A Comparison of Care Delivered in Hospital-based and Freestanding Emergency Departments

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ABSTRACT

Objective: We compare case mix, hospitalization rates, length of stay (LOS), and resource use in independent freestanding emergency departments (FSEDs) and hospital-based emergency departments (H-EDs).

Methods: Data from 74 FSEDs (2013–2015) in Texas and Colorado were compared to H-ED data from the 2013–2014 National Hospital Ambulatory Medical Care Survey. In the unrestricted sample, large differences in visit characteristics (e.g., payer and case mix) were found between patients that use FSEDs compared to H-EDs. Therefore, we restricted our analysis to patients commonly treated in both settings (<65 years, privately insured, nonambulance) and used inverse propensity score weighting (IPW) to balance the two settings on observable patient characteristics. We then compared ED LOS and as well as hospital admission rates and resource utilization rates in the IPW-weighted samples.

Results: Before balancing, FSEDs saw more young adults (age 25–44) and fewer older adults (age 45–64) than H-EDs. FSED patients had fewer comorbidities, more injuries and respiratory infections, and fewer diagnoses of chest or abdominal pain. In balanced samples, LOS for FSED visits was 46% shorter (60 minutes) than H-ED patients. Hospital admission rates were 37% lower overall (95% confidence interval = –51% to –23%) in FSEDs and varied considerably by primary discharge diagnosis. X-ray and electrocardiogram use was significantly lower at FSEDs while others measures of resource utilization were similar (ultrasound, computed tomography scans, and laboratory tests).

Conclusion: In this sample of FSEDs, a greater proportion of younger patients with fewer comorbidities and more injuries and respiratory system diseases were evaluated, and almost all patients had private health insurance. When restricted to < 65 years, privately insured, and nonambulance patients in both samples, LOS was considerably shorter and hospital admission rates lower at FSEDs, as well as the use of some diagnostic testing. This study is limited as diagnoses codes may not fully capture severity and patients who perceived greater need of hospital admission may have chosen a H-ED over FSEDs.

In 2014 there were an estimated 138 million visits to hospital-based emergency departments (H-EDs) in the United States.[1] Over the past two decades, H-ED visits have grown and consistently outpaced population growth.[2] H-ED visit growth is fueled by uneven access to primary care, advances in medical

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technology, and an aging population with increasingly complex health care needs.[3] H-ED crowding and long waiting times have been shown to negatively impact patient safety and quality of care.[4,5]

Independently owned freestanding EDs (FSEDs) are promoted as alternatives to hospital-based emergency care. FSEDs deliver a broad spectrum of acute and emergency care. They offer 24/7 access to board-certified emergency medicine physicians, have similar advanced imaging (e.g., computed tomography [CT], x-ray, electrocardiogram [ECG], ultrasounds) and laboratory capabilities as H-EDs, but in general, ambulances do not bring patients to FSEDs. FSEDs are not recognized by the Centers for Medicare and Medicaid Services (CMS) as EDs and therefore cannot accept Medicare or Medicaid payment.[6] While FSEDs have existed since the 1970s, they have grown dramatically in recent years. As of 2015, there were an estimated 172 FSEDs in the United States.[7,8] Compared to H-EDs, FSEDs tend to be located in areas of higher income and with fewer Medicaid beneficiaries and therefore primarily treat patients with private insurance.[9,10] Most FSEDs are located in Texas, Colorado, and Arizona, which allow FSEDs to open without certificates of need.[11]

Importance

The rapid growth of FSEDs has raised concerns by payers and policymakers. One concern is that FSEDs primarily see lower-acuity patients who could be treated at lower cost—both to the insurer and to the patient—in urgent care centers (UCCs).[12–14] There are also concerns that FSEDs preferentially draw profitable patients away from H-EDs (i.e., privately insured, lower-acuity visits), leaving H-EDs to treat the more critically ill patients with public or no insurance at all.[15] Yet, FSED operators claim they treat a wide spectrum of emergent conditions and offer more timely and patient-centered services.[7] In addition, FSEDs may reduce hospital admissions because they are not physically located within hospitals or financially linked to hospitals and thus lack the same financial incentive to admit patients. To our knowledge, no studies have directly compared patient visits in FSEDs to H-EDs in a large sample of hospitals.

Goals of the Investigation

We compare case mix, hospital admissions, length of stay (LOS), and resource use (CT, ECG, x-ray, ultrasound, laboratory tests) in a sample of FSEDs from a single company to a weighted sample of U.S. H-ED visits. For direct comparison of hospital admissions, LOS, and resource use, we used a propensity score–weighted sample of patients under 65 years with private insurance who did not arrive by ambulance.

METHODS

Study Design, Setting, and Population

We conducted a retrospective study comparing data from a sample of H-EDs to 74 FSEDs operated by Adeptus Health, Inc., in Texas and Colorado. Data for FSEDs include all visits to these facilities between January 1, 2013, and September 30, 2015. These data were gathered by Adeptus for administrative and billing purposes on paper and in electronic health records. These data were sent to the research team at George Washington University for analysis. The data were generated based on patient encounters over the study period to all Adeptus FSEDs. Data included information on patient age, sex, insurance status, and codes for procedures (i.e. Current Procedural Terminology–[CPT-4] codes) and International Statistical Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM), codes for diagnosis, as well as LOS, which was calculated as time in minutes from ED arrival to ED departure. Data from Arizona FSEDs (n = 7) were removed prior to analysis because that particular sample of EDs was hospital-affiliated and the goal was to compare independent FSEDs only. Data for H-EDs come from the 2013 and 2014 National Hospital Ambulatory Medical Care Survey ED public use micro-data files (NHAMCS-ED).[16] This study was approved by the institutional review board at George Washington University.

