

Department of Veterans Affairs-Medicare dual beneficiaries with stroke: Where do they get care?

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Abstract—This study examined care patterns among stroke patients with diabetes who were dually eligible for Department of Veterans Affairs (VA) and Medicare services. We investigated the location (VA hospital or community-based hospital reimbursed by Medicare) of initial and postacute stroke care during a 1-year follow-up period. We used logistic regression to identify the factors associated with the locations of initial and subsequent stroke care. Of the 6,699 patients studied, 76% received their initial care at a Medicare-reimbursed hospital (“Medicare-first” patients) and 24% at a VA hospital (“VA-first” patients). Patients who were white, married, female, or living farther from the VA were more likely to be Medicare-first patients. During the follow-up period, Medicare-first patients were more likely not only to seek further care but also to use the dual systems than were VA-first patients (71% vs 49%, respectively). The high rates of dual-system use highlight the need for care coordination across systems to address issues of care duplication and continuity.

Key words: care coordination, diabetes, disability, dual enrollment, length of stay, Medicare, rehabilitation, stroke, utilization, veterans.

INTRODUCTION

Stroke is a key public health issue and a leading cause of disability [1]. Each year, an estimated 500,000 individuals experience a first stroke and an additional 200,000 individuals experience a recurrent stroke [2].

Stroke is far more disabling than fatal, resulting in lost productivity, a significant need for healthcare resources, and decreased quality of life; the impact is greater among individuals with diabetes, who incur a two- to fourfold greater risk of stroke [3–4]. Additionally, the impact is more pronounced in men, whose stroke incidence is 1.25 times greater than that of women, a difference that increases as the population ages [1]. Such disparities become particularly important when one considers the veteran population, a predominantly aging male population that had a 19.6 percent diabetes rate in fiscal year (FY) 2000 [5].

Veterans may present to either a Department of Veterans Affairs (VA) hospital or to a community-based hospital for their initial stroke care, particularly veterans who are “dually enrolled” (i.e., have Medicare benefits and are enrolled to be eligible for VA care). Appropriate

Abbreviations: CCI = Charlson Comorbidity Index, DOD = Department of Defense, FY = fiscal year, LOS = length of stay, PTF = Patient Treatment File, VA = Department of Veterans Affairs.

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management of acute stroke is a critical element of care [6] that can improve function and survival and thus reduce overall care costs [7]. Once stabilized in acute care, the patient may be evaluated for continued follow-up care, such as inpatient or outpatient rehabilitation. Again, the choice of location for this poststroke care may vary between the VA and community-based sites for veterans who are dually enrolled.

Dually enrolled individuals can choose to use either VA providers or non-VA providers reimbursed by Medicare. The use of non-VA care is well documented among dually enrolled veterans [8–10]. However, to our knowledge, little work has examined which factors are associated with the source of initial (i.e., acute) stroke care among dually enrolled veterans. Furthermore, no studies have looked at the transitions between the two systems and the associated resource use.

Medicare and the VA are increasingly using administrative data to measure quality of care and tools such as care guidelines and standards to improve care coordination, particularly for patients with multiple comorbidities and the resulting complex care needs. However, beneficiaries' use of multiple care systems significantly complicates these efforts. To assess the extent of the challenge that cross-system use poses to the assessment of quality measurement and improvement, we examined the care patterns of a cohort of stroke patients with diabetes who were dually enrolled to receive VA and Medicare services. More specifically, we aimed to answer the following questions:

- Where did initial care of an incident stroke occur: At a VA hospital or at a community-based hospital reimbursed by Medicare?
- What types of postacute stroke care did veterans receive at the two settings?
- What factors were associated with the location of initial stroke care and the location of subsequent care?

For the VA and other systems with dually enrolled beneficiaries, such information is very important with respect to resource allocation and quality of care for this growing population of intensive resource users.

