Out-of-Network Emergency Department Use among Managed Medicaid Beneficiaries

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Objective. Out-of-network emergency department (ED) use, or use that occurs outside the contracted network, may lead to increased care fragmentation and cost. We examined factors associated with out-of-network ED use among Medicaid beneficiaries.

Data Sources and Study Setting. Enrollment, claims, and encounter data for adult Medi-Cal health plan members with 1+ ED visits and complete Medicaid eligibility during the study period from 2013 to 2014.

Study Design. We analyzed the data to identify factors associated with out-of-network ED use classified by mode of arrival (ambulance vs. nonambulance).

Data Extraction Methods. We extracted encounter, ambulance, and ED census data and linked them together based on ED visit date.

Principal Findings. Of 11,143 ED visits, 6,808 (61.1 percent) were out-of-network. The number of hours the study ED was on ambulance diversion increased the odds of out-of-network visits for the 3,365 (30.2 percent) ED visits arriving by ambulance. For all visit types, assignment to a primary care clinic at the in-network hospital and having had any primary care visit during the study period decreased the odds of out-of-network ED care. Individuals were more likely to go out-of-network for ED care if they lived in neighborhoods containing out-of-network EDs.

Conclusions. There are a number of factors related to out-of-network ED use, including the proximity and density of out-of-network EDs, race and ethnicity, a prior history of out-of-network ED use, and individuals' connection to primary care. EDs that serve Medicaid beneficiaries may need to explore alternative sites and modalities of care as alternatives to the ED, and consider their ability to absorb large numbers of out-of-network visits given already limited capacity.

Key Words. Medicaid, ED, out-of-network, health plan, ambulance

Medicaid beneficiaries have higher rates of emergency department (ED) visits than those with private insurance (Tang et al. 2010), and some research has indicated that ED use will increase with Medicaid expansion among individuals newly covered by Medicaid (Finkelstein and Taubman

2015). This has meant that State Medicaid programs and Medicaid health plans are focused on ED visits within this population. Medicaid expansion under the Affordable Care Act provides coverage for hundreds of thousands of newly insured individuals. Nationally, over half of Medicaid beneficiaries receive most or all of their care from health plans that contract with state Medicaid agencies (Centers for Medicare & Medicaid Services 2013; The Henry J. Kaiser Family Foundation 2016). In 21 states, over two-thirds of beneficiaries were enrolled in managed care, and the number of states that administer Medicaid via health plans is growing (Swisher, Lawson, and Del Pilar 2011).

In order to ensure access to services, Medicaid health plans contract with multiple medical groups—groups of providers that are affiliated with one or more hospitals and are paid by the health plan to provide care (Coursolle 2013; Hansen 2013). Health plans require beneficiaries to seek care within a specific provider network; otherwise visits are considered “out-of-network.” Safety-net hospitals and health systems that provide health services to low-income and uninsured individuals play an important role in Medicaid managed care networks (Sparer and Brown 2000).

Out-of-network care can be problematic for health plans, safety-net hospitals, and health care systems and their members (Pham et al. 2007; Bourgeois, Olson, and Mandl 2010; McWilliams et al. 2014). The financial risk-bearing entity (e.g., Medicaid health plans; safety-net hospitals) has a monetary incentive to discourage out-of-network ED use because they pay more for these visits than contracted in-network rates. While the commercial insurance market creates financial incentives for remaining in-network by imposing higher copayments and other fees for out-of-network utilization, federal law prohibits balance billing of Medicaid beneficiaries (Cuppett 2010) and most states do not impose ED copayments with Medicaid. As a result, there is no financial incentive for Medicaid beneficiaries to remain in-network for ED care.

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In addition, when patients seek care at multiple facilities, they may be at risk for care fragmentation, which is represented by duplicative or unnecessary testing or medical errors caused by a lack of coordination between providers (Bourgeois, Olson, and Mandl 2010; Grinspan et al. 2014; Unni et al. 2014). Most research regarding out-of-network care has focused on out-of-network ambulatory care (Kyanko, Curry, and Busch 2013a,b; McWilliams et al. 2014) and focused on privately insured individuals (Kyanko, Curry, and Busch 2013a,b). The limited research focused on out-of-network ED care has acknowledged that it exists (Kyanko and Busch 2012), and that medical emergencies are a main contributor to out-of-network use overall (Kyanko, Curry, and Busch 2013a,b). However, no research has examined factors associated with out-of-network ED use among Medicaid beneficiaries. We conducted the first study of patient-, hospital-, and community-level factors associated with out-of-network ED use among a large group of Medicaid health plan members. We aimed to determine if there are modifiable factors related to out-of-network ED use.

