

Identifying Demographic Variables Related to Failed Dental Appointments in a University Hospital-based Residency Program

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Abstract: *Purpose:* The objective of this study was to identify characteristics of pediatric patients who failed to keep the majority of their scheduled dental appointments in a pediatric dental clinic staffed by pediatric dental residents and faculty members. *Methods:* The electronic records of all patients appointed over a continuous 54 month period were analyzed. Appointment history and demographic variables were collected. The rate of failed appointments was calculated by dividing the number of failed appointments with the total number of appointments scheduled for the patient. *Results:* There were 7,591 patients in the analyzable dataset scheduled with a total of 48,932 appointments. Factors associated with an increased rate of failed appointments included self-paying for dental care, having a resident versus a faculty member as the provider, rural residence, and adolescent aged patients. Multivariable regression models indicated self-paying patients had higher odds and rates of failed appointments than patients with Medicaid and private insurance. *Conclusions:* Access to care for children may be improved by increasing the availability of private and public insurance. The establishment of a dental home and its relationship to a child receiving continuous care in an institutional setting depends upon establishing a relationship with a specific dentist. (*Pediatr Dent* 2014;36:296-301) Received August 8, 2013 | Last Revision November 26, 2013 | Accepted November 29, 2013

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Patient failure to keep scheduled dental appointments is a problem facing dental clinics that provide oral health care for children. There are manifold negative outcomes resulting from patients who regularly fail to keep scheduled dental visits. Failed appointments are deleterious to a child's health because they compromise the efficacy of treatment for the child, impact continuity of care, and impede the development of a strong doctor-patient relationship. Dental clinics are faced with the challenge of decreased scheduling efficiency and the resultant loss of income from broken appointments.¹ An additional issue encountered in pediatric dentistry residency clinics is that residents are unable to learn how to effectively manage their clinic time due to high patient appointment failure rates.²

Few studies have been conducted to identify characteristics of patients who may be considered more likely to fail a scheduled dental appointment. Existing literature suggests that patients utilizing public dental insurance programs, such as Medicaid and the Children's Health Insurance Program (CHIP), may be at greater risk of failing to keep scheduled dental visits than patients with private insurance or who self-pay for treatment. A positive correlation has been shown between the number of missed appointments and the number of publicly insured patients in hospital-based residency clinics for both pediatric dentistry and pediatric medicine.^{2,3}

Another study reported that 63 percent of the "high risk of no show" patients used public insurance and that these patients were more likely to fail an appointment than self-

paying patients.⁴ Findings from another investigation found that the "rate of missed appointments was three times higher among public insurance patients than patients with private insurance" in a pediatric practice.⁵ The same trend of higher cancellations with public insurance patients has also been reported in general adolescent clinics and orthodontic practices.^{6,7}

Other risk factors associated with failing scheduled dental appointments are delinquent financial accounts, being a male patient, whether or not the appointment was confirmed with the parent, and if the appointment had been scheduled more than 30 days in advance.^{1,8,9} Deyo found that a patient's risk of failing an appointment decreased with increasing age, education, and socioeconomic status.¹⁰

Minimal research has been conducted in the U.S. on the characteristics of patients who fail to keep scheduled dental appointments. A prospective study in Iowa compared appointment-keeping behavior of parents in a private pediatric dental office, a public health dental clinic, and a university-based clinic.¹¹ The study lasted one month and compared public insurance patients versus patients using other forms of payment and whether or not the patient was on time, failed, or cancelled the appointment. No demographic data were collected. The remaining U.S. studies are primarily surveys and claims reviews that examine provider attitudes toward public insurance.¹²⁻¹⁷

Given the paucity of research in this area, the purpose of this study was to identify characteristics of patients who failed 75 percent or more of their scheduled dental appointments in a university hospital-based pediatric dental clinic staffed by residents and members of the faculty over a continuous 54-month period. Specifically, this study aimed to determine the percentage of failed scheduled appointments by payment method and whether any demographic variables were related to failed appointments. Identifying factors that increase the likelihood that a patient will fail a scheduled dental appointment may assist with making policy recommendations

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to increase access to care and promote the establishment of a dental home for children.

Methods

Study design. The Office of Research Integrity at the University of Kentucky (UK), Lexington, Ky., reviewed and approved the study protocol. Axium, the electronic dental management system utilized by the UK College of Dentistry, was used to access records and appointment histories of patients seen in the pediatric dentistry clinic over a continuous 54-month period that ranged from April 2006 to October 2010. All data searches were analyzed electronically, and all personal identifiers were removed from the data to protect patient confidentiality. All deidentified data were stored in spreadsheets using Microsoft Excel 2010 (Microsoft Corp., Redmond, Wash., USA) and imported into SAS 9.3 (SAS Institute Inc., Cary, N.C., USA) for analysis.

