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Age, Gender, Health Insurance, and Race Associated with Increased Rate of Emergent Pediatric Gastrointestinal Procedures

Ashley Andrews, MPH¹, Linda Franklin, LPN¹, Natasha Rush, MHA¹, Robin Witts, MSW, CPRP¹, David Blanco, MD^{1,2}, and Harpreet Pall, MD^{1,2}

¹Section of Gastroenterology, Hepatology, and Nutrition, St. Christopher's Hospital for Children, Philadelphia, PA, United States

²Department of Pediatrics, Drexel University College of Medicine, Philadelphia, PA, United States

Abstract

Objectives—Few studies have examined the role health disparities play in pediatric gastrointestinal (GI) procedures. We hypothesized that health disparity factors affect whether patients undergo an emergent vs. non-emergent GI procedure. The aims were to characterize the existing pediatric population undergoing GI procedures at our institution and assess specific risk factors associated with emergent vs. non-emergent care.

Methods—We retrospectively reviewed the medical records of 2,110 patients undergoing GI procedures from January 2012–December 2014. Emergent procedures were performed on an urgent inpatient basis. All other procedures were considered non-emergent. Health disparity factors analyzed included age, gender, insurance type, race, and language. Logistic regression analysis identified the odds of undergoing emergent procedures for each factor.

Results—Most study patients were male (58.2%), primarily insured by Medicaid (63.8%), Caucasian (44.0%), and spoke English (91.7%). 10% of all patients had an emergent procedure. Logistic regression analysis showed significant odds ratios [OR, p-value] for ages 18+ years [2.16, 0.003], females [0.62, 0.001], commercial insurance users [0.49, <0.0001], African Americans [1.94, <0.0001] and other race [1.72, 0.039].

Corresponding Author: Harpreet Pall, M.D., St. Christopher's Hospital for Children, 160 East Erie Avenue, Philadelphia, PA 19134, Tel: (215) 427-6781, Fax: (215) 427-6782, Harpreet.pall@drexelmed.edu.

Author Contributions

Ashley Andrews conceptualized and designed the study, analyzed the data, drafted the initial manuscript, reviewed and revised the manuscript and approved the final manuscript as submitted.

Linda Franklin conceptualized and designed the study, analyzed the data, reviewed and revised the manuscript and approved the final manuscript as submitted.

Natasha Rush conceptualized and designed the study, analyzed the data, reviewed and revised the manuscript and approved the final manuscript as submitted.

Robin Witts conceptualized and designed the study, reviewed and revised the manuscript and approved the final manuscript as submitted.

David Blanco conceptualized and designed the study, reviewed and revised the manuscript and approved the final manuscript as submitted.

Harpreet Pall conceptualized and designed the study, coordinated and supervised data collection, critically reviewed and revised the manuscript and approved the final manuscript as submitted.

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Conclusion—Health disparities in age, gender, insurance, and race appear to exist in this pediatric population undergoing GI procedures. Patients 18+ years of age, African Americans, and other races were significantly more likely to have an emergent procedure. Females and commercial insurance users were significantly less likely to have an emergent procedure. More research is necessary to understand why these relationships exist and how to establish appropriate interventions.

Keywords

pediatric gastroenterology; health disparities; emergent procedures

Introduction

In general, emergent procedures and surgeries are less desirable for hospitals. In part, improved quality is associated with decreased cost of inpatient procedures [1]. Improved access to timely primary care has been shown to decrease the need for emergent services [2]. In a study to lower the rate of pediatric hospitalizations in Maryland, patients were assigned a primary care physician who authorized all emergency department visits. The intervention resulted in an increased use of primary care practices and decreased pediatric hospitalization rates [2]. Reducing the number of emergent admissions for gastrointestinal (GI) conditions also decreases the cost of healthcare [3]. A study on the annual costs for care in pediatric patients with irritable bowel syndrome and functional abdominal pain found the annual cost for a hospital admission was roughly 2.6 times the annual cost for pediatric gastroenterology outpatient visits [3]. In order to reduce the rate of inpatient procedures, it is important to understand the factors influencing the likelihood of emergency department utilization.

