Patterns of Multiple Emergency Department Visits: Do Primary Care Physicians Matter?

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ABSTRACT

Context: Overutilization and overreliance on Emergency Departments (EDs) as a usual source of care can lead to unnecessarily high costs and undesirable consequences, such as a gap in care coordination and inadequate provision of preventive care.

Objective: To identify factors associated with multiple ED visits by patients, in particular, the impact of primary care physicians (PCPs) on their patients' multiple ED visit rates.

Design: Geisinger Health Plan claims data among adult patients who averaged more than 1 ED visit within a 12-month period between 2013 and 2014 were obtained (N = 20,351).

Main Outcome Measures: Rate of ED visits. Three linear regression models using patient characteristics and utilization patterns as covariates along with PCP fixed effects were estimated to explain the variation in the multiple ED visit rates.

Results: Multiple ED visits were significantly associated with younger age (18-39 years), having Medicaid insurance, and greater comorbidity. Higher rates of physician office visits and inpatient admissions were also associated with higher rates of multiple ED visits. Accounting for PCP characteristics only marginally improved the explained variation (R^2 increased from 0.14 to 0.16).

Conclusions: Multiple ED visit patterns are likely driven by patients' health conditions and care needs rather than by their PCPs. Multiple ED visits also appear to be complementary, rather than substitutionary, to PCP visits, suggesting that PCP-focused interventions aimed at reducing ED use are unlikely to have a major impact.

INTRODUCTION

Emergency Departments (EDs) play a crucial role in providing needed care for patients who lack routine access to primary care.[1] However, overutilization and overreliance on EDs as a usual source of care can lead to undesirable consequences, such as a gap in care coordination and inadequate provision of preventive care.[2] Moreover, the cost of care associated with nonurgent emergency care is often cited as a source of wasteful spending.[3] Numerous interventions have been implemented over the years to reduce discretionary ED utilization rates.[4] Recently, efforts to reduce ED utilization have included redesigning the primary care delivery system (eg, implementation of a patient-centered medical home)[5,6] and introducing financial incentives to primary care physicians (PCPs).[7-9]

The rationale for both the approaches is that primary care can exert substantial influence on patterns of ED utilization and that altering the current model of primary care delivery can affect ED use by patients. The underlying assumption is that primary care and ED care are, at least to some degree, substitutes for each other.[10-12] Such an assumption stems from previous findings that patients who use EDs more frequently are less likely to have PCPs.[11,13,14] Therefore, it is assumed that if primary care is made more accessible and available, patients will visit EDs less frequently. Existing literature, however, provides mixed evidence to support such a rationale. First, the reported effects of patient-centered medical homes on ED utilization are heterogeneous.[4] Second, provision of financial incentives to PCPs has been shown to have no significant impact on ED utilization rates.[4,6,8]

In this study, we seek to identify factors associated with multiple ED visits. In particular, we explore to what extent PCPs contribute to the variation in their patients' frequency of ED visits. We focus on multiple ED visits—defined as more than 1 ED visit within a 12-month period. Repeated ED visits within a defined period are more likely to be discretionary in nature and to show a systematic pattern than are 1-time ED visits, which may be more likely to be subject to random variation because of events such as accidents and trauma that require appropriate ED care. The aim of this article is not to explicitly identify any specific PCP characteristics, such as PCP age, sex, panel size, and clinic hours of operation, that may be correlated with patients' frequent ED visits. Instead, the goal is to assess the magnitude and the degrees to which such PCP characteristics collectively may influence multiple ED visit rates by their patients, without having to define exactly what those characteristics are.

METHODS

Data

The data were obtained from Geisinger Health Plan's claims data, covering a 2-year period from January 1, 2013, through December 31, 2014. Geisinger Health Plan is a full-service regional health plan that provides health insurance coverage to approximately 0.5 million members residing primarily in Central Pennsylvania. As a component of Geisinger Health System, Geisinger Health Plan's lines of business include commercial, Medicaid, and Medicare.

To identify the study sample, the following inclusion criteria were applied to the claims data: patients who 1) were at least

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age 18 years, 2) averaged more than 1 ED visit per 12-month period, and 3) were enrolled in health maintenance organization (HMO) plans for at least 6 months during the study. The sample was restricted to HMO enrollees for accurate attribution of the patients to their PCP because HMO enrollees are required to select a PCP and are required to obtain referrals from the PCP for specialist care. All Medicaid enrollees were considered to be in an HMO, because Geisinger Health Plan's Medicaid enrollees were required to select a PCP and obtain referrals.