METHODS

Data Sources

The Institutional Review Board of the VA New Jersey Health Care System approved this project. The study

was a cross-sectional analysis that used the VA Diabetes Epidemiology Cohort database, a registry of veterans who were identified as having diabetes in 1998 and 1999 and used the VA for care. Veterans were identified as having diabetes if they had one inpatient or two outpatient visits with diabetes-specific codes or had received an oral antiglycemic medication or insulin as an outpatient. Details of the identification and construction of the cohort are described elsewhere [5]. Therefore, this study used VA patient medical data from VA inpatient Patient Treatment File (PTF) Main files and outpatient medical SAS data sets maintained at the VA Austin Automation Center. Since many VA patients are Medicare eligible, we obtained Medicare claims data from the Centers for Medicare and Medicaid Services for all VA patients with any indication of diabetes in the VA data, supplemented by any additional VA patients with any codes for diabetes in the claims data alone. We used a verification process that identified dependents and others who received care and were claimed under each beneficiary's number to ensure that we applied claims correctly to the VA patients. We used Medicare files for institutional inpatient, outpatient, and physician care (Parts A and B). Data elements examined included vital status, demographics, encounter dates, and diagnostic and procedure codes (International Classification of Diseases, 9th Revision, Clinical Modification; and Current Procedural Terminology 4). These files are known to be relatively complete for Medicare-covered care that is provided on a fee-for-service basis [11]. For this analysis, we used Medicare data from October 1996 to September 30, 2000. We determined mortality by using the Beneficiary Identification and Records Locator Subsystem maintained at the Austin Automation Center. This file contains information on veterans known to be deceased. It is reported to be 95 percent complete for the VA patient population [12–13], and the VA conducts routine cross-checks with Social Security Administration files to identify any missing deaths among veterans. We ascertained death in the study sample through 2003.

Study Subjects

We identified patients who were admitted to the hospital for an incident stroke in FY1999. Of the two definitions of stroke that Reker and colleagues developed within the VA [10], we used the Reker-specific definition rather than the Reker-sensitive definition, which maximizes the sensitivity of the coding algorithms and might

have increased the “false positive” identification of patients within the data set. The Reker-specific definition includes patients who have a hospital admission or discharge diagnosis with any of the following International Classification of Diseases, 9th Revision, Clinical Modification, codes: 431.xx, 433.x1, or 434.x1. As Medicare use data are only available for fee-for-service patients, we used the Medicare Denominator File to identify patients who were alive and had full fee-for-service coverage during the study period to ensure that we captured the totality of their Medicare use. We excluded 20 patients who had a stroke in FY1998 to ensure that we focused on initial incident stroke hospitalizations. The final sample size was 6,699 patients.

Key Outcomes

We investigated the location of each patient’s acute hospitalization to determine whether the admission was to a VA hospital (“VA-first”) or to a community-based hospital reimbursed by Medicare (“Medicare-first”). Then, we used the combined FY1999 to FY2000 Medicare and VA data to construct a 1-year follow-up care data set that started from the date of discharge from the initial stroke hospitalization for each patient.

During this 1-year follow-up period, we also investigated whether patients received inpatient or outpatient care after discharge from initial care and, if so, where they received this subsequent care (i.e., VA or Medicare). In addition, we also examined intensity of inpatient and outpatient care and location of care in the 1-year follow-up period.

Statistical Analysis

We used logistic regression to examine which factors were associated with use of VA or non-VA settings for initial care. Explanatory variables included sociodemographic information such as age, sex, race/ethnicity, marital status, travel distance to VA, Charlson Comorbidity Index (CCI) score in FY1998, and whether VA inpatient or outpatient care was used in FY1998. For those who had initial care in Medicare, we used the logistic model to examine the factors associated with their likelihood of switching to the VA for subsequent care; similarly, we examined likelihood of staying with the VA for those who had their initial care in the VA. In the latter two models, we included variables associated with the initial stroke hospitalization, such as length of stay (LOS), days elapsed between discharge from the initial incident stroke

hospitalization and subsequent care, and type of subsequent care (inpatient or outpatient) in addition to the other variables just listed. The LOS was calculated as the discharge day minus the admit day plus 1. For VA stays, we excluded the absent bed occupant days.

Sensitivity Analysis

For Medicare billing, acute hospitalization ends when patients transfer to a different type of care (e.g., rehabilitation, outpatient), while in the VA setting, acute hospitalization and inpatient rehabilitation care can be viewed as one episode. This difference in how hospitalization is recorded may cause different interpretations of care use. To address this issue, we examined care received within three specified time frames: the first 3 months following the acute incident stroke, the second 3 months, and the last 6 months of the 1-year follow-up period. We considered care within the 3 months after acute hospitalization to be linked to the poststroke care. We did not consider care received more than 3 months after acute hospitalization to be directly linked to the initial stroke; this distinction allowed us to assess the time trend and progression of care over the 1-year follow-up period.

