Predicting Negative Outcomes While Awaiting Dental Treatment Under General Anesthesia

David M. Okuji, DDS, MBA, MS[1] Jiachen Lin, BS[2]

ABSTRACT

Purpose: To determine the wait time for dental treatment under general anesthesia (GA) and its impact on clinical outcomes in a pediatric population at federally qualified health centers in the United States.
Methods: Data were collected from 566 pediatric subjects who underwent dental rehabilitation under GA between July 1, 2013, and June 30, 2014. One-way analysis of variance and linear regression analyses were performed.
Results: Patients waited 110.6 days (±standard deviation: 103.9 days) between the initial and treatment visits. Regression analysis demonstrated that prolonged wait time was a significant predictor for an increased number of preoperative visits and more teeth treated than planned. Among the 25.1 percent of patients who returned for follow-up after surgery, 18.6 percent presented with pain, swelling, or broken/displaced restorations. The Canadian diagnostic code system was associated with the American Society of Anesthesiologists classification system ($P<0.001$) and was not coincident with wait time.
Conclusion: Longer wait time was associated with continuous pain, more teeth treated than planned, and more frequent pre- and postoperative visits. Wait time was predictive of a higher number of preoperative visits. Initial visit pain, and extra- and intraoral swelling were associated with the Canadian diagnostic system.
(J Dent Child 2021;88(1):3-10)

Received August 16, 2020; Last Revision October 21, 2020; Accepted October 22, 2020.

KEYWORDS: PEDIATRIC DENTISTRY, DENTAL CARIES, GENERAL ANESTHESIA, ACCESS TO CARE, OUTCOMES

Dental rehabilitation under general anesthesia (**GA**) is a standard treatment for children with complex medical conditions and developmental disabilities, those who need extensive dental care, or who have uncooperative behavior during treatment.[1] In recent decades, parents have shown increasing acceptance of GA for dental care. According to Eaton et al.,[2] GA was the third most commonly accepted practice, after tell-show-do and nitrous oxide sedation, by parents in the early 2000s. In addition to that, there is an increased likelihood of GA utilization by pediatric practitioners, especially recent graduates, female providers, and pediatric dentists treating low-income populations.[3]

Comprehensive care under GA is more efficient and effective than repeated care using sedation.[4] Children also experience significantly improved quality of life and overall satisfaction after dental rehabilitation under GA. Acs et al.[5] found that the child's level of pain was decreased and eating, sleeping, and overall health improved following dental treatment under GA. Furthermore, Fuhrer et al.[6] found that children treated under GA were 3.9 times more likely to have positive behaviors at future dental visits than those who were treated under conscious sedation.

Patients treated under GA may experience extensive wait times before treatment is delivered. A Canadian

[1]*Dr. Okuji is a senior associate director, Division of Dental Medicine, NYU Langone Health, Brooklyn, N.Y., USA; and* [2]*Ms. Lin is a fourth-year dental student, Harvard School of Dental Medicine, Harvard University, Boston, Mass., USA.*
Correspond with Dr. David Okuji at david.okuji@nyulangone.org

hospital reported that wait time for dental care under GA ranged from nine months to a year from consultation to treatment.[7] A British study found that, on average, the wait for dental treatment under GA was 137 days.[8] For the United States, in 28 out of 54 graduate pediatric dental programs, the average GA wait time for complex pediatric dental care with patients in pain was 28 days, while without pain it was 71 days.[9]

Delays in dental care due to wait times for dental rehabilitation under GA have adverse effects on pediatric patients. A British study found that while patients waited for treatment under GA, 41 percent presented increased pain and required more analgesics, 49.4 percent required more antibiotics, and 28.5 percent had their sleep affected.[10] Similarly, in 2007, Boehmer et al.[11] determined that four- to five-year-old patients had the longest wait times for dental rehabilitation under GA, with 43 percent of them developing complications in the meantime.