Sample and Covariates

First, we compared the full sample of FSEDs to H-ED visits and examined overall differences in patient populations without any exclusions (Table 1). Many differences between the samples were found. Since the study goal was to compare patients treated at FSEDs to similar patients treated at H-EDs, we restricted the sample to privately insured patients under the age of 65 that did not arrive by ambulance in both samples. This was done because many FSEDs—particularly those that are independently owned—are not recognized by the CMS and cannot bill government insurance. This resulted in 10.5% of patients being

Table 1
Characteristics of Patients Treated at FSEDs and H-EDs

	FSEDs	H-EDs*	Raw Difference
Total visits (unweighted)	329,309	48,828	
% of visits			
Admitted to hospital	3.6	11.3	–7.7 (–9.0 to –6.3)
CT scan	12.2	15.1	–2.9 (–4.2 to –1.7)
X-ray	29.8	32.5	–2.7 (–4.2 to –1.1)
ECG	8.1	17.9	–9.8 (–11.2 to –8.5)
Ultrasound	2.9	3.8	–0.9 (–1.5 to –0.4)
Any laboratory test	38.9	48.3	–9.4 (–11.1 to –7.7)
ED LOS, median (IQR)			
All visits	65 (40 to 100)	150 (90 to 245)	80 (70 to 85)
Admitted to hospital	170 (125 to 225	265 (180 to 385)	90 (80 to 105)
Discharged	60 (40 to 95)	140 (85 to 225)	70 (65 to 75)
Mean age, years	32.5	37.4	–4.9 (–6.1 to –3.7)
Age categories (years), % of visits			
Under 5	6.6	10.2	–3.6 (–5.0 to –2.1)
5–14	12.2	8.7	3.5 (2.3 to 4.7)
15–24	16.6	15.1	1.5 (0.8 to 2.3)
25–44	36.9	28.0	8.9 (7.4 to 10.4)
45–64	25.1	22.3	2.7 (1.5 to 3.9)
65–74	1.9	7.0	–5.1 (–5.6 to –4.5)
75 and over	0.7	8.6	–8.0 (–8.8 to –7.1)
Payer source, % of visits			
Private insurance	90.9	29.1	61.8 (59.6 to 64)
Medicaid	0.0	29.0	–28.9 (–31.1 to –26.8)
Medicare	0.0	18.5	–18.5 (–19.8 to –17.2)
Uninsured	9.0	13.6	–4.6 (–6.4 to –2.7)
Other	0.1	3.0	–2.9 (–3.7 to –2.1)
Unknown	0.0	6.9	—
Sex, % female	55.2	55.4	–0.2 (–1.2 to 0.8)
Race/ethnicity			
Non-Hispanic white	—	57.8	N/A
Non-Hispanic black	—	23.1	N/A
Hispanic	—	15.8	N/A
Non-Hispanic other	—	3.3	N/A
MCCS categories, % of visits			
Injury and poisonings	31.0	20.3	10.7 (9.6 to 11.9)
Respiratory system diseases	19.1	14.0	5.0 (4.0 to 6.0)
Symptoms, signs, ill-defined conditions	11.3	13.2	–1.8 (–2.5 to –1.1)
Nervous/sensory system diseases	9.9	8.0	1.9 (1.2 to 2.5)
Genitourinary system diseases	6.1	5.9	0.1 (–0.2 to 0.5)
Digestive system diseases	5.7	7.0	–1.3 (–1.8 to –0.8)
Musculoskeletal and connective tissue diseases	4.5	7.5	–3 (–3.7 to –2.4)
Circulatory system diseases	4.3	7.1	–2.7 (–3.3 to –2.1)
Skin and subcutaneous tissue diseases	3.8	3.6	0.3 (0 to 0.6)
Infectious and parasitic diseases	1.9	2.4	–0.5 (–0.8 to –0.2)
Endocrine/nutritional/metabolic diseases	1.1	1.7	–0.7 (–0.9 to –0.4)
Complications of pregnancy	0.4	1.5	–1.1 (–1.4 to –0.8)
Residual codes, unclassified, all E-codes	0.4	1.1	–0.8 (–0.9 to –0.6)
Mental illness	0.3	4.1	–3.8 (–4.2 to –3.4)

(Continued)

Table 1 (continued)

	FSEDs	H-EDs*	Raw Difference
Diseases of the blood and blood-forming organs	0.1	0.4	–0.3 (–0.4 to –0.2)
All other MCCS categories†	0.1	2.2	–2.1 (–2.4 to –1.7)
Selected SCCS categories,‡ % of visits			
Sprains and strains	7.8	4.0	3.8 (3.3 to 4.2)
Other upper respiratory infection	7.5	4.8	2.7 (2.1 to 3.3)
Superficial injury, contusion	5.2	4.4	0.8 (0.5 to 1.2)
Acute bronchitis	4.8	1.0	3.8 (3.3 to 4.2)
Open wounds of extremities	4.7	2.0	2.7 (2.3 to 3.1)
Abdominal pain	4.4	5.4	–1 (–1.4 to –0.6)
Other injuries and conditions due to external causes	4.4	3.0	1.3 (0.7 to 2)
Urinary tract infection	3.0	2.3	0.6 (0.3 to 1)
Skin and subcutaneous tissue diseases	2.9	2.5	0.4 (0.1 to 0.7)
Headache; including migraine	2.6	2.4	0.2 (0 to 0.5)
Nonspecific chest pain	2.5	3.2	–0.7 (–1 to –0.4)
Open wounds of head, neck, and trunk	2.4	1.9	0.5 (0.3 to 0.7)
Allergic reactions	2.3	1.5	0.8 (0.6 to 1.1)
Fever of unknown origin	2.2	1.5	0.7 (0.3 to 1.1)
Fracture of upper limb	2.2	1.2	1 (0.8 to 1.2)
Spondylosis; intervertebral disc disorders, other back problems	2.1	3.4	–1.3 (–1.7 to –0.9)
Other lower respiratory infection	2.1	2.5	–0.4 (–0.7 to –0.1)
Otitis media and related conditions	2.0	1.4	0.6 (0.3 to 0.9)
Other nervous system disorders	1.9	0.8	1.1 (0.5 to 1.7)
Nausea and vomiting	1.7	1.9	–0.2 (–0.5 to 0.1)
Viral infection	1.5	1.5	0 (–0.2 to 0.3)
Other connective tissue disease	1.3	2.1	–0.8 (–1 to –0.5)
Calculus of urinary tract	1.3	0.8	0.5 (0.3 to 0.6)
Noninfectious gastroenteritis	1.3	0.9	0.4 (0.1 to 0.7)
Fracture of lower limb	1.2	0.7	0.5 (0.4 to 0.7)
Asthma	1.2	1.3	–0.1 (–0.3 to 0.1)
Influenza	1.2	0.5	0.7 (0.5 to 0.9)
Inflammation, infection of eye	1.2	0.6	0.6 (0.4 to 0.7)
All other	21.0	40.3	–19.3 (–20.7 to –18)
Ambulance arrivals, % of visits	0.0	14.8	–14.8 (–15.9 to –13.6)
Injury severity score, mean§	1.9	2.2	–0.2 (–0.3 to –0.2)
Comorbidity present in primary or secondary diagnosis, % of visits	3.5	16.2	–12.7 (–13.6 to –11.8)

