prior research.<sup>2,15,24</sup> For hospitals facing consequences of high readmission rates, the intervention may offset costs. The study team plans to expand the intervention to other VA systems with similarly highly rural veteran populations served, using lessons learned in this preliminary evaluation to inform implementation.

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