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Concentration of Hospital Care for Acute Sickle Cell Disease-related Visits

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Abstract

Background—Sickle cell disease (SCD) is characterized by frequent disease-related events that require acute care. It is unknown to what extent patients utilize multiple hospitals for acute care. We examined the continuity pattern of acute care visits to the hospital or emergency department. We hypothesized that among patients with multiple SCD related acute care visits, children experience more concentrated hospital care than adults and privately insured patients experience more concentrated hospital care than publically insured patients.

Procedure—We conducted a retrospective cohort study using data from the 2005 and 2006 Healthcare Cost and Utilization Project State Inpatient Databases and State Emergency Department Databases. Subjects included patients with SCD 1 year of age. The primary outcome was proportion of patients with multiple acute care visits to a single hospital.

Results—A total of 13,533 patients made 2 acute SCD-related visits. Of the 5,030 children, 77.3% went to the same hospital for all visits. In contrast, of the 8,503 adults, only 51.3% visited the same hospital. Adolescents were more likely than adults to go to one hospital (adjusted relative risk (ARR) 1.40, confidence interval (CI) 1.35–1.45). Those with public insurance and the uninsured had a decreased probability of using one hospital (ARR 0.96, CI 0.94–0.99 and ARR 0.83, CI 0.79–0.88 respectively).

Conclusions—Adults and patients with public insurance or no insurance are more likely to use multiple hospitals for acute care. By receiving acute care at multiple hospitals, patients with SCD experience dispersed and fragmented care potentially leading to decreased care quality.

Keywords

access to care; continuity of care; minority health; utilization

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Conflict of Interest Statement

The authors have no conflicts to disclose. The views expressed in this article are those of the authors and do not necessarily represent those of the Agency for Healthcare Research and Quality or the US Department of Health and Human Services.

Introduction

Patients being treated at multiple hospitals by multiple clinicians may lead to missed diagnoses, inappropriate treatments, and increased difficulty managing acute episodes. For patients with a chronic disease this is especially problematic. Patients with sickle cell disease experience frequent and unexpected acute disease-related complications that often result in multiple emergency department visits and inpatient hospitalizations.(1) Not all of these visits may occur at the same health care facility, potentially reducing the quality of care a patient receives for a single episode and the overall quality of the patient's health care. However, little is known about how frequently patients with sickle cell disease use multiple hospitals.

Care that is concentrated at one hospital provides one measure of continuity at the site level. Concentrated ambulatory care is a marker of quality care and is associated with better care coordination, increased communication and compliance, increased patient satisfaction, better preventive care rates, and decreased utilization of emergency departments and hospitals resulting in lower overall costs of care.(2, 3) Whether concentrated hospital care also results in these same outcomes is not known. Current medical home and comprehensive care models implicitly assume that care received at the same site enhances the management and coordination of chronic conditions through better communication about patient history and treatments.(4–6)

It is not known how patients with a chronic disease, such as sickle cell disease, who require frequent and repeated acute care services in the emergency department or as an inpatient, concentrate their acute care at the hospital level. The objective of this study was to examine the concentration of hospital care for acute sickle cell disease-related visits. In addition, we studied the association between age and expected payer and the concentration of hospital care in patients with multiple acute sickle cell disease-related visits. We hypothesized that among patients with multiple sickle cell disease-related acute care visits, children experience more concentrated hospital care than adults and privately insured patients experience more concentrated hospital care than publically insured patients.

Methods

Study Design

We conducted a retrospective cohort study of sickle cell disease patients with at least one acute care visit for a sickle cell disease-related diagnosis in 2005 or 2006. As described elsewhere(1), data for this study were obtained from the Agency for Healthcare Research and Quality-sponsored Healthcare Cost and Utilization Project (HCUP).(7, 8) The 2005 and 2006 State Inpatient Database (SID) and State Emergency Department Databases (SEDD) were used to obtain information on all hospitalizations and treat-and-release emergency department visits at short-term, acute care, non-Federal, community hospitals over the complete two year time period.

Patient Selection

In order to track the acute sickle cell disease-related visits in patients, data from the eight States (AZ, CA, FL, MA, MO, NY, SC, and TN) that include an encrypted identifier and have at least 10 patients with sickle cell disease within each age and insurance type were utilized. These eight states represent 33% of the United States sickle cell disease population. (1, 9) Details on record extraction, linking records and patient selection are detailed in a prior publication.(1) Only sickle cell disease-related encounters for patients one year old or greater were included due to the inability to reliably link records for those under one year of

age. Emergency department visits resulting in transfer were recorded as an acute care visit for the initial emergency department site.

Measures

The primary outcome was the concentration of hospital care for patients with multiple acute sickle cell disease-related visits. Concentration of hospital care was defined as the probability of having a single site of acute care (versus multiple sites of care), where site is defined as the hospital. Acute sickle cell disease-related visits were defined as inpatient hospital stays and treat-and-release emergency department visits (1) classified as sickle cell disease-related using the methodology described prior.