ATT = average treatment effect in the treated; FSED = freestanding emergency department; H-ED = hospital-based emergency department; IQR = interquartile range; LOS = length of stay; MCCS = multilevel clinical classification software; N/A = not applicable; SCCS = single-level clinical classification software.
*Table shows raw means and raw difference in means for the full sample of SED and H-ED visits without any exclusions. 95% CIs are shown in parentheses.
†All other MCCS categories combine three categories with fewer than 30 cases present in the H-ED sample.
‡SCCS categories with at least 1% of total SED visits and >30 cases in the H-ED sample.
§Injury severity score excludes noninjury ED visits and burns (severity = unknown). Standard errors are clustered on ED.

excluded from the FSED sample (which included 9% who were uninsured, i.e., self-pay) and 76% from the H-ED sample (which included 14% uninsured, 29% Medicaid, 18.5% Medicare, and 7% unknown). We also excluded patients who left before being seen by a provider, left against medical advice, or died before discharge. We excluded these patients because, by definition, they were not eligible for our primary outcome—hospital admission. Finally, we excluded patients with burn injuries from injury severity scoring (severity unknown) and excluded visits with LOS of 0 minutes or missing time stamps when measuring LOS (see Data Supplement S1 [available as supporting information in the online version of this paper, which is available at http://onlinelibrary.wiley.com/doi/10.1111/acem.13381/full] for study flow diagram). LOS is known to be right-skewed with outliers, so we report LOS as median with interquartile ranges.

We used the Healthcare Cost and Utilization Project (HCUP) Clinical Classifications Software (CCS) for ICD-9-CM codes to categorize primary ICD-9-CM diagnoses into broader diagnoses categories. We used both the "multilevel" CCS diagnosis categories, which consists of 18 broad clinical categories (e.g., respiratory system diseases, injury and poisonings, diseases of the circulatory system) and the "single-level" CCS diagnosis categories, which consists of 285 more narrowly defined clinical categories (e.g., asthma, sprains and strains, nonspecific chest pain).

Our primary outcome of interest was hospital admission after an FSED or H-ED visit. We defined hospital admissions from an FSED to include all patients transferred to a short-term general hospital. This is because patients who are seen in FSEDs are traditionally treated and released or, if necessary, are transferred for direct admission to the hospital, which usually bypasses the H-ED. We defined hospital admission from an H-ED to include admission to the same hospital (either full admission or "observation" status) or transfer to another hospital.[17] In H-ED transfers, this does not always result in an admission at the receiving hospital. Therefore, we conducted a sensitivity analysis excluding transfers to another hospital from the numerator of the admission rate at H-EDs to assess results using a more conservative estimate of the H-ED admission rate.[18]

Secondary outcomes included resource utilization rates (imaging and laboratory) and LOS. For imaging and laboratory tests, NHAMCS-ED includes a binary variable indicating if a specific imaging test (e.g., x-ray) or laboratory procedure (e.g., complete blood count) was performed, but does not indicate if multiple similar tests or procedures were performed. We therefore use similar binary coding for FSED patients. We mapped the CPT-4 codes used by Adeptus Health for imaging and laboratory tests to the HCUP CCS categories for services and procedures used in NHAMCS-ED.[19]

We calculated LOS as the number of minutes between a patient's arrival and departure times. These data were available in both data sets. Calculation of injury severity scores and identification of Elixhauser comorbidities were calculated from the primary and secondary diagnosis using the International Classification of Diseases Programs for Injury Categorization (ICDPIC) Version 3.0.[20]

Data Analysis

To compare means and proportions, we computed point estimates, cluster-robust standard errors, t-statistics, p-values, and 95% confidence intervals (CIs). We assessed the statistical significance of differences in median LOS using the generalized Hodges-Lehmann (H-L) median difference. For "raw" analyses, we weighted the NHAMCS observations using the sampling weights provided with the NHAMCS-ED survey. To compare FSED patients to similar H-ED patients we used inverse propensity score weights (IPWs) and intentionally did not use the NHAMCS-ED sampling weights, as recommended.[21] To develop propensity scores, we used covariates available in both datasets to estimate the probability (p) that each patient would visit a FSED. The covariates we used were age, sex, 15 multilevel diagnosis categories (plus an "other" category for the three smallest categories), 30 single-level diagnosis categories which each account for 1% or more of FSED visits (plus an "other" category for all remaining single-level categories), a dummy variable for presence of comorbidity, and seven dummy variables that capture injury severity (0, 1–2, 3–4, 5–6, 7–9, 10–14, >15). We then applied IPWs to compute the average treatment effect for the treated (ATT, for the FSED patients). These weights are 1 for FSED visits and $p/(1 - p)$ for H-ED visits. Below, we call these ATT weights. Table 1 shows the raw means for FSED and H-ED patients (using survey weights for the H-ED patients), the ATT-weighted H-ED means, and the raw and weighted differences in means. The ATT weights generate balance in expectation on all covariates used to estimate the propensity score and generate good balance in our sample, but cannot account for unmeasured characteristics that may lead patients to seek care at H-EDs versus FSEDs. We confirmed that no control visits had unusually high weights. In Table 2 we show differences between FSEDs and H-EDs, both raw and with ATT weights, for hospital admissions rates, resource utilization rates (CT, ECGs, ultrasounds, x-rays, and laboratory use), and median LOS. In Table 3 we use ATT weights and estimate differences in admission rates for the multilevel and single-level CCS diagnoses categories. All standard errors were clustered on the ED. All analyses were performed using Stata version 14.1 (StataCorp).

Table 2
Characteristics of Patients Treated at FSEDs and H-EDs Restricted to Under 65 Years, Privately Insured, and Nonambulance Patients