The following demographic and clinical variables were collected from the patient's electronic chart data: gender; age at initial appointment; payment method (public insurance, private insurance, self-pay); and zip code. The zip code was used to determine the distance traveled by the patient. The 2003 Rural Urban Continuum Codes, also known as Beale codes, were used to determine whether the county in which the patient lived was rural or urban (Economic Research Service, U.S. Department of Agriculture, Washington, D.C., USA). Scheduled appointments that were kept and those that were not were recorded for each patient. The rate of failed appointments was calculated using the number of failed appointments divided by the total number of appointments scheduled for the patient in the study period. The study investigators used an arbitrary percentage of greater than or equal to 75 percent to represent patients with a high rate of failed appointments. The patients were grouped into three categories: (1) patients with greater than or equal to 75 percent failed appointments; (2) patients with no (zero percent) failed appointments; and (3) patients with more than zero percent but less than 75 percent failed appointments

(zero percent less than the rate of failed appointments greater than 75 percent).

Sample selection and size. Appointment records for all children younger than 18 years old during the 54-month study period were examined. Patients were excluded if no data were entered in Axium for birth date, gender, payment method, zip code, or the date the appointment was scheduled. Each patient's first recorded appointment in Axium during the study period was considered the initial visit. The preliminary data extraction yielded 10,074 total unique patients.

However, orthodontic patients (N=55) treated by pediatric dentistry residents, emergency patients (N=900), children returning for postoperative appointments (N=20), and patients scheduled with a dental hygienist (N=1508) were excluded. Orthodontic patients were excluded due to the nature of treatment differing from the typical pediatric dental patient. Emergency patients were excluded because many of these children were patients of record from surrounding clinics that periodically deferred their emergency call to the UK pediatric dentistry clinic. Postoperative appointments after dental treatment under general anesthesia were excluded because a large number of these patients were referred to the UK clinic by community dental clinics unable to manage their hospital care; these patients typically returned to the referring clinic after their treatment was completed. Patients scheduled with a dental hygienist were excluded because the provider types of interest for this study were pediatric dentistry faculty members and residents.

Patients who failed to keep two consecutive scheduled appointments without 24-hour notification were designated by clinic protocol as "block patients." Block patients (N=634) were also excluded from the primary data analysis and were scheduled during a "block" afternoon clinic session in which each patient was allotted only a 30-minute appointment. Pediatric dental residents provided treatment, and patients could not schedule appointments outside of the block session or request a particular resident. Patients that kept two consecutive

TABLE 1. VISIT DISTRIBUTION OF PATIENTS

	Total* (N=7,591)	Block† (N=634)	Nonblock patients			P-value (0% vs. ≥75% failed appointments)
			0-100% failed appointments (N=6,957)	0% failed appointments (N=1,735)	≥75% failed appointments (N=1,570)	
<i>No. of visits</i>						
Mean (±SD)	6.5±8.6	10.1±11.5	6.1±8.2	2.7±2.6	1.7±1.6	<.001
Med (min, max)	3 (1-115)	6 (1-84)	3 (1-115)	2 (1-24)	1 (1-24)	
<i>No. of visits (in categories)</i>						
1 visit N (%)	1,819 (24)	71 (11)	1,748 (25)	695 (40)	1,050 (67)	<.001
2-4 visits N (%)	2,007 (26)	141 (22)	1,866 (27)	640 (37)	405 (26)	
4+ visits N (%)	3,765 (50)	422 (67)	3,343 (48)	400 (23)	115 (7)	
<i>Time in database (ds)</i>						
Mean (±SD)	334±440	492±535	320±427	158±290	33±129	<.001
Med (min, max)	109 (0-1,633)	252 (0-1,630)	98 (0-1,633)	15 (1-605)	0 (0-1,428)	

* Patients scheduled with block sessions and regularly scheduled patients with failed appointments of 0-100 percent were included.

† Block patients with rates of failed appointments ranging from 0-100 percent were included.

block appointments were allowed to schedule subsequent appointments during regular clinic hours. These "block" patients were investigated as a subset analysis separate from the primary analysis due to the restrictions in scheduling appointments as well as the patient's ability to enter and exit block scheduling during the study's time period. Therefore, a final analyzable sample of 7,591 patients was collected.

Data analysis. The primary goal of the analysis was to characterize patients regarding appointment-keeping behavior. The visit distribution of patients is presented in Table 1. Patients are described overall (N=7,591), by block status (N=634) or not (N=6,957), as well as for those with no (zero percent) failed appointments (N=1,735), and for those with a high (greater than or equal to 75 percent) rate of failed appointments (N=1,570) for visit distribution.

The characteristics of the study population, which include age, provider type, and rural/urban location, are presented in Table 2. Continuous variables were summarized using descriptive statistics, and categorical variables were summarized using frequencies and percentages. Comparisons were made between patients without any failed appointments (zero percent) and those with many (greater than or equal to 75 percent) failed appointments using chi-square tests of independence and two-sample *t* tests for categorical and continuous variables. The multiple variable relationships between factors were investigated using regression analyses.

Three models are presented, and the results are in Table 3. For Model I, the rate of failed appointments were used in a negative binomial regression (PROC GENMOD, link=log, dist=negbin); rate ratio estimates and 95% confidence intervals are presented (Table 3). Negative binomial regressions allow for the count nature of the number of failed appointments offset by the number of total appointments but does not require the assumption of equal mean and variance, as is required for a Poisson regression. As an additional analysis, to account for the fact that those with more appointments may be more likely to keep appointments, logistic regression models were utilized (Models II and III).

