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The Impact of Community Care Referral on Time to Surgery for Veterans With Carpal Tunnel Syndrome

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Background: The US Department of Veterans Affairs (VA) enacted policies offering Veterans care in the community, aiming to improve access challenges. However, the impact of receipt of community care on wait times for Veterans receiving surgical care is poorly understood.

Objectives: To compare wait times for surgery for Veterans with carpal tunnel syndrome who receive VA care plus community care (mixed care) and those who receive care solely within the VA (VA-only).

Research Design: Retrospective cohort study.

Subjects: Veterans undergoing carpal tunnel release (CTR) between January 1, 2010 and December 31, 2016.

Measures: Our primary outcome was time from primary care physician (PCP) referral to CTR.

Results: Of the 29,242 Veterans undergoing CTR, 23,330 (79.8%) received VA-only care and 5912 (20.1%) received mixed care. Veterans receiving mixed care had significantly longer time from PCP referral to CTR (median mixed care: 378 days; median VA-only care: 176 days, $P < 0.001$). After controlling for patient and facility covariates, mixed care was associated with a 37% increased time from PCP referral to CTR (adjusted hazard ratio, 0.63; 95% confidence interval, 0.61–0.65). Each

additional service provided in the community was associated with a 23% increase in time to surgery (adjusted hazard ratio, 0.77; 95% confidence interval, 0.76–0.78).

Conclusions: VA-only care was associated with a shorter time to surgery compared with mixed care. Moreover, there were additional delays for each service received in the community. With likely increases in Veterans seeking community care, strategies must be used to identify and mitigate sources of delay through the spectrum of care between referral and definitive treatment.

Key Words: access to care, carpal tunnel syndrome, community care, Veterans Administration

(*Med Care* 2021;59: S279–S285)

The Veterans Health Administration (VHA) is the largest integrated health system in the United States, providing care to over 9 million Veterans.¹ However, in 2014, the VHA came under scrutiny regarding Veterans' long wait times, prompting legislation to improve Veterans' access to health care.^{2,3} In 2018, the US Department of Veterans Affairs (VA) instituted the VA Maintaining Internal Systems and Strengthening Outside Networks (MISSION) Act to build upon the Veterans Choice Program, offering Veterans the opportunity to seek care within the community (ie, private sector). These efforts aim to improve the quality and efficiency of care provided to Veterans. Specifically, under the VA MISSION Act, Veterans are eligible for community care if they cannot receive a primary care physician (PCP) appointment within 20 days or a specialty care appointment within 28 days.⁴ However, the VA does not measure wait time from referral to definitive treatment, including surgical intervention. Moreover, little is known regarding how mixed care, defined as care received partially in the community and partially in the VA, compares to VA-only care for wait times for appointments, diagnostic tests, and treatment, in particular for patients seeking surgical care.

Given VA policies that expand the receipt of care in the community, carpal tunnel syndrome (CTS) provides an excellent case study to understand access to care for Veterans because of the variety of diagnostic modalities, nonsurgical management, and surgical treatment that are potentially received by patients with CTS. In addition, carpal tunnel release (CTR) is a low-risk procedure that any hand surgeon can perform, thus making it an ideal candidate procedure to assess wait times. CTS is one of the most common musculoskeletal disorders, affecting ~10% of the population.⁵ CTS can lead to

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E.D.S. is supported by Career Development Award Number IK2 HX002592 from the United States Department of Veterans Affairs Health Services R&D (HSRD) Service. R.A.H. is supported by grant P30DK092926 (Michigan Center for Diabetes Translational Research Methods Core) from NIDDK. The funding organizations had no role in the design and conduct of the study, including collection, management, analysis, and interpretation of the data.

The authors declare no conflict of interest.

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Supplemental Digital Content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's website, www.lww-medicalcare.com.

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ISSN: 0025-7079/21/5906-S279

hand pain, weakness, and subsequent functional decline; therefore, prompt diagnosis and treatment is often essential. CTS is commonly diagnosed through history and physical examination with the addition of imaging modalities in select cases. Nonsurgical treatment of CTS includes hand therapy, use of orthoses, and corticosteroid injections.^{6–8} However, definitive treatment of persistent symptoms often requires surgical intervention.^{9–11} Veterans with CTS may be eligible for care within the community (outside VA) for multiple indications: diagnostic modalities, nonsurgical treatment, and surgical management. However, recent studies have shown that the VA performs similarly if not better than the community on wait times for initial appointments.¹² Yet, little is known as to how the VA compares to the community on wait times for definitive treatment, which may be a more robust measure of access. Moreover, it remains unclear how referral indication into the community affects time to surgery.