Multiple factors contribute to the prolonged GA wait time. In general, demand exceeds the supply and there is a shortage of skilled medical teams to perform GA, with a reduced capacity to provide care in the operating room (**OR**).[12] Although 59.5 percent of pediatric dentists reported using an OR in a hospital or accredited surgical facility, research shows that pediatric dentists might experience unequal opportunities to schedule the OR than other medical specialties.[13,14] Therefore, it is difficult to reconcile the opposing supply and demand problems of limited dental GA availability in order to reduce the GA wait time and improve access to care. Dentists can help identify shortcomings in the delivery system and improve the access to quality of care for individual patients. Commonly, the GA wait time is scheduled based on a first-come, first-served queuing method such that a patient who is seen receives a treatment plan first and may be given an earlier available GA appointment time than patients with more urgent needs. To allocate GA availability more rationally, Canadian researchers have investigated prioritization guidelines based on treatment needs and the existing medical conditions of children.[15-17] The clinical guidelines to prioritize GA schedule showed good face validity but did not demonstrate clinical relevance to wait time targets.[17] Thus, there is a need to further understand the effects of long wait times on dental conditions and develop an improved allocation system to help schedule high priority cases.

The purpose of the American Society of Anesthesiologists (**ASA**) physical status classification system is to assess a patient's pre-anesthesia medical comorbidities. The classification system alone does not predict the perioperative risks, but when used with other factors (e.g., type of surgery, frailty, level of deconditioning) it can help predict perioperative risks.[18] The Canadian diagnostic code classification system was developed by the Dental Department of the Hospital for Sick Children, Toronto, Ontario, Canada, to describe a child's medical and dental status. Each diagnostic code is linked to a priority level to aid in the prioritization of children for surgery.[17]

The purposes of this study were to: (1) calculate the wait time experienced by pediatric patients seen at federally qualified health centers (**FQHCs**) in the states of Maryland, Massachusetts, and Missouri in the United States who needed dental treatment under GA; (2) quantify clinical outcomes of wait times for these patients; and (3) identify associations between clinical outcomes and the Canadian diagnostic code system that may serve as a foundation for future research in order to find ways of improving clinical outcomes based upon children's medical and dental status. It was hypothesized that a longer wait time would be associated with more negative outcomes (e.g., more frequent visits, pain or swelling, and increased number of teeth needed treatment). Moreover, it was predicted that the Canadian diagnostic code system would be associated with the ASA classification system and pain, since these variables comprise the definitions of the diagnostic code.

METHODS

This project was approved by the Institutional Review Board of Lutheran Medical Center (now known as the New York University [NYU] Grossman School of Medicine), New York, N.Y., USA. A retrospective chart review was conducted for patients who received dental rehabilitation under GA at three NYU Langone Dental Medicine-affiliated FQHCs in Maryland, Massachusetts, and Missouri. Inclusion criterion for the study was children seven years of age or younger who underwent dental rehabilitation under GA between July 1, 2013, to June 30, 2014.

Data obtained from each patient chart included demographics (age and sex); clinic location; distance traveled to the clinic; ASA classification; modified Canadian diagnostic code classification; date and clinical findings during the initial visit, including pain and intraoral/extraoral swelling, as well as treatment delivered during the visit, such as pain medications and/or antibiotics prescribed, extractions, incision and drainage of odontogenic abscesses, interim therapeutic restorations (**ITR**), pulpal therapy, definitive restorations, sedative procedure, and topical fluoride application, and number of teeth planned to be treated under GA; and number of and reasons for pre- and post-GA and visits. On the day of the GA treatment appointment, data related to symptoms and actual procedures performed were recorded, including pain; intraoral/extraoral swelling; and number of teeth treated.

Microsoft Excel (Microsoft, Inc, Redmond, Wash., USA) was used for data entry, and SPSS 25.0 software (IBM Corp., Armonk, N.Y., USA) was used for statistical analysis. Frequency distributions, including minimum, maximum, means and standard deviations for all continuous variables, and rates for all categorical variables, were calculated. A bivariate analysis was performed to determine associations between outcomes and independent variables: Pearson's chi-square test for categorical variables and one-way analysis of variance for categorical and continuous variables. Further analysis was performed using the hierarchical regression model, which was serially adjusted for age and sex (first step), clinic location and patients' distance from the clinic (second step), and the initial symptoms and treatment procedures (third step). The wait time was entered as the fourth step to assess whether it accounted for variance in the number of preoperative visits in an underserved pediatric patient population. All statistical tests were two-sided. Statistical significance was set at P=0.05.