METHODS

Study Design

We performed a cross-sectional analysis of administrative encounter data obtained from San Francisco Health Plan (SF Health Plan) and San Francisco General Hospital and Trauma Center (SFGH) (study hospital) for the period September 1, 2013 through August 30, 2014. The SF Health Plan is the largest Medicaid health plan in San Francisco, managing over 85 percent of Medicaid beneficiaries in the city and county. Of their 136,513 members, 65,980 (48.3 percent) have primary care physicians (PCPs) assigned to the network that includes SFGH as their contracted hospital. The primary care clinics are spread throughout San Francisco; of those who care for adults, three are located at SFGH and the rest are located in the community. SF Health Plan receives encounter data for all of its members' ED use within and outside San Francisco, regardless of whether an ED is contracted to provide care to SF Health Plan members. We examined SF Health Plan members who were contracted to receive care at SFGH and its associated clinics who had at least one visit to the ED within the 12-month study period. ED visit data were classified based on the mode of arrival (ambulance vs. nonambulance).

Datasets

We obtained demographic and health services encounter data (ED visits, hospital admissions, and PCP visits) from the SF Health Plan's internal reporting system (PEAK), which is based on claims data in their data warehouse on the 65,980 members who are contracted to receive hospital care at SFGH. We identified all claims related to ED visits using procedure codes and combined all claims related to a single ED visit using the member SF Health Plan identification number, provider (as listed on a facility claim) and the date of service. We obtained daily SFGH ED census data from Pulse-check, the SFGH ED's electronic health record. We extracted data regarding ambulance diversion from a web-based application used for communication and data tracking. We accounted for a claims verification lag of 6 months to assure complete capture of all ED and primary care encounters made by the study population and to ensure complete capture of ambulance claims. The Institutional Review Board of the University of California, San Francisco and the data governance board of the San Francisco General Hospital approved this study.

Sample Description

All adult (18 or over) SF Health Plan members who were contracted to receive care at SFGH with at least one visit to any ED were included in our initial dataset. In order to assure complete capture of all ED visits during the study period, we limited our study population to individuals who had 12 months of eligibility during the study period. We included participants' ED visits regardless of whether the visit resulted in discharge from the ED or admission to the hospital. We included all ED visits made by the study population during the study period in the analysis regardless of whether they occurred within or outside of San Francisco.

Outcome Measures

The primary outcome of interest was the type of ED visit made during the study period based on whether the visit was to SFGH ED (categorized as an "in-network" ED visit) or to other EDs (categorized as an "out-of-network" ED visit). The SF Health Plan database captures all ED visits including both visits that result in discharge—"treat and release visits"—and visits that lead to hospital admission. Because patients do not know whether they will be admitted when they go to the ED, we did not differentiate between treat and release visits and visits that result in admission.

There is limited literature on factors associated with out-of-network ED use. As a result, to identify and classify factors potentially associated with out-of-network ED use, we identified independent variables that previous research has shown affect why patients seek ED care. These variables are related to primary care access (office location; having made a visit to a primary care provider) (Grumbach, Keane, and Bindman 1993; Kangovi et al. 2013), convenience (including ED proximity) (Lowe et al. 2009; Cheung et al. 2012), mode and availability of transport (ambulance vs. nonambulance) (Cheung et al. 2012; Hefner, Wexler, and McAlearney 2015), and cultural background (race/ethnicity).

Mode of Arrival. We categorized ED visits that had an accompanying claim for an ambulance transport as ambulance visits and all other visits not accompanied by ambulance claims as nonambulance visits (walk-in visits).

Ambulance Diversion. We defined ambulance diversion as a continuous variable based on the reported number of hours that SFGH was on diversion for each 24-hour period starting and ending at midnight.

ED Census. We calculated the total number of patients seen in a 24-hour period. We excluded individuals who left the ED without being evaluated by a physician from the denominator. We calculated the percentage of ED patients who were admitted to SFGH and discharged from the ED based on the total number of patients seen in the 24-hour period.

