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Failure to thrive: The socioeconomics of pediatric gastrostomy complications

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ABSTRACT

Purpose: One of the most common procedures in the pediatric population is the placement of a gastrostomy tube. There are significant medical, emotional, and social implications for both patients and caregivers. We hypothesized that socioeconomic status had a significant impact on gastrostomy complications.
Methods: A retrospective chart review was performed. Patient and census data including median household income, unemployment rate, health insurance status, poverty level, and caregiver education level were merged. Statistical tests were conducted against a 2-sided alternative hypothesis with a 0.05 significance level. Outcomes examined were minor and major complications in association with socioeconomic variables.
Results: Patients with mechanical complications were younger, weighed less, and had a 72% greater chance of having commercial insurance. Patients with Medicare/self-pay were three times more likely to have a minor complication. The average unemployment rate was 23% greater in families with a major complication. Individuals with a minor complication came from community tracts with a lower percentage of families below the poverty level.
Conclusion: An association between socioeconomic factors and gastrostomy complications was identified. Insurance status and employment status were more significant predictors than poverty level. Further work with variables for targeted interventions to provide specific family support will allow these children and families to thrive.
Level of evidence: Level II prognosis study.

One of the most common surgical procedures performed in the pediatric population is the placement of a gastrostomy tube [1]. Several indications exist for this operation, ranging from a diagnosis of failure to thrive to the lack of enteral access in patients with multiple other medical conditions. Due to to the prevalence of gastrostomy tubes in children, a significant number of hospital visits for this population are related to gastrotomy complications. These complications are vast and most commonly include infection, formation of granulation tissue, and accidental removal [2]. To help prevent some of these complications, many studies have stressed the need for preoperative education protocols to make families aware of a typical postoperative course [3]. The implementation of family centered programs can help to build the confidence and knowledge needed for gastrostomy tube care.

The necessity of family involvement in children's healthcare and initiation, as well as standardization, of education protocols originates from the ongoing issue of healthcare disparities. It has been demonstrated frequently in the literature that minority status is associated with surgical disparities and poor surgical outcomes [4,8]. In addition to racial disparities, socioeconomic status (SES) can interfere with a patient's health care course at many different times [5]. For instance, low SES may inhibit the initial access to surgical care or may prevent families from attending necessary informative sessions. Socioeconomic issues may prevent normal attendance at postoperative follow up appointments and therefore surgical outcomes. The purpose of this study was to determine if an association exists between socioeconomic status of the patient and subsequent complications. If this association is able to be identified, the specific factors acting as cause for increased risk can be isolated and lead to targeted interventions to prevent these complications.

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1. Methods

1.1. Study design

Following IRB approval, with reference number 00000688, a retrospective review of patients less than 18 years of age who received a gastrostomy tube at our institution from 2011 to 2016 was performed. Patients were identified using current procedural terminology (CPT) codes for placement of a gastrostomy tube by laparoscopy, endoscopy, or fluoroscopy with no subgroup analysis based on method of insertion. Standard procedures for these patients included preoperative education with caregiver, a scheduled postoperative clinic visit at approximately 2 weeks, instructions for home care in both written and verbal forms, and instructions for accidental dislodgement. Once the cohort was established, patient data regarding socioeconomic variables such as race, gender, payor status, and language spoken were collected from the electronic medical record. Measured clinical outcomes included the presence of a gastrotomy tube complication, the type of complication, occurrence of readmission of a patient within 30 days of discharge, and the reason for readmission. Utilizing ICD 9 and 10 codes, any gastrostomy tube complications following insertion were identified. Complications included infection, mechanical issues, hemorrhage, or any unspecified/other complication. Inconsistencies in patient medical records did not enable us to properly trend BMI following gastrotomy insertion.

1.2. Applying tract level census data

Patient caregiver's income, education, and unemployment were not available using the patient's electronic medical record. Therefore, block level U.S. Census data based on the patient's address and zip code were used. Using Krieger et al. as a guide, patient addresses were geocoded using the OpenCage Geocoder [6]. Patient data was merged with tract level census data via GEOID, a numerical code that uniquely identified all administrative/legal and statistical geographic areas for which the Census Bureau tabulates data. Tract-level Census data included median household income of all households, median household income of families, unemployment rate, percentage of those less than the age of 18 without health insurance, percentage of all families with income below the poverty level, percentage of families with a child less than 18 years of age below the poverty level, percentage that have a high school degree or more, and percentage that have a bachelor's degree or higher. This data was pulled from the U.S. Census Bureau 2012–2016 American Community Survey 5-year Estimates via United States Census Bureau American Fact Finder. Owing to the nature of the pediatric population income, education, and employment, factors were most applicable to the patient's parent or primary caregiver. As a result of the lack of available patient specific socioeconomic conditions, block level census data was deemed to have the highest level of granularity for the purposes of this study.