RESULTS

Descriptive Findings

In the study sample, 76.0 percent ($n = 5,060$) had their initial stroke care at a community-based hospital reimbursed by Medicare and 24.0 percent ($n = 1,639$) had their initial care at a VA hospital (**Table 1**). Patients older than 74 were more likely to be Medicare-first patients. Among the Medicare-first patients, 41.5 percent were older than 74 compared with 35.5 percent of the VA-first patients. Whites were more likely to initiate their care in Medicare-reimbursed settings: the percentage of Medicare-first patients who were white was much greater than that of VA-first patients (83.2% vs 73.3%, respectively). Given that males predominantly use the VA system overall, we not surprisingly found that males were more likely to turn to the VA for their initial care. Married veterans were more likely to initiate their care in Medicare-reimbursed settings. Furthermore, VA-first patients lived an average 29 miles away from the VA hospital, while Medicare-first patients lived an average 41 miles away from the VA hospital. All differences were statistically significant ($p < 0.001$, **Table 1**). Additionally, we observed that VA-first patients had a higher mortality rate than Medicare-first

Table 1.
Patients' characteristics by location of initial stroke hospitalization.

Characteristic	Medicare (n = 5,060)	VA (n = 1,639)
Age (%) [*]		
<45	0.6	1.0
45–54	3.0	4.5
55–64	7.7	10.4
65–74	47.3	48.6
>74	41.5	35.5
Race/Ethnicity (%) [*]		
White	83.2	73.3
Sex (%) [*]		
Male	96.2	98.2
Marital Status (%) [*]		
Divorced	11.9	20.6
Married	68.7	55.6
Never Married	6.1	7.9
Separated	1.2	2.7
Widower	12.0	13.1
Distance to VA Hospital (mi) [*]	41	29
Charlson Comorbidity Index Score [*]	0.65	0.41
VA Inpatient Care in FY1998 (%) [*]	6.1	24.9
VA Outpatient Care in FY1998 (%) [*]	22.4	37.3

Note: Not all percentages sum to 100 because of rounding.

^{*}p < 0.001.

FY = fiscal year, VA = Department of Veterans Affairs.

patients in the second year after their initial stroke episode; the cumulative death rate that year was 10.7 percent (VA-first) versus 9.9 percent (Medicare-first) for those younger than 65 and 16.6 percent (VA-first) versus 14.4 percent (Medicare-first) for those 65 or older.

Initial and Subsequent Care

A vast majority, 98.7 percent, of stroke patients initially admitted to a Medicare-reimbursed hospital were discharged from initial care within 30 days compared with 80.4 percent of those initially admitted to a VA hospital. Average LOS was 29.8 days for VA-first patients but only 6.2 days for Medicare-first patients (Table 2).

After being discharged from the initial hospitalization (i.e., acute and rehabilitation combined), VA-first patients were more likely to attend an outpatient setting for their subsequent care than Medicare-first patients: 84.6 percent of VA-first patients had an outpatient visit for subsequent care compared with 60.1 percent of Medicare-first patients (Table 2).

Overall during the 1-year period after discharge from initial stroke care, Medicare-first patients received more

inpatient and outpatient care than VA-first patients did. About 69.0 percent of Medicare-first patients received inpatient care, with an average of 40 inpatient days, whereas 53.0 percent of VA-first patients received inpatient care, with an average of 38 inpatient days. Almost all the Medicare-first patients (99.6%) had outpatient visits, with an average of 35 visits, and 96.0 percent of the VA-first patients had outpatient visits, with an average of 28 visits (Table 2).

During the first 3 months after initial hospitalization, the VA-first patients were much less likely than the Medicare-first patients to have inpatient care (30.8% vs 51.7%, respectively). The VA-first patients were also less likely to have outpatient visits (94.3% vs 97.0%, respectively). As time progressed, Medicare-first patients were consistently more likely to seek care, particularly outpatient care. However, the magnitude of differences decreased over time: during the second 3 months after discharge, 23.6 percent of Medicare-first patients had additional inpatient care and 95.4 percent had outpatient visits; in comparison, 21.8 and 89.7 percent of VA-first patients had additional inpatient and outpatient care, respectively. During the last 6 months of the follow-up period, 32.9 percent of Medicare-first patients had inpatient care and 97.9 percent had outpatient care. Correspondingly, 30.3 percent of VA-first patients had inpatient care and 91.7 percent had outpatient care (Table 3).