Primary Care Clinics. To determine if the location at which a patient received primary care influenced out-of-network ED use, we developed a variable to describe three clinic groupings based on where patients in the dataset received their primary care. Thirteen clinics are part of the same integrated delivery system (San Francisco Health Network, or SFHN) as the study hospital, of which 3 are on the hospital campus (hospital-based SFHN clinics) and 10 are located throughout San Francisco (community-based SFHN clinics). An additional 14 nonhospital-based clinics were loosely affiliated (consortium clinics) and also located throughout the city.

Primary Care Physician Visits. PCP visits were identified in the SF Health Plan claims based on billing codes associated with outpatient primary care visits.

We dichotomized PCP visits into “any” or “none” based on whether a patient had zero versus one or more PCP visits during the 12-month study period.

Number of EDs in a Neighborhood. We created nine neighborhood groupings (Figure 1) based on a patient’s home zip code in order to evaluate the impact of neighborhood location on out-of-network ED use. Each neighborhood contained anywhere from 1 to 23 zip codes. All zip codes outside San Francisco County were classified as a single neighborhood. We based neighborhood boundaries in San Francisco on existing residential districts. We also gave consideration to dividing neighborhoods along major geographic features such as parks and freeways. For example, we accounted for the fact that Interstate 80 and highway 101 bound specific neighborhoods and provide individuals who live there with relatively quick access to the study hospital. Other key features split the city geographically because they are difficult to traverse by car or ambulance, and include Twin Peaks and Golden Gate Park. We then

Figure 1: Map of San Francisco Neighborhoods and Emergency Departments [Color figure can be viewed at wileyonlinelibrary.com]

determined the number of out-of-network EDs within each neighborhood using the address of every ED in San Francisco. For patients with zip codes outside San Francisco, we assigned a value of one out-of-network ED. We included the number of out-of-network EDs as a predictor in our models.

Prior Out-of-Network ED Use. For each ED visit in the dataset, we looked backwards to determine if a patient had made at least one out-of-network ED visit in the 90 days prior. Because this variable is undefined until the 91st day of follow-up, only visits occurring in the final 9 months of our 12-month dataset were included in the analysis.

Statistical Analysis

We used mixed-effects logistic regression to examine factors associated with our dependent variable of out-of-network ED use. Data from each patient were treated as forming a single cluster in the model (i.e., the model included a patient-specific random effect). All predictors in the model were considered as fixed effects. There are no validated measures that can be applied in advance of an ED visit or at the time of ED triage to predict ED visit severity; we used mode of transport (ambulance vs. nonambulance arrival) as a proxy. We performed separate modeling according to mode of arrival). When fitting and comparing multiple predictor models, we determined potential predictors of interest in the dataset and then retained independent variables in the fitted model with *p*-values of .2. However, we included demographic factors such as race/ethnicity, gender, and age by default in multivariate models, regardless of associated statistical significance. We used *SAS version 9.4* (SAS Institute Inc 2012) for data preparation and descriptive statistics. We used *Stata version 12* for statistical modeling (StataCorp 2011).

RESULTS

The study population was comprised of 4,271 adults who had at least one ED visit. These patients made a total of 11,143 ED visits for a mean of 2.6 visits per person (range 1–141). Individuals with four or more visits accounted for 1,883 visits (16.9 percent). Overall, 1,827 visits (16.4 percent) resulted in a

hospital admission. The majority of all visits (6,808, 61.1 percent) were out-of-network. Most out-of-network ED visits occurred at one of three other EDs in San Francisco (EDs A, B, and C in Figure 2). See Table 1 for demographic characteristics of the study population.

A total of 7,778 visits (69.8 percent) were nonambulance visits. More people who arrived by ambulance were admitted to the hospital: of all visits brought in by ambulance, 1,719 (22.1 percent) were admitted to the hospital, while 1,081 (13.9 percent) of nonambulance visits were admitted. ED visits were less likely to result in hospital admission if they occurred out-of-network. The highest volume of both all ED visits and of out-of-network ED visits occurred on Mondays.