Insufficient literature exists regarding the influence of health disparities on emergent vs. non-emergent procedures in pediatric gastroenterology. Most of the literature on pediatric outpatient and inpatient care focuses on the cost and utilization rates for specific gastrointestinal conditions. Functional gastrointestinal disorders (FGID) such as constipation, functional dyspepsia, and abdominal migraine are amongst the most common outpatient diagnoses in pediatric gastroenterology. However, results from one study discovered that inpatient costs for FGID have increased slightly between 1997–2009, with the average cost per hospitalization increasing roughly \$12,000 over this 12-year period [4]. Although it is necessary to understand inpatient and outpatient health care costs over time, it is equally important to appreciate the factors influencing an individual to utilize inpatient care. Our study seeks to add to the body of knowledge by examining trends in emergent vs. non-emergent GI procedures at an urban pediatric hospital. We hypothesized that health disparity measures such as age, gender, insurance type, race and language play an important role in determining whether patients receive an emergent vs. non-emergent GI procedure. Identifying and designing interventions for specific health disparities that predispose patients to emergent procedures may help improve timely care and possibly reduce health care costs.

Methods

The Institutional Review Board at Drexel University College of Medicine approved this study. The study was conducted at St. Christopher's Hospital for Children, an academic pediatric hospital in Philadelphia, PA, USA. We examined the impact of key health disparity factors on emergent vs. non-emergent pediatric GI procedures. Emergent procedures were defined as any inpatient GI procedure performed in an urgent manner through non-elective inpatient care. For example, patients admitted for upper endoscopy for bleeding control were classified as emergent. The decision to undergo an emergent procedure was determined at the hospital rather than at the outpatient clinic. We assume here that all non-elective inpatient procedures could have been prevented with timely access to care. Non-emergent procedures were defined as any GI procedure performed in elective manner through outpatient scheduling. An example of a non-emergent procedure is a colonoscopy with polyp removal in the outpatient setting. All emergent procedures occurred in the inpatient setting. Non-emergent procedures included all outpatient procedures as well as electively scheduled inpatient procedures. Patients seen in the clinic but electively scheduled for an inpatient procedure were classified as undergoing a non-emergent procedure.

We retrospectively reviewed the electronic medical records (EMR) of 2,110 patients undergoing GI procedures at our institution from January 2012–December 2014. Data was collected from the hospital's billing database and individual chart reviews. All procedures were based on physician coding (CPT code). We excluded patients who were seen for procedures deemed non-emergent such as pH impedance probe, pH probe, PEG placement, esophageal manometry, and anorectal manometry (n= 117). Other than this exclusion criteria, patients were included if results for all variables were available.

After examining current literature and considering variables that directly impact our hospital, we chose to examine five health disparity factors: age, gender, insurance type, race, and language. All information was extracted from a retrospective review of billing and patient charts. Age was classified into four distinct groups: 0–5 years, 6–11 years, 12–17 years and 18+ years. Each age group was determined based on a combination of age distribution and biological points (e.g. early childhood, middle childhood, adolescence, young adulthood). Gender consisted of males or females. Insurance type had two groups: Medicaid or commercial insurance. Only one patient was uninsured and was excluded from the analysis. Race had four groups: Caucasian, African American, Hispanic, and other. The EMR used by our hospital classifies Hispanic as both a race and an ethnicity. For the purposes of this evaluation we will consider Hispanic as a race rather than an ethnicity. Primary language for parent had three groups: English, Spanish, or other.