Patients who met the following exclusion criteria were not included in the sample: 1) switched plan types during the study period (eg, from commercial to Medicare, from HMO to non-HMO, or vice versa), 2) were in PCP sites with fewer than 20 Geisinger Health Plan HMO enrollees meeting the inclusion criteria during the study period (to ensure adequate sample size in each PCP site represented in the data), and 3) enrolled in a third-party administration plan purchased by self-funded employers. The last exclusion criterion was necessary because self-funded employers can set benefit designs that are different from those used in other plan types for which Geisinger Health Plan assumes the risk. Thus, the final sample included only those members for whom Geisinger Health Plan assumed the risk and provided uniform benefit designs. The final sample included 20,351 unique patients meeting the inclusion criteria and not the exclusion criteria.

Table 1. Descriptive statistics of sample (N = 20,351)[a]

Variable	No. (%)
Emergency Department visits, mean (SD)[b]	2.6 (2.8)
Mean age, years (SD)	47.2 (21.1)
Women	13,554 (66.6)
No. of chronic conditions (range: 0-10)	
0	4905 (24.1)
1	4945 (24.3)
2	3785 (18.6)
≥ 3	6716 (33.0)
Insurance type	
Medicaid	11,234 (55.2)
Commercial	3989 (19.6)
Medicare	5128 (25.2)
Health care utilization	
Any high-end imaging	8242 (40.5)
Any outpatient surgery	14,673 (72.1)
PCP visits (SD)[b]	4.8 (3.9)
Specialist visits (SD)[b]	3.9 (4.4)
Inpatient acute days (SD)[b]	1.7 (5.2)
PCP site characteristics	
Geisinger-owned[c]	12,170 (59.8)
PCMH[c]	9952 (48.9)

[a] Sample was restricted to patients who averaged at least 1 Emergency Department visit per year.
[b] Average count per member per year.
[c] Some PCMHs were not Geisinger-owned PCP sites; as such, these proportions do not add up to 100%.
PCMH = patient-centered medical home; PCP = primary care physician; SD = standard deviation.

Multivariate Models

Three multivariate linear regression models were estimated, using each patient's ED visit rate (conditional on having at least one ED visit) per year as the dependent variable in all three models. In the first model (Model 1), only the patient demographic characteristics (age and sex), number of comorbid conditions (up to ten conditions: asthma, cancer, chronic kidney disease, chronic obstructive pulmonary disease, congestive heart failure, coronary artery disease, diabetes, depression, end-stage renal disease, and hypertension), and plan types (Medicaid, commercial, and Medicare) were included as covariates. In the second model (Model 2), all the covariates included in Model 1 plus other health care utilization patterns (yearly rates of PCP visits, specialist visits, high-end imaging [computed tomography and magnetic resonance imaging], outpatient surgery, and inpatient admissions) were included as additional covariates.

Last, Model 3 included all the covariates included in Model 2 plus PCP fixed effects (ie, inclusion of binary indicator variable for every 1 of the 345 PCP sites in the sample). The inclusion of PCP fixed effects accounts for any variation in the dependent variable that is uniquely attributable to each of the PCP sites. The PCP fixed effects therefore represent any PCP site-level characteristics that are common to all the patients in the same PCP site (eg, hours of operation, patient-staff ratio, geographic location, available information technology infrastructure, patient-centered medical home, and ownership status) but differ across the patients who are in different PCP sites.

For each of the three models, the corresponding R^2 statistic is calculated and reported. R^2 measures the amount of explained variation in the dependent variable by the multivariate linear regression model.[15] A higher R^2 value, which takes a value between zero and one, represents a greater amount of the explained variation in the dependent variable, in this case the multiple ED visit rates. Thus, a large increase in the R^2 value obtained with the inclusion of the PCP fixed effects in the regression model (relative to the corresponding R^2 value obtained without the PCP fixed effects) constitutes a strong indication that PCPs contribute significantly to their patients' ED utilization patterns. On the other hand, if the R^2 value changes little or only marginally increases with the inclusion of the PCP fixed effects, it is an indication that PCPs do not account for much of the variation in the ED utilization pattern.

RESULTS

Our study included 20,351 patients who had more than 1 ED visit per year, with an average of 2.6 ED visits during the 2-year study period. Table 1 describes patients' baseline characteristics. The mean age of patients was 47.2 years, with 66.6% of patients being women. Thirty-three percent of patients had more than 3 chronic conditions. Medicaid composed 55.2% of the total study population.

Tables 2 and 3 show the results on the basis of the 3 multivariate linear regression models. The model results suggest that younger adults (age 18-39 years), Medicaid enrollees, and patients with multiple chronic conditions were more likely to have multiple ED visits ($p < 0.05$; see Tables 2 and 3). Increased PCP visits,

specialist visits, and inpatient admissions were also significantly associated with increased ED visits; that is, 1 additional PCP visit, specialist visit, or inpatient admission per member per year was associated with approximately 0.1, 0.05, and 0.04 additional ED visits per member per year, respectively ($p < 0.05$).

