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Research Article

Data acquisition process for VA and non-VA emergency department and hospital utilization by veterans with spinal cord injury and disorders in California using VA and state data

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Context: To identify VA and non-VA Emergency Department (ED) and hospital utilization by veterans with spinal cord injury and disorders (SCI/D) in California.

Design: Retrospective cohort study.

Setting: VA and Office of Statewide Health Planning and Development (OSHPD) in California.

Participants: Total 300 veterans admitted to the study VA SCI/D Center for initial rehabilitations from 01/01/1999 through 08/17/2014.

Interventions: N/A.

Outcome Measures: Individual-level ED visits and hospitalizations during the first-year post-rehabilitation.

Results: Among 145 veterans for whom ED visit data available, 168 ED visits were identified: 94 (55.2%) at non-VA EDs and 74 (44.8%) at the VA ED, with a mean of 1.16 (± 2.21) ED visit/person. Seventy-seven (53.1%) veterans did not visit any ED. Of 68 (46.9%) veterans with \geq one ED visit, 20 (29.4%) visited the VA ED only, 34 (50.0%) visited non-VA EDs only, and 14 (20.6%) visited both VA and non-VA EDs. Among 212 Veterans for whom hospitalization data were available, 247 hospitalizations were identified: 82 (33.2%) non-VA hospitalizations and 165 (66.8%) VA hospitalization with a mean of 1.17 (± 1.62) hospitalizations/person. One hundred-seven (50.5%) veterans had no hospitalizations. Of 105 veterans with \geq one hospitalization, 58 (55.2%) were hospitalized at the study VA hospital, 15 (14.3%) at a non-VA hospital, and 32 (30.5%) at both VA and non-VA hospitals.

Conclusion: Non-VA ED and hospital usage among veterans with SCI/D occurred frequently. The acquisition of non-VA healthcare data managed by state agencies is vital to accurately and comprehensively evaluate needs and utilization rates among veteran populations.

Keywords: Veterans, Spinal cord injuries, Health care utilization, Hospitalization, Emergency department visit, Veterans' health

Introduction

Spinal cord injury and disorders (SCI/D) are considered catastrophic life events, disrupting vital functions such as ambulation, sensation, bowel and bladder control, and other autonomous regulations.¹ SCI/D is also implicated in secondary conditions

such as chronic pain, depression, anxiety, pressure injuries, and other chronic medical conditions.^{2,3} Individuals with SCI/D visit Emergency Departments (ED) often and are frequently hospitalized for acute and chronic health problems especially in the early period following their initial rehabilitation.^{4,6} Previous studies report that about 50% of non-veterans with traumatic SCI/D had an ED visit at least once and 27.5% to 57% are hospitalized at least once during the first year following rehabilitation.⁷⁻¹⁰ ED visits and hospitalization confer high

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costs on society and impair quality and continuity of life for individuals with SCI/D.^{10–14}

Per the Agency for Healthcare Research and Quality, effective preventive and interventional healthcare delivery is dependent upon accurate data related to patients' needs and utilization. Understanding rates and drivers of ED visits and hospitalizations is the first step toward designing effective strategies to better understand utilization.¹⁵ However, there have been no studies of post-rehabilitation ED visits and hospitalizations among veterans with SCI/D in over 20 years.¹⁶

Veterans, who represent 26% of the SCI/D population in the US, are entitled to receive healthcare at both Department of Veterans Affairs (VA) and non-VA facilities.¹⁷ The VA operates the single largest integrated network of SCI/D services, delivering comprehensive, multidisciplinary, lifelong care via 25 SCI/D Centers (“hubs”), extending to more than 120 SCI/D primary and specialty care teams or support clinics (“spokes”). The goal of the hub and spoke system is to deliver emergency care, acute medical and surgical care, rehabilitation, primary care, and home care. The VA SCI/D network is regarded as one of the most comprehensive continuous care models for people with SCI/D in the US.^{18,19} Accurate information regarding rates of ED visits and hospitalizations among veterans with SCI/D is important to evaluate and improve upon the quality and effectiveness of the services and care provided by VA.