RESULTS

There were 594 patients whose data were collected, but 28 could not be included in the analyses because of missing data. A total of 566 pediatric patients (325 males and 241 females) were included, with ages ranging from one to seven years (mean: 3.9 years; standard deviation [SD]: ±1.3 years). Participants included 6.4 percent from Maryland, 18.6 percent from Massachusetts, and 75 percent from Missouri. On average, patients

Table 1. Demographic Characteristics and Overall Treatment of Pediatric Patients Who Received Dental Rehabilitation Under General Anesthesia

N		566				
Mean age in years at initial visit (SD)	3.9 (1.3)					
Sex (N, %)	Male	325 (57.4)	Female	241 (42.6)		
Clinic location (N, %)	Maryland	36 (6.4)	Massachusetts	105 (18.6)	Missouri	425 (75.0)
Mean distance in miles traveled to clinic (SD)	43.7 (38.1)					
ASA classification (N, %)†	ASA 1	485 (85.7)	ASA 2	76 (13.4)	ASA 3	5 (0.9)
Canadian diagnostic code (N, %)‡	Class 3	1 (0.2)	Class 4	471 (83.2)	Class 6	1 (0.2)
	Class 7	19 (0.4)	Class 9	2 (0.4)	Class 10	72 (12.7)
Initial visits						
Symptoms (N, %)	Pain	102 (18.0)	Extraoral swelling	5 (0.9)	Intraoral swelling	84 (14.8)
Treatment (N, %)						
Pain medication prescribed	32 (5.7)		Pulpal therapy		0 (0)	
Antibiotics prescribed	44 (7.8)		Definitive restoration(s)		6 (1.1)	
Extraction(s)	47 (8.3)		Sedation procedure		23 (4.1)	
Incision and drainage (intraoral)	1 (0.2)		Topical fluoride application		208 (36.7)	
Interim therapeutic restorations	11 (1.9)		Other procedures		108 (19.1)	
Number of teeth planned to treat at the OR (mean±[SD])		8.6 (3.8)				
Preoperative visits during the wait time		*Postoperative visits*				
Patients who had preoperative visits (N, %)	79 (14.0)	Patients who had postoperative visits (N, %)			142 (25.1)	
1 visit	35 (6.2)	1 visit			68 (12.0)	
2 visits	12 (2.1)	2 visits			27 (4.8)	
3 visits	10 (1.8)	3 visits			19 (3.4)	
4 visits	4 (0.7)	4 visits			13 (2.3)	
5 visits	10 (1.8)	5 visits			15 (2.7)	
6 visits	3 (0.5)					
7 visits	3 (0.5)					
8 visits	1 (0.2)					
9 visits	1 (0.2)					
Reasons for preoperative visits (N, %)	211	Reasons for postoperative visits (N, %)			306	
Pain	32 (15.2)	Pain			19 (6.2)	
Swelling	15 (7.1)	Swelling			3 (1.0)	
Broken/lost restorations or crown	2 (0.9)	Broken/lost restorations or crown			35 (11.4)	
Dental trauma	2 (0.9)	Loose tooth			2 (0.7)	
Recall visits	160 (75.8)	Dental trauma			3 (1.0)	
		Gingival problems			8 (2.6)	
		Fluoride visit			30 (9.8)	
		Recall visit			206 (67.3)	

Table 1 continue on next page.

lived 43.7 miles from the clinic sites (range: 0.3 to 176 miles, SD: ±38.1 miles, median: 31.1 miles). Patients traveled farthest in Missouri (mean: 54.6 miles), followed by Maryland (mean: 16.4 miles) and Massachusetts (mean: 9.3 miles). Among the 566 patients, 485 were classified as ASA 1, 76 as ASA 2, and five as ASA 3 (Table 1).

The wait time between the initial visit and the day of treatment under GA ranged from one day to 1,201 days, with an average of 110.6 days (SD: ±103.9 days, median: 96 days). Patients from Maryland waited the longest (mean: 300.2, SD: ±207 days), followed by Missouri (mean: 98.1, SD: ±78.1 days) and Massachusetts (mean: 96, SD: ±77.5 days). During the waiting period, 79 patients (14.0 percent) had emergency visits (6.2 percent had one visit, 4.6 percent had two to four visits, and 3.2 percent had five or more visits). The patients had a total of 211 pre-GA visits, with the most common reasons being scheduled recall (75.8 percent), followed by pain (15.2 percent) and swelling (7.1 percent).

On the scheduled GA treatment visit, 112 patients (19.8 percent) presented with pain, 61 patients (10.8 percent) presented with intraoral swelling, and two patients (0.4 percent) presented with extraoral swelling.

