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Hospital-level variation in risk-standardized admission rates for emergency care–sensitive conditions among older and younger Veterans

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Abstract

Objectives: Research examining emergency department (ED) admission practices within the Department of Veterans Affairs (VA) is limited. This study investigates facility-level variation in risk-standardized admission rates (RSARs) for emergency care–sensitive conditions (ECSCs) among older (≥65 years) and younger (<65 years) Veterans across VA EDs.

Methods: Veterans presenting to a VA ED for an ECSC between October 1, 2016 and September 30, 2019 were identified and the 10 most common ECSCs established. ECSC-specific RSARs were calculated using hierarchical generalized linear models, adjusting for Veteran and encounter characteristics. The interquartile range ratio (IQR ratio) and coefficient of variation were measures of dispersion for each condition and were stratified by age group. Associations with facility characteristics were also examined in condition-specific multivariable models.

Results: The overall cohort included 651,336 ED visits across 110 VA facilities for the 10 most common ECSCs—chronic obstructive pulmonary disease (COPD), heart failure, pneumonia, volume depletion, tachyarrhythmias, acute diabetes mellitus,

gastrointestinal (GI) bleeding, asthma, sepsis, and myocardial infarction (MI). After adjusting for case mix, the ECSCs with the greatest variation (IQR ratio, coefficient of variation) in RSARs were asthma (1.43, 32.12), COPD (1.39, 24.64), volume depletion (1.38, 23.67), and acute diabetes mellitus (1.28, 17.52), whereas those with the least variation were MI (1.01, 0.87) and sepsis (1.02, 2.41). Condition-specific RSARs were not qualitatively different between age subgroups. Association with facility characteristics varied across ECSCs and within condition-specific age subgroups.

Conclusions: We identified unexplained facility-level variation in RSARs for Veterans presenting with the 10 most common ECSCs to VA EDs. The magnitude of variation did not appear to be qualitatively different between older and younger Veteran subgroups. Variation in RSARs for ECSCs may be an important target for systems-based levers to improve value in VA emergency care.

KEYWORDS
Department of Veterans Affairs, efficiency measurement, emergency department, health care quality, hospital admission, value-based care, Veterans

INTRODUCTION

Unexplained variations in health care utilization present seminal opportunities to improve value in health care delivery.[1,2] As health care expenditures in the United States (U.S.) continue to rise, policymakers are increasingly scrutinizing utilization of care of marginal health benefit.[3] The National Academy of Medicine suggests that 20%–30% of health expenditures are misused—spanning overutilization to underutilization—relative to evidence of effectiveness.[4] Studies suggest that this has, in part, derived from a lack of consensus surrounding the value of certain health care services.[5] This may be particularly germane for hospital admissions, which represent one of the costliest health care decisions and one for which explicit clinical practice guidelines are limited and decision making is impacted by a multitude of medical, social, and systems-based considerations with known variation across health care providers and settings.[5–21]

Given that the emergency department (ED) is the primary source of hospital admissions, researchers have focused on this setting when seeking to understand modifiable drivers of admission practices.[22,23] Variation in hospital admissions has been demonstrated at the patient, condition, provider, and hospital levels as targets for performance benchmarks and interventions to improve the value of health care delivery.[5–9,16] Research surrounding variations in ED admission practices within the Department of Veterans Affairs (VA), however, is limited. Given that the VA operates the largest U.S. integrated health care system, it is poised to offer unique insights into improving the value of emergency care that may also be applicable to non-VA settings.[24,25]

The role of emergency care in the VA is increasing—during the past VA fiscal year, there were over two million ED visits by Veterans and half of these visits were by Veterans over the age of 65 years.[24,26,27] As a result, improving the value of emergency care, especially for older Veterans, is a research priority area of interest for VA.[28] This study accordingly investigates facility-level variation in risk-standardized admission rates (RSARs) for emergency care–sensitive conditions (ECSCs)—conditions for which early diagnosis and intervention in acute illness improve outcomes—stratified by older (≥65 years) and younger Veteran (<65 years) age subgroups. Examining ECSCs enables focused assessment of emergency care–specific processes and outcomes when compared to other measures (for example, ambulatory care–sensitive conditions) that are often used to measure potentially preventable emergency care.[29,30] ECSCs were also designed to assess hospital variations to inform interventions at the emergency carelevel.[15,29,31–33] Therefore, in efforts seeking to improve the value of acute care delivery, focusing on ECSCs represents a promising opportunity. Further, because older patients presenting to the ED have unique presentations, social determinants, disposition considerations, and outcomes, we stratified the analysis by age.[29,34–42] This approach acknowledges that there may be consequent differences in practice patterns and variations for older Veterans when compared to their younger counterparts.

