


Low Income and Nonadherence to Health Supervision Visits Predispose Children to More Emergency Room Utilization

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Abstract

Social inequity can have broad health impacts. The purpose of this study was to examine the effects of low income and nonadherence to health supervision visits on emergency room (ER) utilization in Eastern Brooklyn, New York. This study surveyed parents/guardians of children who received routine medical care at Brookdale ambulatory clinics from June 2017 to February 2018. Participants were asked to fill out a questionnaire on social demographics, food insecurity, and relocation. Electronic medical records (EMRs) were reviewed to retrieve numbers of missing health supervision and ER visit in past 12 months. Comorbidity was identified through EMR by International Classification of Diseases. Logistic regression analyses were used to examine the effects of nonadherence to health supervision visits on ER utilization when controlling for demographics, food insecurity, recent moving, and comorbidity. Among 268 participants, 56.0% reported their household income was less than \$20,000 annually, 39.6% missed at least 1 health supervision visit, and 31.7% had at least 1 ER visit within the past 12 months. Younger age (adjusted odds ratio [aOR] = 0.92, 95% confidence interval [CI] = 0.86-0.97, $P < .01$), household income less than \$20,000 (aOR = 1.86, 95% CI = 1.02-3.39), preexisting comorbidity (aOR = 2.36, 95% CI = 1.26-4.42), and nonadherence to health supervision visits (aOR = 5.83, 95% CI = 3.21-10.56) were associated with increased ER utilization. Nonadherence to health supervision visits is an independent risk factor and potentially modifiable. Evaluation and remediation should be pursued as a means of improving health outcomes of children in vulnerable circumstances.

Keywords

pediatric, emergency room visit, poverty, adherence, medical appointment

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Introduction

There were 136.9 million emergency room (ER) visits per year in the United States from 1997 to 2015. Among them, 21% were people younger than 18 years.¹ In 2015, 16.9% of children had at least 1 visit to the ER, and among them, 69.2% were children living below the poverty line.¹ The ER is often an alternative site for primary care, even if there are reliable, accessible, and low-cost health services in their community.² Inappropriate use of the ER is not only costly,³ but also not ideally suited to act as a provider of preventive service such as immunization, medication refills, or health education.⁴

Health supervision and well-child visits are a core component of general pediatric care. In the pediatric population, adherence to health supervision appointments is particularly important as it is an opportunity for

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the physician to assess a child's developmental milestones, nutrition safety, and immunization administration, and to provide health education. Therefore, the American Academy of Pediatrics requires children to visit their primary care providers periodically to ensure healthy development.⁵ Furthermore, nonadherence to health supervision visits is associated with a variety of subsequent poor health outcomes, including increased health care costs,⁶ and hospitalizations.⁷

The purposes of this study were the following:

1. To describe the differences between users and nonusers of the ER in terms of caregiver's social demographics, household food and relocation, child age and comorbidity, and adherence to health supervision.
2. To determine the relative contribution of caregiver's social demographics, household food and relocation, child age and comorbidity, as well as adherence to health supervision as predictors of ER utilization.

Materials and Methods

Research Design

Retrospective cohort study.

Context

Brookdale Hospital Medical Center is a community hospital that serves Eastern Brooklyn, New York City, an area with high rates of poverty, crime, and substance use.⁸ There are 275 000 annual visits to outpatient clinics and 100 000 visits to the ER, where 30% of the population is 19 years and younger.⁹ There is a significant rate of missed pediatric health surveillance appointments in the ambulatory clinics. According to an electronic medical record (EMR) review, this was as high as 30%, 3 times higher than the rates observed in other communities.^{10,11}

This retrospective cohort study surveyed parents/guardians of patients who received routine medical care at 4 Brookdale Hospital Medical Center pediatric ambulatory clinics (from June 2017 to February 2018). Eligibility criteria were the following: (1) child(ren) aged 18 years or younger who were brought by parents/guardians to the clinics; (2) patients who self-reported to receive health care solely at Brookdale including health supervision services such as annual examination and immunization, as well as sick visits; and (3) English- or Spanish-speaking parents/guardians. Exclusion criteria were the following: (1) caregivers were not able to

complete questionnaire (eg, low literacy level, mental health, or language barrier) and (2) refused consent.