Data Analysis

Stata SE version 14.0 (College Station, TX) was used to analyze the odds of having an emergent procedure for each variable in a logistic regression analysis. The logistic regression was used to analyze the odds of undergoing an emergent procedure when holding age, gender, health insurance, race and language constant. To run a logistic regression model all variables must be nominal and all categorical variables must have a 0/1-coding scheme for each variable outcome (i.e. African American, Hispanic, Asian) where the most

occurrences are considered the baseline (Males, primarily insured by Medicaid, Caucasians, and English speakers). For the logistic regression we compared all variable outcomes to the most common occurrence. This model assumes the log odds of age, gender, health insurance, race and language are linearly associated with emergent procedures. It also assumes that the model is neither over- nor under-fitted. To assure all assumptions were true, categorical variables were recoded as individual outcome variables with 1 if satisfied and 0 if not. A sixth variable, Department of Human Services (DHS) status, was recorded but only two patients were classified as being under DHS care. This variable was dropped and removed from the model. Observations with missing values were completely dropped from review (n =160).

Results

Table 1 describes the demographics of the study population, non-emergent and emergent procedure groups. Of the 2,110 patients, 221 (10.5%) underwent an emergent procedure. The overall study population was most commonly between the ages of 12 and 17 years (49.2%), male (52.5%), had Medicaid insurance (63.8%), was Caucasian (44.0%), and spoke English (91.7%). Compared to the non-emergent and overall populations, the emergent procedure population had a higher percentage of patients who were between the ages of 0–5 years, older than 18 years, male, primarily insured by Medicaid, African American and Spanish speaking.

Table 2 describes the procedure distribution of the entire study population, non-emergent and emergent procedure groups. A total of six procedure types composed the entire study population. The most common procedure was upper endoscopy with 1,398 patients (66.3% of procedures). The second most common procedure was colonoscopy with 611 patients (29.0% of procedures). All procedures were seen in the emergent and non-emergent populations.

Our logistic regression showed statistical significance ($p < 0.05$) [OR for emergent procedure, p-value, 95% CI] for ages 18+ years [2.16, 0.003, 1.30– 3.59], females [0.62, 0.001, 0.46 – 0.83], commercial insurance users [0.49, <0.0001, 0.34–0.72], African Americans [1.94, <0.0001, 1.32 –2.85] and other races [1.72, 0.039, 1.03–3.89].

Table 3 shows the odds of undergoing an emergent procedure for each variable outcome. Language was the only variable without a significant relationship with emergent procedures. Age and race variables increased the likelihood of having an emergent procedure. With an odds ratio of 2.16, patients over the age of 18 years had the highest risk of undergoing an emergent procedure compared to patients 12–17 years old. Females were 38% less likely to have an emergent procedure compared to their male counterparts. Patients with commercial insurance were 51% less likely to have an emergent procedure compared to patients with Medicaid. Language was not statistically significant. All races other than Caucasian had an increased risk of undergoing an emergent procedure (OR= 1.72). With a statistically significant odds ratio of 1.94, African American patients had the highest risk of emergent procedures.

Discussion

Our study population consisted of roughly 90% non-emergent procedures and 10% emergent GI procedures. This is consistent with a previous report from the Pediatric Endoscopy Database System - Clinical Outcomes Research Initiative (PEDS-CORI) showing 85% of gastrointestinal procedures are delivered as outpatient procedures [5]. Procedures typically done in a non-scheduled emergent manner included upper endoscopies, capsule endoscopies and colonoscopies. Most types of procedures were also performed on a non-emergent basis. The data did not provide ICD-10 diagnosis codes so we could not determine validity of the emergent nature.

Our study found significant utilization of emergent procedures in different age, gender, insurance and race groups. In our study we saw a 116% increased risk of emergent procedures in the age 18+ years compared to patients between 12–17 years. These findings are congruent with a study that examined upper GI endoscopy in a pediatric population [6]. The patients with the most upper GI endoscopy procedures were between the ages of 0–5 and 10–15 years- the study's youngest and oldest age groups. Further research is needed to understand why these age groups have higher rates of emergent procedures. It may be that older patients have a number of comorbid diseases, including developmental delay.

Unlike our study, previous research has not shown gender differences between gastrointestinal procedures. As of 2005, PEDS-CORI found no statistically significant variation between male and female endoscopy rates in either pediatric or adult populations [5]. Our study found female patients were 38% less likely to have an emergent procedure compared to male patients. It is not clear why gender had a protective effect for females in this study. Although gender appeared to be related to emergent procedures in our study, future prevention models should be catered to both genders.