Therefore, we sought to understand the rate at which Veterans obtain care in the community for the diagnosis and treatment of CTS. In addition, we aimed to assess the association of referral indication (eg, imaging, therapy, surgery, etc.) on time to definitive surgical intervention for different subgroups of Veterans with CTS receiving VA-only care and mixed care. Findings from this study will provide a comprehensive understanding of access to hand surgical care from referral to surgical treatment for Veterans receiving care within the VA and the community. Future studies are needed to evaluate access to surgical care across a wide spectrum of surgical procedures with varying complexity.

METHODS

Study Cohort

This study received approval from the Institutional Review Board and waived the need for informed consent. We conducted a retrospective cohort study using the VHA Corporate Data Warehouse (CDW) to identify all Veterans with a diagnosis of CTS between January 1, 2000 and December 31, 2016. VHA CDW contains administrative data from all Veterans who obtained care within the VA health system and care which was obtained in the community and paid for by the VA.¹³ Data for Veterans who received care in the community were obtained from the fee-basis tables within the CDW. To establish a surgical cohort, we included all Veterans, age 18 years or older, who underwent an initial CTR from January 1, 2010 to December 31, 2016. The inclusion period was ended at 2016 because after this time VA purchased care (community care) data began a transition to a new database with varying reliability in capturing community utilization until recently. We identified the study cohort using *International Classification of Disease, Ninth Revision and Tenth, Clinical Modification* (ICD-9/10) and Current Procedural Terminology (CPT) codes (Table, Supplemental Digital Content 1, <http://links.lww.com/MLR/C151>). We excluded Veterans who received a previous CTR in the 10 years before the study period (2010–2016), Veterans who had their CTR performed in conjunction with another major operation, and Veterans who were not established with a VA primary care provider within the 2 years before CTR (Fig., Supplemental Digital Content 2, <http://links.lww.com/MLR/C152>).

CTS-related care was categorized as: (1) VA-only care for Veterans receiving the entirety of their diagnostic work-up, nonsurgical treatment, and surgical management for CTS solely in the VA or (2) mixed care for Veterans receiving any portion of their diagnostic, nonsurgical, or surgical care in the community. Diagnostic workup included electrodiagnostic testing or radiographic imaging. Nonsurgical care encompassed corticosteroid injections, nonspecific hand therapy/orthosis fitting (splinting), and specific hand therapy modalities. Surgical management included open or endoscopic CTR. A portion of the Veterans with mixed care received their nonsurgical or diagnostic testing in the community and their CTR in the VA. All CTS-related care was identified using CPT codes (Table, Supplemental Digital Content 1, <http://links.lww.com/MLR/C151>).

Outcome

The primary outcome was time from PCP referral to CTR in days. PCP referral was identified as the last PCP visit before the first surgeon evaluation in which CTS was an associated diagnosis.

Covariates

We included covariates at the patient-level and facility-level based on clinical understanding and prior research. Patients were assigned to a home facility based on where they received primary care. Patient-level variables of interest included age, sex, race, presence of diabetes, Charlson Comorbidity Index, and VA priority group. The Charlson Comorbidity Index was used to evaluate health status with higher scores indicative of patients with more comorbidities.^{14,15} The VA priority group factors in military service history, service-connected disability rating, income level, and is used to determine the amount of benefits received by the VA and cost sharing.¹⁶ In addition, we included whether the patient received VA-only care or mixed care for specific services rendered in the VA versus community settings, including diagnostic testing, corticosteroid injection, hand therapy, and CTR. We constructed separate models for the different services rendered. Lastly, we included facility-level covariates including PCP facility type, whether the PCP and surgical specialist were located within the same facility, and the proportion of patients referred for any community care for a CTS-related service at the facility level.