Overall, our sensitivity analyses, based on care received within specified time frames, confirmed our findings regarding the intensity of follow-up care; i.e., Medicare-first patients were more likely than VA-first

Table 2.
Initial and subsequent care by location of initial stroke hospitalization.

Care	Medicare	VA
Initial Stroke Hospitalization		
No. Days in Care [*]	6.2	29.8
% Discharged Within 30 Days [*]	98.7	80.4
Subsequent Care		
% with Inpatient Care [*]	39.7	12.2
% with Outpatient Care	60.1	84.6
% with No Subsequent Care	0.2	3.2
1-Year Care		
% with Inpatient Care [*]	69.0	53.0
No. Inpatient Days [*]	40	38
% with Outpatient Care [*]	99.6	96.0
No. Outpatient Visits [*]	35	28

^{*}p < 0.001.

VA = Department of Veterans Affairs.

Table 3.

Subsequent care during different time frames after initial stroke by location of initial stroke hospitalization.

Care	First 3 Mo			Second 3 Mo			Last 6 Mo		
	Medicare	VA	<i>p</i> -Value	Medicare	VA	<i>p</i> -Value	Medicare	VA	<i>p</i> -Value
% with Inpatient Care	51.7	30.8	0.003	23.6	21.8	0.13	32.9	30.3	0.04
No. Inpatient Days	27.9	23.4	<0.001	18.8	18.5	0.83	26.1	28.5	0.34
% with Outpatient Care	97.0	94.3	<0.001	95.4	89.7	<0.001	97.9	91.7	<0.001
No. Outpatient Visits	11.5	9.0	<0.001	8.1	6.9	<0.001	16.2	13.1	<0.001

VA = Department of Veterans Affairs.

patients to seek care after being discharged from their initial stroke hospitalization.

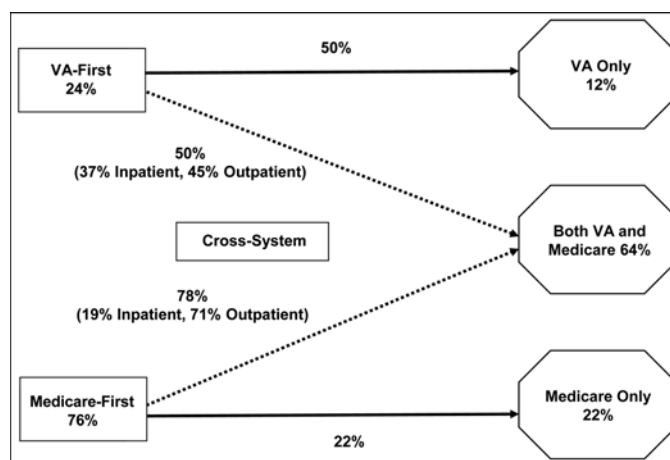
Cross-System Use

After discharge from the initial hospitalization, 15.5 percent of Medicare-first patients went to the VA for subsequent care and 12.8 percent of VA-first patients switched to Medicare. By the end of the 1-year follow-up period, only 22.0 percent of the cohort used Medicare exclusively and 12.0 percent used VA exclusively. Overall, Medicare-first patients were more likely to use the other system (i.e., VA). During the 1-year follow-up period, 78.0 percent of Medicare-first patients received care in the VA, while 50.0 percent of VA-first patients received care in Medicare. When we examined inpatient and outpatient care separately, we found that Medicare-first patients were more likely to use the VA for outpatient care; when they had outpatient care during the 1-year follow-up period, 71.0 percent used the VA, whereas 45.0 percent of VA-first patients used Medicare.

On the other hand, VA-first patients were more likely to use Medicare for inpatient care when they crossed systems; when they had inpatient care during the 1-year follow-up period, 37.0 percent of VA-first patients used Medicare, while 19.0 percent of Medicare-first patients used the VA (Figure).

