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Impact of Insurance Type on Access to Pediatric Surgical Care

Rachel R. Watson, MPH
Cassi J. Niedziela, BA
Laura C. Nuzzi, BA
Rebecca A. Netson, MS
Catherine T. McNamara, MPH
Anuoluwa E. Ayannusi, BS
Sarah Flanagan, BA
Gabrielle G. Massey, BS
Brian I. Labow, MD, FACS, FAAP

Background: This study aimed to measure the impact of insurance type on access to pediatric surgical care, clinical and surgical scheduling decisions, provider-driven cancelations, and missed care opportunities (MCOs). We hypothesize that patients with public health insurance experience longer scheduling delays and more frequently canceled surgical appointments compared with patients with private health insurance.

Methods: This retrospective study reviewed the demographics and clinical characteristics of patients who underwent a surgical procedure within the plastic and oral surgery department at our institution in 2019. Propensity score matching and linear regressions were used to estimate the effect of insurance type on hospital scheduling and patient access outcomes while controlling for procedure type and sex.

Results: A total of 457 patients were included in the demographic and clinical characteristics analyses; 354 were included in propensity score matching analyses. No significant differences in the number of days between scheduling and occurrence of initial consultation or number of clinic cancelations were observed between insurance groups ($P > 0.05$). However, patients with public insurance had a 7.4 times higher hospital MCO rate (95% CI [5.2–9.7]; $P < 0.001$) and 4.7 times the number of clinic MCOs ($P = 0.007$).

Conclusions: No significant differences were found between insurance groups in timely access to surgical treatment or cancelations. Patients with public insurance had more MCOs than patients with private insurance. Future research should investigate how to remove barriers that impact access to care for marginalized patients.
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INTRODUCTION

Existing literature has highlighted disparities in access to high-quality surgical care throughout the United States based on factors such as race, socioeconomic status (SES), and insurance type.[1–5] It is well known that adult patients with public health insurance, such as Medicaid, are more likely to experience delays in treatment compared with those with private insurance.[6–13] Studies also suggest that those with public insurance may experience worse postoperative outcomes, lower provider follow-up rates, longer recovery times, longer hospital stays, and higher total cost.[14–16] However, a dearth of pediatric literature explores how insurance type impacts children's access to surgical care.

The purpose of this study is to measure the impact of patients' insurance type on their access to pediatric surgical care. Further, the study aimed to investigate whether clinical and surgical scheduling decisions, provider-driven cancelations, and missed care opportunities (MCOs) differ by insurance type. We hypothesize that patients with public health insurance experience longer scheduling delays and more frequently canceled surgical appointments compared with patients with private health insurance.

METHODS

After obtaining a waiver of informed consent granted from our institution's review board, we conducted a retrospective review of patients who underwent one of eight elective surgical procedures within a single department (plastic and oral surgery) at our institution in 2019. The procedures include small, medium, and large skin lesion

From the Department of Plastic and Oral Surgery, Boston Children's Hospital and Harvard Medical School, Boston, Mass.

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Watson and Niedziela contributed equally to this work.

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excisions, dental extractions less than 10 minutes in duration, bilateral and unilateral breast augmentations, and reduction mammaplasties with and without liposuction. These procedures were selected due to their high frequency because they are inclusive of the wide scope of procedures carried out in the department, and because they are covered by both private and public insurers. Patients with incomplete medical records were excluded.

Patient demographic and scheduling data were collected from our institution's electronic medical records to compare health care experiences by insurance type. During clinic visits, patients are routinely asked to self-identify their ethnicity as either Hispanic or non-Hispanic, and their race from the following: Asian, Black/African American, Native American/Pacific Islander, White, other, or prefer not to answer. Patients with unknown or "other" race data were excluded from race-specific analyses. Medical and behavioral health comorbidities were also collected for all patients. Patients' American Society of Anesthesiologists (ASA) physical status classifications were also collected and defined as follows: (I) healthy, (II) mild systemic disease, (III) severe systemic disease, and (IV) severe life threatening systemic disease.[17]

As body mass index (BMI) is a covariate in the association between patient demographics and access to care, BMI was collected at clinic visits and included in analyses.[18,19] BMI was calculated and categorized for all participants aged 20 years and older using the Centers for Disease Control and Prevention Adult BMI Calculator (<18.5 kg/m^2 as underweight, 18.5 kg/m^2 to <25.0 kg/m^2 as healthy, 25.0 kg/m^2 to <30.0 kg/m^2 as overweight, and ≥30.0 kg/m^2 as obese).[20] For those younger than 20 years old, the Centers for Disease Control and Prevention Child and Teen BMI calculator was used to calculate and classify BMI-for-age percentiles for patients aged younger than 20 years: less than the fifth percentile as underweight, between the fifth percentile and less than the 85th percentile as healthy, between the 85th percentile and less than the 95th percentile as overweight, and the greater than or equal to 95th percentile as obese.[21] We also derived patients' nationally-normed child opportunity index (COI) scores from 2019, which measure the quality and quantity of community resources available by zip code of primary residence; COI scores range from 1 to 100, with 1 being very low opportunity and 100 being very high opportunity.[22]