Table 1. Continued*

N			566	
Mean wait time for GA (SD)	Overall 110.6 (103.9)	Maryland 300.2 (207.0)	Massachusetts 96.0 (77.5)	Missouri 98.1 (78.1)
On the day of operative treatment (N, %)				
Pain				112 (19.8)
No. of patients who developed pain from initial to treatment visit				72 (12.7)
No. of patients who presented with pain at initial and treatment visits				40 (7.1)
Extraoral swelling				2 (0.4)
Intraoral swelling				61 (10.8)
No. of patients who developed intraoral swelling from initial to treatment visits				28 (4.9)
No. of patients who presented with intraoral swelling at initial and treatment visits				33 (5.8)
Mean number of teeth treated during OR (SD)				11.5 (3.3)
Mean difference in number of teeth planned to treat vs. treated (SD)				2.9 (3.6)

*** *Mean (±standard deviation [SD]) is presented for continuous variables; frequency and percentage (N, %) are presented for categorical variables; OR=operating room; GA=general anesthesia.*

† American Society of Anesthesiologist (ASA) physical status classification: ASA I=normal healthy patient; ASA II=patient with mild systemic disease; ASA III=patient with severe systemic disease; ASA IV=patient with severe systemic disease that is a constant threat to life; ASA V=moribund patient who is not expected to survive without the operation; ASA VI=declared braindead patient whose organs are being removed for donor purposes.

‡ Modified Canadian diagnostic code classifications: 1=facial cellulitis; 2=advanced dental caries: visible carious lesions and pain–high-risk medical status (ASA 4, 5, or 6); 3=advanced dental caries: visible carious lesions and pain–moderate-risk medical status (ASA 3); 4=advanced dental caries: visible carious lesions and pain–low-risk medical status (ASA 1 or 2); 5=dental abscess–high-risk medical status (ASA 4, 5, or 6); 6=dental abscess–moderate-risk medical status (ASA 3); 7=dental abscess–low-risk medical status (ASA 1 or 2); 8=dental caries–no pain, high-risk medical status (ASA 4,5, or 6); 9=dental caries–no pain, moderate-risk medical status (ASA 3); 10=dental caries–no pain, low-risk medical status (ASA 1 or 2).

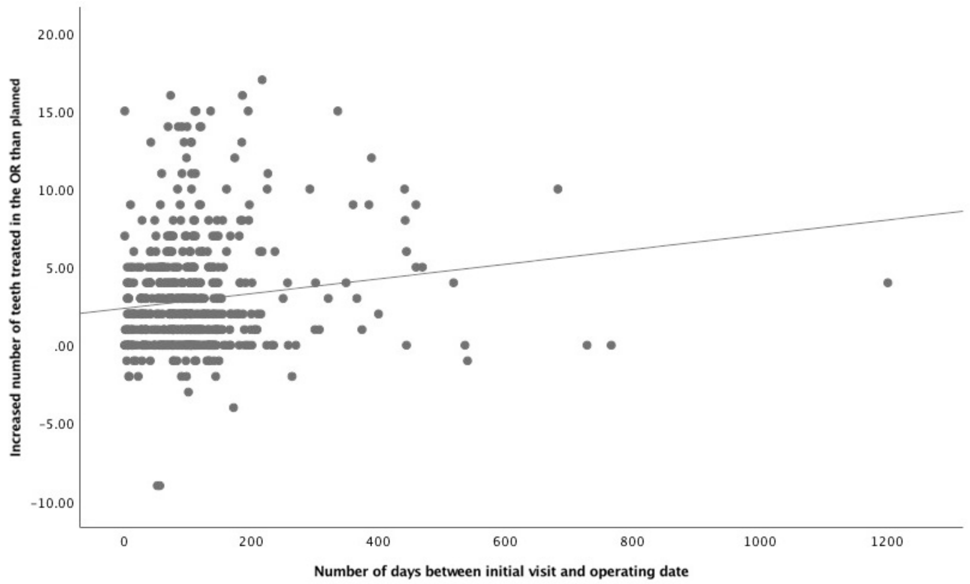

Figure. Correlation between wait time and increased number of teeth treated under general anesthesia compared to the number of teeth planned for treatment at the initial examination visit.*

** Patients had 0.15 more teeth treated under general anesthesia, compared to the number of teeth planned at the initial visit, for every 30 days of additional wait time. β=0.005, P=0.001. The vertical axis represents the increased number of teeth treated in the operating room compared to the number of teeth listed on the treatment plan developed at the initial visit. The horizontal axis represents the number of days between the initial visit and operating room treatment dates.*

Almost 13 percent of patients developed pain between the initial visit and GA treatment visit, while 7.1 percent presented with pain at both the initial and GA treatment visits. In addition to that, 4.9 percent of patients developed intraoral swelling between the initial visit and treatment visit while 5.8 percent presented with intraoral swelling at both the initial and treatment visits. On average, 2.9 more teeth (SD: ±3.6) were treated under GA for each patient compared to the initial treatment planning visit.