Logistic Regressions

Table 4 presents the odds ratios of the logistic regressions. The logistic regressions showed that sociodemographic factors such as race/ethnicity, age, and marital status were associated with the patients' likelihood of using VA for the initial stroke hospitalization (Model 1). African Americans and Hispanics were more likely to use the VA for their initial stroke care, as were unmarried patients. Compared with patients older than 74, those between 55 and 64 were more likely to use the VA for their initial stroke hospitalization. Travel distance was sig-

**Figure.**

Cross-system use during 1-year follow-up after initial stroke hospitalization ($n = 6,699$). All study patients on left side received initial care in either Department of Veterans Affairs (VA) (VA-first, 24%) or Medicare-reimbursed facility (Medicare-first, 76%); 50% of VA-first users stayed in VA, resulting in 12% of sample using VA only. Similarly, 22% of Medicare-first users stayed in Medicare, resulting in 22% of sample using Medicare only. In addition, 50% of VA-first and 78% of Medicare-first users were cross-system users, resulting in 64% of sample using both systems (proportion of inpatient and outpatient use shown in parentheses).

nificantly associated with patients' likelihood of using the VA for incident stroke care. Compared with those living more than 30 miles from a VA hospital, patients living within 10 miles were 2.0 times as likely to use the VA and those living within 10 to 20 miles were 1.3 times more likely to use the VA. Patients with higher CCI scores were more likely to use Medicare for initial stroke care. In addition, having inpatient care in the VA in FY1998 increased the likelihood of using the VA for initial stroke care in FY1999 by 4.9 times while having outpatient care in FY1998 increased the likelihood by 1.4 times.

For those who had initial stroke hospitalization in the VA, the source of the subsequent care was significantly

Table 4.

Logistic regression by location of initial and subsequent stroke care.

Independent Variable	Model 1: Initial Care in VA	Model 2: VA to VA	Model 3: Medicare to VA
Sex (reference group: male)			
Female	1.188	0.395	1.204
Race/Ethnicity (reference group: white)			
African American	1.436*	1.005	1.258
Hispanic	2.493*	1.519	2.800
Other	1.175	1.840	0.987
Age (reference group: >74)			
<45	1.890	5.471	2.056
45–54	1.230	4.476 [†]	2.382*
55–64	1.418 [†]	2.063	1.689 [‡]
65–74	1.133	0.864	1.416*
Marital Status (reference group: married)			
Missing	0.058*	0.732	0.024*
Other	1.483*	0.816	1.620*
Distance from VA, mi (reference group: >30)			
<10	2.035*	0.889	0.911
10–20	1.348 [†]	0.819	0.807
20–30	1.146	1.172	1.080
Missing	1.085	1.535	0.998
Charlson Comorbidity Index Score	0.695*	0.899	0.917 [†]
Fiscal Year 1998			
VA Inpatient Use	4.911*	1.306	2.728*
VA Outpatient Use	1.362*	1.007	1.390*
Length of Stay for Initial Stroke Hospitalization	—	0.991*	0.996
Days Elapsed Between Initial and Subsequent Care	—	1.006	1.014*
Subsequent Care Was Outpatient	—	10.937*	2.250*

* $p < 0.001$.[†] $p < 0.05$.[‡] $p < 0.01$.

VA = Department of Veterans Affairs.

affected by age, LOS for the initial care, and days elapsed between initial and subsequent care (Model 2). Compared with patients older than 74, patients between 45 and 54 were 4.5 times more likely to stay in the VA for their next care. Patients were less likely to continue with VA care for inpatient care than to receive outpatient care in that setting.

For those who received Medicare-reimbursed care for the initial stroke hospitalization, younger or unmarried patients were more likely to switch to the VA for their subsequent care (Model 3). For example, compared with patients older than 74, patients between 45 and 54 were 2.4 times more likely to switch to the VA for their subsequent care. Medicare-first patients with higher CCI scores were less likely to switch to the VA for their subsequent care. The number of days elapsed between dis-

charge from the initial incident stroke hospitalization and subsequent care was associated with higher odds of Medicare-first patients switching to VA care (odds ratio = 1.01, $p \leq 0.001$). Patients who had inpatient or outpatient care in the VA in the preceding FY and those whose subsequent care was outpatient were more likely to switch from Medicare to the VA for subsequent care.