METHODS

Study design, setting, population, and protocol

We used data from the VA Corporate Data Warehouse (CDW), a national repository comprising data from several VA clinical and administrative systems.[43,44] The overall study sample included VA ED visits for the 10 most common ECSCs between October 1, 2016 and September 30, 2019, reflecting VA fiscal years, by Veterans who were ≥18 years of age. Each visit was considered an independent observation. Using ICD-10-CM inclusion and

exclusion subcodes as previously described in the literature, each ED visit's principal ED diagnosis was used to group visits into mutually exclusive ECSCs.[29] Patient variables included age, sex, service-connected disability rating, and Elixhauser Comorbidity Index.[45] The service-connected disability rating for Veterans informs both disability compensation as well as benefits eligibility, such as health care and copayment rates; it is based on illnesses or injuries that were sustained or aggravated during military service and is assigned from 0% (least disabling) to 100% (most disabling).[46,47] Encounter-level Emergency Severity Index (ESI) was used to adjust for patient acuity.[48] Patient- and encounter-level data were obtained from the Outpatient, Inpatient, Purchased Care, and Patient domains of the VA CDW. Available facility-level information included teaching status, facility complexity, rurality, ED volume, and U.S. census region. Teaching status was defined using American Hospital Association data. Facility complexity describes the level of services provided at a VA facility—categorized as 1a, 1b, 1c, 2, or 3—with level 1a being the most complex and level 3 being the least complex. The Facility Complexity Model uses clinical and administrative data to categorize facilities based on workload and programs (such as teaching, research, and complex clinical programs).[49] Rurality designation was obtained from the VA Geospatial Service Support Center data. Visits in which the Veteran left without being seen, left before completion of evaluation, left against medical advice, or died upon arrival or in the ED were excluded. Visits with missing encounter, patient, or facility information were also excluded. Facilities outside of the continental U.S. were not included given differences in health care delivery systems as well as known natural disasters that significantly impacted health care infrastructure during the study period.[50] A required sample size was not explicitly calculated. Simulation literature has found that cluster sizes less than 50 could result in biased level-two standard errors and that fixed effects are robust to sparseness in cluster size as the number of clusters increase.[51,52] We excluded facilities with fewer than 25 ED visits for an ECSC group from the analysis of that ECSC to reduce extremely sparse clusters and to ensure stability of estimates. Mean cluster sizes ranged between 72 and 1457 across ECSCs and age groups.

Measures

Hospital admission was defined as inpatient admission, observation admission, or transfer. Transfers to both VA and non-VA facilities were included as this frequently reflects the need for admission at a facility with more resources or specialized services and allow comparisons between smaller EDs and larger referral EDs.[5] After identifying the top 10 most frequent ECSCs overall, ECSC-related ED visits and facility admissions informed the unadjusted admission rate calculations. This was completed for the overall cohort and two age subgroups (Veterans aged <65 years and ≥65 years). Patient, encounter, and facility characteristics were then compared (unadjusted) by admission status and stratified by ECSC and age group.

Data analysis

Emergency care–sensitive condition-specific RSARs—our outcome of interest—were then calculated for each facility using hierarchical generalized linear regression (*link = logit*). We modeled the log-odds of admission as a function of patient risk, informed by patient and encounter characteristics—such as age, sex, service-connected disability rating, Elixhauser Comorbidity Index, and ESI—and a facility-level random effect. Using this model, we calculated the expected number of admissions based on the facility case mix and national average intercept (without random effects) for each facility.[53] Then, from the model and based on the facility case mix and estimated facility-specific intercept, we calculated the predicted number of admissions (with random effects) for each facility.[53] These enabled us to construct RSARs with the ratio of number of predicted admissions based on the facility case mix to the number of expected admissions based on the average facility with a similar case mix.[54] Using predicted, rather than observed, admissions permitted accounting for sample size variation and clustering.[53] This methodology is used by the Centers for Medicare and Medicaid Services for hospital-level profiling of ED-based disposition decisions and has been used by others addressing similar questions in different contexts.[5,9,53] We assessed variations in facility-level ECSC-specific RSARs through two approaches. First, we calculated the interquartile range ratio (IQR ratio)—the ratio of the RSAR for the 75th percentile and 25th percentile hospitals—as a measure of variation for each condition and stratified by age group, permitting comparison of variation between ECSCs. Second, we calculated the coefficient of variation, normalizing dispersion, to permit comparison between ECSCs with different mean admission rates.[5] The ECSC-specific RSARs were illustrated in violin plots to permit visualization of variation. The associations between admission and patient, encounter, and facility characteristics were also examined for each ECSC in separate models. C-statistics were calculated to assess model performance and discriminant ability surrounding facility admission. A sensitivity analysis excluding transfers was performed to assess variation in ECSC-specific RSARs when limited to only same-hospital admissions.[5] All analyses were performed using SAS Enterprise 7.1 (SAS Institute Inc.) and at the 5% significance level. This study was approved by the Stanford University Institutional Review Board and the VA Palo Alto Healthcare System Research & Development Committee.