	FSEDs	H-EDs*	Raw Difference	H-EDs With ATT Weights	Difference With ATT Weights
Total visits (unweighted)	294,870	11,920			
Mean age, years	31.5	32.0	–0.5 (–1.7 to 0.8)	31.3	0.2 (–0.6 to 1)
Age categories, % of visits					
Under 5	6.7	10.1	–3.4 (–5.4 to –1.4)	7.3	–0.6 (–1.7 to 0.6)
5–14	12.8	9.8	2.9 (1.2 to 4.7)	12.5	0.3 (–1.1 to 1.7)
15–24	17.1	18.0	–0.9 (–2.4 to 0.6)	17.2	–0.1 (–1.2 to 1.1)
25–44	37.5	31.3	6.2 (4.0 to 8.3)	38.1	–0.6 (–2.6 to 1.5)
45–64	25.9	30.7	–4.8 (–6.8 to –2.8)	25.0	0.9 (–0.6 to 2.4)
Sex, % female	55.8	55.8	0.0 (–1.7 to 1.6)	56.0	–0.2 (–1.5 to 1.1)
MCCS categories, % of visits					
Injury and poisonings	31.0	23.1	7.9 (6.0 to 9.7)	32.0	–1.0 (–2.7 to 0.6)
Respiratory system diseases	19.2	12.6	6.6 (5.1 to 8.1)	17.7	1.5 (0.0 to 3.1)
Symptoms, signs, ill-defined conditions	11.5	14.7	–3.3 (–4.4 to –2.1)	11.8	–0.4 (–1.3 to 0.5)
Nervous/sensory system diseases	9.9	8.0	2.0 (1.1 to 2.8)	10.1	–0.2 (–1.0 to 0.7)
Genitourinary system diseases	6.1	6.3	–0.2 (–0.9 to 0.4)	6.1	0.0 (–0.5 to 0.6)
Digestive system diseases	5.8	7.3	–1.5 (–2.4 to –0.6)	6.0	–0.2 (–0.7 to 0.3)
Musculoskeletal and connective tissue diseases	4.5	7.2	–2.7 (–3.7 to –1.8)	4.6	0.0 (–0.5 to 0.4)
Circulatory system diseases	4.1	6.9	–2.8 (–3.7 to –1.9)	4.1	0.0 (–0.5 to 0.5)
Skin and subcutaneous tissue diseases	3.7	3.7	0.1 (–0.5 to 0.7)	3.9	–0.1 (–0.5 to 0.3)
Infectious and parasitic diseases	1.9	2.2	–0.3 (–0.8 to 0.2)	1.9	0.0 (–0.3 to 0.3)
Endocrine/nutritional/metabolic diseases	1.0	1.1	–0.1 (–0.4 to 0.2)	0.6	0.4 (0.2 to 0.5)
Complications of pregnancy	0.4	1.7	–1.3 (–1.7 to –0.9)	0.4	0.0 (–0.1 to 0.1)
Residual codes, unclassified, all E-codes	0.3	0.9	–0.5 (–0.8 to –0.3)	0.4	0.0 (–0.1 to 0.0)
Mental illness	0.3	2.9	–2.6 (–3.1 to –2.2)	0.2	0.1 (0.0 to 0.1)
Diseases of the blood and blood-forming organs	0.1	0.2	–0.1 (–0.3 to 0.0)	0.1	0.0 (0.0 to 0.0)
All other MCCS categories†	0.1	1.2	–1.1 (–1.6 to –0.5)	0.1	0.0 (0.0 to 0.0)
Selected SCCS categories,‡ % of visits					
Sprains and strains	8.1	4.9	3.2 (2.5 to 3.9)	8.2	–0.1 (–0.9 to 0.6)
Other upper respiratory infection	7.7	4.6	3.1 (2.2 to 4)	7.2	0.5 (–0.5 to 1.4)
Superficial injury, contusion	5.3	4.7	0.5 (–0.2 to 1.2)	5.4	–0.2 (–0.8 to 0.5)
Acute bronchitis	4.8	0.8	4 (3.6 to 4.5)	4.8	0.1 (–0.9 to 1)
Abdominal pain	4.5	6.9	–2.4 (–3.3 to –1.5)	4.6	–0.2 (–0.7 to 0.3)
Open wounds of extremities	4.5	2.7	1.8 (1.3 to 2.4)	4.6	–0.1 (–0.6 to 0.5)
Other injuries and conditions due to external causes	4.3	3.3	1.1 (0.1 to 2)	4.6	–0.2 (–0.9 to 0.5)
Urinary tract infection	3.0	2.3	0.7 (0.3 to 1.1)	2.9	0 (–0.3 to 0.4)
Skin and subcutaneous tissue diseases	2.9	2.7	0.2 (–0.3 to 0.6)	3.0	–0.1 (–0.5 to 0.3)
Headache, including migraine	2.7	3.2	–0.4 (–0.9 to 0)	2.9	–0.2 (–0.5 to 0.2)
Open wounds of head, neck, and trunk	2.4	2.2	0.1 (–0.3 to 0.6)	2.6	–0.2 (–0.6 to 0.2)
Nonspecific chest pain	2.4	4.0	–1.6 (–2.2 to –1.1)	2.7	–0.3 (–0.7 to 0.1)
Allergic reactions	2.3	1.9	0.4 (0 to 0.8)	2.2	0 (–0.4 to 0.4)
Fever of unknown origin	2.2	1.8	0.4 (–0.2 to 1)	2.0	0.2 (–0.3 to 0.7)
Fracture of upper limb	2.2	1.4	0.8 (0.4 to 1.1)	2.2	0 (–0.3 to 0.4)
Spondylosis, intervertebral disc disorders, other back problems	2.1	3.4	–1.3 (–1.8 to –0.8)	2.2	0 (–0.3 to 0.2)
Other lower respiratory infection	2.1	2.3	–0.2 (–0.7 to 0.3)	2.1	0 (–0.3 to 0.3)
Otitis media and related conditions	2.0	1.5	0.6 (0.1 to 1.1)	2.0	0.1 (–0.4 to 0.5)
Other nervous system disorders	1.9	0.7	1.1 (0.5 to 1.7)	1.9	–0.1 (–0.8 to 0.7)
Nausea and vomiting	1.7	2.0	–0.3 (–0.7 to 0.1)	2.0	–0.3 (–0.7 to 0.1)

(Continued)

Table 2 (continued)

	FSEDs	H-EDs*	Raw Difference	H-EDs With ATT Weights	Difference With ATT Weights
Viral infection	1.6	1.6	0 (–0.4 to 0.4)	1.5	0 (–0.3 to 0.3)
Other connective tissue disease	1.4	2.3	–0.9 (–1.5 to –0.4)	1.3	0 (–0.2 to 0.2)
Noninfectious gastroenteritis	1.4	1.1	0.3 (–0.1 to 0.7)	1.5	–0.1 (–0.5 to 0.2)
Calculus of urinary tract	1.3	1.4	–0.1 (–0.3 to 0.2)	1.3	0 (–0.2 to 0.2)
Influenza	1.3	0.6	0.7 (0.4 to 1)	1.3	–0.1 (–0.5 to 0.4)
Fracture of lower limb	1.2	0.9	0.3 (0 to 0.6)	1.2	0 (–0.2 to 0.3)
Asthma	1.2	1.2	–0.1 (–0.4 to 0.3)	0.4	0.8 (0.7 to 0.9)
Inflammation, infection of eye	1.1	0.4	0.7 (0.6 to 0.9)	1.2	–0.1 (–0.4 to 0.3)
All other	20.5	33.1	–12.6 (–14.7 to –10.6)	20.0	0.5 (–0.6 to 1.7)
Injury severity score, mean§	1.9	2.0	0.0 (–0.1 to 0.1)	1.9	0.1 (0 to 0.1)
Comorbidity present in primary or secondary diagnosis, % of visits	3.4	11.6	–8.3 (–9.2 to –7.3)	3.2	0.1 (–0.2 to 0.5)