Figure 2: The Proportion of Visits to Out-of-Network EDs by Mode of Arrival [Color figure can be viewed at wileyonlinelibrary.com]

Proportion of Visits to Out of Network EDs, Ambulance Visits

Proportion of Visits to Out of Network EDs, Walk In Visits

Table 1: Demographic Characteristics of Study Population, $n = 4,271$

Age strata, years: n (%)	
18–24	246 (5.76)
25–34	503 (11.78)
35–44	618 (14.47)
45–54	1,177 (27.56)
55–64	1,386 (32.45)
65–79	313 (7.33)
80+	28 (0.66)
Number (percent) female	2,247 (52.6)
Race or ethnicity: n (%)	
Black	1,206 (28.2)
White	1,048 (24.5)
Asian	750 (17.6)
Latino	636 (14.9)
Other or unknown	631 (14.8)
Primary language spoken: n (%)	
English	2,566 (60.1)
Spanish	455 (10.7)
Cantonese	374 (8.8)
Russian	276 (6.5)
Other or unknown	600 (13.9)
Neighborhood of residence: n (%)	
Mission-Bernal-Soma	1,051 (24.6)
Downtown-North Beach	1,015 (23.8)
Bayview-Portola-Visitation Valley	792 (18.5)
Crocker-Merced	410 (9.6)
Fog Belt	324 (7.6)
Marina-Richmond	207 (4.9)
Twin Peaks-St Francis Wood	179 (4.2)
Treasure Island	17 (0.4)
Outside San Francisco	275 (6.4)

ED Visits Arriving by Ambulance

On average, SFGH was on ambulance diversion for 8.3 hours of each day during the study period. A total of 3,365 ED visits (30.2 percent) were brought in by ambulance; 2,265 (67.3 percent) of these ambulance visits occurred out-of-network. In our multiple predictor model, the estimated odds ratio associated with each additional hour the study hospital was on diversion was 1.06; 95 percent CI (1.03, 1.09). Odds of an ambulance visit being out-of-network were greater if the patient was assigned to a non-hospital-based clinic, both for consortium clinics (OR 1.84; 95 percent CI 1.40–2.43) and SFHN clinics (OR 1.70; 95 percent CI 1.24–2.32). This effect in the single predictor model is attenuated in the multiple predictor

model after accounting for the other predictors. Compared to individuals with no out-of-network ED visits, individuals who lived in neighborhoods with two (OR 1.84; 95 percent CI 1.02–3.32) out-of-network EDs were more likely to have out-of-network ED visits that arrived by ambulance (Table 2) while those who lived in a neighborhood with one or three out-of-network EDs were not. Those who self-defined as Latino (OR 0.63; 95 percent CI 0.42–0.96) or black (OR 0.72; 95 percent CI 0.55–0.95) were less likely to have out-of-network ED visits that arrived by ambulance. Individuals who had made out-of-network ED visits in the prior 90 days were more likely (OR 1.66; 95 percent CI 1.33–2.08) to make subsequent out-of-network ED ambulance visits (Table 2).

Table 2: Single Predictor and Adjusted Odds Ratios for Factors Associated with Out-of-Network ED Visits Arriving by Ambulance

<i>Variable</i>	<i>Bivariate OR</i>	<i>Bivariate 95% CI</i>	<i>Adjusted OR</i>	<i>Adjusted 95% CI</i>
Diversion hours	1.08	1.05–1.11	1.06	1.03–1.09
Total number of patients seen	0.99	0.98–0.99	1.01	0.99–1.03
Number of patients discharged	0.98	0.98–0.99	0.98	0.96–1.00
Day of week (referent = Sunday)				
Monday	2.06	1.49–2.84	1.53	1.05–2.22
Tuesday	1.61	1.16–2.22	1.33	0.91–1.93
Wednesday	1.45	1.05–1.99	1.05	0.74–1.51
Thursday	1.49	1.07–2.05	1.14	0.79–1.65
Friday	1.44	1.04–1.98	1.13	0.78–1.63
Saturday	1.45	1.05–2.01	1.15	0.80–1.65
Age	1.00	0.99–1.01	1.00	0.99–1.01
Gender (referent = male)	0.94	0.75–1.18	0.88	0.70–1.11
Ethnicity (referent = white)				
Black	0.77	0.58–1.01	0.72	0.55–0.95
Latino	0.45	0.30–0.67	0.63	0.42–0.96
Asian	0.55	0.35–0.86	0.71	0.45–1.12
Other	0.94	0.65–1.36	1.05	0.72–1.54
Any PCP visit during study period	0.57	0.40–0.84	0.69	0.47–1.01
Clinic group (referent = SFGH)				
Consortium	2.25	1.72–2.95	1.84	1.40–2.43
SFHN	2.20	1.63–2.96	1.70	1.24–2.32
Number out-of-network of EDs in neighborhood (referent = 0 EDs)				
1 ED	1.57	1.21–2.04	1.20	0.91–1.59
2 EDs	2.02	1.12–3.65	1.84	1.02–3.32
3 EDs	1.32	0.71–2.44	1.33	0.70–2.53
Out-of-network ED use in past 90 days (referent = no)	1.68	1.36–2.09	1.66	1.33–2.08