Table 1
Summary of patient demographics ($n = 386$).

Variable	Mean ± SD (min, max) [median] Or *N* (%)
Gender	
Female	181 (46.9%)
Male	205 (53.1%)
Age at Procedure	2.8 ± 4.8 (0, 18.9) [med: 0.53]
Weight at Placement (pounds)	26.2 ± 35.7 (1.1, 211.9) [med: 12.8]
Race	
American Indian and Alaska native	1 (0.3%)
Asian	8 (2.1%)
Black or African American	89 (23.1%)
Other	32 (8.3%)
Unknown	2 (0.5%)
White or Caucasian	254 (65.8%)
Payor Status	
BC/BS	68 (17.6%)
Commercial	66 (17.1%)
Medicaid	249 (64.5%)
Other	2 (0.5%)
Self-pay	1 (0.3%)
Language Spoken	
Arabic	1 (0.3%)
English	373 (96.6%)
French	2 (0.5%)
Other	1 (0.3%)
Sign Language	1 (0.3%)
Spanish	7 (1.8%)
Vietnamese	1 (0.3%)
More than 1 PEG Per Admit	
More than 1	3 (0.8%)
No more than 1	383 (99.2%)
Just Multiple PEGs	
Multiple PEG	3 (0.8%)
No Multiple PEG	383 (99.2%)

Table 2
Summary of patient tracts.

Variable	Mean ± SD (min, max) [median] Or N (%)
Unemployment Rate	8.0 ± 5.0 (0.9, 28.3) [med 7.2]
Median Household Income (All)	50,874 ± 20,242.1 (7004, 133,456) [med 46,920]
Median Household Income (Families)	61,738 ± 23,593.6 (13,750, 140,346) [59,991]
Percent Without Healthcare Coverage (Families with a child less than 18 years old)	3.2 ± 5.0 (0, 41.7) [med 1.6]
Percent Below Poverty Level (All Families)	14.3 ± 13.1 (0, 100) [med 9.8]
Percent Below Poverty Level (Families with a child less than 18 years old)	21.4 ± 16.9 (0, 100) [med 17.6]
Percent with High School Degree or Higher	89.0 ± 7.1 (65.7, 100) [med 90.6]
Percent with bachelor's degree or Higher	23.6 ± 14.4 (2.6, 75.2) [med 19.5]

1.3. Statistical analysis

Analysis was performed using R version 3.4.3. The mean, standard deviations, range, and medians were recorded for all continuous variables. For categorical variables, the frequency and percentage were recorded. All statistical tests were conducted against a 2-sided alternative hypothesis with a 0.05 significance level. Bivariate analysis was initially conducted using T-Tests and Mann Whitney U tests (Wilcoxon rank-sum tests) to test for differences between those with and without a gastrostomy tube complication when the variable of interest was numerical. When the variable of interest was categorical, either a chi-squared test or Fisher's exact test was used. To control for other variables, such as families below poverty level, payor status, weight and percent of families without health coverage, race and percent of families with income below poverty level, multiple separate variable logistic regression models were built and compared using AIC (Akaike information criterion).

2. Results

2.1. Patient demographics (Table 1)

A total of 415 pediatric patients received a gastrostomy tube at our institution from 2011 to 2016. Of this number, 386 were patients from Illinois and included in the study to allow for application of state specific population data. Patients were primarily Caucasian (65.8%), nearly all patients spoke English (96.6%), and 249 (64.5%) patients had government funded health insurance under Medicaid.

Table 3
Socioeconomic differences among patients with and without a gastrostomy complication.