DISCUSSION AND CONCLUSIONS

Almost three out of four Medicare-VA dually enrolled veterans went to the private sector under Medicare for their initial incident stroke care. We also found a substantial difference in the LOS for initial incident

stroke hospitalization between VA and the private sector. Some of this difference can be explained by the structure of the VA care system. The VA views acute care and inpatient rehabilitation as one continuous LOS, whereas Medicare-reimbursed hospitals discharge patients from acute inpatient care and then admit patients to inpatient rehabilitation. Our further analysis confirmed the structural differences in the two systems. For example, we found that Medicare patients were more likely to be discharged from the acute inpatient stay to a subsequent inpatient hospitalization for rehabilitation. We observed that about 40 percent of those discharged from Medicare had an inpatient stay for subsequent care compared with about 12 percent for patients discharged from the VA. By examining the diagnostic-related groups of the subsequent hospitalizations, we found that the most frequently used diagnostic-related group for Medicare-first patients was for rehabilitation. Rehabilitation accounted for 41 percent of Medicare-first patients' subsequent hospitalizations but only 17.5 percent of VA-first patients' subsequent hospitalizations.

In the Medicare reimbursement system, transition from acute hospitalization to inpatient rehabilitation is generally clearly identifiable. In the VA setting, however, a patient may receive acute care and then shift into inpatient rehabilitation in the VA without being discharged. Despite this, Medicare-first patients consistently received more care after the first 3 months from the initial stroke hospitalization, a finding that cannot be attributed to the difference in transition from acute to rehabilitation hospitalization. Overall, the VA-first patients' longer inpatient stays were mitigated after we considered that the VA-first patients used less care (both hospitalization and outpatient visits) in the 1-year follow-up period. This finding raised the question of whether more continuous care up front is more beneficial than segmented care with more follow-up. Drawing conclusions is difficult without more specific health-service research.

Many of the Medicare-first patients sought VA care in the 1-year follow-up period after discharge from their initial stroke hospitalization. Furthermore, regarding cross-system use, we found that Medicare-first patients were more likely to use the VA for outpatient care. Our study cohort comprised patients with diabetes who had had a stroke. Diabetes requires continuous outpatient-based monitoring care and medication. The VA's comprehensive prescription coverage and high-quality diabetes care may explain the Medicare-first patients' higher use

of VA outpatient care. We also found that the VA-first patients were more likely to use Medicare for inpatient care, which may reflect patterns of emergency care because community-based hospitals are often the destination for emergency medical services. This inpatient care pattern may also reflect VA-first patients' preference for a community or university-based hospital system for additional care or their perception that the private sector offers a "more expert" opinion.

Research has found that comprehensive coordinated care, as provided by the VA system, can improve functional outcomes and reduce the length of hospital or nursing home stays more than care in a traditional stroke unit [7–10,14–19]. The VA and the Department of Defense (DOD) recognized the need for care coordination for stroke patients in their publication of the *Clinical Practice Guidelines for the Management of Stroke Rehabilitation 2003* (<http://www.oqp.med.va.gov>), as did the Commission on Accreditation of Rehabilitation Facilities, which introduced stroke specialty program standards for medical rehabilitation in 2005. However, DOD/VA evidence-based guidelines have been established for developing and recommending interventions and evaluations for stroke patients not only to promote the highest levels of function and independence but also enhance quality of life for both the patient and the family. Such comprehensive and scientifically driven guidelines are not universally applied in non-VA settings. Consequently, VA care may more effectively support patients' functional recovery and quality-of-life improvement. Given that our study used data from before implementation of the DOD/VA guidelines, we should extend our research to examine the effect of the guidelines on VA and non-VA system use.

This study has several limitations that we must state to caution interpretation of results concerning the overall LOS. First, we used the PTF files rather than Bed Section files to create a corollary in format to compare with the Medicare files; using the PTF files rather than the Bed Section files may or may not affect the overall LOS reported for the VA-first patients. Second, although the crude death rates showed a 2 percent difference between the VA-first and Medicare-first patients, using the administrative codes did not allow us to control for stroke severity. Therefore, some of the difference in LOS in the initial stroke hospitalization may reflect the more severe strokes experienced by VA-first patients. Finally, the

exact nature and type of the strokes were unknown and this may, along with severity, influence the LOS.

Despite the noted limitations, this study revealed high rates of dual-system use. Patients who bridge the systems may experience inconsistent or duplicative care or simply fall between the cracks of either system in terms of having their care needs met. The dual-system use highlights the need for care coordination across systems not only to address issues of duplication of care but also to address continuity and quality of care for this complex patient population.

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The authors have declared that no competing interests exist.

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