Nonambulance ED Visits

A total of 7,778 ED visits (69.8 percent) were nonambulance visits; 4,535 (58.3 percent) of these visits occurred out-of-network. In our multiple predictor model, older individuals (OR 0.97; 95 percent CI 0.96–0.98) were less likely to seek care out-of-network as were males (OR 0.77; 95 percent CI 0.60–0.98). White individuals (referent group) were more likely than Latino, Asian, and black individuals to seek out-of-network, nonambulance ED care (Table 3). Odds of a nonambulance visit being out-of-network were greater if the patient was assigned to a non-hospital-based clinic, both for consortium clinics (OR 2.69; 95 percent CI 2.01–3.61) and SFHN clinics (OR 3.05; 95

Table 3: Single Predictor and Adjusted Odds Ratios for Factors Associated with Out-of-Network Nonambulance ED Visits

<i>Variable</i>	<i>Bivariate OR</i>	<i>Bivariate 95% CI</i>	<i>Adjusted OR</i>	<i>Adjusted 95% CI</i>
Ambulances	1.01	1.00–1.02	1.01	1.00–1.02
Percent admit	0.99	0.98–1.01	0.98	0.95–1.01
Day of week (referent = Sunday)				
Monday	0.70	0.52–0.94	0.84	0.60–1.17
Tuesday	0.55	0.41–0.74	0.71	0.51–0.98
Wednesday	0.76	0.57–1.02	0.95	0.68–1.32
Thursday	0.77	0.57–1.04	0.86	0.62–1.20
Friday	0.61	0.46–0.83	0.77	0.55–1.07
Saturday	0.67	0.50–0.90	0.80	0.58–1.10
Age	0.96	0.95–0.97	0.97	0.96–0.98
Gender (referent = male)	1.04	0.80–1.36	0.77	0.60–0.98
Ethnicity (referent = white)				
Black	0.47	0.33–0.67	0.51	0.36–0.71
Hispanic	0.09	0.06–0.14	0.17	0.11–0.26
Asian	0.06	0.04–0.10	0.16	0.10–0.25
Other	0.29	0.19–0.45	0.34	0.23–0.51
Any PCP visit during study period	0.10	0.06–0.14	0.19	0.13–0.28
Clinic group (referent = SFGH)				
Consortium	3.24	2.37–4.44	2.69	2.01–3.61
SFHN	5.12	3.57–7.34	3.05	2.17–4.28
Number of EDs in neighborhood (referent = 0 EDs in neighborhood)				
1 ED	2.07	1.55–2.77	1.38	1.05–1.81
2 EDs	3.51	1.89–6.55	2.18	1.22–3.91
3 EDs	4.11	2.11–8.04	2.40	1.29–4.44
Out-of-network ED use in past 90 days (Referent = No)	2.54	2.04–3.16	2.19	1.76–2.73

percent CI 2.17–4.28), and this effect was greater than for visits brought in by ambulance. Individuals with at least one PCP visit during the 12-month study period had lower odds of seeking out-of-network ED care (OR 0.19; 95 percent CI 0.13–0.28). Compared to individuals with no out-of-network EDS in their neighborhood of residence, those with one (OR 1.38; 95 percent CI 1.05–1.81), two (OR 2.18; 95 percent CI 1.22–3.91), or three (OR 2.40; 95 percent CI 1.29–4.44) out-of-network EDs in their neighborhood of residence were more likely to have out-of-network walk-in ED visits. Individuals who had made out-of-network ED visits in the prior 90 days were more likely (OR 2.19; 95 percent CI 1.76–2.73) to make subsequent out-of-network ED non-ambulance visits. For nonambulance ED visits, ambulance diversion hours and the total number of patients seen each day did not gain entry into the model, as neither reached our predetermined significance level of $p \leq .2$ in the bivariate analysis.