Two authors (QS and FC) approached the eligible participants in clinics during study period. Consenting participants were asked to fill out a paper questionnaire. For Spanish-speaking participants, FC translated the questions to the participant and transcribed the questionnaire.

This study was approved by Brookdale University Hospital and Medical Center's Institutional Review Board. Parents/guardians provided informed consent to participate in the study.

Sociodemographic Variables

Parents/guardians were asked to fill out a questionnaire that included sociodemographic factors: child's age (years), gender (boy vs girl), caregiver's age (years), country of birth United States of American (yes vs no), and single parent (yes vs no). Socioeconomic factors: caregiver's education level (high school or less), employment status (yes vs no), and household income (yearly before taxes and deduction).

Food Security and Relocation

Food insecurity status in the past 12 months was measured by 2 items from US Household Food Security Scale Module¹²: "Are you and other household members worried that food would run out before you got money to buy more?" and "Are you and other household members not able to afford to eat balanced meals?" Food insecurity was determined by both questions answered "often true" or "sometime true."^{13,14} Recent relocation was determined by whether the family moved within the past 12 months ("Did you move in the past 12 months?").

Nonadherence to Health Supervision Visits

Electronic medical records were reviewed, and nonadherence to health supervision visits was defined as having missed at least 1 American Academy of Pediatrics-recommended preventive pediatric health care appointment in the past 12 months.¹⁵

ER Visits

Emergency room visits were defined as an ER visit within the past 12 months to either at Brookdale's ER, obtained from our hospital's EMR, or a self-reported ER visit if the child visited the ER at another institution outside of our system. Given the distribution of ER visit,

Table 1. Demographic of Caregiver Sample (N = 268).

Variables	Total, N = 268, N (%)	ER visits, n = 85, n (%)	Non-ER visits, n = 183, n (%)	P
Child age (years), mean (SD)	7.61 (5.2)	6.36 (5.1)	8.19 (5.2)	.01*
Child gender, male	137 (51.1)	42 (49.4)	95 (51.9)	.70
Caregiver characteristics				
Born out of America	103 (38.4)	29 (34.1)	74 (40.4)	.42
Single parent	106 (39.6)	39 (45.9)	67 (36.6)	.15
Unemployed	116 (43.4)	33 (38.8)	83 (45.4)	.32
High school or less	179 (66.8)	54 (63.5)	125 (68.3)	.44
Household income less than \$20,000	150 (56.0)	56 (65.9)	94 (51.4)	.03*
Moved in past 12 months	44 (16.4)	14 (16.5)	30 (16.4)	.99
Food insecurity	89 (33.2)	28 (32.9)	61 (33.3)	.85
Comorbidity	132 (49.3)	47 (55.3)	85 (46.5)	.18
Missed supervision appointment	106 (39.6)	56 (65.9)	50 (27.3)	<.01*

*P < .05.

ER users were defined as those had visited the ER ≥ 1 time in the past 12 months, while non-ER users had not.

Comorbidity

Chronic medical conditions were identified through EMR defined by the International Classification of Diseases, Tenth Revision, on the most recent health supervision record. Examples of chronic medical conditions included in study were asthma, obesity, sickle cell disease, anemia, diabetes, attention deficit hyperactivity disorder, autism, seizure, hyper/hypothyroidism, constipation, and sexual transmitted diseases.

Statistical Analysis

Emergency room users versus nonusers were compared through Student's *t* test or χ^2 test, based on data type, with regard to social determinants of health, food security, recent relocation, comorbidity, and missed health supervision medical appointment. Multiple logistic regression analyses were used to examine the effects of nonadherence to health supervision visits on ER utilization when controlling for caregiver demographics (ie., employment status, level of education, birth place, single parent), household income, food insecurity, recent relocation, child age, and comorbidity as well as adherence to health supervision visit.