The primary predictor variable was patients' insurance type, categorized as public or private. None of the patients who underwent one of the eight elective procedures were without health insurance, and patients with international insurance were excluded from analyses due to the small sample size. We measured access to care using the following outcome variables: (1) the length of time (in days) from when the initial consultation was scheduled to when the appointment occurred, and (2) whether the patient experienced a cancelation related to their initial consult, surgery, or to a postoperative appointment. The reason for appointment cancelation was determined by the staff-selected reasons recorded in the electronic medical record; reason for cancelation was then manually categorized by the research team as either patient-driven, provider-driven, COVID-related, or other. Clinic records were also reviewed for operating room delays, and the reasons for delay were categorized as patient-driven, provider-driven, hospital-driven, or delays in the previous case. Additionally, we assessed MCOs, defined as a clinic appointment that did not take place due to the absence of the patient with no prior notice, in two ways: (1) a patient's hospital-wide MCO rate at the time of data collection, and (2) the number of department-specific clinic MCOs relating to the procedure. Hospital MCO rates for each patient include all institutional visits until the time of data collection.

Takeaways

Question: We measured the impact of insurance type on access to pediatric surgical care, scheduling decisions, provider-driven cancelations, and missed care opportunities (MCOs).

Findings: The number of days between scheduling and occurrence of surgical consultation or number of clinic cancelations did not differ between patients with private versus public insurance ($P > 0.05$). However, patients with public insurance had a 7.4 times higher hospital MCO rate (95% CI [5.2–9.7]; $P < 0.001$) and had 4.7 times more clinic MCOs ($P = 0.007$).

Meaning: In our cohort, insurance type did not impact access to care; however, patients with public health insurance experienced more MCOs.

Statistical Analysis

Patients were sorted into two groups by insurance type (public insurance versus private insurance), and frequency distributions were tabulated for all demographic variables and clinical characteristics. Differences between the two insurance groups were assessed using Fisher exact tests for categorical data and independent samples *t* tests for continuous data.

Propensity score matching was used to estimate the effect of insurance type on hospital scheduling and patient access outcomes while controlling for procedure type and sex. Propensity scores were estimated using logistic regression. Adequate balance was achieved, as all standardized mean differences were below 0.06 with an overall standard mean difference less than 0.002. Procedures with insufficient numbers for matching between insurance types were excluded. Using a ratio of 2:1, all public insurance patients (n = 118) were matched to two private insurance patients (n = 236), amounting to a total sample of 354 patients.

Linear regression models were used to explore the relationship between time to access surgical care and insurance type. Rates of binary outcomes (occurred versus did not occur) are reported with corresponding 95% confidence intervals using the exact binomial method. Statistical analyses were performed using R, version 4.0.5 (R Foundation for Statistical Computing), the RStudio interface, version 2022.07.1 (RStudio Inc.), and IBM SPSS Statistics version 29.0 (IBM Corp., Armonk, N.Y.). Statistical significance was set at a *P* value less than 0.05 for all analyses.

Table 1. Demographic Characteristics by Insurance Type

	Private (n = 339)	Public (n = 118)	P
Sex, n (%)			0.37
Male	120 (35.4)	36 (30.5)	
Female	219 (64.6)	82 (69.5)	
Race, n (%)			
White	202 (59.6)	43 (36.4)	**<0.001**
Black or African American	10 (3.0)	11 (9.3)	
Asian	5 (1.5)	2 (1.7)	
American Indian or Alaska Native	1 (0.3)	0 (0.0)	
Other	11 (3.2)	28 (23.7)	
Unknown	110 (32.5)	34 (28.8)	
Hispanic Ethnicity, n (%) *			**<0.001**
Yes	6 (3.2)	23 (30.3)	
No	183 (96.8)	53 (69.7)	
Interpreter Needed, n (%)			**<0.001**
Yes	0 (0.0)	16 (13.6)	
No	339 (100.0)	102 (86.4)	
Nationally-normed Child Opportunity Index score, mean (SD)	80.7 (20.9)	58.3 (29.8)	**<0.001**

*n = 265 (missing 192).