After the GA treatment visit, 142 children (25.1 percent) returned for postoperative visits (12.0 percent had one visit, 10.5 percent had two to four visits, and 2.7 percent had five visits). The 142 patients had a total of 306 visits after GA treatment, of which 206 (67.3 percent) were scheduled recall visits, 30 visits (9.8 percent) for fluoride application, 35 visits (11.4 percent) for broken/lost filling or crown, 19 visits (6.2 percent) due to pain, and three visits (1.0 percent) due to swelling.

Longer wait time was found to be positively associated with the number of pre- and post-GA visits. In general, as the wait time increased, there was an increased number of teeth treated on the GA treatment visit compared to the number of teeth identified for treatment at the initial visit (Figure). To infer causality between wait time and the number of pre-GA visits beyond a correlational relationship, a series of linear regression analyses was conducted. Cohen's convention for small (f^2=0.02), medium (f^2=0.15), and large effects (f^2=0.35) were used as a general guide to determine the size of variance.[19] Results of the model are presented in Table 2. The hierarchical regression model showed that wait time was a significant predictor (β=0.344, P<0.001) and accounted for a medium (f^2=0.26) and significant nine percent of additional unique variance in the number of pre-GA visits (F (18, 547)=59.4, P<0.001).

Table 2. Hierarchical Regression Analyses of How Wait Time Contributed to the Number of Preoperative Visits*

Measure	β	Adjusted R^2	Δ R^2	F
Step 1: Demographics	--	.03	--	9.46§
Age	-.171§			
Sex	-.069			
Step 2: Other factors	--	.45	.43	118.5§
Clinic site	-.699§			
Distance from clinic	.105‡			
Step 3: Initial visit presentation and treatment	--	.56	.11	43.0§
ASA classification¦	-.034			
Presence of pain	-.135§			
Extraoral swelling	-.016			
Intraoral swelling	.007			
Canadian diagnostic code‡	-.355§			
No. teeth planned to treat	-.037			
Prescription for pain med	-.162§			
Prescription for antibiotics	.015			
Extraction performed	.045			
Incision and drainage performed	.010			
Interim therapeutic restoration	.047			
Definitive restoration	.015			
Sedation procedure	-.076†			
Step 4: Wait time for GA in OR	.344§	.65	.09	59.4§

* N=566; GA=general anesthesia; OR=operating room; b=standardized coefficient; adjusted R2=amount of the total variation in the dependent variable can be explained by the independent variables after adjusting for the number of predictors in the model; Δ adjusted R2=difference of variation in the dependent variable explained by the independent variables compared to the previous step after adjusting for the number of predictors in the model; F=variance between the means of two groups significantly different, calculated by mean square regression divided by the mean square residual.

† P<0.05. ‡ P<0.01. § P≤0.001.

¦ American Society of Anesthesiologist (ASA) physical status classification: ASA I=normal healthy patient; ASA II=patient with mild systemic disease; ASA III=patient with severe systemic disease; ASA IV=patient with severe systemic disease that is a constant threat to life; ASA V=moribund patient who is not expected to survive without the operation; ASA VI=declared braindead patient whose organs are being removed for donor purposes.

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Given that the Canadian diagnostic code system was developed to help prioritize GA scheduling for patients with the greatest need, an analysis was performed to determine how patients' symptoms correlated with the modified Canadian diagnostic code system for the patients treated by FQHC dentists in the United States. No patient was assigned to the modified Canadian diagnostic code 1, 2, 5, or 8 because all patients had ASA code 3 or below (Table 1). For the 566 pediatric patients, the majority (83.2 percent) were code 4, the second most was code 10 (12.7 percent), followed by code 7 (3.4 percent), code 9 (0.4 percent), code 3 (0.2 percent), and code 6 (0.2 percent). To have an adequate sample size, groups 3, 6, 7, and 9 were combined when evaluating the relationship between the Canadian diagnostic code system and wait time, number of pre- and post-GA visits. Table 3 shows that the Canadian diagnostic code system was associated with ASA classification and initial visit symptoms (i.e., pain, extraoral and intraoral swelling). In addition to that, the Canadian diagnostic system was associated with extraction and pain medication and antibiotic prescription, and whether ITR, definitive restoration, or sedation was performed during the initial visit. There was a significant difference in the number of pre- and post-GA visits between various classification groups, but no statistically significant difference in wait time between different Canadian diagnostic code classes.