Table 3 indicates that inclusion of PCP site fixed effects that accounted for PCP characteristics in the regression model only marginally increased the explained variation in the multiple ED visit rates from 14% to 16% while having virtually no impact on the estimated coefficients on the other covariates in the model. Namely, the corresponding coefficient estimates for Model 2 (shown in Table 2) and Model 3 are similar to one another both in magnitude and in statistical significance.

DISCUSSION

Multiple ED visits are significantly associated with younger age (age 18-39 years), having Medicaid, and greater comorbidity. Higher rates of physician office visits and inpatient admissions are also associated with higher multiple ED visit rates. Accounting for PCP characteristics only marginally improves the explained variation. The implication of these findings is twofold. First, although PCP characteristics do appear to influence multiple ED visit patterns somewhat (as indicated by a slight increase in the R^2 value in the model that includes PCP site fixed effects), PCP characteristics are unlikely to be the main driver of multiple ED visit patterns among their patients. If they were the main driver, the R^2 value would have been much higher than 16% with the inclusion of the large number of PCP fixed effects in the model. Second, because multiple ED visits are correlated with greater utilizations of other modes of care and greater comorbidity, multiple ED visits are likely to be reflective of unmet health care needs of the population rather than discretionary or avoidable overutilization of ED.

At first glance, these findings seem to be at odds with earlier studies reporting that certain PCP characteristics, particularly accessibility to PCPs via longer clinic hours of operation, are associated with lower rates of ED use.[12,16] In this study, however, as noted above, such PCP characteristics are subsumed under the PCP fixed effects in the regression model. Indeed, many of the PCP fixed effects are significantly associated with the rates of multiple ED visits in the full regression results (not shown but available on request); consequently, the R^2 value does increase with the inclusion of the PCP fixed effects. Therefore, the results of this study confirm the earlier studies rather than contradicting

Table 2. Linear regression results: Patient characteristics and utilization patterns

Variable	Model 1 coefficient (95% confidence interval)	Model 2 coefficient (95% confidence interval)
Female sex	0.094[a] (0.015, 0.173)	0.006 (-0.071, 0.082)
Patient age, years		
18-29	(Reference)	(Reference)
30-39	-0.054 (-0.203, 0.094)	-0.091 (-0.231, 0.050)
40-49	-0.589[a] (-0.736, -0.442)	-0.669[a] (-0.821, -0.517)
50-59	-0.941[a] (-1.102, -0.781)	-1.022[a] (-1.184, -0.859)
60-69	-1.552[a] (-1.741, -1.362)	-1.605[a] (-1.797, -1.413)
70-79	-1.819[a] (-2.052, -1.586)	-1.844[a] (-2.078, -1.611)
≥ 80	-1.861[a] (-2.108, -1.614)	-1.771[a] (-2.015, -1.526)
No. of chronic conditions (range: 0-10)		
0	(Reference)	(Reference)
1	0.628[a] (0.537, 0.718)	0.428[a] (0.334, 0.522)
2	1.198[a] (1.058, 1.338)	0.821[a] (0.691, 0.951)
≥ 3	1.693[a] (1.513, 1.873)	1.018[a] (0.855, 1.182)
Insurance type		
Medicaid	(Reference)	(Reference)
Commercial	-1.210[a] (-1.296, -1.124)	-1.077[a] (-1.158, -0.996)
Medicare	-0.597[a] (-0.803, -0.392)	-0.620[a] (-0.825, -0.414)
Health care utilization		
High-end imaging		-0.02 (-0.087, 0.046)
Outpatient surgery	(Omitted)	-0.008 (-0.031, 0.015)
PCP visits	(Omitted)	0.098[a] (0.077, 0.118)
Specialist visits	(Omitted)	0.054[a] (0.038, 0.070)
Inpatient acute days	(Omitted)	0.035[a] (0.025, 0.044)
R^2	0.107	0.137

[a] Statistically significant at $p < 0.05$.
PCP = primary care physician.

Table 3. Linear regression results: Primary care physician (PCP) fixed effects included[a]

Variable	Model 3 coefficient (95% confidence interval)
Female sex	0.007 (-0.066, 0.081)
Patient age, years	
18-29	(Reference)
30-39	-0.091 (-0.227, 0.045)
40-49	-0.661[b] (-0.802, -0.521)
50-59	-1.041[b] (-1.184, -0.898)
60-69	-1.587[b] (-1.765, -1.41)
70-79	-1.838[b] (-2.055, -1.62)
≥ 80	-1.753[b] (-1.975, -1.531)
No. of chronic conditions (range: 0-10)	
0	(Reference)
1	0.412[b] (0.324, 0.5)
2	0.792[b] (0.661, 0.924)
≥ 3	0.987[b] (0.85, 1.124)
Insurance type	
Medicaid	(Reference)
Commercial	-1.038[b] (-1.145, -0.931)
Medicare	-0.584[b] (-0.78, -0.389)
Health care utilization	
High-end imaging	-0.022 (-0.078, 0.034)
Outpatient surgery	-0.008 (-0.03, 0.013)
PCP visits	0.103[b] (0.084, 0.121)
Specialist visits	0.054[b] (0.037, 0.07)
Inpatient acute days	0.035[b] (0.025, 0.045)
R^2	0.157