RESULTS

A total of 651,336 ED visits for the 10 most common ECSCs across 110 VA facilities were identified from October 1, 2016 to

TABLE 1 ED visits and admission rates by ECSC, overall and by age group, October 2016–September 2019.

	Overall		<65 years		≥65 years	
ECSC[a]	Visits, *n*	Admit rate, %	Visits, *n*	Admit rate, %	Visits, *n*	Admit rate, %
COPD	160,232	33.1	48,126	28.4	112,106	35.2
HF	98,118	73.5	23,217	72.4	74,901	73.9
Pneumonia	89,032	62.2	28,289	46.3	60,743	69.6
Volume Depletion	73,806	40.4	30,272	31.3	43,534	46.8
Tachyarrhythmias	55,966	61.1	15,077	60.3	40,889	61.3
DM-Acute	51,047	36.8	27,314	34.9	23,733	39.0
GI Bleed[b]	39,898	70.5	15,451	57.7	24,425	78.6
Asthma[c]	31,541	10.5	23,881	9.1	7,536	14.9
Sepsis [d]	30,682	95.6	9,483	94.0	20,891	96.4
MI[e]	21,014	97.4	6,399	96.8	14,290	97.6

Abbreviations: COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; ECSC, emergency care-sensitive condition; GI, gastrointestinal; HF, heart failure; MI, myocardial infarction.

[a]The visit counts reflect data from 110 facilities unless otherwise indicated.

[b]For the <65 years group, the visit count reflects data from 109 facilities. This condition group includes bleeding and/or perforation.

[c]For the ≥65 years group, the visit count reflects data from 103 facilities.

[d]For the <65 years group, the visit count reflects data from 94 facilities. This condition group includes systemic inflammatory response syndrome.

[e]For the <65 years group, the visit count reflects data from 89 facilities.

September 30, 2019. Of these visits, 344,612 (52.9%) resulted in a hospital admission. The top 10 ECSCs by frequency were chronic obstructive pulmonary disease (COPD), heart failure, pneumonia, volume depletion, tachyarrhythmias, acute diabetes mellitus, gastrointestinal (GI) bleeding, asthma, sepsis, and myocardial infarction (MI). Table 1 presents the number of visits and admission rate for these 10 ECSCs. This is described for the overall cohort as well as by Veteran age subgroups (<65 years and ≥65 years). There was wide variation in unadjusted admission rates across ECSCs—spanning 10.5% for asthma to 97.4% for MI among the overall cohort. This variation across ECSCs was also apparent in the younger and older Veteran subgroups. Unadjusted admission rates by ECSC were generally higher for Veterans ≥65 years when compared to those <65 years.

Characteristics of the patients, visits, and facilities for the 10 most common ECSC visits, overall and condition-specific, are described in Table 2. The majority of VA ED visits for the 10 most common ECSCs were by men (94.6%) with a mean (±SD) age of 67.6 (±12.8) years and Elixhauser Comorbidity Index of 6.5 (±3.4). Forty-five percent of ECSC visits were made by Veterans who did not have a service-connected disability rating whereas 16.0% were 100% service-connected. The majority (91.2%) of visits were at high-complexity facilities, in urban settings (94.8%), and at teaching facilities (56.0%) with an annual ED volume between 10,001 and 30,000 visits (77.6%). Almost half of these visits were at facilities located in the South (46.7%). Facility-level trends were similar across the top 10 ECSCs. When compared to other ECSCs, visits for asthma were comprised of more women (23.3%) with higher rates of service-connectedness, a lower mean age (53.6 ± 14.6 years) as well as Elixhauser Comorbidity Index (3.9 ± 2.6).