Statistical Analyses

We used descriptive analyses to examine the differences between Veterans receiving VA-only care and mixed care. Log-rank comparisons for Kaplan-Meier analysis were applied to examine unadjusted associations in time from PCP referral to CTR between the 2 groups.

Multivariable Cox proportional hazard models were used for our time-to-event analyses to examine the associations among VA-only care, mixed care, and community care referral indication with the time to CTR outcome. In these models, hazard ratios (HRs) were generated. With a reference value of 1, HRs > 1 indicate shorter time-to-event (surgery) or faster time from PCP referral to surgery compared with the reference group. HRs < 1 indicate longer time-to-event (surgery) or slower time from PCP referral to surgery compared with the reference group. Frailty terms were included at the facility-level to account for clustering. Separate models were constructed for each community referral indication (diagnostic testing, hand therapy, corticosteroid injections, and

TABLE 1. Demographic and Clinical Characteristics of Veterans Receiving Carpal Tunnel Release From 2010 to 2016

Characteristics	Total Cohort Number (%) (N = 29,242)	Mixed Care Number (%) (N = 5912)	VA-only Care Number (%) (N = 23,330)
Mean age (SD)	57.6 (12.8)	55.3 (12.1)	58.1 (12.9)
Sex			
Male	26,189 (89.6)	5290 (89.5)	20,899 (89.6)
Female	3047 (10.4)	622 (10.5)	2425 (10.4)
Race			
White	23,543 (80.5)	4879 (82.5)	18,664 (80.0)
Black	3682 (12.6)	585 (9.9)	3097 (13.3)
Asian	127 (0.4)	27 (0.5)	100 (0.4)
American Indian/Pacific Islander	276 (0.9)	64 (1.1)	212 (0.9)
Multiracial	3 (0)	1 (0)	2 (0)
Unknown	1326 (4.5)	284 (4.8)	1042 (4.5)
Ethnicity			
Non-Hispanic	26,776 (91.6)	5439 (92.0)	21,337 (91.5)
Hispanic	1583 (5.4)	298 (5.0)	1285 (5.5)
Unknown	883 (3.0)	175 (1.3)	122 (1.4)
Mean Charlson Comorbidity Index (SD)	1.33 (1.37)	1.34 (1.30)	1.33 (1.39)
Diabetes	6994 (23.9)	1307 (22.1)	5687 (24.4)
VA priority group			
High service-connected disability	6415 (21.9)	1452 (24.6)	4963 (21.3)
Low-to-moderate service-connected disability	8710 (29.8)	1963 (33.2)	6747 (28.9)
Low income	9385 (32.1)	1766 (29.9)	7619 (32.7)
No service-connected disability	4298 (14.7)	699 (11.8)	3599 (15.4)
Unknown	434 (1.5)	32 (0.5)	402 (1.7)

VA indicates US Department of Veterans Affairs.

CTR) and for the cumulative number of community referral indications as independent predictors. Each model had the outcome of time from PCP referral to CTR and was adjusted for the aforementioned patient-level and facility-level covariates. Statistical and graphical inspection revealed no evidence of substantial violation of the proportional hazards assumption. We also performed sensitivity analyses where we included the facility-level covariate of distance from PCP facility to nearest VA hand surgeon facility. All analyses were performed using R, version 3.6.0 (R Foundation for Statistical Computing). Significance level was set at $P > 0.05$ for all analyses.

RESULTS

A total of 29,242 Veterans undergoing CTR met inclusion criteria, of which 23,330 (79.8%) received VA-only care and 5912 (20.1%) received mixed care for at least 1 CTS-related service. Table 1 illustrates the demographic characteristics of Veterans stratified by VA-only and mixed care. Those receiving VA-only care were somewhat older than Veterans receiving mixed care (58.1 vs. 55.3 y, respectively). However, the 2 groups were fairly similar in other demographic attributes and had a near-identical mean Charlson Comorbidity Index (Table 1).

Almost all Veterans who eventually underwent CTR (99%) received 1 or more diagnostic test. Overall, 9.0% of the 28,935 tests ordered were done in the community (non-VA facilities) (Table 2). Approximately 17,695 Veterans (60.5% of the total cohort) received some nonsurgical hand therapy with 84.1% receiving hand therapy in the VA and 15.9% receiving hand therapy in the community. Only 3.1% of Veterans underwent surgery at a community facility.