Table 2. Clinical Characteristics by Insurance Type

	Private (n = 339)	Public (n = 118)	P
Primary Procedure, n (%)			
Breast augmentation, bilateral	5 (1.5)	3 (2.5)	$P > 0.05$
Breast augmentation, unilateral	6 (1.8)	2 (1.7)	
Reduction mammaplasty	67 (19.8)	24 (20.3)	
Reduction mammaplasty with liposuction	1 (0.3)	1 (0.9)	
Dental extractions <10 minutes	33 (9.7)	17 (14.4)	
Excision lesion, small (<2.5 cm)	116 (34.2)	36 (30.5)	
Excision lesion, medium (2.5–5 cm)	67 (19.8)	20 (17.0)	
Excision lesion, large (>5 cm)	35 (10.3)	15 (12.7)	
Location of Procedure, n (%)			
Parent hospital	97 (28.6)	55 (46.6)	**0.002**
Satellite clinic 1	214 (63.1)	55 (46.6)	
Satellite clinic 2	28 (8.3)	8 (6.8)	
BMI Category, n (%) *			
Underweight	7 (2.6)	2 (2.1)	**<0.001**
Healthy	166 (62.2)	42 (44.2)	
Overweight	48 (18.0)	15 (15.8)	
Obese	46 (17.2)	36 (37.9)	
ASA Classification, n (%) †			
I	200 (60.8)	50 (43.9)	**0.008**
II	115 (35.0)	59 (51.8)	
III	13 (4.0)	5 (4.4)	
IV	1 (0.3)	0 (0.0)	
Any physical health comorbidity, n (%)	191 (56.3)	84 (71.2)	**0.005**
Any behavioral health comorbidity, n (%)	99 (29.2)	43 (36.4)	0.16

*n = 362 (95 missing).
†ASA physical status classification, n = 443 (14 missing).

RESULTS

Demographic and Clinical Characteristics

Of the 457 patients included in descriptive analyses, 339 (74.2%) had private insurance. The majority of patients in both cohorts identified as White; however, Black or African American patients had 5.2 times the odds of having public insurance compared with White patients (95% CI [2.1–12.9]; $P < 0.001$). Hispanic patients had 13.2 times the odds of having public insurance compared with non-Hispanic patients (95% CI [5.1–34.2]; $P < 0.001$). Patients with public insurance were more likely to require a language interpreter for their clinical visits ($P < 0.001$), and had lower average COI scores than patients with private insurance (58.3 versus 80.7, $P < 0.001$; Table 1). Insurance type did not vary significantly by primary procedure ($P > 0.05$; Table 2). However, insurance type did vary significantly by treatment location; the parent hospital treated a greater proportion of patients with public insurance than both satellite locations ($P = 0.002$).

Patients with public insurance were more likely to be obese (37.9% versus 17.2%, $P < 0.001$). The majority of patients with private insurance had an ASA classification of I, whereas the majority of patients with public insurance had an ASA classification of II ($P = 0.008$). Similarly, a higher proportion of patients with public insurance (71.2% versus 56.3%; $P = 0.005$) had at least one comorbidity; specifically, asthma was more prevalent in the public insurance group (19.5% versus 10.9%, $P = 0.03$). No significant differences were found in the prevalence of other comorbidities or in behavioral health diagnoses ($P > 0.05$, all).

Scheduling and Patient Access

For propensity score matching analyses, a total of 236 patients with private insurance were matched to 118 patients with public insurance. Of the 354 patients included in the matched sample, there were no significant differences between groups in the primary outcome variables: number of days between scheduling and occurrence of initial consultation, number of clinic cancelations, length of postoperative hospital stay, number of postoperative visits, or number of days between a postoperative complaint and treatment ($P > 0.05$, all; Table 3). For both groups, initial consultation and postoperative visit cancelations were most commonly patient-driven, and operating room delays were most commonly caused by delays in the previous cases. There was no significant variation observed in provider-driven cancelation rates for procedures ($P > 0.05$). However, patients with public insurance had a hospital MCO rate that was 7.4 times higher than patients with private insurance (95% CI [5.2–9.7], $P < 0.001$). Further, patients with public insurance had 4.7 times more clinic MCOs ($P = 0.007$). The number of clinic MCOs also varied significantly by COI ($P = 0.008$) and by primary procedure type ($P < 0.001$). There was no significant variation in MCO outcomes between groups when stratifying by race.