ATT = average treatment effect in the treated; FSED = freestanding emergency department; H-ED = hospital-based emergency department; MCCS = multilevel clinical classification software; SCCS = single-level clinical classification software.
*H-ED sample is limited to privately insured patients, under age 65, not arriving by ambulance. Table shows raw means, raw difference in means, H-ED means after balancing the H-ED sample to the FSED sample using ATT weights, and differences in means after balancing. 95% CIs are shown in parentheses.
†All other MCCS categories combine three categories with fewer than 30 cases present in the H-ED sample.
‡SCCS categories with at least 1% of total SED visits and >30 cases in the H-ED sample.
§Injury severity score excludes noninjury ED visits and burns (severity = unknown). Standard errors are clustered on ED.

Table 3
Hospital Admissions, Resource Utilization, and LOS at FSEDs and H-EDs

	FSEDs	H-EDs	H-EDs With ATT weights	Difference With ATT Weights	% Difference With ATT Weights
Median LOS (minutes)					
All visits	60	140	130	60 (50 to 65)	–46.2 (–50.0 to –38.5)
Admitted to hospital (1)	170	270	280	100 (80 to 125)	–35.7 (–44.6 to –28.6)
Discharged encounters	60	135	125	55 (50 to 65)	–44.0 (–52.0 to –40.0)
With CT scan	120	225	215	90 (80 to 100)	–41.9 (–46.5 to –37.2)
Without CT scan	55	125	115	55 (45 to 60)	–47.8 (–52.2 to –39.1)
Admitted to hospital (2)	170	275	290	110 (90 to 135)	–37.9 (–46.6 to –31.0)
% of visits					
Admitted to hospital (1)	3.5	7.6	5.6	–2.1 (–2.9 to –1.3)	–37.1 (–51.2 to –23.1)
CT scan	12.4	14.3	12.7	–0.4 (–1.6 to 0.8)	–3.1 (–12.7 to 6.6)
X-ray	30.0	30.5	33.4	–3.4 (–5.0 to –1.8)	–10.3 (–15.1 to –5.5)
ECG	7.7	14.1	10.6	–3.0 (–4.1 to –1.9)	–27.9 (–38.2 to –17.6)
Ultrasound	3.0	4.3	3.0	0.0 (–0.5 to 0.4)	–0.9 (–15.4 to 13.5)
Any laboratory test	39.5	46.0	38.9	0.6 (–1.5 to 2.6)	1.5 (–3.7 to 6.8)
Admitted to hospital (2)	3.5	6.6	4.9	–1.3 (–2.2 to –0.5)	–27.5 (–59.0 to –26.7)

ATT = average treatment effect in the treated; ECG = electrocardiogram; FSED = freestanding emergency department; H-ED = hospital-based emergency department.
H-ED sample is limited to privately insured patients, under age 65, not arriving by ambulance. Table shows raw means, H-ED means after balancing the H-ED sample to the FSED sample using ATT weights, differences in means after balancing, and percentage difference in means after balancing. 95% CIs are shown in parentheses. Percentage of visits admitted to hospital includes transfers and observation stays. Differences and CIs for median LOS calculated using the generalized Hodges-Lehmann median difference. Standard errors for differences in means are clustered on ED. Admitted to hospital definition (1) *includes* patents transferred to other hospitals. Admitted to hospital definition (2) *excludes* transfers to other hospitals.

RESULTS

Patient Populations and Case Mix

The full FSED sample included 329,309 visits to 74 FSEDs in Texas and Colorado. The majority of the FSEDs were located in Texas (n = 58). The full H-ED sample included 48,828 visits from the NHAMCS-ED survey (unweighted). Differences were found in patient age, case mix, and comorbidities (Table 1). In FSEDs,

Table 4
Common Diagnoses and Hospital Admission Rates at Freestanding EDs and H-EDs