In contrast to gender, race is typically associated with differences in emergency care. Our study found African American patients had a 94% increased risk of undergoing an emergent GI procedure compared to Caucasian patients. This finding is consistent with previous research findings. Pippins et al. showed an increase in admittance rates for gastrointestinal bleeding in African American patients compared to Caucasian patients [7]. As shown in Table 1, we only saw one patient for gastrointestinal bleeding control, but if we had more cases we may have expected to see a higher rate of African American patients compared to Caucasian patients. Another study found worse overall health communication with minority patients compared to Caucasian patients [8]. In this study, communication was examined using a health survey that asked patients to rank their communication experiences with nurses, doctors, and pharmacists. Health literacy and communication was found to be vital for maintaining health outside the clinic and preventing unnecessary emergency admissions [8]. Patient-doctor communication and educational materials are important components of health communication but they must also be culturally competent to reduce racial and ethnic disparities.

Insurance can influence whether patients access care in a timely manner. Our results showed that patients with commercial insurance were 51% less likely to undergo an emergent

procedure compared to patients with Medicaid insurance. This may be related to patients with commercial insurance possibly having more diverse preventative strategies. For example, high deductible health plans may discourage families from accessing unnecessary emergency care [9]. Medicaid insurance may not innately deter families from using the hospital's emergency department vs. a primary care physician.

Another common barrier to receiving timely care is language. A recent study showed language might have a role in health disparities [10]. Patients who required an interpreter were more likely to have an inpatient procedure compared to patients who spoke English. Although we did not find a relationship between language and emergent care, it is important that we consider language in future interventions.

As shown in Table 2, all analyzed procedures were seen in both the emergent and non-emergent populations. Upper endoscopies and colonoscopies were, on average, more prevalent in the non-emergent population than in the emergent population. In contrast, sigmoidoscopies, capsule endoscopies, and liver biopsies were more prevalent in the emergent population compared to the non-emergent population. Sigmoidoscopies and capsule endoscopies occurred at a rate of 3.5 and 2.5 in the emergent population compared to the non-emergent population, respectively. We need to better understand what factors influence this difference.

There are several limitations to our study. An overall limitation is the retrospective design. This was a retrospective chart review using all patients from 2012–2014 at a single tertiary health center. The use of only one hospital also lacks generalizability. Our methodology fails to determine if an inpatient procedure is truly emergent or not. We excluded a small proportion of procedures from our analysis because we knew they were not typically emergent procedures. The only way to determine the state of emergency for each patient is to compare each procedure code with his or her diagnosis codes. We did not have access to this data and therefore are unable to prove that the emergent population underwent procedures were truly medically emergent.

Another limitation was our choice in health disparity variables. We chose to examine five variables. However, there may also be additional variables we did not examine including presence of disability, rural vs. urban location, and socioeconomic status. Each variable used in this study has its own limitations. One limitation is the small proportion of patients who spoke a language other than English or Spanish (1.3%). This small proportion, paired with a large number of English speaking patients, may obscure a true relationship between language and emergent care that our study failed to detect. Also, since this is a pediatric hospital, the language variable describes the language of the parent rather than the patient. There are cases where a patient is bilingual and fluent in English, but their parents speak a language that requires translational services. Age cutoff points were arbitrarily decided based on distribution and overall developmental stages. In our EMR system, Hispanic defines both a race and an ethnicity. Federal policy defines Hispanic as an ethnicity and not a racial group. We also used physician coding to classify the type of procedures, which may not always reflect the therapeutic interventions performed.

Conclusion

Our study appeared to show associations between emergent GI procedures and health disparities including age, gender, insurance type, and race. These have not been described previously. Patients are more likely to have an emergent procedure if they are 18+ years old, are African American, or are of a race other than Caucasian, African American, or Hispanic. Patients are less likely to have an emergent procedure if they are female or have commercial insurance. Future studies may explore additional health disparity factors such as household status (i.e. single parent household, two parent household) and parental health literacy indicators. Including ICD-10 diagnosis codes in addition to procedure type may lead to a better understanding of which procedures are deemed truly emergent. Designing and implementing interventions to ensure patients receive the appropriate care in the right setting should be an achievable goal.