DISCUSSION

This study examined wait times for dental care under GA for pediatric patients at FQHCs, identified associations between wait times and pre- and post-GA clinical outcomes, and found associations between clinical outcomes and the Canadian diagnostic code system. The mean time between the first consultation date and operative treatment date was significantly longer than the number reported by Lewis and Nowak.[9] The Maryland site showed a significantly longer wait time than the Massachusetts and Missouri locations. This difference could be explained by its small sample size of 36 people but also potentially due to factors such as hospital GA capacity, GA scheduling protocol between FQHC and hospitals, number of dentists with hospital privileges, and local dentists' preference of behavior management techniques. All three FQHCs are located in rural communities, and the data supports findings of inadequate access to care for pediatric patients requiring dental treatment under GA.[20,21] Additional factors may play a role in the three-month prolonged wait time, such as inherent long waiting lists for GA treatment, difficulty with scheduling pediatric dental patients with complex medical conditions, frequent canceled or failed appointments, and inefficient utilization and estimation of OR time needed.[22] For the above-noted reasons, it is important to address the issue of long wait times for pediatric patients at FQHCs.

While waiting to receive treatment under GA, the patients' oral health continues to deteriorate. Consistent with this and past studies,[10,11] it was found that pediatric patients continuously experienced or started developing more symptoms during the three-month wait time, leading to more extensive dental care under GA than the previous treatment

Table 3. Comparison of Initial Presentations, Wait Time, and Number of Preoperative and Postoperative Visits Separated by Canadian Diagnostic Code Classifications

	Total	Class 4¦	Class 10¦	Other classes¦ (3, 6, 7, 9)	*P*-value
N	**566**	471	72	23	
ASA classification (%)†§					<0.001
ASA 1		424 (90.0)	48 (66.7)	13 (56.5)	
ASA 2		46 (9.8)	24 (33.3)	6 (26.1)	
ASA 3		1 (0.2)	0 (0.0)	4 (17.4)	
Initial visit pain (%)†					<0.001
No pain		386 (82.0)	72 (100.0)	6 (26.1)	
Pain		85 (18.0)	0 (0.0)	17 (73.9)	
Initial visit extraoral swelling (%)†					<0.001
No swelling		469 (99.6)	72 (100.0)	20 (87.0)	
Swelling		2 (0.4)	0 (0.0)	3 (13.0)	
Initial visit intraoral swelling (%)†					<0.001
No swelling		408 (86.6)	70 (97.2)	4 (17.4)	
Swelling		63 (13.4)	2 (2.8)	19 (82.6)	
Pain medication prescribed (%)†					<0.001
No prescription		452 (96.0)	72 (100.0)	10 (43.5)	
Prescription		19 (4.0)	0 (0.0)	13 (56.5)	
Antibiotics medication prescribed (%)†					<0.001
No prescription		440 (93.4)	71 (98.6)	11 (47.8)	
Prescription		31 (6.6)	1 (1.4)	12 (52.2)	
Extraction (%)†					0.029
Not performed		432 (91.7)	69 (95.8)	18 (78.3)	
Performed		39 (8.3)	3 (4.2)	5 (21.7)	
Incision and drainage (%)†					0.904
Not performed		470 (99.8)	72 (100.0)	23 (100.0)	
Performed		1 (0.2)	0 (0.0)	0 (0.0)	
ITR(s) (%)†					0.004
Not performed		465 (98.7)	67 (93.1)	23 (100.0)	
Performed		6 (1.3)	5 (6.9)	0 (0.0)	
Definitive restoration(s) (%)†					0.004
Not performed		469 (99.6)	69 (95.8)	22 (95.7)	
Performed		2 (0.4)	3 (4.2)	1 (4.3)	
Sedation procedure (%)†					<0.001
Not performed		463 (98.3)	60 (83.3)	20 (87.0)	
Performed		8 (1.7)	12 (16.7)	3 (13.0)	
Wait time (mean±[SD])‡		107.2 (98.9)	136.2 (114.7)	100.8 (152.7)	0.079
Number of preoperative visits (mean±[SD])‡		0.3 (1.0)	1.1 (1.9)	0.5 (1.4)	<0.001
Number of postoperative visits (mean±[SD])‡		0.3 (0.9)	1.7 (1.7)	1.4 (1.3)	<0.001

† Pearson's chi-square test for categorical variables.