Violin plots illustrate the distribution of RSARs for the identified 10 most common ECSCs for the overall cohort and highlight that the RSAR distribution is narrower for MI as well as sepsis and wider for asthma, COPD, acute diabetes mellitus, and volume depletion (Figure 1). Violin plots for each subgroup (<65 and ≥65 years) did not reveal qualitative differences (Figure S1) in the RSAR distribution across ECSCs. Table 3 numerically depicts these findings. The volume of visits varied by ECSC. COPD (160,232 visits) was the most common ECSC and MI (21,014 visits) was the least common. Among the identified 10 most common ECSCs, the conditions with the greatest variation overall (IQR ratio, coefficient of variation) were asthma (1.43, 32.12), COPD (1.39, 24.64), volume depletion (1.38, 23.67), and acute diabetes mellitus (1.28, 17.52). These conditions were also those with the greatest variation for Veterans <65 years as well as those Veterans ≥65 years. Of the top 10 ECSCs identified by frequency, the ECSCs with the least variation were MI (1.01, 0.87) and sepsis (1.02, 2.41). These conditions were also those with the least variation for Veterans <65 years as well as those Veterans ≥65 years. A sensitivity analysis excluding transfers from the hospital admission measure definition identified the same conditions as having the most—asthma, COPD, volume depletion, and acute diabetes mellitus—and least—MI and sepsis—variation (Table S2). Across condition-specific multivariable models, hospital admission was frequently associated with patient- and encounter-level characteristics (Table S1). When compared to ECSCs with the least variation, ECSCs with greater variation more frequently demonstrated associations with facility characteristics. For example, associations with facility volume were not observed for sepsis but were evident for asthma; similarly, associations with facility complexity were not appreciated for MI but were apparent for COPD. These associations varied across conditions and within condition-specific age subgroups without generalizable

TABLE 2 Patient, visit, and facility characteristics of ED visits, overall and by ECSC.

	% of visits[a]	ECSC									
Characteristic	Overall	COPD	HF	Pneumonia	Volume Depletion	Tachyarrhythmias	DM-Acutecute	GI Bleed	Asthma	Sepsis	MI
Male, %	94.6	95.5	97.7	94.8	92.5	96.7	94.5	95.2	76.7	95.7	97.2
Age (years), mean (±SD)	67.6 (±12.8)	68.9 (±9.0)	71.9 (±11.0)	68.8 (±13.5)	65.3 (±15.5)	69.9 (±11.3)	62.5 (±11.9)	65.7 (±14.9)	53.6 (±14.6)	68.5 (±12.8)	69.2 (±11.5)
Service-connected distability rating											
No SC	45.0	47.8	48.4	44.2	43.3	47.4	40.3	44.2	31.0	43.7	47.2
0%–49%	18.0	17.5	16.4	17.6	18.4	20.0	19.1	18.9	20.9	17.1	18.2
50%–99%	21.0	19.6	17.2	21.2	22.8	19.7	24.1	22.4	33.4	19.2	19.2
100%	16.0	15.1	18.1	17.1	15.5	13.0	16.5	14.6	14.8	20.1	15.4
Elixhauser Comorbidity Index, mean (±SD)	6.5 (±3.4)	6.0 (±3.2)	8.7 (±3.0)	6.0 (±3.4)	6.1 (±3.2)	6.5 (±3.1)	6.0 (±3.2)	6.2 (±3.7)	3.9 (±2.6)	7.1 (±3.3)	6.5 (±3.3)
ESI											
1 (most urgent)	0.4	0.3	0.2	0.3	0.2	0.7	0.3	0.5	0.1	1.6	2.7
2	25.7	22.0	28.0	23.2	19.0	44.2	16.4	23.2	11.4	43.7	49.5
3	64.9	63.5	69.1	65.9	77.5	50.3	70.0	74.5	56.2	53.1	46.6
4	8.0	12.9	2.2	9.9	3.3	3.7	11.4	1.7	28.7	1.5	0.8
5 (least urgent)	1.0	1.4	0.5	0.6	0.1	1.2	1.8	0.1	3.6	0.2	0.4
Facility complexity											
1a (most complex)	45.3	40.4	49.7	43.1	44.6	46.2	47.4	49.6	49.0	51.5	43.0
1b	21.4	21.0	20.9	21.8	21.7	19.8	19.4	22.4	23.2	23.2	25.5
1c	24.5	27.5	22.0	25.5	25.2	24.4	25.6	21.0	20.7	19.0	23.8
2	7.3	9.0	6.3	7.9	6.4	8.3	6.6	5.9	5.7	5.7	6.7
3 (leastcomplex)	1.6	2.1	1.1	1.7	2.2	1.3	1.1	1.2	1.4	0.7	1.1
Facility ED volume, FY2019											
≤10,000	6.9	8.7	6.0	7.1	6.9	7.4	6.0	5.7	5.9	4.5	5.3
10,001– 20,000	31.5	33.5	30.7	31.8	31.4	32.7	29.1	28.9	28.8	31.7	30.4
20,001– 30,000	46.1	43.9	46.3	48.5	46.4	45.8	43.8	49.3	45.0	48.1	49.5
≥30,001	15.5	13.9	17.0	12.7	15.3	14.1	21.2	16.1	20.3	15.7	14.9
Teachingfacility	56.0	50.9	58.2	55.1	55.4	57.3	55.7	60.4	60.4	65.6	57.1
Rural facility	5.2	7.1	4.1	5.4	5.0	5.1	4.8	3.4	3.8	4.3	3.4
Region											