Veterans use both VA and non-VA healthcare facilities for their primary,²⁰ specialty,²¹ urgent,²² and hospitalization care.^{23,24} Dual use of VA and non-VA facilities has been studied mainly among Medicare-eligible veterans with chronic diseases such as congestive heart failure,²² diabetes,²⁵ dementia,²⁶ depression,²⁷ and rheumatoid arthritis.²¹ Veterans in general and those with SCI/D also rely on non-VA pharmacies for prescription refills.^{28,29} While use of both VA and non-VA facilities may increase access and choice, it can also create fragmentation and duplication, sometimes with harmful outcomes such as increased opioid overdose risk when prescriptions are refilled at both a VA and non-VA pharmacy using the Medicare Part D benefit, and poor glycemic control *et al.*^{25–30} Rates of non-VA healthcare utilization are needed for purposes of strategic planning, care coordination, and financial allocation,³¹ as the Veterans Mission Act of 2018 greatly expanded non-VA healthcare for veterans.³² Evidence is lacking regarding how veterans with SCI/D, one of the most costly health conditions in the VA healthcare system,¹³ utilize non-VA facilities; these data are critical to meet veterans' emergency and hospital care needs.

Obtaining individually identifiable healthcare utilization data from non-VA systems for veterans with SCI/D presents numerous challenges due to regulatory mandates such as the Health Insurance Portability and Accountability Act (HIPAA) which needs data use agreements for sharing of protected health information among healthcare systems;³³ and VA restricts release of protective personal information to non-VA entities. Traditional methods of collecting these data rely on patient self-report and insurance claims.³⁴ Self-report is time consuming on data collection with an inherent weakness related to recall bias.^{35,36} Health insurance (Medicare, Medicaid, Tricare, or private) claims data are confined to those enrolled in these programs. The Office of Statewide Health Planning and Development (OSHPD) houses data of all hospitalizations at non-Federal healthcare facilities in California since the 1960s and ED visit data since 2005, regardless of patients' insurance status.³⁷ The OSHPD dataset includes veterans who received care at non-VA facilities in California, serving as an important source to understand non-VA utilization. Forty-eight states have databases similar to OSHPD to track hospitalizations, and 38 states have ED databases as of August 2019.³⁸ These state-owned systems include a variety of data elements and procedures to request access. This report discusses an approach to combine VA and OSHPD data to obtain a more complete picture of healthcare utilization for veterans with SCI/D in California while adhering to VA privacy and data security regulations (VHA Directive 1605 VHA Privacy program).³⁹ This method may be replicated in other states with similar databases and can be applied to a broader VA SCI/D populations or veterans with various health conditions.

Methods

Cohort identification

The VA SCI/D centers accept patients with SCI/D by referral only. All patients must have SCI/D confirmed by imaging (CT or MRI) and their records are reviewed by SCI/D physicians for validated SCI/D diagnoses before acceptance. Upon admission to our center, each patient is entered into the local SCI/D registry, which is a part of national SCI/D registry system. Veterans being accepted into the study VA SCI/D center for an initial acute rehabilitation between 01/01/1999 and 08/17/2014 were considered as index cases for this study. We manually identified these cases in the registry and collected first name, first letter of last name, social security number (SSN), date of birth, date of discharge, SCI/D etiology and level, and discharge location. We assembled the cohort list and asked a data technician

to automatically validate full social security numbers and date of births against the VA computerized patient records system to ensure all individuals in the cohort were indeed VA patients and there were no errors due to transcription error. There were 300 veterans discharged from initial SCI/D rehabilitation during this timeframe, of whom 212 who were discharged to home or assisted living facilities in California were included in this study; 88 were excluded for the following reasons: discharged outside California ($n = 47$); deceased during rehabilitation ($n = 3$); discharged to hospice care ($n = 3$); discharged to skilled nursing and assisted living facilities in California ($n = 30$); and transferred to other healthcare facilities ($n = 5$). The study was approved by three IRBs: VA/Stanford University; University of California at Davis; and State of California Human Subjects Study Commission.

Steps to obtain non-VA data

Identify data availability

We reviewed the OSHPD website (<https://oshpd.ca.gov/data-and-reports/request-data/>) for historical documents including an algorithm guide, detailed mission and history, dataset formation, availability for public access, the data acquisition process, and peer reviewed publications.^{37,40,41} We concluded that OSHPD would provide high quality administrative data to meet our aims to collect non-VA ED visits and hospitalization in California among veterans with SCI/D.

Patient-level hospitalization data were available beginning 01/01/1999 in both VA and OSHPD dataset, but ED visit data were only available beginning 01/01/2005 when California OSHPD started collecting ED data.