‡ One-way analysis of variance for categorical and continuous variables.

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plan. More significantly, this study's findings underscore that the duration of wait time remained an important and unique predictor of the number of pre-GA visits, even after controlling for other variables. Patients who waited longer for the GA visit had an increased number of pre-GA visits than others who received treatment sooner.

Additionally, a large proportion of patients did not return for the recommended follow-up visits. Similarly, Jamieson and Vargas[23] found that only 54 percent of patients returned for two-week postoperative visits after GA and only 13 percent returned at six months and five percent at 30 months. Dental treatment does not end after dental rehabilitation, and when patients fail to follow-up with their dentists, additional treatments or even emergency treatments may be necessary.[24] The study also found that patients presented to 18.6 percent of postoperative visits with pain, swelling, and/or broken/displaced restoration. Similarly, researchers at the University of Iowa reported that 26 percent of patients developed caries and 13 percent had an emergency visit within three years after GA treatment.[23] The results further indicate that GA was not a definitive treatment and, without changing the underlying causes, patients had a high risk for recidivism. Hence, dentists must focus on educating caregivers about proper home care, nutrition, and maintaining frequent periodic prevention visits to preclude new caries development.

To optimize the outcome of dental health with limited GA capacity for pediatric dentistry in the United States, this study also examined a diagnostic code system proposed by Canadian researchers.[16,17] As expected, the modified Canadian diagnostic code system was associated with patients' ASA classification and initial visit symptoms. However, there was a lack of association between the wait times and the code system. One explanation is that pediatric patients who required dental treatment under GA are typically scheduled under the first-come and first-served method at the study locations. Dentists in the U.S. may not be aware of and do not use the Canadian diagnostic code system to prioritize patient scheduling. Secondly, the system was designed to consider both medical risk and dental status by combining the ASA classification and the status of dental diseases. The Canadian system was simply divided into advanced dental caries, dental abscess, or non-painful dental caries. In this study, 83.2 percent of patients were assigned to Canadian code 4 (advanced dental caries with ASA 1 or 2). In such a situation, the system did not serve the purpose of stratifying the patient's urgency of treatment. Hence, there is a need to improve existing prioritization systems so that children with the highest urgency might be scheduled to improve clinical outcomes.

Despite the importance of this study's findings, there were study limitations. First, a more rational triage system will improve the quality of care but will not reduce the overall wait time. Therefore, the fundamental goal would be to prevent the need for GA. The data for this study were collected before August 2014, when the U.S. Food and Drug Administration approved silver diamine fluoride for the market.[25] This new treatment option provides dentists an alternative caries-management tool and can potentially reduce the need for GA. Secondly, this study was conducted at three FQHCs. To validate it, the wait time at private practices or public institutions that mainly serve underserved children populations should also be examined to rule out the effects of local dentist practice preferences, hospital GA capacity, and other elements. Lastly, future studies could investigate factors that help prioritize the urgency of dental care under GA and develop a more clinically relevant system for scheduling patients.

CONCLUSIONS

Based on the results of this study, the following conclusions can be made:

1. The wait time on average was 110.6 days for pediatric patients at three FQHCs in the U.S., a number that varied by geographic region.
2. Longer wait time was associated with continuous pain, a larger number of teeth treated under GA than planned, and more frequent pre- and post-GA visits.
3. Prolonged wait time was an important predictor of an increased number of pre-GA visits.
4. The Canadian diagnostic code system was associated with ASA classification and initial visit symptoms (i.e., pain, extraoral swelling, and intraoral swelling).

ACKNOWLEDGMENTS

The authors wish to thank Jay Balzer, DMD, MPH, a dental public health specialist, and the former resident-investigators with the NYU Langone Hospitals' Advanced Education in Pediatric Dentistry Program who supported the study: Amanda Doll-Engelhardt, DDS, Meghan Greabell, DMD, and Jennifer Sielski, DMD.

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