Sample Size Calculation

Using a rule of thumb, 5 to 10 persons per variable entered into regression models, and 11 predictors would require 110 participants. Therefore, our sample of 268 participants was sufficiently powered.

Results

Among 213 families with 268 children, 150 (56.0%) reported that their household income was less than \$20,000 annually. A total of 219 (81%) children were insured by Medicaid, and 132 (49.3%) had at least 1 pre-existing disease, the most common being asthma (25.3%) followed by obesity (14.9%). One hundred six (39.6%) missed at least 1 health supervision visit, and 85 (31.7%) had at least 1 ER visit within the past 12 months. Children who were ER users were younger (mean age 6.4 vs 8.2 years, $P < .01$), more likely to live in a low-income household (65.9% vs 51.4%, $P = .03$), and more likely to have missed health supervision appointments (65.9% vs 27.3%, $P < .01$; Table 1).

The multiple logistic regression analysis (Table 2) indicated that younger age (adjusted odds ratio [aOR] = 0.92, 95% confidence interval [CI] = 0.86-0.97, $P < .01$), household income less than \$20,000 (aOR = 1.86, 95% CI = 1.02-3.39), preexisting comorbidity (aOR = 2.36, 95% CI = 1.26-4.42), and nonadherence to health supervision visits (aOR = 5.83, 95% CI = 3.21-10.56) were associated with increased ER utilization, after adjusting for caregiver's birth place, whether single parent, level of education, employment status, food insecurity, and relocation.

Discussion

This study indicates that after considering age and pre-existing comorbidity, nonadherence to health supervision was a strong predictor of ER utilization, and that poverty was to a lesser extent an additional predictor.

We found that nearly one third of our participants received ER services in the past 12 months. This number is higher than the national study conducted in 2010, that

Table 2. Univariate and Multivariate Modeling of Predictors to ER Visit.

	Univariate (OR, 95% CI)	P	Multivariate (aOR, 95% CI)	P
Child age	0.93 (0.88-0.98)	.008*	0.92 (0.86, 0.97)	.007*
Child gender (male vs female)	0.91 (0.54-1.51)	.70		
Caregiver characteristics				
Born out of American	0.87 (0.51-1.48)	.60		
Single parent	1.47 (0.87-2.48)	.15	1.26 (0.70, 2.28)	.45
Unemployed	0.77 (0.45-1.29)	.32		
High school or less	0.81 (0.47-1.39)	.44		
Household income less than \$20,000	1.83 (1.07-3.12)	.03*	1.86 (1.02, 3.39)	.04*
Moved in past 12 months	1.01 (0.52-2.01)	.98		
Food insecurity	1.17 (0.70-1.96)	.56		
Comorbidity	1.43 (0.85-2.39)	.18	2.36 (1.26, 4.42)	.007*
Missed supervision appointment	5.14 (2.95-8.94)	<.01*	5.83 (3.21, 10.56)	<.001*

Abbreviations: ER, emergency room; OR, odds ratio; AOR, adjusted OR; CI, confidence interval.

*P < .05.

14% children living in the United States had an ER visit in the past 12 months.¹⁶ In communities where there is a lack of reliable and low-cost health care services, the ER is considered an alternative source of continuous primary care for low-income children and their families. This would explain an association between lack of attendance at health supervision visits, if families were substituting the use ER as a source of primary care. However, the reasons for this are not clear, since the ambulatory centers in community serving these families are well equipped to provide low-cost health services. Some centers offer evening and weekend hours, which are open to all the patients. Several studies have shown that frequent yet preventable visits to the ER can be a poor use of resources in an already overburdened system.^{17,18}

We also found that the children who are most at risk are those of younger age, from families with a household income of less than \$20,000, and with preexisting comorbidities. Other factors such as the child's gender, foreign-born parents, unemployment, less educated parents, recent relocation, and food insecurity were not associated with increased ER visits. It may be that those with less income have precarious work, more low-paying jobs, and less decision latitude for taking time off work, prompting them to use the ER for medical care to avoid compromising precarious work situations.¹⁹ Alternatively, issues like transportation costs might also be a factor.