Establish data acquisition process

VA data sources

We assembled information from the local SCI/D data registry at the study VA SCI/D center into a file and matched it with VA healthcare utilization data including age at discharge, sex, marital status, ethnicity, death status, home zip code, and most recent home distance in miles from the VA SCI/D center. We extracted dates and associated diagnoses of ED visits and hospitalizations that occurred at the study VA healthcare system during the first year after discharges from initial rehabilitation at the VA SCI/D center.

OSHPD data source

In addition to IRB approval from the VA Palo Alto/Stanford and the University of California at Davis, OSHPD required an independent review by the

Committee for the Protection of Human Subjects for the California Health and Human Service Agency. OSHPD also requested a computer security certification from the VA to attest the plan for secure storage of OSHPD data.

Per HIPPA and Veterans Health Administration Directive 1605-VHA Privacy program,³⁹ there are specific requirements for individuals or organization (*i.e.* OSHPD) to access patients identifiers (SSNs) and/or personal health information (PHI-date of birth, dates of admission and discharge from the VA SCI/D rehabilitation). We hired an experienced dual contractor of VA and OSHPD with access to both OSHPD and VA data. These identifiers were used to obtain ED visits and hospitalizations from the OSHPD dataset via an encrypted virtual private network (VPN). Once ED visits and hospitalizations data were obtained from the OSHPD, the contractor returned an encrypted data file with previous assigned research ID, dates of non-VA admission and discharge, dates of non-VA ED visits, first five diagnoses of each ED visits and each hospitalizations, and was ready to be combined with VA data sources.

Combined data

The OSHPD data were exported to the master file containing VA-derived data by research IDs for a combined file containing both VA and non-VA healthcare utilization data. [Figure 1](#) depicts the data collection and management process. The cohort identification start date was the date the VA began tracking veterans receiving rehabilitation at a VA SCI/D Center (01/01/1999). The end date was determined by the IRB-approved study period (08/17/2014) yielding 300 veteran hospitalization records. Of these, 212 met the inclusion criteria-discharged to home or assisted living facilities in California (see the cohort identification for the exclusion criteria). It should be noted that OSHPD ED data were limited to veterans whose initial rehabilitation took place after that 1/2005 ($N = 145$).

Statistical analysis

Stata statistical software 13.1 (College Station, TX) was used to derive counts, frequencies, and percentages as only descriptive analysis is presented in this report.

Results

The combined VA-OSHPD dataset contained information on hospitalizations for 212 veterans over a 15-year period and ED visits for 145 veterans over a 10-year period. [Table 1](#) presents demographic and

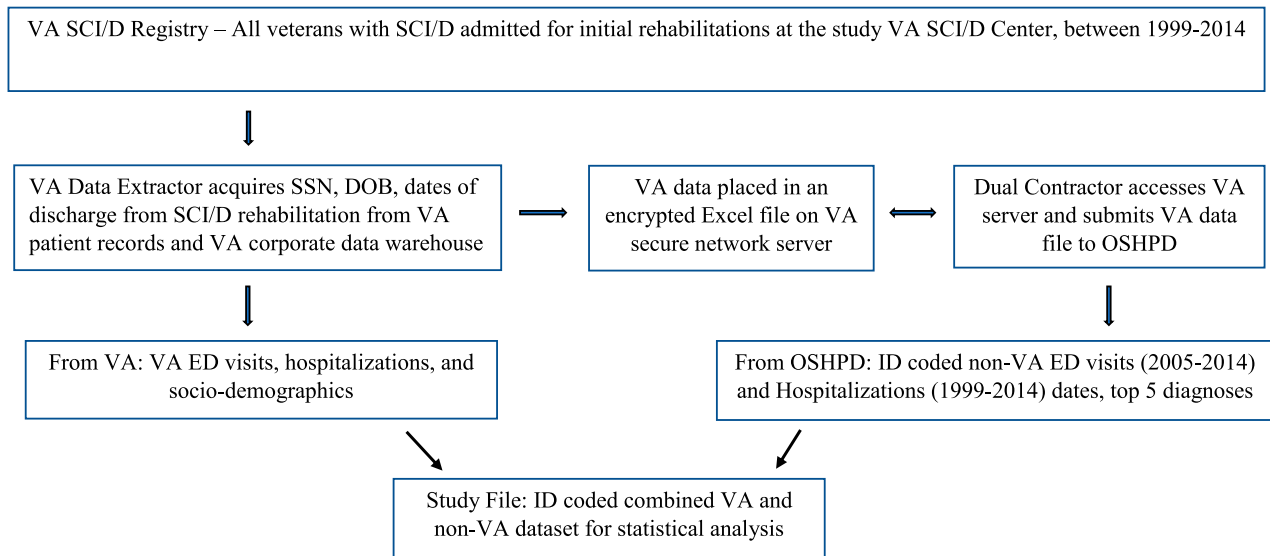


Figure 1 Flow diagram of process to acquire, combine, and manage information on VA and Non-VA healthcare utilization of SCI/D Veteran cohort.