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What Is Known

- In general, it is more cost effective for patients to access healthcare in an elective manner rather than in an emergent crisis.
- Timely access to primary care and specialist physicians decreases the need for emergent services.

What Is New

- Key health disparity factors drive the need for emergent care in an urban pediatric gastroenterology population.
- Older ages (18+ years) and African American race appear to increase the likelihood of emergent gastroenterology procedures.
- Female gender and commercial insurance appear to decrease the likelihood of emergent gastroenterology procedures.

Table 1

Patient Demographics (n= 2,110)

	Emergent Procedure Population Demographics n(%)	Non-Emergent Procedure Population Demographics n(%)	Overall Population Demographics n(%)
Total	221(10.5)	1,889(89.5)	2,110(100)
Age	0–5 years 48(21.7) 6– 11 years 44(19.9) 12– 17 years 105(47.5) 18+ years 24(10.9)	0–5 years 330(17.5) 6– 11 years 533(28.2) 12– 17 years 935 (49.5) 18+ years 91(4.8)	0–5 years 380(18.0) 6– 11 years 577(27.3) 12– 17 years 1,040(49.2) 18+ years 115(5.5)
Gender	Male 142(64.3) Female 79(35.7)	Male 974(51.6) Female 915(48.4)	Male 1,116(52.8) Female 996(47.2)
Insurance	Commercial 47(21.3) Medicaid 174(78.7)	Commercial 738(39.1) Medicaid 1,151(60.9)	Commercial 784(37.2) Medicaid 1,327(63.8)
Race	Caucasian 65(29.4) African American 70(31.7) Hispanic 61(27.6) Other 25(11.3)	Caucasian 864(45.7) African American 350(18.5) Hispanic 532(28.2) Other 143(7.6)	Caucasian 930(44.0) African American 421(19.9) Hispanic 593(28.1) Other 168(8.0)
Language	English 198(89.6) Spanish 21(9.5) Other 2(0.9)	English 1,737(92.0) Spanish 127(6.7) Other 25(1.3)	English 1,937 (91.7) Spanish 148(7.0) Other 27(1.3)

Table 2

Emergent and Non-Emergent Procedure Demographics (n= 2,110)

	Emergent Procedure Population Demographics n(%)	Non-Emergent Procedure Population Demographics n(%)	Overall Population Demographics n(%)
Totals	221(10.5)	1,889(89.5)	2,110(100)
Upper Endoscopy	142(64.3)	1,256(66.5)	1,398(66.3)
Colonoscopy	54(24.4)	557(29.5)	611(29.0)
Sigmoidoscopy	10(4.5)	24(1.3)	34(1.6)
Capsule endoscopy	9(4.1)	30(1.6)	39(1.9)
Liver biopsy	6(2.7)	22(1.2)	28(1.3)

Table 3

Odds of Emergent Procedure By Variable Outcome

	Odds of Emergent Procedure	95% Confidence Interval	P-value
Age			
0–5 years	1.07	0.73 – 1.54	0.738
6–11 years	0.75	0.52– 1.09	0.127
12–17 years	---	---	---
18+ years	2.16	1.30 – 3.59	0.003 **
Gender			
Male	---	---	---
Female	0.62	0.46 – 0.83	0.001 **
Health Insurance			
Commercial	0.49	0.34 – 0.72	<0.0001 **
Medicaid	---	---	---
Race			
Caucasian	---	---	---
African American	1.94	1.32 – 2.85	<0.0001 **
Hispanic	0.98	0.64– 1.50	0.911
Other	1.72	1.03– 3.89	0.039 *
Language			
English	---	---	---
Spanish	1.45	0.83– 2.52	0.187
Other	0.56	0.12– 2.41	0.432

* Statistically significant at alpha = 0.05

** Statistically significant at alpha = 0.01