(Continues)

TABLE 2 (Continued)

Characteristic	% of visits[a]	ECSC									
	Overall	COPD	HF	Pneumonia	Volume Depletion	Tachyarrhythmias	DM-Acutecute	GI Bleed	Asthma	Sepsis	MI
Northeast	11.8	11.7	11.2	12.3	11.5	12.6	9.7	12.2	14.2	12.2	11.8
South	46.7	47.1	48.2	45.2	45.8	43.6	53.4	45.2	44.3	47.1	45.2
Midwest	19.7	21.7	19.6	19.4	18.9	21.5	16.7	19.2	17.2	16.0	20.7
West	21.8	19.6	21.0	23.1	23.8	22.3	20.2	23.5	24.3	24.7	22.3

Abbreviations: COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; ECSC, emergency care–sensitive condition; ESI, Emergency Severity Index; FY, fiscal year; GI, gastrointestinal; HF, heart failure; MI, myocardial infarction; SC, service-connected.

[a]Number of ED visits: overall 651,336; COPD 160,232; HF 98,118; Pneumonia 89,032; Volume Depletion 73,806; Tachyarrhythmias 55,966; DM, Acute 51,047; GI Bleed 39,898; Asthma 31,541; Sepsis 30,682; MI 21,014.

trends across ECSCs. The discrimination of all models was good with C-statistics >0.7. Examination of fit statistics and residuals did not show violation of the assumptions for hierarchical generalized linear models.

DISCUSSION

In this population-based study of U.S. Veterans presenting to VA EDs with the 10 most common ECSCs, we identified four primary findings. First, RSARs varied widely across facilities. Second, there were ECSC-specific differences in RSARs. Third, older Veterans presenting with ECSCs were more likely to be admitted than younger Veterans; variations in RSARs at the facility level, however, were not qualitatively different between the two subgroups. Fourth, when compared to ECSCs with the least variation, ECSCs with greater variation more frequently demonstrated associations with facility characteristics. Taken together, these findings highlight important opportunities to improve the value of acute care delivery in the VA. Future studies could identify drivers of these observed variations that may permit opportunities for standardization and implementation of evidence-based practices or risk-adjusted benchmarking.[5,55]

We identified the 10 most common ECSCs at VA EDs and highlighted wide variations in RSARs for these conditions. This study extends seminal work surrounding geographic variation in hospital admission practices, builds upon contemporary scaled analyses through its unique VA-centered evaluation, supports targeted assessment of emergency care–specific processes in its analysis of ECSCs, and highlights potential opportunities to embrace bidirectional learning between VA and non-VA ED settings to advance our knowledge and ability to more fully realize high-value emergency care.[1,2,5,56] Existing research analyzing condition-specific RSARs among national samples comprised of public, voluntary, and proprietary hospital-owned, domestic EDs support our findings.[5,6,9] This suggests that ED-based hospital admission practices within the VA, a large integrated system, reflect established trends of variation in ED-based RSARs more broadly and that ECSCs are not exempt from the variation observed in existing studies evaluating all presenting conditions.