DISCUSSION

Our study is one of the first to examine factors associated with out-of-network ED use for a large group of Medicaid health plan members. Despite being assigned to a network of providers, we found that our study population comprised of individuals in a Medicaid health plan made the majority of all ED visits out-of-network. This finding is relevant for policy makers, safety-net hospitals, and health plans who are invested in retaining patients within a single network of providers.

When an ED and hospital are overcrowded and have a high volume of acutely ill patients, they stop accepting ambulances for a period of time (ambulance diversion). Our finding that a higher percentage of visits by ambulance versus walk-in were out-of-network is likely due to the effect of ambulance diversion. We found that diversion was common in the study hospital. On 364 of 365 of days, the hospital had a period of diversion and on average these lasted for 8.3 hours (or 35 percent of the day). When on diversion, the hospital would have sent any patients arriving by ambulance to another hospital, without regard to the patients' medical coverage or request.

We found that individuals who live in neighborhoods with one or more out-of-network EDs are more likely to use out-of-network ED care for visits that did not arrive by ambulance. Our results for nonambulance ED visits show a dose–response relationship where the rate of out-of-network ED visits increases along with the number of out-of-network EDs in a neighborhood.

This implies that patients are choosing to visit EDs that are close to where they live. Because many safety-net EDs in urban areas are overcrowded, policy makers could consider incentivizing safety-net systems to open urgent care centers and improve access to same-day primary care in neighborhoods where the patient population is concentrated, away from the in-network facility, to serve as alternatives to out-of-network ED care. For visits that arrived by ambulance, only individuals with two out-of-network EDs in their neighborhood of residence were more likely to have out-of-network walk-in ED visits. It is likely that our model was underpowered to detect statistical significance in neighborhoods with three or more out-of-network EDs due to the small number of ED visits (105 visits out of 3,362) from this single neighborhood that arrived by ambulance.

We found that prior out-of-network ED use is associated with future out-of-network ED use. This finding held true for both ambulance and nonambulance visit models, yet the association was greater for nonambulance visits. Nonambulance visits comprise the majority of all visits. Patients have a higher degree of control over which ED they visit when they walk in, suggesting that when individuals are able to control the choice of ED, individuals who choose an out-of-network ED once are more likely to choose it again. This suggests that when health systems or payers identify an initial out-of-network ED use, they should consider interventions, including patient and provider education, to redirect individuals to an in-network ED in the future. It will be difficult to affect some aspects of state policy around out-of-network ED use for Medicaid beneficiaries because regulations prevent certain disincentives/penalties that are permitted in the commercial insurance market, such as higher copayments for out-of-network utilization and balanced billing. Policy makers can consider locating health services with drop-in availability closer to where the affected population resides and including more in-network ED options for beneficiaries.

We found that for both ambulance and nonambulance visits, individuals who identified as Latino and Asian were less likely to seek out-of-network ED care. The study hospital cares for a large percentage of limited English proficiency (LEP) patients and has bilingual health care providers and an established interpreter system to optimize care for this population. LEP individuals may choose disproportionately to receive care at the study hospital because of the availability of these services here, or may choose not to go to other hospitals that do not have such extensive services. Research has shown that professional interpreters have a positive impact on utilization, clinical outcomes, and satisfaction with care (Karliner et al. 2007). One study found that non-

English-speaking patients were less likely than English-speaking patients to state they would return to an ED if they had a problem that required emergency care (Carrasquillo et al. 1999).

An important factor associated with out-of-network ED use was whether an individual had any primary care (PCP) visit during the 12-month study period. Those with at least one PCP visit had much lower odds of seeking ED care out-of-network. However, as most individuals in the study population had at least one PCP visit (85.1 percent), the attributable risk of out-of-network ED care was mostly borne by patients who did see a PCP even though at an individual level, those without a PCP visit had a higher likelihood of using out-of-network ED care. In addition, we found that patients who were assigned to primary care clinics onsite at the study hospital (SFGH hospital-based clinics) were less likely to have out-of-network ED visits than individuals assigned to other clinics across the city. It may be that patients accustomed to seeking care at the location where the study ED is located are more likely to seek ED care there as well. It may also be that hospital-based clinic providers are more likely to refer their patients to the onsite ED, whereas clinic providers located elsewhere throughout SF may view other, closer EDs as more convenient for their patients. Future research could explore these and other possibilities.