Figure 1 displays the Kaplan-Meier estimate for Veterans receiving VA-only and mixed care for CTS-related services. Overall, Veterans receiving VA-only care had a shorter time to surgical intervention. Veterans receiving VA-only care had a median time from PCP referral to CTR of 176 days (interquartile range: 94–470) compared with a median time of 378 days for Veterans receiving any mixed care (interquartile range: 136–1136) (unadjusted HR, 0.63; 95% confidence interval (CI),

TABLE 2. Veterans Receiving Diagnostic Testing, Nonsurgical Management, or Surgery for Carpal Tunnel Syndrome Stratified by Location

Service Utilized	Delivered in the VA (%)*	Delivered in the Community (%)*
Any diagnostic testing (N = 28,935)	26,320 (91.0)	2615 (9.0)
Electrodiagnostic studies (N = 26,995)	25,168 (93.2)	1827 (6.8)
Imaging studies (N = 9647)	8689 (90.1)	958 (9.9)
Any nonsurgical hand therapy (N = 17,695)	14,888 (84.1)	2807 (15.9)
Nonspecific therapy/orthosis (N = 16,808)	14,332 (85.3)	2476 (14.7)
Specific hand therapy modalities (N = 7055)	4414 (62.6)	2641 (37.4)
Corticosteroid injection (N = 3830)	2854 (74.6)	974 (25.4)
Carpal tunnel release (N = total cohort)	28,339 (96.9)	903 (3.1)

Veterans with mixed care received part of their care in the VA as seen by the larger numbers in the VA column.

*Location of where Veterans received the specific diagnostic testing, nonoperative treatment, or surgery.

VA indicates US Department of Veterans Affairs.