Variable	G-tube Complication ($n = 270$)	No Complication ($n = 116$)	Estimate (95% Conf. Int)	Test Test Statistic p-value
	Mean ± SD (min, max) [median] Or N (%)	Mean ± SD (min, max) [median] Or N (%)		
Patient-level data				
Age at Placement	2.3 ± 4.1 (0, 18.4) [0.5]	4.1 ± 5.9 (0, 18.9) [0.8]	0.17 (0.04, 0.40)	Mann Whitney U $W = 18{,}312$ 0.0083
Race	180 (66.7%)	74 (63.8%)		Chi-Square
White or Caucasian	56 (20.7%)	33 (28.4%)	0.70 (0.42, 1.16)	0.1639
Black or African American	34 (12.6%)	9 (7.8%)	1.55 (0.71, 3.40)	0.2676
Other				
Gender				Chi-Square
Female	129 (47.8%)	52 (44.8%)		0.5943
Male	141 (52.2%)	64 (55.2%)	0.90 (0.57, 1.37)	
Payor Status				Chi-square
Other (Commercial, Self-Pay, etc.)	99 (36.7%)	38 (32.8%)		0.4619
Medicaid	171 (63.3%)	78 (67.2%)	0.84 (0.53, 1.33)	
Language Spoken				Fisher's Exact
English	261 (96.7%)	112 (96.6%)	1.04 (0.23, 3.81)	1.0000
Non-English	9 (0.03%)	4 (3.4%)		
Weight at initial Placement	21.3 ± 26.2 (1.1, 189.0) [12.0]	37.6 ± 49.7 (1.3, 211.9) [15.8]	1.41 (1.13, 1.75)	t-Test (log trans)$t = 3.1$ df = 175.90.0023
Tract-level Census Data				
Unemployment Rate	8.2 ± 5.2 (0.9, 28.3) [med: 7.3]	7.5 ± 4.4 (1.3, 26.5) [med: 6.6]	0.95 (0.83, 1.09)	T-test (log tans) $t = -0.76$ df = 384 0.4489
Median Household Income (All)	50,964.5 ± 20,227.1 (11,053, 133,459) [46,869]	50,664.2 ± 20,363.3 (7004, 133,459) [47,197.5]	0.98 (0.90, 1.07)	T-test (log trans) $T = -0.44$ df = 385 0.6603
Median Household Income (Families)	61,708.8 ± 23,373.2 (13,750, 140,346) [60,160]	61,806 ± 24,201.5 (15,625, 140,346) [59,917]	0.99 (0.91, 1.09)	T-test (log trans) $T = -0.12$ df = 384 0.9068
Percent Without Healthcare Coverage (Families with a child less than 18 years old)	2.9 ± 4.1 (0, 41.7) [1.6]	3.8 ± 6.5 (0, 41.7) [2.0]	0.00007 (−0.00004, 0.7)	Mann Whitney U $W = 16{,}496$ 0.4012
Percent Below Poverty Level (All Families)	14.3 ± 13.3 (0, 100) [9.7]	14.3 ± 12.8 (0, 68.6) [10.1]	−0.00004 (−1.70, 1.70)	Mann Whitney U $W = 15{,}563$ 0.9235
Percent Below Poverty Level (Families with a child less than 18 years old)	21.4 ± 16.6 (0, 100) [17.5]	21.6 ± 17.6 (0, 100) [18.0]	−0.00005 (−2.80, 2.90)	Mann Whitney U $W = 15{,}674$ 0.9897
Percent with High School Degree or Higher	88.93 ± 7.01 (65.7, 100) [90.5]	89.16 ± 7.31 (65.7, 100) [90.9]	0.30 (−0.80, 1.60)	Mann Whitney U $W = 16{,}228$ 0.5719
Percent with bachelor's degree or Higher	23.39 ± 19.5 (4.5, 75.2) [19.5]	24.04 ± 14.72 (2.6, 72.6) [19.1]	1.01 (0.89, 1.15)	t-test (log trans) $t = 0.21$ df = 384 0.8333

2.2. Gastrostomy tube complications

A total of 270 (69.9%) patients had at least one gastrostomy complication. Specifically, 237 (61.2%) had at least one mechanical complication, 83 (21.5%) had a gastrostomy complication coded as "other gastrostomy complication," 32 (8.3%) had an infection of the gastrostomy, and 29 (7.5%) had an unspecified G-tube complication. A small portion, 2 patients (0.5%), had hemorrhage at the site of gastrostomy insertion.

2.3. Adverse events following gastrostomy tube placement

Feeding difficulties with the gastrostomy tube were experienced by 295 (76.4%) patients. A failure to thrive diagnosis was given to 203 (52.6%) patients following gastrostomy tube insertion. Readmission within 30 days occurred among 73 (18.9%) patients, 4 of which (5.5%) were readmitted for reasons pertaining to gastrostomy. Of the children enrolled in this study, 40 patients (10.4%) died after their feeding tube insertion. However, none of these patients were thought to have expired as a result of their gastrostomy tube or complications related to their surgical procedure.