The ECSCs with the greatest variation in RSARs were asthma, COPD, volume depletion, and acute diabetes mellitus. In contrast, perhaps not unsurprisingly, the ECSCs with the least variation were MI and sepsis. Similar to other investigators, we hypothesize that ECSCs with greater ambiguity surrounding clinical trajectory, risk stratification, diagnostic certainty, and clinical practice guidelines manifest as conditions with greater variation in ED-based RSARs.[5,6,57] This suggests that clinicians may be applying different criteria surrounding admissions decisions for these conditions and may also be influenced by differences in patient preferences.[9] Conclusions surrounding the drivers of the observed variation—underutilization or overutilization—and appropriate condition-specific admission rates cannot be drawn based upon this study but are important areas for further research. This should also include examining for variation in application of ESI or diagnostic code assignment in ED encounters—which may be influenced by patient,

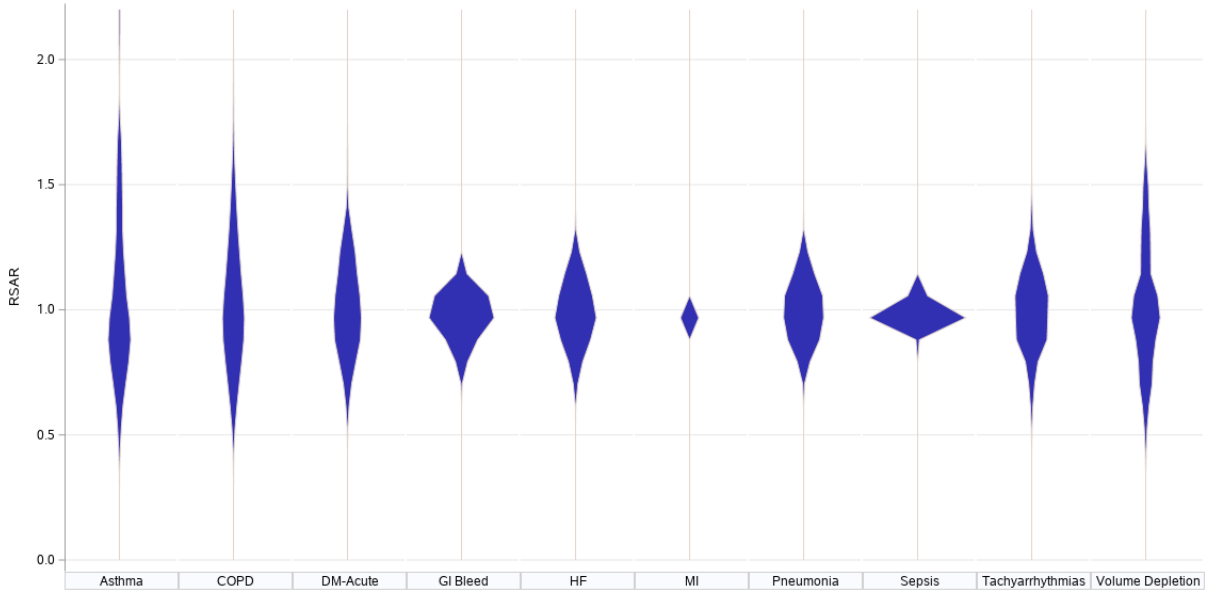

FIGURE 1 Variation in the RSARs for ECSCs, overall cohort. Violin plots of the distribution of RSARs for the identified 10 most common ECSCs. The RSAR distribution is narrower for MI as well as sepsis and wider for asthma, COPD, acute diabetes mellitus, and volume depletion. ECSCs, emergency care–sensitive conditions; GI, gastrointestinal; MI, myocardial infarction; RSARs, risk-standardized admission rates.

provider, facility, and community factors—and, if variation is present, assessing the relative contribution to the observed variation in RSARs. For example, the breadth of illness severity captured in the diagnostic code for asthma may be greater than that for MI, which may in turn influence variations in RSARs. Interestingly, when compared to the existing literature, the condition-specific coefficients of variation in this study appear lower.[5] This may be consequent to a multitude of factors such as temporal changes, practice evolution, or differences in physician characteristics, patient preferences, payment incentives, and institutional culture within the VA.[20,58,59] It may also suggest that the unique integrated systems design, including an enterprise-wide electronic health record system, near-universal ambulatory care access, comprehensive social and case management services, and patient-centered initiatives within the VA, may address some of the proposed drivers of variation identified in the current literature examining emergency care more broadly beyond the VA.[25,56,60,61]

In this study, older Veterans generally had higher adjusted admission rates when compared to younger Veterans. This is consistent with findings from a longitudinal evaluation of the largest publicly available all-payer inpatient health care database.[62] Notably, however, our study highlights that variation in ECSC-specific RSARs existed for both older and younger Veteran populations. This suggests that there is undoubtedly a need for specific focus on the older Veteran population, but that to fully understand drivers of variation, the entire age spectrum needs to be considered in seeking to design interventions aimed at achieving the greatest value improvement.[42,63] Further, there were no significant qualitative differences among ECSC-specific RSARs when comparing older and younger Veteran age groups. This may be, in part, attributable to characteristics of the Veteran population, the study design focus on ECSCs, and the integration of care coordination as well as services addressing social determinants of health within the VA.