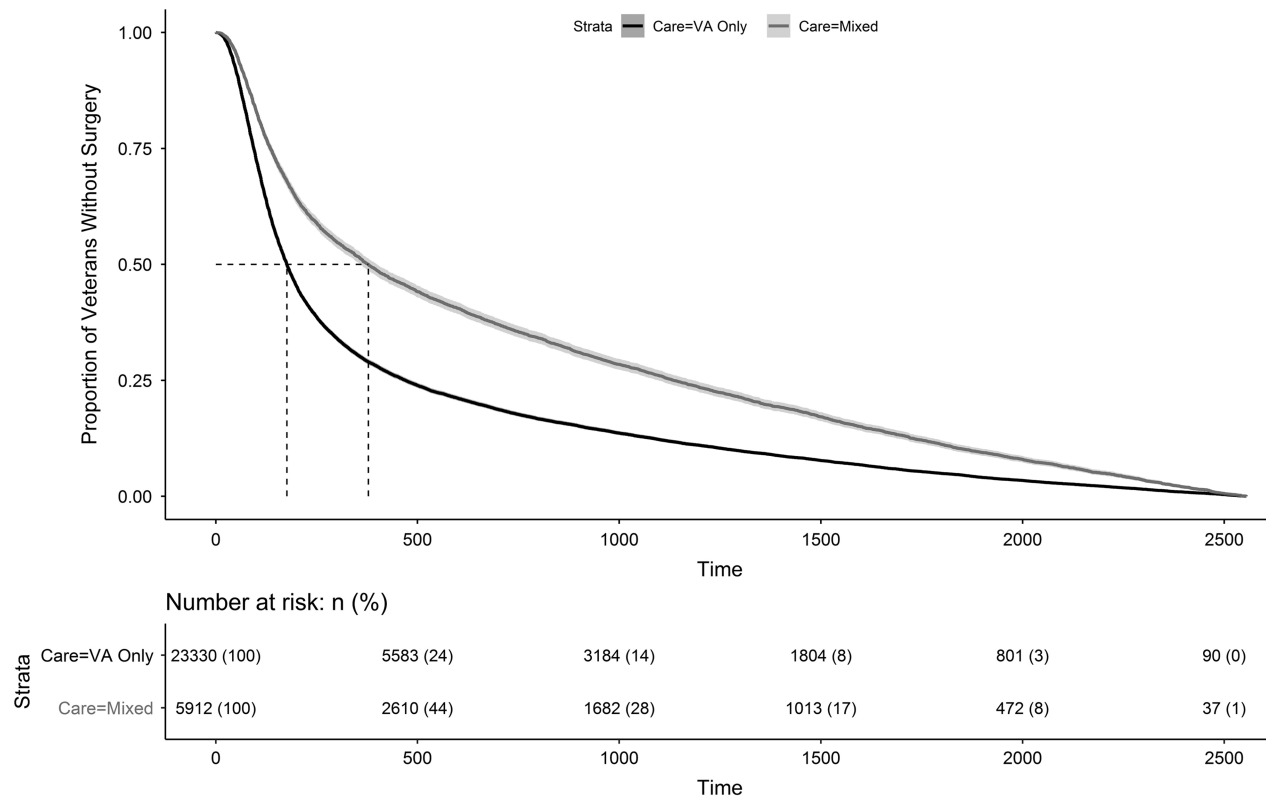


FIGURE 1. Kaplan-Meier estimate of Veterans receiving VA-only care and mixed care. VA indicates US Department of Veterans Affairs.

0.61–0.64; note: HR < 1 signifies longer time-to-surgery compared with the reference group) (Table, Supplemental Digital Content 3, <http://links.lww.com/MLR/C153> and Table, Supplemental Digital Content 4, <http://links.lww.com/MLR/C154>). After controlling for Veteran and facility factors, mixed care for any CTS-related service was associated with a 37% increased time from PCP referral to CTR (adjusted HR, 0.63; 95% CI, 0.61–0.65) compared with VA-only care (Table, Supplemental Digital Content 4, <http://links.lww.com/MLR/C154> and Fig. 2).

Figure 3 compares the time from PCP referral to CTR for Veterans receiving VA-only care and mixed care for the different services rendered in the VA versus community settings. Veterans receiving any diagnostic test, nonsurgical treatment, or surgical treatment in the community experienced longer wait times for surgery compared with VA-only care (Table, Supplemental Digital Content 3, <http://links.lww.com/MLR/C153>). The adjusted HRs for each service provided within the community is shown in Figure 2. Each additional service provided in the community was associated with a 23% increase in time to surgery (adjusted HR, 0.77; 95% CI, 0.76–0.78; note: HR < 1 denotes longer time-to-surgery compared with the reference group).

The sensitivity analyses of adding the covariate of distance from PCP facility to nearest VA hand surgeon facility demonstrated similar findings. Veterans receiving mixed care was associated with a 38% increased time to surgery (adjusted HR, 0.62; 95% CI, 0.60–0.64) (Supplemental Digital Content 5, <http://links.lww.com/MLR/C155>). Each additional service provided in the community was associated with a 23% increase

in time from PCP referral to CTR (adjusted HR, 0.77; 95% CI, 0.76–0.78).

DISCUSSION

In this nationwide study of Veterans receiving primary care in the VA system and who were ultimately treated with surgery, we found that VA-only care was associated with a significantly shorter time from PCP referral to definitive surgical intervention compared with mixed care. Diagnostic studies, nonsurgical treatments, and surgery obtained in the community were associated with longer wait times for surgical intervention compared with delivery in a VA facility. The specific reasons for these disparities cannot be determined from the data we currently have available, but collectively, these findings highlight the importance of understanding the totality of care from referral to treatment and defining access measures that also assess wait times for definitive treatment, in particular for patients referred for surgical interventions. Moreover, with VA policies aimed at increasing the provision of care within the community, strategies must be used to identify sources of delay to expedite time to definitive treatment for Veterans seeking care in both the VA and community settings.

Our findings are consistent with previous studies that compare wait times for VA care versus care in the private sector. Penn and colleagues compared wait times between the VA with the private sector and found a similar time to new appointments for primary care, dermatology, cardiology, and orthopedic surgery in 2014. In 2017, the wait times for new appointments within the VA were significantly shorter than the private sector.¹² Analyses from RAND revealed that