	% of FSED Visits	FSED Admission Rate, %	H-ED With ATT Weights Admission Rate, %	Difference w. ATT Weights	% Difference With ATT Weights
MCCS categories					
Injury and poisonings	31.0	1.6	1.9	–0.3 (–0.8 to 0.3)	–15.6 (–45.4 to 14.1)
Respiratory system diseases	19.2	1.6	4.8	–3.1 (–4.4 to –1.9)	–65.5 (–92.1 to –38.9)
Symptoms, signs, ill-defined conditions	11.5	3.3	7.7	–4.4 (–6.1 to –2.7)	–56.8 (–78.6 to –35)
Nervous/sensory system diseases	9.9	1.9	3.3	–1.4 (–2.8 to 0.0)	–41.8 (–84.4 to 0.8)
Genitourinary system diseases	6.1	2.8	5.4	–2.7 (–4.6 to –0.8)	–49.2 (–84.4 to –14.0)
Digestive system diseases	5.8	13.1	13.5	–0.4 (–3.3 to 2.5)	–3.1 (–24.7 to 18.4)
Musculoskeletal and connective tissue diseases	4.5	1.3	2.4	–1.1 (–2.2 to 0.1)	–44.6 (–94.9 to 5.6)
Circulatory system diseases	4.1	21.0	27.0	–6.0 (–11.2 to –0.8)	–22.3 (–41.6 to –3.0)
Skin and subcutaneous tissue diseases	3.7	2.9	5.9	–3.0 (–5.6 to –0.3)	–50.3 (–94.8 to –5.8)
Infectious and parasitic diseases	1.9	0.8	3.0	–2.2 (–4.0 to –0.5)	–74.7 (–134.4 to –15.0)
Endocrine/nutritional/metabolic diseases	1.0	9.1	17.1	–8.0 (–14.6 to –1.4)	–46.7 (–85.4 to –8.1)
Complications of pregnancy	0.4	6.6	18.1	–11.4 (–23.4 to 0.6)	–63.2 (–129.6 to 3.1)
Residual codes, unclassified, all E-codes	0.3	8.8	14.7	–5.9 (–14.1 to 2.3)	–40.1 (–95.8 to 15.7)
Mental illness	0.3	5.4	14.3	–8.9 (–14.4 to –3.4)	–62.1 (–100.1 to –24.0)
Diseases of the blood and blood-forming organs	0.1	35.2	35.7	–0.6 (–19.1 to 18.0)	–1.5 (–53.5 to 50.4)
All other MCCS categories	0.1	7.8	9.0	–1.2 (–7.3 to 4.9)	–13.3 (–80.8 to 54.1)
SCCS categories					
Sprains and strains	8.1	0.7	0.1	0.6 (0.2 to 0.9)	405.1 (156.1 to 654.0)
Other upper respiratory infection	7.7	0.2	0.6	–0.5 (–1.1 to 0.2)	–71.5 (–178.7 to 35.6)
Superficial injury, contusion	5.3	0.7	0.5	0.2 (–0.5 to 0.9)	47.6 (–94.1 to 189.4)
Acute bronchitis	4.8	0.4	3.5	–3.0 (–5.9 to –0.2)	–87.4 (–170.1 to –4.7)
Open wounds of extremities	4.5	0.8	0.6	0.2 (–0.6 to 1.0)	38.1 (–103.1 to 179.4)
Abdominal pain	4.5	5.4	10.3	–4.9 (–7.9 to –2.0)	–47.9 (–76.5 to –19.3)
Other injuries and conditions due to external causes	4.3	2.4	1.7	0.8 (–0.6 to 2.1)	45.2 (–33.4 to 123.9)
Urinary tract infection	3.0	1.4	5.7	–4.2 (–7.4 to –1.1)	–74.6 (–130.6 to –18.5)
Skin and subcutaneous tissue diseases	2.9	3.6	7.6	–4.0 (–7.3 to –0.7)	–52.3 (–95.9 to –8.6)
Headache; including migraine	2.7	1.9	2.9	–1.0 (–2.6 to 0.6)	–35 (–91.4 to 21.5)
Nonspecific chest pain	2.4	20.7	26.3	–5.6 (–11.9 to 0.7)	–21.3 (–45.4 to 2.8)
Open wounds of head, neck, and trunk	2.4	0.9	0.7	0.2 (–0.8 to 1.2)	25.3 (–115.3 to 165.9)
Allergic reactions	2.3	0.9	0.0	0.9 (0.6 to 1.2)	—
Fracture of upper limb	2.2	2.7	4.3	–1.6 (–4.4 to 1.1)	–37.3 (–101.2 to 26.6)
Fever of unknown origin	2.2	1.9	9.5	–7.6 (–12.8 to –2.4)	–80.1 (–134.6 to –25.6)
Other lower respiratory infection	2.1	3.2	7.9	–4.8 (–8.5 to –1.0)	–60 (–107.2 to –12.9)
Spondylosis, intervertebral disc disorders, other back problems	2.1	0.9	1.8	–0.9 (–2.2 to 0.4)	–48.6 (–121.7 to 24.6)
Otitis media and related conditions	2.0	0.2	0.8	–0.7 (–2.3 to 1.0)	–79.7 (–275.6 to 116.2)
Other nervous system disorders	1.9	3.6	6.7	–3.1 (–8.3 to 2.1)	–46.2 (–124.6 to 32.1)
Nausea and vomiting	1.7	2.2	6.7	–4.5 (–8.8 to –0.2)	–67.1 (–131.3 to –2.9)
Viral infection	1.6	0.2	0.0	0.2 (0.1 to 0.3)	–
Noninfectious gastroenteritis	1.4	2.4	5.0	–2.6 (–7.4 to 2.1)	–52.7 (–147.1 to 41.6)
Other connective tissue disease	1.4	2.0	3.3	–1.2 (–3.8 to 1.3)	–38.1 (–116.6 to 40.4)
Influenza	1.3	0.3	4.9	–4.6 (–10.3 to 1.1)	–94.4 (–210.8 to 21.9)
Calculus of urinary tract	1.3	4.4	4.6	–0.1 (–3.5 to 3.2)	–3.0 (–76.5 to 70.6)
Asthma	1.2	3.7	7.4	–3.7 (–7.9 to 0.6)	–49.8 (–108 to 8.5)

(Continued)

Table 4 (continued)

	% of FSED Visits	FSED Admission Rate, %	H-ED With ATT Weights Admission Rate, %	Difference w. ATT Weights	% Difference With ATT Weights
Fracture of lower limb	1.2	1.8	6.5	–4.7 (–8.9 to –0.5)	–72.4 (–137.1 to –7.6)
Inflammation, infection of eye	1.1	0.7	2.0	–1.4 (–4.7 to 1.9)	–67.9 (–228.6 to 92.8)
All other	20.5	8.8	12.3	–3.5 (–5.2 to –1.7)	–28.1 (–42.4 to –13.9)
Total	100.0	3.5	5.6	–2.1 (–2.9 to –1.3)	–37.1 (–51.2 to –23.1)

ATT = average treatment effect in the treated; FSED = freestanding emergency department; H-ED = hospital-based emergency department; MCCS = multilevel clinical classification software; SCCS = single-level clinical classification software.
H-ED sample is limited to privately insured patients, under age 65, not arriving by ambulance. Table shows proportion of SED visits, FSED admission rate, H-ED admission rate after balancing the H-ED sample to the FSED sample using ATT weights, differences in admission rates after balancing, and percentage difference in admission rates after balancing. 95% CIs are shown in parentheses. H-ED admission rate defined as the percentage of visits admitted to the hospital, including transfers and observation stays. FSED admission rate defined as the percentage of visits transferred to another hospital. Standard errors are clustered on ED.

91% of visits were from privately insured individuals compared to 29% in H-EDs. Less than 3% of FSED visits were from patients over the age of 65 compared to 16% in H-EDs. A total of 15% of H-ED visits arrived by ambulance while only five FSED visits (<0.1%) arrived by ambulance in the sample.