Previous studies have found that children who live below the poverty line are prone to have poor health and chronic health conditions, which require more medical attention.²⁰ However, these children may not be able to access preventive care due to lack of transportation²¹ or inability of the parents to take time off if the scheduled medical appointment conflicts with their working hours.

Our study found that nonadherence to health supervision visit among children is associated with increased ER use. Health supervision visits serve as an opportunity to evaluate a child's growth, provide parental guidance, and administer immunizations when the child is healthy. Increased ER utilization may act as a proxy for increased nonadherence, as patients not established in primary care may wait to present until their disease progresses to a point where children require urgent or emergent evaluation. In a study evaluating the factors influencing the resident's primary care clinic no-show rates, Nguyen et al¹⁰ found that the high no-show rates hindered the providers' ability to deliver good continuity of care. Continuity of care provided by health supervision visits has been associated with improved outcomes for pediatric patients, especially those with chronic diseases.²² Similarly, in a study by Christakis et al,²³ it was found that decreased continuity of care was significantly associated with higher rates of ER visits and hospitalizations. These associations were stronger for children on Medicaid and asthma,²⁴ which is also consistent with our findings.

Previous studies that looked at specific comorbidities, such as asthma, have concluded that limited continuity of care and increased number of no-shows led to higher rates of ER use and hospitalizations due to asthma exacerbations and related complications.^{25,26} A plausible explanation for these findings is that decreased adherence to treatments translates to higher rates of exacerbations that require ER visits. Therefore, adherence to scheduled medical appointment(s) is particularly important as it is an opportunity for the physician not only to provide immunizations, but also to assess a child's pre-existing conditions, adherence to medications, and to provide health education. It also serves as an opportunity

to cement the connection with the family. Interventions dedicated to providing a strong continuity of care through health supervision visits and preventing missed medical appointments may reduce the frequency of ER visits. Technology-based reminders such as phone calls and text messages have proven effective in primary care and specialty clinics.²⁷ From the health systems perspective, one way to identify and work with families with poor continuity of care is to use health service data to identify patients with high numbers of missed medical appointments and ER visits. This would allow pediatric practices to focus interventions aimed at reducing barriers that lead to missed appointments to families at highest risk. In addition, this would serve as a tool for caregivers focused on reducing the number of missed appointments, while emphasizing the importance of health maintenance visits.

There are some limitations noted for this study. First, a self-administrated questionnaire was used, and the caregiver may not have provided accurate information such as ER visits at institutions other than Brookdale. In addition, the reason for the ER visits (ie, high-acuity vs low-acuity ER visit) was not analyzed in this study. Moreover, this is a convenience sample that leads to unavoidable selection bias. Nevertheless, in the study, we evaluated the ER utilization and the factors associated with it in an underserved area in New York. Providers may use the results of this study to manage patients with preexisting comorbidities with more targeted guidance, educating caregivers about the potentially detrimental consequences of missing their child's health supervision visits. Working with caregivers to offer health supervision visits at times convenient to the family may reduce the number of missed visits.

Conclusion

Low income and nonadherence to health supervision visits are risk factors that increase ER utilization. Providing low-cost, reliable, and accessible continuity of care for children living in poverty, providing appointment reminders, and educating families on the importance of health maintenance visits may optimize health outcomes while decreasing the rates of ER visits. Improved understanding of barriers to adherence to health supervision visits as well as alternative mechanisms for providing these visits might reduce inappropriate utilization of the ER.

Author Contributions

QS conceived of research idea and designed the study. QS acquired the data, and conducted the analysis. FC was involved in acquisition of the data. QS drafted the first version of manuscript. JCM, KV, and FK revised the manuscript critically for important intellectual content. All authors approved the final version of the manuscript.

Declaration of Conflicting Interests

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