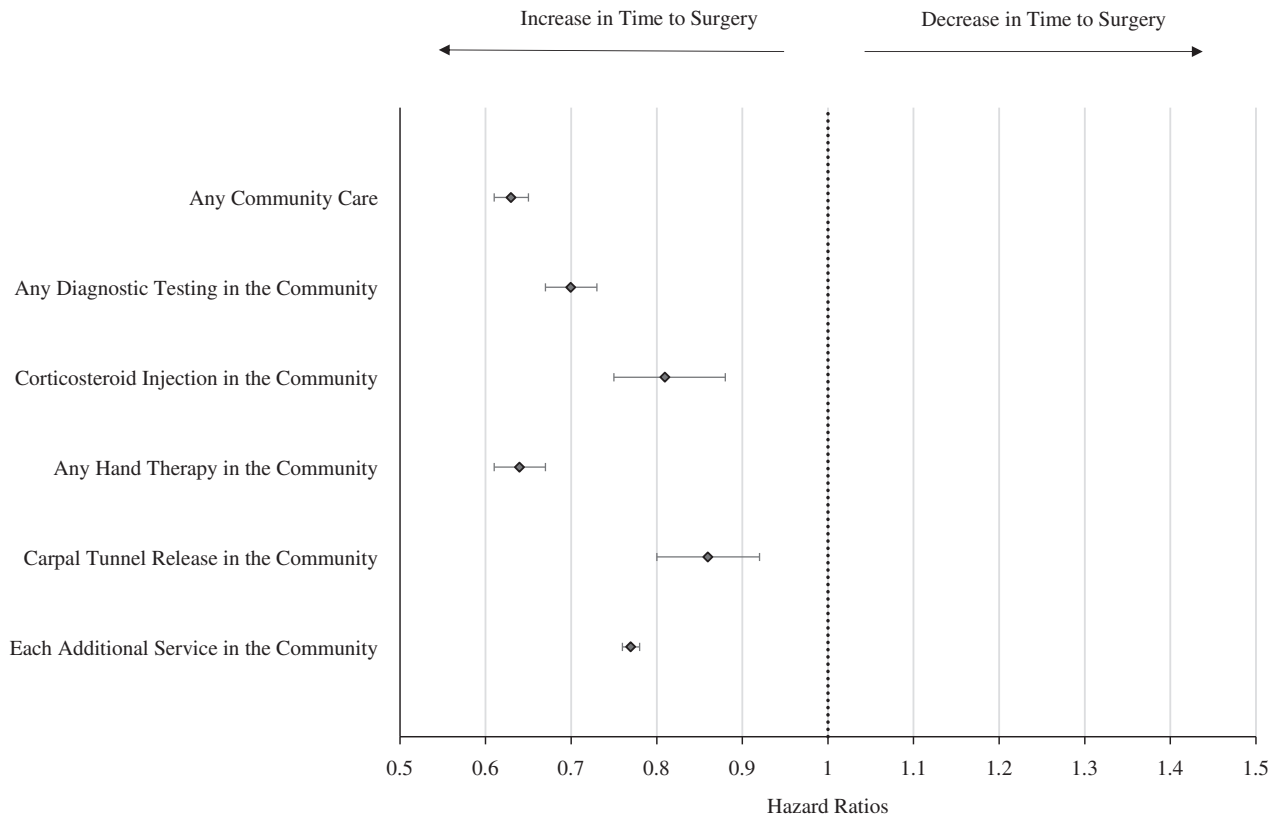


FIGURE 2. Forest plot of hazards ratios for Veterans receiving mixed care relative to VA-only care. Error bars reflect 95% confidence intervals for the hazard ratios. Models controlled for age, sex, race, Charlson Comorbidity Index, diabetes, VA priority group, primary care physician and surgeon in same facility, proportion of mixed care at the facility level, and complexity of the primary care clinic. Sample sizes: Any community care: n=29,191, facilities: 129; Any diagnostic testing: n=27,654, facilities: 129; Corticosteroid injection: n=3822, facilities: 121; Any hand therapy: n=17,448, facilities: 125; carpal tunnel release: n=29,191, facilities: 125; each additional service: n=29,191, facilities: 125. VA indicates US Department of Veterans Affairs.

overall the VA provided timely care for Veterans. However, there was substantial variation in wait times across VA facilities with only ~50% of Veterans reporting receiving care “as soon as needed.”¹⁷ In addition, the RAND analyses forecasted an increase in the future demand for VA care, especially for subspecialty care, which may augment the risk for further delays in care for Veterans. Nevertheless, in our analysis of Veterans who received CTR, Veterans who received VA-only care had a significantly shorter time to definitive surgical intervention compared with Veterans receiving mixed care, and more research is needed to understand the sources of delay within the VA and the community. With recent VA policies aimed at increasing access through offering community care, our findings highlight the need to consider innovative strategies to streamline the community referral processes to improve wait times for Veterans.