2.4. Block level census data (Table 2)

According to the U.S. Census Bureau 2012–2016 American Community Survey 5-year estimates, the average unemployment rate for the tracts where patients resided was 8.0 ± 5.0 with rates varying between 0.9 and 28.3. Median household income within each tract averaged $50,874 ± $20,242 (median $46,920) and ranged between $7,004 and $133,456. On a family level, the median household income was $61,738 ± $23,593.6 (median $59,991) with a range between $13,750 and $140,346. The average percentage of families with a child less than 18 years old without healthcare coverage was 3.2% ± 5.0% (median 1.6%) and ranged between 0% and 41.7%. The average percent of families with income below the poverty level was 14.3% ± 13.1% (median 9.8%) and ranged between 0% and 100%. For families with a child less than 18 years of age, the percent below poverty level average 21.4% ± 16.9% with median 17.6%. The percent with a high school degree or higher averaged 89.0% ± 7.1% (median 90.6%) among the tracts that patients resided, whereas the percent with a bachelor's degree or higher averaged 23.6% ± 14.4% (median 19.5%) among census tracts.

Table 4
Socioeconomic differences among patients with and without a mechanical complication.

Variable	No Complication $N = 149$	Complication $N = 237$	Estimate (95% Conf. Int)	Test Test Statistic p-value
	Mean ± SD (min, max) [median] Or N (%)	Mean ± SD (min, max) [median] Or N (%)		
Patient-level Data				
Race	91 (61.1%)	163 (68.8%)	0.65 (0.39, 1.10)	Chi-square
White or Caucasian	41 (27.5%)	48 (20.3%)	0.85 (0.42, 1.77)	0.0875
Black or African American	17 (11.4%)	26 (11.0%)		0.6402
Other				
Payor Status	46 (30.9%)	90 (38.0%)	0.73 (0.47, 1.13)	Chi-square
Other (Commercial, etc.)	103 (69.1%)	147 (62.0%)		0.1550
Medicaid/ Self-pay				
Language Spoken	5 (3.4%)	8 (3.4%)	0.99 (0.25, 3.52)	Fisher's Exact
English	144 (96.6%)	229 (96.6%)		1.000
Non-English				
Tract-level Census Data				
Unemployment Rate	7.9 ± 4.6 (1.3, 26.5) [7.0]	8.0 ± 5.2 (0.9, 28.3) [7.2]	1.02 (0.90, 1.16)	t-test (log trans) $t = 0.31$, df = 384 0.7541
Median Household Income (All)	50,391.5 ± 18,900.4 (7004, 133,459) [47,367]	51,177.1 ± 21,075.5 (11,053, 133,456) [46,869]	0.99 (0.91, 1.08)	t-test (log trans) $t = -0.28$, df = 384 0.7818
Median Household Income (Families)	61,508.5 ± 22,713.7 (15,625, 140,346) [59,928]	61,882.4 ± 24,176.8 (13,750, 140,346) [60,054]	−373.85 (−5230.0, 4482.3)	t-test $t = -0.15$, df = 384 0.8798
Percent Without Healthcare Coverage (Families with a child less than 18 years old)	3.7 ± 6.2 (0, 41.7) [1.9]	2.8 ± 4.0 (0, 41.7) [1.6]	0.00002 (−0.00001, 0.5)	Mann–Whitney U $W = 18{,}390$ 0.4874
Percent Below Poverty Level (All Families)	14.2 ± 12.2 (0, 68.6) [10.0]	14.4 ± 13.7 (0, 100) [9.7]	0.10 (−1.30, 1.80)	Mann–Whitney U $W = 17{,}856$ 0.8517
Percent Below Poverty Level (Families with a child less than 18 years old)	21.8 ± 17.0 (0, 100) [18.0]	21.2 ± 16.9 (0, 100) [17.4]	0.60 (−2.00, 3.50)	Mann–Whitney U $W = 18{,}175$ 0.6274
Percent with High School Degree or Higher	88.9 ± 7.2 (65.7, 100) [90.6]	89.1 ± 7.0 (65.7, 100) [90.9]	−0.10 (−1.30, 0.90)	Mann–Whitney U $W = 17{,}322$ 0.7539
Percent with bachelor's degree or Higher	23.1 ± 14.3 (2.6, 72.6) [18.5]	23.9 ± 14.4 (4.5, 75.2) [20.0]	1.08 (0.85, 0.96)	t-test (log trans) $t = -0.72$, df = 384 0.4699

2.5. Association between census data and gastrostomy complications

2.5.1. Unspecified complications (Table 3)

After performing a Fisher's Exact Test, there is enough evidence to suggest an association between payor status and unspecified complications. Specifically, patients paying with Medicare or self-pay are approximately 3 times more likely have an unspecified complication versus a patient with another insurance provider. Contrary to expectations, individuals with an unspecified complication were from tracts that had a lower percent of families, and families with a child less than 18 years old, below poverty level.