Many state Medicaid programs have begun to develop accountable care organizations (ACOs) (*Emerging Medicaid Accountable Care Organizations: The Role of Managed Care* 2012). ACOs incentivize care coordination, which can be undermined by out-of-network visits. While safety-net hospitals will place a high value on retaining patients who may have other options regarding where to seek care, they may also have limited capacity to serve additional patients. Our study found that the majority of all ED visits were out-of-network. Expanding ED-based capacity by contracting with additional hospitals and their associated EDs, thereby bringing them into county-based safety-net network, would be a complex undertaking. Expanding a network of care involves contracting with the physicians who provide care at the relevant EDs and hospitals, as a substantial portion of patients are admitted from the ED and would end up receiving inpatient care. It would also have implications in terms of a shared medical record and financial arrangements. Retaining these visits in-network would mean a marked increase in the daily ED census, and this may not be practical for EDs who are seeing increasing numbers of patients, have long wait times for patients to be seen, and have high numbers of admitted patients that are boarding while awaiting inpatient beds (Rabin et al. 2012). To this point, SFGH has since begun to use process improvement tools to improve patient flow and experience. It may also require significant efforts on

the part of health plans to educate members about which facilities are within their contracted network of care (Kyanko et al. 2013). Most important, ACOs will need to invest in alternatives to the ED such as same-day primary care visits, urgent care centers, and nurse advice lines.

Our study highlights a number of factors that may influence whether patients choose to seek care at safety-net hospitals. Future research can further investigate these and other factors in more depth and can test whether adjusting some of the modifiable factors related to out-of-network use can reduce it.

Limitations

Our study has several limitations. Our study is based in an urban area with multiple EDs in close proximity to one another, so while our results are applicable to high-density urban areas, they are not generalizable to rural or exurban settings. Due to data limitations, we were unable to account for factors that might be associated with out-of-network ED use, such as patient awareness regarding where to seek in-network care, or factors that might influence where individuals seek ED-based care for mental health or substance use issues, such as the presence of 24-hour social work or an on-call psychiatrist. The SF Health Plan uses mailings and phone calls to new members that attempt to educate them about where to obtain primary, emergency, and hospital care, which may mitigate this. However, some SF Health Plan members may not be aware that their ED care must occur at the study hospital to be considered in network. We were unable to relate the exact timing of the ED visit to the hours when the study hospital was on ambulance diversion, instead needing to use total hours on ambulance diversion effectively as a pseudoindicator for the risk that the hospital was on diversion at the time of admittance. We did not have a reliable measure of illness severity or triage level, but used mode of transport as a proxy. For all datasets in our study period, we allowed for a 6-month claims lag to minimize the chance that claims for ED, primary care, or ambulance visits had not been submitted and did not appear in our dataset. Because the study hospital operates using a capitated budget, and because the SF Health Plan receives a capitated monthly fee for each member in their plan, we did not have a method to measure accurately the cost of services delivered at the study hospital. Because Medicaid beneficiaries cannot be billed for the cost of services that may exceed reimbursement by a health plan (balance billing), these costs are incurred by health plans or safety-net hospitals that assume risk for beneficiaries. Reimbursements are based on contractual arrangements between the health plan and the hospital or provider

group. Because these data are proprietary, and are not generalizable, we did not include them. Strengths of our study included an analysis only of individuals with a full 12 months of enrollment in the SF Health Plan, so that we were able to fully capture all of their ED and primary care use both within and outside of their network of care. In addition, to our knowledge, ours is the first study to examine the relationship between ambulance diversion and out-of-network ED use and the first to focus on out-of-network utilization in the Medicaid population.

CONCLUSIONS

Medicaid beneficiaries in our study made the majority of their ED visits to out-of-network EDs. Ambulance diversion status, while an important health policy concern (Shen and Hsia 2011), did not appear to be a factor influencing out-of-network care for most ED visits because most ED visits did not arrive by ambulance. Instead, the number of EDs in a member's neighborhood, prior out-of-network ED use, connection to primary care, and race/ethnicity appeared more influential. Safety-net hospital EDs that serve the Medicaid population may need to consider their ability to absorb large numbers of out-of-network ED visits given what may be already limited capacity. In addition, delivery systems that provide care for Medicaid beneficiaries may benefit from expanding timely access to non-ED ambulatory sites of care.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.