The way VA policies are implemented or revised in the future may benefit from a greater understanding of wait times across the continuum of care that Veterans experience until definitive treatment. Current VA access metrics focus primarily on time to new appointment and do not incorporate time to definitive treatment. For specialty care, under the VA MISSION Act, Veterans are eligible for community care if they cannot receive an appointment within 28 days with no mention of

metrics for wait times for ultimate treatment.⁴ However, studies in the VA have targeted improving wait times for surgery due to concerns about delay. In a study by Valsangkar et al,¹⁸ increasing Veteran wait times in VA facilities for surgery led to implementation of lean processes to reduce inefficiencies and improve access. Lean processes resulted in a significant reduction in Veterans’ wait time for surgery, underlining the importance of understanding the totality of care from referral to surgery. Our study provides additional information regarding time to surgery. Among Veterans who received CTR, Veterans who obtained 1 or more services in the community (eg, diagnostic testing, nonsurgical treatment, and surgical management) had a significantly longer time from PCP referral to surgical intervention compared with Veterans who received carpal tunnel surgery and related services in the VA, highlighting the importance of providing access data for the entire trajectory of surgical care. Understanding the totality of care from referral to definitive treatment may provide a more robust assessment of access and a greater understanding of sources of delay throughout the entire treatment course.

Our findings further raise questions about potential consequences of fragmentation of care for Veterans. Prior research suggests fragmentation of care, defined as a lack of care continuity, is strongly associated with worse care quality, decreased patient