After controlling for the percent of families below poverty level, there is enough evidence to suggest that payor status is associated with unspecified complications. Specifically, the odds of an unspecified complication are 4 times greater for someone paying with Medicaid or self-paying compared to those paying with a commercial insurance. Of note, self-pay most commonly referenced uninsured patients.

2.5.2. Infection

There is not enough evidence to suggest any of the variables or socioeconomic factors are associated with having an infection.

2.5.3. Mechanical complication (Table 4)

Although both age and weight were significant in the bivariate analysis, after controlling for other variables, weight at placement better explains this effect on mechanical complications. The odds of having a mechanical complication decrease for older patients at time of surgery. Despite not being significant in the bivariate analysis, after controlling for weight and percentage of families without health coverage, there is a significant association between payor status and having a mechanical complication. However, contrary to common assumptions, those with commercial insurance have a 72% greater chance of having a mechanical complication verses someone paying with Medicaid or self-pay.

2.5.4. Other complications (Table 5)

Before controlling for any other variables, there is a significant difference in the unemployment rates between those that have another complication and those that do not. Specifically, the average unemployment rate is about 23% greater in the tracts that patients with another complication reside versus the tracts of patients without another complication.

3. Discussion

As gastrostomy placement remains one of the most common surgical procedures in the pediatric population, the associated complications act as cause for frequent visits to the ED and subsequent hospitalizations. The prevalence of this issue cannot be underappreciated as it comsumes an immense amount of hospital, financial, and personnel resources annually. Our study alone identified almost 69% of patient with a gastrostomy tube with some form of a reported complication over the 6-year period of data review. This highlights the importance of this issue for patients, their families, and all personnel involved in both the placement of gastrostomy tubes and long-term management of their complications.

Table 5
Socioeconomic differences among patients with and without "other gastrostomy complication"

Variable	No complication $N = 303$	"Other" Complication $N = 83$	Estimate (95% Conf. Int)	Test Test Statistic p-value
	Mean ± SD (min, max) [median] Or N (%)	Mean ± SD (min, max) [median] Or N (%)		
Patient-level Data				
Race	202 (66.7%)	52 (62.7%)	1.69 (0.94, 3.01)	Chi-square and
White or Caucasian	62 (20.5%)	27 (32.5%)	0.40 (0.10, 1.18)	Fisher's Exact
Black or African American	39 (12.9%)	4 (4.8%)		0.0572
Other				0.0939
Payor Status		26 (31.3%)	1.25 (0.74, 2.10)	Chi-square
Other (Commercial, Self-Pay, etc.)	110 (36.3%)	57 (68.7%)		0.4002
Medicaid	193 (63.7%)			
Language Spoken	12 (4.0%)	1 (1.2%)	3.37 (0.49,	Fisher's Exact
Non-English	291 (96.0%)	82 (98.8%)	146.21)	0.3144
English				
Tract-level Census Data				
Unemployment Rate	7.6 ± 4.8 (0.9, 28.3) [6.7]	9.2 ± 5.4 (0.9, 28.3) [8.1]	0.81 (0.70, 0.94)	t-test (log trans) $t = -2.7$, df = 384 0.0069
Median Household Income (All)	51,391.8 ± 21,026.4 (7004, 133,459) [47,224]	48,984.9 ± 17,056.8 (16,337, 113,412) [45,849]	1.02 (0.93, 1.12)	t-test (log trans) $t = 0.47$ df = 158.2 0.6391
Median Household Income (Families)	62,565.1 ± 24,551.6 (13,750, 140,346) [60,266]	58,719.0 ± 19,540.6 (13,750, 117,083) [56,304]	3846.1 (−1223.6, 8915.8)	t-test $t = 1.50$, df = 160.1 0.1360
Percent Without Healthcare Coverage (Families with a child less than 18 years old)	3.1 ± 5.3 (0, 41.7) [1.5]	3.5 ± 3.7 (0, 14.7) [2.4]	−0.30 (−1.00, 0.00004)	Mann–Whitney U $W = 11{,}043$ 0.0859
Percent Below Poverty Level (All Families)	14.1 ± 13.5 (0, 100) [9.5]	14.9 ± 11.6 (0.8, 58.5) [10.5]	−1.00 (−2.90, 0.80)	Mann–Whitney U $W = 11{,}554$ 0.2571
Percent Below Poverty Level (Families with a child less than 18 years old)	20.9 ± 16.9 (0, 100) [17.4]	23.2 ± 16.8 (2, 81.1) [18.3]	−2.0 (−5.2, 1.2)	Mann–Whitney U $W = 11{,}455$ 0.2140
Percent with High School Degree or Higher	89.1 ± 7.4 (65.7, 100) [91.3]	88.8 ± 5.8 (69.0, 99.3) [89.6]	1.00 (−0.30, 2.40)	Mann–Whitney U $W = 13{,}936$ 0.1308
Percent with bachelor's degree or Higher	24.1 ± 14.9 (2.6, 73.4) [19.5]	21.8 ± 12.3 (5.4, 75.2) [18.8]	1.07 (0.92, 1.23)	t-test (log trans) $t = 0.88$, df = 384 0.3793