SCI/D characteristics for both the full study cohort for whom hospitalization data were available and the subset for whom ED visits were available. The full

study population was primarily male (97.9%) and white (69.7%) with mean age of 57.2 (±16.3) years at the time of discharge; approximately one third were older than 65 (35.2%). More than half had education beyond high school (59.3%), and less than half were married (41.5%). Many lived more than 100 miles from the study VA site (42.3%). The average length of stay for SCI/D rehabilitation was 75.2 (±73.9) days, and all were discharged home or to assisted living facilities in California. The demographics and SCI/D characteristics for the ED subset were very similar to the those of the full cohort.

Table 1 Subject characteristics and demographics of study cohort and subset for which emergency department data are available.

	Hospitalization Cohort (1999–2014) (N = 212)	ED Cohort* (2005–2014) (N = 145)
Age at discharge from rehabilitation, Mean (SD)	57.2 (±16.4)	58.2 (±16.3)
Age ≥65, N (%)	70 (33.0)	51 (35.2)
Male (%)	97.9	98.1
Race, White (%)	69.7	70.2
Level of SCI/D Injury, N (%)		
C4 and above A–C	26 (12.3)	23 (15.9)
C5–C8 A–C	25 (11.8)	12 (8.3)
T1 and below A–C	39 (18.4)	26 (17.9)
All D	105 (49.5)	72 (49.7)
Neurodegenerative diseases	7 (3.3)	4 (2.8)
Malignancy, N (%)	10 (4.7)	8 (5.5)
Education > high school, (%)	59.3	52.8
Married (%)	41.5	43.5
Days of initial rehabilitation, Mean (SD)	75.2 (±73.9)	74 (±81.6)
Home discharge after rehabilitation (%)	100	100
Distance from home to VA SCI/D center > 100 miles (%)	42.3	40

ED: Emergency Department.

SCI/D: Spinal Cord Injury and Disorders.

*Note that the ED Cohort is a subset of the Hospitalization Cohort and includes only those patients who accessed health care from 2005 and later.

Emergency department visits

We identified 68 veterans for a total of 168 ED visits (47% of the cohort) with a mean of 1.16 (±2.21) ED visits per person; a total of 77 (53%) veterans had no ED visits in the year after their initial rehabilitation. Of the 168 ED visits identified in the combined dataset, ED visits were almost equally distributed between VA (n = 74, 44%) vs. non-VA facilities (n = 94, 56%) (Fig. 2). Among the 68 veterans with at least one ED visit, 29 (42.6%) visited an ED once, 21 (30.9%) visited twice, and 18 (26.5%) had three or more ED visits (Fig. 3). Twenty (29.4%) veterans had ED visits only at a VA facility, 34 (50%) only visited a non-VA facility, and 14 (20.6%) veterans had visits to both a VA and a non-VA facility (Fig. 4).

Hospitalizations

There were 247 hospitalizations among 212 veterans during the first year post initial rehabilitation with a

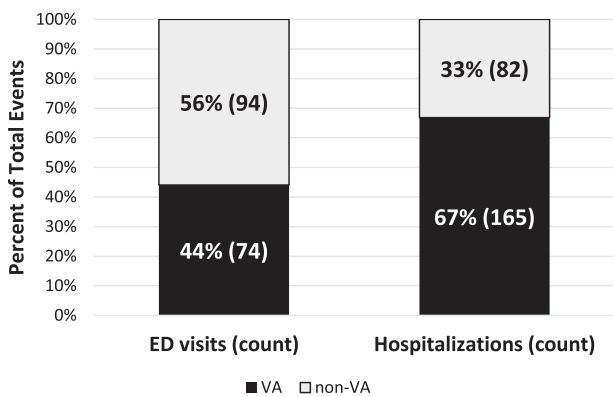


Figure 2 Distribution of ED visits and hospitalizations occurring at VA and non-VA facilities in the first-year post discharge from SCI/D rehabilitation. Black bars represent VA; gray bars represent non-VA events. Number of events is shown for each category; relative distribution is shown by percent of total.