[a] Includes 324 indicator variables for each of the PCP sites as covariates; the coefficients for all of these indicator variables are not shown for brevity.
[b] Statistically significant at $p < 0.05$.

them. These results further elaborate on past research findings by illustrating the degrees to which the PCP characteristics may account for the overall ED use pattern in the context of all patient types, not just in specific subsets of the patient population.

Moreover, the findings of this study are also consistent with other studies showing that Medicaid patients are more likely to use the ED than are non-Medicaid patients,[17] possibly because of Medicaid recipients' lower socioeconomic status as well as Medicaid's systematic barriers to primary care,[18] coupled with more severe health conditions that require increased health care needs.[18,19] Furthermore, the results also indicate that younger patients may be more likely to rely on the ED for their health care than do older patients, which is a phenomenon that an earlier study has suggested.[20] This phenomenon may be a result of younger patients' unmet needs owing to insufficient health insurance coverage or inexperience in navigating through the health care system.

The finding that higher rates of multiple ED visits are associated with higher frequencies of PCP office visits, specialty visits, and inpatient admissions during the same period suggests that ED visits are likely to be complements to—rather than substitutes for—other health care utilization. These findings imply that frequent users of ED services may be patients with substantial disease burden, requiring more health care than the average patient population. Similar findings have been observed in other health care delivery settings in which frequent users of the ED were also frequent users of other health care services, including outpatient care.[19,21-23] This is likely to reflect that fact that the ED provides unique care that other health care venues do not typically offer, such as continuous care without restricted hours of operation. Indeed, the ED may be the most appropriate mode of care for certain disease states and patient subpopulations.[19] As such, the results of this study are consistent with others studies suggesting that frequent ED visits are not necessarily indicative of discretionary or avoidable ED utilization.[19,22]

This study has several limitations. First, this study relies on cross-sectional data obtained from an administrative data source (health insurance claims data); as such, the data offer only a limited amount of relevant information. Consequently, it is not possible to determine any causal relationship. Second, because of the data limitation, this study does not directly examine any specific PCP characteristics (eg, hours of operation, staffing, or geographic locations) and market conditions (eg, availability of nearby urgent care centers) that are likely to further explain the variation in rates of multiple ED visits. Moreover, the study implicitly relies on an assumption that multiple ED visits—defined as more than 1 ED visit in a 1-year period—is probably indicative of potentially discretionary or avoidable ED utilization. Therefore, a more refined approach to identifying such ED visits may strengthen this study. However, the currently available claims data do not contain relevant clinical information for each ED visit that would allow such identification. Third, the overall amount of variation in the data explained by our models (as represented by the R^2 values) does not exceed 20%, which means more than 80% of the variation in the data remain unexplained. This implies that there may still exist patterns in the data that have not been fully uncovered in this study. Last, our findings were based on a single health plan within a large integrated health delivery system and therefore may not be generalizable to other plans and populations.

The findings of this study do not support the assumption that simply increasing access to PCPs or to other lower acuity care settings (eg, urgent care centers) will dramatically reduce ED utilization. Previous studies also suggest that simply focusing on PCP access alone will not lead to lower ED utilization via shifting patients to outpatient preventive care.[12,23] Instead, our findings suggest that interventions should be focused on targeting multiple ED users and addressing the particular needs of this subpopulation. The goal is therefore not necessarily to reduce ED use per se, but rather to promote appropriate use of health care resources and better coordinated care, including EDs as part of the care continuum. As such, this study suggests that leveraging PCPs to reduce ED overutilization may not be the best use of resources. Existing literature has shown mixed evidence on the impact of PCP intervention on ED use. Those studies that have shown potential reductions in ED use have been largely focused on managed care interventions, such as case management, to promote better coordinated care.[4-6]

CONCLUSION

Patterns of multiple ED visits are likely driven by patients' health conditions and care needs rather than by PCP-related factors. Multiple ED visits also appear to be complementary, rather than substitutionary, to physician office visits. This implies that multiple ED visits are not indicative of discretionary use. The finding also suggests PCP-focused interventions aimed at reducing ED use are unlikely to have a significant impact. ❖

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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Heroes

Those heroic men whose life work marked epochs in medicine we think of as individuals, but what they accomplished singly was perhaps of less importance than the inspiration they gave to the group of men who followed them.

— William J Mayo, MD, 1861-1939, American physician and surgeon, cofounder of the Mayo Clinic