A previous study, Berman et al. [1], demonstrated that more than 8% of patients with gastrostomy tubes placed required at least 1 emergency department visit within 30-days of placement and nearly 4% of patients required readmission. This study identified 3 specific areas of focus and potential intervention including caregiver education, availability of the healthcare team, and empowerment of the caregivers. It has also been proposed in the literature that telephone availability with 24-hour access to primary care physicians reduced ED utilization from 41% to 8% of visits, emphasizing the importance of ongoing education and support [7].

Expanding on the findings of this and other previous studies, we have incorporated the socioeconomic status of the patients and their families into the concept of prevention. For example, our data demonstrated that insurance status and employment status were more significant predictors than poverty level of the patient and family. The odds of an unspecified complication were 4 times greater for someone paying with Medicaid or self-paying compared to those paying with a commercial insurance. Using this information, patients paying with Medicaid could be identified at the time of gastrostomy placement and placed into a subset that would receive a more intensive education program prior to discharge as well as frequent contact from the surgeon's team in the form of phone and in person visits.

As demonstrated in Golden et al. [7], race was previously isolated as an independent risk factor for return to the ED within 30 days of gastrostomy tube placement. This was taken into account as we expected race may act as a confounder for our data. However, our bivariate analysis illustrates that there is enough evidence to suggest an association between unemployment rate of the tract and having another complication after controlling for race and percent of families with income below poverty level.

As some previous studies have demonstrated [1], implementing standardized education programs with patient families can help to prevent some emergency department visits and gastrostomy complications. While some risk factors may be nonmodifiable such as age, race, and household income, with early identification, families falling in the high-risk categories may benefit from targeted education and follow up programs more specific to the complications seen in their demographic.

We do recognize there are some limitations with this study. The first would be generalizability. While our data does reflect an accurate subset of patients for our geographic location, there is significant variability in other parts of the nation when it comes to race and employment status. For example, our study contained patients that were 66% Caucasian. A larger metropolitan area or county hospital would likely have a different socioeconomic breakdown than our tertiary referral center in a more rural location. Another limitation is our study relied heavily on data collected from ED and hospital admissions. It would be beneficial to include data in the future from outpatient surgical clinics as well as general pediatricians' offices to incorporate a more comprehensive view of the ongoing needs of patients with gastrostomy tubes and identify moments of early intervention to prevent the ED visits from occurring. Lastly, caregivers that were uninsured or self-paying may have been less likely to seek medical care regarding complications with

gastrostomy tube owing to financial concerns. This may have had an effect on the overall data but is a difficult limitation to avoid.

This study adds to the slowly growing subset of research that focuses on socioeconomic factors and their effects on medical conditions. As healthcare costs continue to increase exponentially, it is imperative to change focus toward increasing awareness of these relationships and how they affect the lives of the patient and their families. While this study will help to serve as groundwork in identifying factors associated with increased risk of complication, the next step is the development and implementation of comprehensive education and follow up programs specific to the socioeconomic status of each patient. Further efforts incorporating these variables for targeted intervention to prevent complications will allow these patients and their families to thrive.

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