In the condition-specific multivariable models, hospital admission was associated with patient and encounter characteristics; however, association with facility characteristics varied across conditions and within condition-specific age group stratification. In our study, there were some conditions for which there were geographic-related associations with admission—including region and rurality. Previous research, however, suggests that geographic variation in hospitalization rates may not always be correlated with inappropriate hospitalizations.[64] Our findings provide an opportunity to explore knowledge gaps surrounding overuse and underuse of condition-specific hospital admissions.[5] This may be further facilitated by the regional systems of care within the VA. Exploring the influence of granular department, staff, and resource characteristics, in addition to the observed associations with facility teaching status, complexity, and ED volume for some conditions, could be facilitated through climate assessment initiatives such as the VHA Emergency Departments and Urgent Care Clinics Survey.[65] This poses an opportunity to understand modifiable and local contextual drivers of variations that may influence the value of emergency care delivery that may be generalizable beyond the VA.

For policymakers, our findings suggest that variations in ED-based ECSC-specific RSARs may be important targets for better understanding and developing interventions aimed at improving the quality, cost, and appropriateness of emergency care delivery within the VA for both older and younger Veterans. This could be achieved through performance benchmarking and/or collaborative quality improvement as well as leveraging the robust VA network to optimize the delivery of emergency care for Veterans presenting with ECSCs.[66–68] Given the increasing role of emergency

TABLE 3 Variation in ECSC-specific RSARs and adjusted admission rates.

ECSC[a]	Visits, *n*	RSAR (min, max)	Adjusted admission rate (min, max)	IQR ratio	Coefficient of variation
COPD					
Overall	160,232	0.57, 1.85	18.86, 61.23	1.39	24.64
<65 years	48,126	0.52, 1.84	14.80, 52.26	1.40	24.78
≥65 years	112,106	0.56, 1.80	19.75, 63.47	1.41	24.49
HF					
Overall	98,118	0.69, 1.23	50.38, 90.17	1.19	12.19
<65 years	23,217	0.74, 1.27	53.45, 92.16	1.18	11.17
≥65 years	74,901	0.68, 1.24	50.01, 91.35	1.18	12.19
Pneumonia					
Overall	89,032	0.72, 1.22	44.57, 75.58	1.21	11.40
<65 years	28,289	0.65, 1.32	29.95, 61.17	1.23	13.82
≥65 years	60,743	0.75, 1.22	52.52, 84.91	1.18	10.36
Volume Depletion					
Overall	73,806	0.49, 1.57	19.87, 63.31	1.38	23.67
<65 years	30,272	0.53, 1.79	16.44, 55.88	1.39	25.50
≥65 years	43,534	0.47, 1.52	22.16, 71.03	1.30	22.75
Tachyarrhythmias					
Overall	55,966	0.59, 1.40	36.23, 85.26	1.23	15.02
<65 years	15,077	0.69, 1.33	41.56, 80.07	1.19	13.81
≥65 years	40,889	0.60, 1.36	36.75, 83.44	1.22	14.88
DM-Acute					
Overall	51,047	0.62, 1.58	22.93, 57.97	1.28	17.52
<65 years	27,314	0.63, 1.46	21.88, 50.96	1.28	16.01
≥65 years	23,733	0.66, 1.48	25.66, 57.75	1.26	17.01
GI Bleed					
Overall	39,898	0.69, 1.29	48.93, 91.23	1.12	9.80
<65 years[b]	15,451	0.66, 1.35	38.03, 78.06	1.17	11.96
≥65 years	24,425	0.75, 1.20	58.60, 93.98	1.11	8.55
Asthma					
Overall	31,541	0.48, 2.18	5.07, 22.88	1.43	32.12
<65 years	23,881	0.52, 2.08	4.69, 18.91	1.50	31.13
≥65 years[c]	7,536	0.50, 2.19	7.50, 32.73	1.40	29.41
Sepsis					
Overall	30,682	0.86, 1.04	81.95, 99.00	1.02	2.41
<65 years[d]	9,483	0.76, 1.06	71.06, 99.23	1.03	3.64
≥65 years	20,891	0.92, 1.02	89.10, 98.54	1.01	1.66
MI					
Overall	21,014	0.96, 1.01	93.30, 98.57	1.01	0.87
<65 years[e]	6,399	0.96, 1.01	92.79, 98.27	1.01	0.96
≥65 years	14,290	0.97, 1.01	94.56, 98.66	1.01	0.67

Abbreviations: COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; ECSC, emergency care–sensitive condition; GI, gastrointestinal; HF, heart failure; IQR, interquartile range; MI, myocardial infarction; RSAR, risk-standardized admission rate.