After patients over the age of 65, patients without private insurance, and patients arriving by ambulance were removed, the sample included 294,870 FSED visits and 11,920 H-ED visits. Before applying ATT weights, patient age, case mix, and comorbidities were different between FSEDs and H-EDs (Table 2). While mean age was similar, FSEDs treated fewer young children (under age 5) and fewer patients aged 45 to 64 than H-EDs. Among the multilevel CCS categories, FSEDs saw a larger proportion of visits with injuries and poisonings, respiratory system diseases, and nervous system/sensory system disorders. H-EDs treated more patients with mental illnesses; circulatory system diseases; digestive system diseases; complications of pregnancy; musculoskeletal and connective tissue diseases; and symptoms, signs, and ill-defined conditions. Rates for several single-level CCS categories were also different before applying ATT weights. Notably, FSEDs saw fewer patients with a primary diagnosis of nonspecific chest pain, spondylosis/intervertebral disc disorders, other connective tissue diseases (e.g., limb pain), and abdominal pain. H-EDs saw fewer patients with other nervous system disorders (e.g., disturbance of skin sensation), acute bronchitis, other upper respiratory infections (e.g., acute pharyngitis), sprains and strains, open wounds of the extremities, and other injuries and conditions due to external causes. Injury severity was similar in FSEDs and H-EDs; however, more H-ED visits had at least one comorbidity present.

LOS, Hospital Admission, and Resource Utilization

In Table 3 we compare LOS, hospital admission, and resource utilization rates between FSEDs and H-EDs, both raw and with ATT weights. With ATT weights, LOS was substantially shorter in FSEDs. Average LOS across all visits was 46% lower (95% CI = –50% to –39%) at FSEDs at 60 minutes versus 130 minutes at H-EDs with a H-L median difference of 60 minutes (95% CI = 50 to 65 minutes). LOS for admitted patients was 36% lower (95% CI = –45% to –29%) at FSEDs at 170 minutes versus 280 minutes at H-EDs with a H-L median difference of 100 minutes (95% CI = 80 to 125 minutes). For discharged patients, LOS was 44% lower (95% CI = –52% to –40%) at FSEDs at 60 minutes versus 125 minutes at H-EDs with a H-L median difference of 55 minutes (95% CI = 50 to 65 minutes). FSEDs had substantially shorter LOS in discharged encounters with and without a CT scan.

With ATT weights, hospital admission rates were 37% lower at FSEDs than H-EDs (3.5% vs. compared to 5.6%), a –2.1% absolute difference (95% CI = –2.9% to –1.3%). When excluding transfers at H-EDs from the denominator, there was a 28% lower admission rate in FSEDs (95% CI = –59% to –27%). X-ray use was 10% lower (95% CI = –15% to –6%), and ECG use 28% lower (95% CI = –38% to –18%). CT, ultrasound, and laboratory testing rates were similar.

Admission Rates for Specific Conditions

In Table 4, we examine hospital admission rates based on primary diagnosis, using ATT weights, for the multilevel and single-level CCS categories listed in Table 2. FSED admission rates were lower than H-ED rates for all multilevel CCS categories. Notable differences in admission rates included infectious and parasitic diseases (0.8% at FSEDs vs. 3.0% at H-EDs); complications of pregnancy (6.6% vs. 18.1%); respiratory diseases (1.6% vs. 4.8%); and other symptoms, signs, and ill-defined conditions (3.3% vs. 7.7%).

Among single-level CCS categories, admission rates were substantially higher at H-EDs for acute bronchitis (3.5% at H-EDs vs 0.4% at FSEDs), other lower respiratory infection (7.9% vs. 3.2%), urinary tract infections (5.7% vs. 1.4%), skin and subcutaneous tissue infections (7.6% vs. 3.6%), fracture of lower limb (6.5% vs. 1.8%) fever of unknown origin (9.5% vs. 1.9%), nausea/vomiting (6.7% vs. 2.2%), and abdominal pain (10.3% vs. 5.4%). Admission rates were higher in FSEDs for a few single-level CCS categories, including sprains and strains (0.7% at FSEDs vs. 0.1% at H-EDs) and allergic reactions (0.9% v. 0.0%).

DISCUSSION

In this study, we found differences the patient populations and the approach to care between FSEDs and H-EDs. This certainly warrants further study with other data sets to address our study's limitations. We found that without exclusions, patient populations seen in FSEDs were substantially different than H-EDs with respect to age, case mix, payer mix, underlying comorbidities, diagnosis, and testing utilization rates. When the sample was limited to privately insured patients under 65 years who did not arrive by ambulance, patients in FSED encounters were still more likely to be aged 25 to 44 years, with fewer comorbid conditions than H-ED patients, and had a different case mix. FSEDs treated more encounters with injuries and respiratory infections and H-EDs treated more patients with chest and abdominal pain. However, FSEDs and H-EDs treated similar proportions of encounters for other common conditions such as urinary tract infection, skin and subcutaneous tissue diseases, and headaches. Yet, after statistically balancing FSED and H-ED visits among patients who were under 65 years, privately insured, and did not come by ambulance, we found lower hospital admission rates at FSEDs overall and for all major CCS categories and most single-level categories, including categories with admission rates that have been observed to vary considerably across H-EDs.[22,23] We demonstrate robustness to this finding, which persisted even after excluding H-ED transfers who normally are ultimately admitted at the second hospital after transfer.

There is considerable ongoing debate about FSEDs occurring in the literature and in other circles with questions over the value and the cost of FSED care.[24] This has become contentious with a recent controversy about potential data manipulation that occurred surrounding an article published in the *Annals of Emergency Medicine.*[14,25] Yet an open question exists whether FSEDs treat patients that could have been seen in UCCs or whether their characteristics resemble an H-ED population. The prior study—and the source of the controversy at *Annals*—reported that FSED care overlaps considerably with care in UCCs when it comes to the top 20 diagnoses seen in both settings.[14] While our study did not examine UCCs, what we can say from our data is many of the conditions commonly treated in FSEDs are also seen in H-EDs. However, the populations did differ even in our subsample comparison, particularly in that H-EDs treated higher proportions of abdominal and chest pain while FSEDs treated higher proportions of sprains and strains and upper respiratory infections. In addition, from our data we observe many tests conducted in FSEDs—specifically CT and ultrasound—that are not commonly available in UCCs. The use rate of these tests—along with laboratory tests—is similar in FSEDs and H-EDs, suggesting that the acuity mix in FSEDs does resemble H-EDs to some degree in the restricted sample. Nevertheless, while the proportion of FSED and H-ED visits that could potentially have been treated in UCCs was beyond the scope of this study, a prior study by our group did show that between 10 and 46% of H-ED visits could have potentially been seen in UCCs and that it depended heavily on the hours of UCC operation as well as other factors.[26] Therefore, it is very likely that there is population overlap between the three different settings—UCCs, FSEDs, and H-EDs—which should be the focus of future study.