Our primary covariates of interest were age and primary expected payer. Age of the patient was based on the first visit. Primary expected payer was assigned based on the primary payer for the majority of visits. Patients were assigned to one of four categories: public payer (Medicare or Medicaid), private, other or unknown, or uninsured (self pay or no charge).

Secondary covariates of interest included number of visits, gender, rurality of the patient's county code of residence, and state of residence and care. The number of visits was classified as: 1) single versus multiple visits; 2) nine groups including 1 visit, 2 visits, 3 visits, 4 visits, 5 visits, 6 visits, 7–8 visits, 9–12 visits and > 12 visits. Rurality was based on the patient's zip code at the time of the first visit. Using a modified version of the 2003 Urban Influence Codes, patients were classified as being from an urban (large metropolitan, small metropolitan or micropolitan which is defined as urban areas with 10,000 to 49,000 residents) or rural (noncore)(10) area.

Statistical Analysis

To determine the overall pattern of acute sickle cell disease-related visits, we performed bivariate analyses examining the characteristics of patients with single versus multiple sickle cell disease acute care visits using chi-square tests. For patients with multiple visits, we examined characteristics associated with having gone to a single hospital versus multiple hospitals. We then examined the bivariate relationship between the distribution of patients who went to one hospital and the number of acute care visits (classified by nine groups), by age and primary expected payer, focusing first on all acute care visits followed by an analysis of inpatient visits. We performed the inpatient only analysis separately because concentration of hospital care on the inpatient unit is perhaps more important than continuity between acute care visits that did not result in inpatient hospitalization. By definition, these visits are more severe and transfers to an inpatient unit where the patient is known may be possible.

To control for potential confounders, we derived two multivariable models to examine the association between the concentration of hospital care and patient characteristics (age, categorized into one of six groups: 1–9 years, 10–17 years, 18–30 years, 31–45 years, 46–64 years, or ≥ 65 years, and expected primary payer), among patients with two or more acute care visits. Given the high prevalence of the outcome of multiple hospitals, two models were derived using a modified Poisson regression (11) to determine the association between the proportion of patients with acute care visits to one hospital (versus more than one hospital) and age and primary expected payer, controlling for gender, rurality of residence, state of residence and a continuous measure of number of visits.(12–15) The first model focused on all acute care visits, and the second on inpatient visits only.

There were 468 persons removed from the regression analyses with other/unknown payer status. In addition, less than 10 additional persons were dropped from the model due to missing urban designation.

This study (and waiver of consent) was approved by the Medical College of Wisconsin/Children's Hospital of Wisconsin Institutional Review Board. The analyses were conducted using the Base and STAT software of SAS system for Windows, version 9.2 Copyright 2002–2008, SAS Institute Inc., Cary, NC, USA.

Results

Study Population

There were 21,118 patients with sickle cell disease who had one or more acute care sickle cell disease-related visits in the two year study period. Approximately 37% of patients were children, ages 1–17 years; 30% were 18–30 year olds. Approximately 85% of patients had insurance with the majority publicly insured (59.7%); 11.3% had no insurance. The majority of patients (94.2%) resided in an urban county. Of all acute care visits, approximately 75% were for a pain episode.

There were 13,533 patients (64.1%) (Table I) in the study population who made two or more acute care visits during the two year study period and were thus eligible for care at multiple hospitals. The majority of these patients had public insurance (65.7%) and many were young adults ages 18–30 years (32.7%). For the subgroup of patients who made just two visits but at different sites (n=3,583), 39.3% went to two different academic facilities and 18.3% went to two different non-academic facilities; the remainder went to one academic and one non-academic facility. Overall, 61% of patients with more than one visit were seen at a single hospital.

Age, Primary Expected Payer and Proportion of Patients with Acute Care Visits to One Hospital

Of the 5,030 children (ages 1–17 years) with multiple visits, 3,888 (77.3%) went to the same hospital for all their acute care (Table I). In contrast, only 4,361 (51.3%) of the 8,503 adults with multiple visits sought all acute care at the same hospital.

The proportion of children and adults with sickle cell disease who went to one hospital for all their acute care decreased as the number of visits that patients made increased. As Figures 1a and 1b illustrate, of those children who had two visits, 85.1% went to one hospital compared to 73.3 % of adults (Figure 1b). Among those with four acute care visits, over three-quarters (75.3%) of children had all visits to one hospital compared to slightly more than half (54.6%) of adults.