mean of 1.17 (± 1.62) hospitalization per person, 165 (67%) admissions to VA facilities and 82 (33.2%) to non-VA facilities. One hundred seven (51.5%) veterans were never hospitalized during this period while 105 (49.5%) experienced at least one hospitalization. Among the latter, 45 (42.9%) veterans were hospitalized once, 19 (18.1%) were hospitalized twice, and 41 (39.1%) veterans were hospitalized three or more times (Fig. 3). Among veterans who were hospitalized, 58 (55.2%) were admitted to the study VA health care system, 15 (14.3%) were admitted to a non-VA facility, and 32 (30.5%) had admissions to both the VA and non-VA hospitals (Fig. 4).

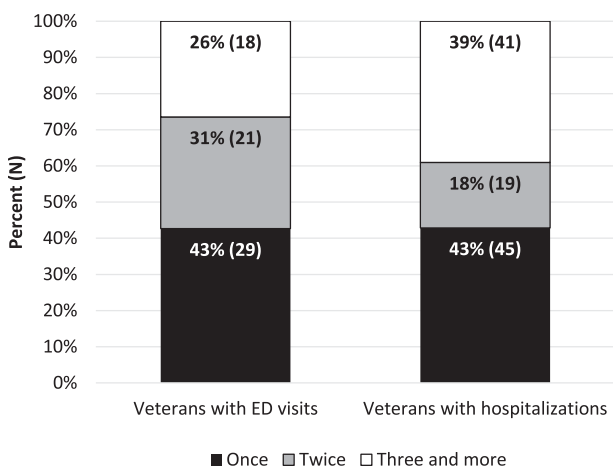


Figure 3 Proportion and number of veterans with SCI/D by frequency of utilization of ED and hospital facilities in the first-year post discharge from rehabilitation. Black bars represent once, gray bars represent twice, white bars represent three times or more.

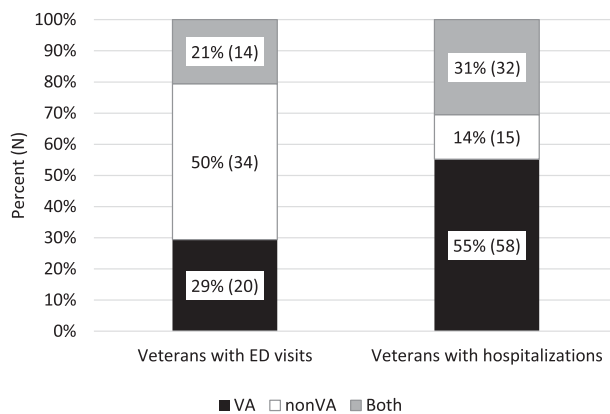


Figure 4 Proportion and number of veterans with ED visits and hospitalizations at VA, non-VA, or both VA and non-VA facilities in the first-year post discharge from SCI/D rehabilitation. Black bars represent VA, white bars represent non-VA, gray bars represent both.

Discussion

SCI/D is a catastrophic event producing multiple systems impairment and numerous secondary conditions,¹ with up to millions of dollars in lifelong healthcare costs.¹³ Ready access to emergency and hospitalization services are necessary to reduce comorbidity and extend longevity in this vulnerable population.⁶⁻⁴² Although the VA has established a national multidisciplinary, comprehensive care network to serve veterans with SCI/D, greater than 40% of the study cohort lived more than 100 miles from the study VA SCI/D Center. Therefore, for those who live at a distance, non-VA healthcare systems fill an unmet need for veterans with SCI/D during emergencies and urgent hospital care.

Collecting data on veterans' non-VA healthcare utilization is a daunting task for many reasons: (a) understanding and adhering to numerous regulations related to protecting identifiable personal health information, (b) identifying and requesting relevant information from the range of non-VA facilities used by veterans, and (c) managing data acquisition from various medical record systems. Fortunately, many state-owned databases, such as California's OSHPD, house data regarding ED and hospital use in non-federal healthcare systems. When non-VA facility data are combined with VA data, a more complete picture emerges of healthcare utilization regardless of payer source. Our approach can be replicated in any state with a similar database, to evaluate utilization patterns in any veteran population.