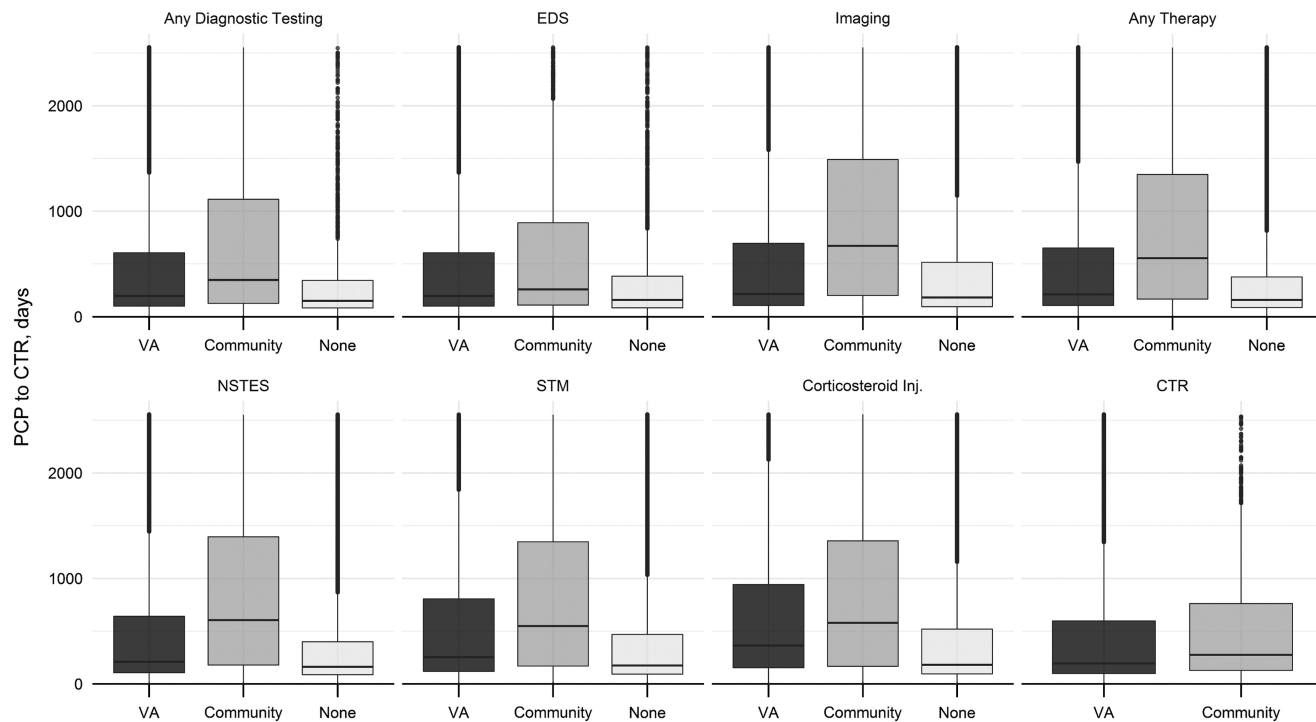


FIGURE 3. Box and Whisker plots of differences in wait time between primary care referral to carpal tunnel release for Veterans receiving various CTS-related services in VA versus community settings. Each plot represents patients receiving each service in the VA, community, or not at all. CTS indicates carpal tunnel syndrome; CTR, carpal tunnel release; EDS, electrodiagnostic testing; NSTES, nonspecific therapy evaluation services; PCP, primary care physician; STM, specific therapeutic modalities.

satisfaction, treatment delays, and increased health care costs as well as inefficiencies in health care delivery, health care waste, and ineffective care.^{19,20} Poor coordination of care among providers may lead to further delays in care, diagnostic errors, and poor patient outcomes.^{21–23} For example, postsurgical patients admitted to a different hospital than where their original procedure occurred had a 50% increased odds of postoperative mortality.^{24,25} In a study by Carico et al,²⁶ Veterans dual enrolled in VHA and Medicare were at increased risk of receiving overlapping opioid and benzodiazepine prescriptions from both the VA and the community. In our study of Veterans receiving mixed care, we found that Veterans who received diagnostic testing and nonsurgical treatment in the community had a longer time to definitive surgical treatment. Moreover, each additional service (eg, imaging, nonsurgical treatment, and surgery) provided in the community was associated with a longer time to surgery, underscoring the possibility that services that require a higher degree of coordination (diagnostic testing for example) may need to be prioritized to be performed in the VA when possible to reduce delays. However, because this study lacks data on outcomes, it is unknown if more complex or higher risk patients were preferentially treated in 1 setting, which may warrant longer wait times. Nonetheless, CTR is a low-risk procedure with few complications. Lastly, the movement of Veterans back and forth between the VA and the community may contribute to delays in time to surgical intervention. Given the likely increase in Veterans receiving some of their health care within the community, additional measures need to be implemented to ensure efficiency and decrease common sources of delays in care.

This study has several limitations. First, the VHA CDW contains administrative data and does not include CTS severity, which likely impacts the time from referral to definitive surgical intervention. Some delays in care may be because of the discretionary nature of the procedure with more time-sensitive and essential conditions being prioritized. However, this does not explain the differences in time to surgery between Veterans with VA-only care and those receiving care within the VA and the community. It is also possible that substantial use of community care is driven by Veteran convenience, and Veterans could be accepting longer wait times in order to have care closer to home. Moreover, the data we have do not lend itself for understanding the specific reasons for these disparities since we lack information on the physician-patient relationship, patient preferences, and rationale to seek community care. However, we did control for many patient-level and facility-level factors that we believed clinically would affect wait times. We did not have access to many community provider-level factors including provider specialty type and volume of patient panels, which can influence access to care. It is unknown whether Veterans were more delayed in securing an initial appointment with a hand surgeon, whether there was a delay in scheduling surgery once seen, or whether there was a different source of delay altogether. In addition, we have examined a surgical cohort and do not know if there are different delays in nonsurgical patients who have received full resolution of symptoms with conservative treatment. Lastly, we do not know whether these longer wait times for mixed care were because of delays within the VA or within the community.

In this study of Veterans receiving CTR, we found that Veterans who received VA-only care had a significantly shorter

time from PCP referral to definitive CTS-related surgical intervention compared with Veterans who received CTS care both within and outside of the VA. These findings were consistent for all types of services rendered for CTS-related care within the VA and the community. VA policies aimed at improving access to care must also evaluate time to definitive treatment to comprehensively monitor access in the VA relative to the community. To improve efficiency and access, strategies are needed to identify and mitigate sources of delay across the continuum of surgical care for Veterans receiving care in all settings.

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