Proportion of patients who went to one hospital evaluated by primary expected payer and age—When the proportion of patients who went to one hospital was evaluated by primary expected payer and stratified by age, the uninsured were consistently less likely to have made all visits to one hospital compared to patients with private insurance (Figures 1a and 1b). Of adults with two acute care visits, 66.8% of those without insurance went to one hospital compared to 75.6% with private insurance and 74.2% with public insurance. Of children with two acute care visits, 69.4% of those without insurance went to one hospital compared to 80.9% with private insurance and 77.7% with public insurance. When examining adults with four acute care visits, 41.2% of those without insurance went to one hospital for acute care compared to 56.4% with private insurance and 56.5% with public insurance. Among children with four acute care visits, 54.5% of those

without insurance went to one hospital compared to 78.7% with private insurance and 75.2% with public insurance.

Inpatient Hospitalizations—Restricting the analysis to inpatient hospitalizations (Figure 2), the age disparity in the proportion of patients who went to the same hospital became more pronounced. Approximately 90% of children with two hospitalizations went to one hospital compared to 75.5% of adults. Of patients with four hospitalizations, 82.6% of the children went to the same hospital for each inpatient stay compared to 58.1% of adults. For each number of hospitalizations, the percentage of children hospitalized at the same hospital was consistently higher than the percentage of adults.

Independent Effect of Age and Primary Expected Payer on Concentration of Hospital Care

In the multivariable regression model (Table II), the association between age and primary expected payer and the probability of all acute care at one hospital was statistically significant after adjusting for other covariates (visit count, gender, state of residence, area of residence). Younger age increased the probability of going to one hospital for all sickle cell disease-related acute care visits (adjusted relative risk (ARR): 1–9 years 1.39, 10–17 years 1.40) while having public insurance (ARR 0.96) or being uninsured (ARR 0.83) decreased the probability of going to one hospital. When restricted to inpatient visits only, the findings persisted (ARR age: 1–9 years 1.39, 10–17 years 1.42 and ARR expected payer: public insurance 0.96 and uninsured 0.87).

Discussion

The concentration of hospital care is inherently important in our current healthcare system since patients and their medical histories are unique to each system or hospital. In addition, there is further fragmentation of care at the physician level for individuals who require inpatient hospitalizations given the more recent use of a hospitalists' system of care. For patients with sickle cell disease, a chronic illness which is characterized by frequent and recurrent complications that lead to emergency department visits and hospitalizations, this health care system is even more problematic.(1, 16) Our findings show that adults with sickle cell disease are more likely than children to go to multiple hospitals for acute care. This resultant lower concentration of hospital care for adults likely contributes to less coordinated care and lower quality care given the systems' fragmentation. In addition, we also found that lack of insurance is strongly associated with receiving acute care at multiple hospitals. Of note, while publicly insured patients receive acute care at more hospitals than privately insured, uninsured patients are much more likely to experience care at multiple hospitals.

There are no prior studies examining the number of hospitals a patient with a chronic disease utilizes for acute care. Sickle cell disease is unique in that most patients are expected to require an emergency department visit and hospitalization for an acute event in their lifetime and many will have numerous visits.(1, 17) Our findings demonstrate that adults are more likely to receive their acute sickle cell disease care from multiple hospitals than children. The reasons for the decreased concentration of care within the adult population are not known and cannot be directly determined from the data. However, the finding may in part be explained by a lack of subspecialists (18) or other knowledgeable clinicians to provide care for the adult sickle cell disease population.(19, 20) Patients with chronic, debilitating conditions, such as sickle cell disease, express greater satisfaction when healthcare providers, including nurses, have sickle cell disease expertise.(21) Adult patients might recognize a lack of expertise at a given hospital or have a negative experience(22) and therefore seek care at different hospitals. A lack of expertise in sickle cell disease may also

contribute to an erosion of trust. Recently, in a study focusing on patient's trust in clinicians, adult patients with sickle cell disease who had more frequent hospitalizations for pain had lower trust,(23) an integral part of quality of care.(24) In addition, a pediatric hospital system may, in and of itself, promote concentrated care since there are pediatric hematologists available to care for these patients. Furthermore, pediatric hospital systems that tend to focus on patient and family-centered care providing services such as child life and game rooms which may make it difficult to transition to adult hospitals. Lastly, community hospitals may be unlikely to admit a pediatric sub- specialty patient.

Our study team recently found that those patients with sickle cell disease aged 18–30 years and those with public insurance as the primary expected payer had the highest rate of utilization for acute care.(1) In addition, our prior work showed those who were uninsured had similar rates of utilization to those with private insurance. In our current study, not only did patients who were 18–30 years old have the highest utilization, over one-third had multiple visits to multiple hospitals. The 18–30 year old patients are also the group that experience a transition in care as they become young adults.(25) It is well known that this transition time is problematic for patients with a chronic disease for many reasons, some of which are systems-related issues.(26) This transition most certainly affects the concentration of their acute sickle cell disease-related hospital care which may be quite fragmented.(19, 27, 28) Although prior work demonstrates the need for transition from pediatric to adult programs for patients with sickle cell disease,(25) prior to our study, no data existed on how many different hospitals patients with sickle cell disease utilize for their emergency department and inpatient care, a critical finding to inform transition programs.