An important finding in our study was that there were lower admission rates in FSEDs in the under 65, privately insured, nonambulance group comparison. Several factors may have contributed to this result. First, it may be unmeasured severity of illness and other unmeasured confounders that may increase H-ED admission rates (e.g., patients who believe they need hospital admission may choose an H-ED over an FSED) and reduce FSED admission rates (e.g., patients with minor ailments who use an FSED instead of a UCC). However, we believe that the difference is large enough to deserve further investigation. This particularly true in the context of another recent study that used health system data and found an analogous finding—20% lower admission rates in FSEDs for chronic obstructive pulmonary disease, congestive heart failure (CHF), and asthma compared to a tertiary care center.[27] Because we were unable to directly observe why these large differences exist, we could not determine the precise reason for such a large finding. However, several factors may contribute beyond unmeasured confounding, including that FSEDs are not physically colocated within a hospital, differing financial incentives across settings,[28] differing standards of care or care patterns,[29] or issues of ED flow.

With respect to the latter—ED flow—there were large differences between settings. Lower crowding in FSEDs is reflected in our study through considerably lower LOS for both admitted and discharged encounters. Stays at FSEDs were about 46% shorter overall, 36% shorter for admitted patients, and 44% to 48% shorter for discharged patients, who account for 96% of FSED visits. Lengthy ED stays are a common patient complaint and LOS is a common measure of ED quality.[30,31] Shorter LOS may reflect a combination of lower ED volumes, better staffing ratios, or differences in the customer service culture.[32] FSEDs may use shorter LOS as a source of comparative advantage in competing with H-EDs for patients. More research is needed to understand the operational differences that allow FSEDs to achieve the large LOS reductions that we observe, as well as how expected LOS impacts how people choose between FSEDs and H-EDs or between FSEDs and UCCs.

With greater emphasis placed on value-based care by CMS and private insurers,[33,34] settings with lower resource utilization—or lower costs overall—may produce cost savings if health outcomes and downstream costs are similar (which we cannot measure). In 2014, the average cost for a U.S. hospitalization was $10,885 and ED visits that result in hospital admission account for 8% of national health care expenditures.[1,35] More work is needed to explore how FSEDs impact overall health care costs within a community and whether FSEDs, by predominantly treating privately insured patients, impact the financial health of H-EDs, which accept a full range of patients.

LIMITATIONS

Our study has a number of limitations. The first is our inability to control for unmeasured severity of injury or illness that may affect patient choice to visit an H-ED rather than a FSED. After removing patients less likely to use a FSED, we still found significant differences in age, case mix, and comorbidities existed between FSED and H-ED patients. Using ATT weights, our FSED and H-ED populations were well balanced on observable covariates, but diagnosis codes may not fully capture severity.[36] It is possible that privately insured, nonambulance patients who perceived greater severity of illness (e.g., acute chest pain, shortness of breath, allergic reaction) chose a H-ED over an FSED. The lower use of x-rays and ECGs in FSEDs may represent unmeasured lower acuity. However, because CT and laboratory uses were similar, lower use of x-rays and ECGs may also represent differences in practice styles

Our FSED data only included two diagnosis fields, so we restricted the H-ED to two diagnosis fields for purposes of calculating comorbid conditions. This likely underestimates the true prevalence of comorbidities and/or additional injuries. Elixhauser comorbidities are calculated from ICD-9-CM diagnoses codes and may not truly represent clinical severity at the time a patient presents to the FSED or H-ED. We lacked data on physiologic parameters such as vital signs and laboratory test results or triage levels, which influence admission decisions. We could only determine whether a particular resource (e.g., laboratory test) was used, but not whether the same resource was used multiple times in any particular visit. FSEDs tend to locate in urban areas with higher densities of privately insured patients.[8] However, we have only basic demographic information on patients and no useful geographic information for the control H-ED visits, so we could not match the two groups on demographic characteristics that vary by location.

We cannot assess whether our results would generalize to other populations, such as the elderly or patients arriving by ambulance, who are generally not seen in FSEDs. In addition, our sample of FSEDs was restricted a single company which operates primarily in Texas and may not be representative of other FSED companies, of FSEDs in other states, or to hospital outpatient departments. Importantly, the sample of H-ED visits are located in rural, suburban, and urban areas throughout the United States while FSEDs are primarily located in suburban areas.[9] Limitations in geographic identifiers in the NHAMCS data preclude us from comparing geographies more specifically. Additionally, we did not have data on the race or ethnicity of FSED patients. It is likely that this characteristic differs significantly between FSEDs and

H-EDs. There may also be differences in coverage and benefits of private health insurance plans in Texas and Colorado compared to the rest of the country that would impact FSED/H-ED use that we are unable to measure.

We lack information on costs paid by insurers or patients in the two settings. We lack data on patient health outcomes after they were admitted or discharged from either setting. Return visits may result in additional resource utilization for patients that were not observable in our sample. For example, we cannot determine how often patients discharged from a FSED later appear at an H-ED and are admitted. The FSED data did not include outcomes after transfer to hospital, so we cannot tell how often transfers resulted in full inpatient admission, admission to observation status, or no admission. Our calculation of LOS at FSEDs does not account for travel time between the FSED and the receiving hospital for admitted patients. Finally, the comparison between FSEDs and H-EDs may be further influenced by unobserved differences in provider, nurse, and administrator characteristics that were unable to observe.

Finally, the H-ED and FSED data are collected in fundamentally different ways. The H-ED data come from a national probability sample that is administered via questionnaire to hospitals by the Centers for Disease Control and Prevention. By contrast, the FSED data came from one company's electronic record system

CONCLUSIONS

We found notable differences in patients treated at freestanding EDs compared to hospital-based EDs. Freestanding EDs saw more patients aged 25 to 44 and with fewer comorbidities than hospital-based EDs and had notable differences in case mix in some common conditions. We used an inverse propensity weighted sample to adjust for observable differences in case mix and other factors and found freestanding EDs had shorter lengths of stay than hospital-based EDs, used fewer electrocardiograms and x-rays, and had lower hospital admission rates. These findings convey important information for the debate over the optimal role of freestanding EDs in U.S. health care. Our work also raises questions, calling for future research about how freestanding EDs achieve more timely care and whether the lower admission rates are due to unobserved differences in patient populations or if any apparent savings from lower admissions rates are offset by differences in patient outcomes or costs following an initial freestanding ED visit.

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Supporting Information

The following supporting information is available in the online version of this paper available at http://onlinelibrary.wiley.com/doi/10.1111/acem.13381/full

Data Supplement S1. Study flowchart.

Data Supplement S2. Analytical code.