Table 3. Matched Scheduling and Access Outcomes by Insurance Type (n = 354)

	Private (*n* = 236)	Public (*n* = 118)	*P*
Hospital MCO* rate, mean (SD)	2.5 (7.1)	9.9 (12.4)	**<0.001**
No. department MCOs*, mean (SD)	0.1 (0.4)	0.3 (1.0)	**0.007**
Length of time (d) between scheduling and initial consult, mean (SD)†	28.6 (35.6)	30.3 (34.8)	0.68
No. postoperative visits, mean (SD) ‡	1.5 (1.6)	1.4 (1.3)	0.39
No. cancelations, mean (SD)	1.1 (1.8)	1.4 (2.9)	0.34
Initial Consult Canceled, *n* (%) §	38 (17.1)	16 (14.4)	0.64
Patient-driven cancelation	33 (86.8)	16 (100.0)	0.31
Provider-driven cancelation	4 (10.5)	3 (18.8)	0.41
Postoperative Visit Canceled, *n* (%)	74 (31.8)	38 (32.5)	0.90
Patient-driven cancelation	54 (73.0)	24 (63.2)	0.29
Provider-driven cancelation	7 (9.5)	2 (5.3)	0.72
Initial surgery canceled, *n* (%)	1 (0.4)	2 (1.7)	0.26
Mean (SD) length of stay, d	0.2 (0.5)	0.2 (0.6)	0.40
Operating Room Delays, *n* (%)	124 (52.5)	72 (61.0)	0.14
Patient-driven delay	16 (6.8)	14 (11.9)	0.11
Provider-driven delay	10 (4.2)	6 (5.1)	0.79
Hospital-driven delay	5 (2.1)	6 (5.1)	0.19
Previous case delay	89 (37.7)	46 (39.0)	0.82

*Missed care opportunity.
†n = 326 (28 missing).
‡Within the first year of surgery.
§n = 333 (21 missing).

DISCUSSION

The impact of systemic inequities on health outcomes is well studied and documented; patients with public health insurance like Medicaid are more likely to have delayed access to health services.[6–13] However, less is known about pediatric surgical care and whether similar inequities exist within this population. This study examined the impact of insurance type on access to care using a cohort of pediatric patients seeking surgical care within a single department at a single pediatric academic medical center (AMC).

We hypothesized that patients with public health insurance would experience longer scheduling delays and more frequently canceled clinic appointments compared with patients with private insurance. Contrary to our hypothesis, no significant differences in timely access to surgical treatment or cancelation frequency were observed between private and public insured groups. However, we found that patients with public insurance had a higher hospital MCO rate and higher number of clinic MCOs. Those with public insurance were more likely to be treated at the main campus as opposed to a satellite facility and were more likely to identify as Hispanic or a race other than White. Patients with public insurance were also more likely to require a language interpreter; live in a zip code with a lower COI score; and have asthma, obesity, and a higher ASA classification.

Cancelations were more likely to be patient-driven in both insurance cohorts. Although we found no disparities in scheduling and cancelations based on insurance type in our cohorts, it is well documented that insurance type can negatively impact access to health services and the quality of care a patient receives, resulting in worse long-term outcomes.[6–8,23,24] These poorer outcomes and delays in access for patients with public insurance are prevalent across many medical specialities for a myriad of institutional and structural reasons.[23,25–32] In Massachusetts, patients with public insurance may also be more likely to face additional obstacles accessing care due to cost-related barriers or by not having a primary care provider.[33] Further, there is a higher administrative workload associated with caring for patients with Medicaid such as payment delays, claim rejections, and preauthorization requirements, which could further delay care for these patients and result in poorer health outcomes.[34]

One reason we may not observe a difference in scheduling outcomes and cancelations between insurance types is that our institution is an AMC, and thus all providers are mandated to care for patients with private insurance, public insurance, and no insurance. AMC compensation models aim to remove potential financial disincentives associated with patients with public insurance. These mandates and compensation models may differ at other institutions, impacting the generalizability of our findings. Our study did not demonstrate a significant association between insurance type and access to surgical care for the procedures of interest during the study's observation period. However, future studies should investigate whether such inequities exist in other healthcare contexts or practice settings, as our findings differ from what has been documented in the literature.[1–16]

Our analyses revealed that hospital MCO rates and number of department MCOs were higher among patients with public insurance. Future studies should investigate this disparity to determine how social, environmental, and socioeconomic factors external to the clinical setting may also impact care delivery. When investigating occurrences of missed appointments in patients with low SES, many of whom have public insurance, studies have found that family obligations, limited work flexibility, and lack of accessible transportation negatively impact appointment attendance.[35–37] One study examining a surgical population found that experiences with physicians, communication, finances, social resources, and individual agency impact patient compliance in low-income urban hospitals.[37] Health care institutions, community-based organizations, and providers must acknowledge how these barriers impact patient access to care, and should adopt patient-centered strategies such as easing transportation barriers, reducing wait times, and creating a welcoming environment to intentionally decrease the instances of MCOs.[38–40]