Furthermore, we demonstrate that the uninsured are less likely to receive their acute care at a single hospital compared to those with insurance; suggesting they are at increased risk for worse quality of care given the inherent lack of continuity across multiple hospitals. Patients who were uninsured may have limited access to healthcare that contributes to lower continuity of care.(29) We did not find any improvement in the concentration of hospital care when we examined only inpatient hospitalizations. There are no data available in other chronic disease populations to compare these results.

Research suggests that at least half of the adults with sickle cell disease do not receive their comprehensive care from specialized centers.(30) In addition, the adults who receive their care from non-specialized centers are less satisfied than the adults who receive care at specialized sickle cell disease centers. (30) There has been recognition of the shortage of adult benign hematology physicians and this may contribute to the dispersion of care.(18, 20, 31) Regardless of the type of physician available, adolescents with sickle cell disease are most concerned that they receive care where there are experienced physicians.(32) It is possible that patients with sickle cell disease seek acute care at more than one site due to these reasons although there are likely many factors that play a part.

This study is limited by having only two continuous years of patient data to follow acute care utilization. In addition, we did not have data on utilization patterns for outpatient sickle cell disease-related care. However, our goal was to focus on emergency department visits and hospitalizations and our population based datasets allow us to track visits to all emergency departments and inpatients units across a state. As with any administrative data, there is potential for misclassification of sickle cell disease-related diagnoses. However, the HCUP data are known to be accurate, highly tested and a reliable source to estimate utilization patterns. Furthermore, this study does not account for the common practice of hospitalists managing adults and this practice of inpatient care adds another layer of fragmentation of care but at the physician level. In addition, it is possible that the providers for a practice group admit their patients to several different hospitals. Thus, patients with

sickle cell disease could frequent these different hospitals and receive care by the same provider. However, their care is still fragmented and dispersed at the hospital level given the current lack of shared medical records and key staff such as nurses within each hospital system. Lastly, our study did not have the ability to detect the impact of fragmented care on the care these patients receive.

In conclusion, for those with sickle cell disease, adults and patients with public insurance or no insurance utilize multiple hospitals for their acute care. Further study is essential to understand the impact of this dispersion of care on outcomes and quality of care for patients with sickle cell disease. Ultimately, improvement in the concentration of hospital care for patients with sickle cell disease may lead to less fragmented care and improved care quality.

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Figure 1.

Figure 2.

Table I

Characteristics of Patients with Multiple Acute Care Visits for Sickle Cell Disease in Eight States, 2005–2006.

	Multi-visit*		P value
	Multiple Hospitals N=5,284 (%)	Single Hospital N=8,249 (%)	
Patient Characteristics			
Age (years)			P 0.001
1–9	547 (10.4)	2,117 (25.7)	
10–17	595 (11.3)	1,771 (21.5)	
18–30	2,298 (43.5)	2,122 (25.7)	
31–45	1,332 (25.2)	1,503 (18.2)	
46–64	476 (9.0)	671 (8.1)	
65+	36(0.7)	65 (0.8)	
Primary Expected Payer			P 0.001
Public	3,652 (69.1)	5,243 (63.6)	
Private	953 (18.0)	2,074 (25.1)	
Uninsured	516 (9.8)	627 (7.6)	
Other/Unknown	163 (3.5)	305 (3.7)	
Gender†			P 0.001
Female	2,933 (55.5)	4,207 (51.0)	
Male	2,188 (41.4)	3,737 (45.3)	
Urban/Rural by Zip Code of Residence**			P 0.001
Urban	4,977 (94.2)	7,817 (94.8)	
Rural	144 (2.7)	122 (1.5)	

* Multi-visits represents patients who made more than one visit for an acute sickle cell-related diagnoses over the two year study period;

** some data missing

Modified Poisson Regression Model: Effect of Age and Primary Expected Payer on Proportion of Patients with Sickle Cell Disease Who Go to One Hospital for Acute Care

Table II

Variable	All Visits [*]	
	Adjusted Risk Ratio ^{**}	95% Wald Confidence Limits
Age		
Age 1–9	1.39	1.34 1.44
Age 10–17	1.40	1.35 1.45
Age 31–45	1.05	1.01 1.10
Age 46 >	1.11	1.05 1.17
Age 18–30 (referent)	---	---
Primary Expected Payer		
Public	0.96	0.94 0.99
Uninsured	0.83	0.79 0.88
Private (referent)	---	---

^{*} All visits include both inpatient hospitalization and treat and release emergency department visits;

^{**} model adjusted for gender, rurality of patient’s residence, State, and visit count