Without the method employed in this study, 56% of ER visits and 33.2% of hospitalizations would not have been identified because they occurred outside the VA system, resulting in a serious underestimation of

actual healthcare utilization by the study population. Without information on non-VA health care utilizations, VA would not be able to design effective interventions to avert preventable ED visits or hospitalizations as the reasons to seek non-VA care are likely different than VA care. This work could be further extended to explore specific reasons and underlying factors for non-VA ED visits and hospitalizations in order to reduce bias and inaccuracy of reports based solely on VA data.

Previous studies on the dual use of VA and non-VA healthcare facilities have mainly focused on Medicare-eligible veterans,^{4,15,27–29} with or without chronic disease, who generally use non-VA facilities for primary,²⁰ urgent,^{43,44} and specialty care.²⁷ To our knowledge, this is the first study to report specifically that veterans with SCI/D, regardless of payer source, use non-VA emergency and inpatient care at a substantial rate during the first year post-rehabilitation period. Details on causes for ED visits and hospitalizations and associated factors will be reported in a separate paper.

Indeed, the VA has been paying for uninsured veterans' non-VA ED visits and hospitalizations since 1999 in accordance with the Veterans Millennium Health Care and Benefits Act,⁴⁵ and this access continues to expand. The Veterans Access, Choice, and Accountability Act of 2014 authorized VA to pay for a wide array of non-VA healthcare services including outpatient care for eligible veterans.⁴⁶ Moreover, the Veterans Mission Act of 2018 further broadened non-VA healthcare services to include any care that the VA cannot provide within 20 days, is not available at a VA facility, or is deemed in the best interest of veterans. The VA is establishing non-VA community care networks to fulfill this mission.⁴⁷ Our study method has considerable practical implications for capturing these data to more reliably depict veterans' needs and usage patterns as veterans utilize non-VA healthcare services with greater frequency.

The current study accessed the California OSHPD to identify all non-VA ED and hospital usage over 10 years for ED visits and 15 years for hospitalizations in California. Understanding utilization of non-VA services is important to evaluate overall healthcare needs and use among veterans with SCI/D. Accurate data is the first step to designing efficient and effective healthcare delivery interventions to reduce avoidable ED visits and hospitalizations in this population. The method presented here may be applied to states beyond California where a state-wide healthcare services registry is available to more accurately characterize

veterans' usage patterns. This study validates previous findings on dual use of VA and non-VA healthcare systems by veterans with a specific illness and insurance, such as Medicare. Further, it provides evidence to support the VA policy to reimburse non-VA healthcare usage for veterans with SCI/D.

As this paper mainly focused on the research method to assess non-VA health care utilization with a state-owned administrative dataset, there are a few limitations of this study. The first limitation is lack of access on information about hospitalizations or ED visits outside California and the study VA health care system. However, our clinical experience informs us that most veterans with SCI/D do not travel widely during the first year following rehabilitation due to community adjustment and the continuing recovery process. Nonetheless, if equivalent information is available from other states in the future, out-of-state utilization could be identified and included for a more accurate picture of healthcare patterns among veterans with SCI/D. Second, the non-VA ED visit data period (2005–2014) was five years shorter than the non-VA hospitalization data period due to the limitation of the OSHPD dataset. Therefore, conclusions were based on a smaller study cohort. Third, the study method may have limited generalizability for the entire VA health care system due to local regulation and data access procedures of individual VA facilities. Last, this study excluded nursing home residents ($N = 27$, 10.7% of the cohort discharged in California) from the analysis as our study aims focused on the mission of VA SCI/D population to “sustain living in the community,” and we suggest that decision-making about visiting an ED or being admitted to a hospital may be different for individuals who are not living independently.

Conclusion

Like other veterans' cohorts, veterans with SCI/D depend on non-VA health care facilities to fill their unmet healthcare needs for emergency care and hospitalizations. State-owned health care utilization registries are efficient and reliable sources to study non-VA health care utilization among the veteran population in order to gain a comprehensive accounting of health care access.

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Disclaimer statements

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Conflicts of interest Authors have no conflict of interests to declare.

Compliance with ethical standards

Ethical Approval: All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Three institutional review boards – California State Committee for the Protection of Human Subjects, University of California at Davis, Stanford University/VA approved this study. Views expressed here are those of the authors and not necessarily those of the Department of Veterans Affairs or other affiliated organizations.

The interpretation and reporting of the data are the responsibility of the authors and in no way should be seen as an official policy or interpretation of the US government.

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