[a]The visit counts reflect data from 110 facilities unless otherwise indicated.

[b]The visit count reflects data from 109 facilities. This condition group includes bleeding and/or perforation.

[c]The visit count reflects data from 103 facilities.

[d]The visit count reflects data from 94 facilities. This condition group includes systemic inflammatory response syndrome.

[e]The visit count reflects data from 89 facilities.

care within the VA, this will be of great interest to inform efforts seeking to align resource investment to achieve optimal health outcomes.[5,26] Further, this is of particular policy relevance given increased Veteran access to non-VA care under the VA Maintaining Internal Systems and Strengthening Integrated Outside Networks (MISSION) Act.[26,69,70] Understanding differences in variations in ED-based admissions practices between VA and non-VA settings will be integral when analyzing the influence of the MISSION Act on care utilization and health outcomes for Veterans.

For hospitals and physicians, our findings provide an opportunity to better understand local contextual drivers of variations and to develop innovative interventions to support a paradigm of higher-value emergency care. This will benefit Veterans presenting to VA EDs with generalizable knowledge for emergency care more broadly and presents an opportunity to engage patients to align resources not only with health outcomes but also patient preferences.[61] This may be especially important for older Veterans for whom admission rates were generally higher. Analyzing variations in ED-based admissions practices within the VA may also help to address unanswered questions related to the relative influence of differences in health care access, integration of different health care delivery modalities (such as telehealth), and the impact of services addressing social determinants of health.

LIMITATIONS

This study is not without its limitations. First, it is focused on ECSCs rather than all presenting complaints. ECSCs, however, enable assessment of emergency care–specific processes and outcomes.[26,29] This is important because it enables targeted interventions at the emergency carelevel. Second, though this study analyzed data derived from robust and standardized clinical data systems cultivated with a focus on health care outcomes and also used established methods for case-mix adjustment, employing this approach within an administrative claims infrastructure may not account for all differences in clinical severity that could influence the outcome and observed variations. Some ECSCs, such as asthma, have less strict diagnostic criteria and may therefore be subject to greater variation in illness severity coding relative to other ECSCs with more strict diagnostic criteria such as MI. In addition, the assignment of diagnostic codes to ED encounters may be influenced by external factors such as billing concerns or secular practice trends. For example, there is presently a greater propensity to designate certain infectious processes as sepsis rather than in the past coding as pneumonia or urinary tract infection given the evolution in evidence and enhanced focus on the early identification and treatment of sepsis.[71,72] However, VA providers may not experience as strong of incentives to modify coding practices driven by billing concerns given the salaried reimbursement structure and operation under a global budget; this is in contrast to other sectors where diagnoses must be recorded to support submitted claims for payment. Finally, the retrospective nature of the analysis renders the potential for unmeasured confounding, despite adjustment procedures.

CONCLUSIONS

Our collective findings reveal that there is unexplained variation in emergency care–sensitive condition–specific risk-standardized admission rates for both older and younger Veterans, presenting a critical opportunity for future research and interventions to improve the value of emergency care delivery within the Department of Veterans Affairs.[55] Moving forward, research in this area should focus on evaluating the association of variation in risk-standardized admission rates with health outcomes and cascades of care through the lens of care delivery and reimbursement within the Department of Veterans Affairs.

AUTHOR CONTRIBUTIONS

Study concept and design—all authors. Data acquisition—Siqi Wu, Tracy H. Urech, Anita A. Vashi. Data analysis and interpretation—all authors. Manuscript drafting—Christina M. Cutter, Anita A. Vashi. Critical revision of the manuscript for important intellectual content—all authors. Statistical expertise—Linda D. Tran, Siqi Wu. Funding acquisition—Anita A. Vashi.

CONFLICT OF INTEREST STATEMENT

The authors report no conflicts of interest.

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SUPPORTING INFORMATION

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