Previous studies assessing the impact of no-show appointments on the healthcare system found that no-show appointments negatively impact cost, revenue, and use of resources in healthcare systems, as well as decrease provider and clinic productivity, efficiency, and capacity.[41,42] Additionally, no-shows can negatively impact patient health and lead to increased costs for patients in the long term due to delayed treatment.[42] Other studies have concluded that decreasing the prevalence of no-show

appointments improves patient health outcomes and the quality of care provided, and decreases costs on the healthcare system.[43] Although we did not specifically assess the time-cost impact of MCOs on our practice in this study, this would be a valuable area of focus for future research in our department.

The limitations of this study must be acknowledged. Due to the limited scope and retrospective nature of this study, results might not be generalizable to other care settings. Further, due to the study's retrospective nature, we were unable to capture patient voices about their experiences undergoing a procedure in the department, which would add depth and context to the analysis; future studies should be prospective and actively include patient voice through a mixed-methods approach. Additionally, we were adequately powered at 80% to answer our primary research questions; however, due to effect size, some secondary analyses concerning MCOs were underpowered. Our data were also limited to patients who did undergo surgical care in our department; therefore, we were unable to assess the prevalence of patients who did not receive care at our institution for any number of reasons, including the cost of care or lack of health insurance.

Due to data limitations, we were unable to investigate important factors related to MCOs. For example, future studies should investigate reasons for patient-driven MCOs. We were unable to investigate whether MCOs differed by patient distance to hospital, family income, or zip code, although COI score served as a proxy for these factors, and a significant difference was found ($P = 0.008$). Further, characterization of MCOs was reliant on data in the electronic medical record, so we were unable to validate the data reported by scheduling staff. Whether the MCOs were rescheduled after cancelation was not collected but would be important for more accurately understanding how MCOs impact patient access to care.

This data set had considerable unknown race and ethnicity data, potentially resulting in an under- or overestimation of resulting associations. This challenge suggests the need for improved demographic data collection within the clinical context. Our institution is an AMC in a large metropolitan area in the northeastern United States that is disproportionately White and has a higher SES relative to the rest of the country, which may skew our patient pool towards homogeneity. However, it is important to note that the sample was disproportionately White in relation to the surrounding community; due to this, results may not be directly generalizable to or accurately represent marginalized communities who face additional barriers to accessing care. Further, the state of Massachusetts has an uninsured rate of 2.4%, which is lower than the national average of 9.4%; however, this varies by state, with some states, like Texas, having an uninsured rate of 16.6%.[44,45] Of those with insurance in Massachusetts, 64.3% have employer-sponsored insurance; 16.6% have MassHealth or ConnectorCare; 13.6% have Medicare; and 2.6% have private, nongroup coverage.[44] In contrast, the national average of private insurance coverage is 67.2%, and the national average of public insurance coverage is 37.2%.[45] The low uninsured rate and general distribution of insurance in Massachusetts should be considered when comparing this study's findings with those with other study populations.

The sample included a larger proportion of patients with private insurance. We addressed this limitation through propensity score matching, which reduces the imbalance between cohorts and enhances the comparability of the two groups; however, the asymmetry of the sample could potentially still influence the findings. Future research is needed to determine if these results are generalizable to other domains within pediatric plastic and oral surgery, other surgical subspecialties, to public and community-based medical centers, or to institutions with different insurance distributions. The study was conducted at a quaternary care facility; therefore, patients may experience fewer delays in care and more attentive postoperative follow-up. Future studies should investigate potential disparities in other health care settings and should focus on identifying and addressing barriers to surgical care, specifically for marginalized communities.

CONCLUSIONS

The present study demonstrates that, in this sample of patients treated at an AMC, insurance type did not impact access to pediatric surgical care. Patients seen in our department did not have delayed access to care based on insurance type. However, the study found significant differences in MCOs by insurance type; hospital MCO rates and the number of plastic and oral surgery clinic MCOs were higher among those with public insurance. These findings warrant further investigation to determine and address potential barriers to more equitable surgical care for patients with public insurance.

Brian I. Labow, MD, FACS, FAAP
Department of Plastic and Oral Surgery
Boston Children's Hospital and Harvard Medical School
300 Longwood Avenue, Hunnewell 1
Boston, MA 02115
E-mail: brian.labow@childrens.harvard.edu

DISCLOSURES

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