In Model II, the data were subset so that only the appointment following the initial study period visit was used, and an indicator variable for whether or not this visit was failed or not was created. In Model III, the data were subset so that only the last appointment in the study period was used, and an indicator variable for whether or not this visit was failed or not was created. Using logistic regression, multiple factors were investigated for the relationship between failing the next consecutively made appointment (Models II and III); odds ratio estimates with 95% confidence intervals are presented. All data analyses were completed using SAS 9.2 statistical software (SAS Institute Inc.) A *P*-value less than .05 was considered statistically significant for all statistical tests.

Table 2. CHARACTERISTICS OF PATIENTS

	Total * (N=7,591)	Block † (N=634)	Nonblock patients			<i>P</i> -value (0% vs ≥75% failed appointments)
			0-100% failed appointments (N=6,957)	0% failed appointments (N=1,735)	≥75% failed appointments (N=1,570)	
<i>Age, mean (±SD)</i>	7.1±4.5	8.2±4.2	7.0±4.5	6.2±4.7	7.3±4.6	<.001
<i>Age category (yr)</i>						<.001
<6 N (%)	3,397 (45)	201 (32)	3,196 (46)	974 (56)	682 (43)	
6-13 N (%)	2,979 (39)	310 (49)	2,669 (38)	499 (29)	614 (39)	
≥13 N (%)	1,214 (16)	122 (19)	1,092 (16)	262 (15)	274 (18)	
<i>Provider type</i>						<.001
Faculty N (%)	N/A	N/A	1,749 (25)	467 (27)	282 (18)	
Resident N (%)	N/A	N/A	5,208 (75)	1,268 (73)	1,288 (82)	
<i>Payment method</i>						<.001
Public insurance ‡ N (%)	4,023 (53)	496 (78)	3,527 (51)	980 (57)	335 (21)	
Self-pay N (%)	1,437 (19)	59 (9)	1,378 (20)	112 (6)	1,142 (73)	
Private insurance N (%)	2,131 (28)	79 (13)	2,052 (30)	643 (37)	93 (13)	
<i>Residence</i>						<.001
Rural N (%)	2,608 (34)	152 (24)	2,456 (35)	473 (33)	965 (67)	
Urban N (%)	4,983 (66)	482 (76)	4,501 (65)	1,262 (68)	605 (32)	
<i>Gender</i>						.18
Male N (%)	3,884 (51)	312 (49)	3,572 (51)	879 (51)	832 (53)	
Female N (%)	3,707 (49)	322 (51)	3,385 (49)	856 (49)	738 (47)	

* Patients scheduled with block sessions and regularly scheduled patients with failed appointments of 0-100 percent were included.

† Block patients with rates of failed appointments ranging from 0-100 percent were included.

‡ The sources of public insurance were Medicaid and CHIP.

Table 3. MULTIPLE VARIABLE RELATIONSHIPS WITH FAILED APPOINTMENTS OF NONBLOCK PATIENTS*

	Model I (N= 5,209) 95% CI	Model II (N=5,036) 95% CI	Model III (N=4,088) 95% CI
Provider (resident vs. faculty)	1.07 (1.03, 1.12)	0.99 (0.85, 1.14)	1.25 (1.07, 1.46)
Insurance (self-pay vs. public insurance [†])	2.01 (1.74, 2.32)	2.82 (2.21, 3.61)	2.13 (1.64, 2.78)
Insurance (self-pay vs. private insurance)	2.15 (1.84, 2.51)	4.55 (3.52, 5.88)	5.13 (3.88, 6.80)
Zip code (rural vs. urban)	1.12 (1.08, 1.17)	1.13 (0.99, 1.30)	1.45 (1.26, 1.68)
Age (<6 vs. ≥13 ys)	0.99 (0.85, 1.15)	1.08 (0.92, 1.28)	0.88 (0.74, 1.05)
Age (6-12 vs. ≥13 ys)	0.94 (0.80, 1.10)	1.14 (0.97, 1.34)	1.19 (1.01, 1.40)

* Model I—outcome is number of failed appointments (uses negative binomial regression with offset for number of total appointments); Model II—outcome is whether subsequent appointment is failed (uses logistic regression and first visit after study period initial visit); Model III—outcome is whether subsequent appointment is failed (uses logistic regression and last visit).

† The sources of public insurance are Medicaid and CHIP.

Results

The 7,591 patients in the analyzable set scheduled a total of 48,932 appointments in the time period, with a median of three appointments per patient and a range from one to 115 appointments (Table 1). The range of the number of appointments (1, 24) was not different for those with greater than or equal to 75 percent or zero percent failed appointments. With the exception of block patients, most patients had fewer than four visits. Overall, the average patient age was seven years old (± 4.47 SD), most children were from urban counties (66 percent), and the main payment method was Medicaid/CHIP (53 percent) followed by private insurance (28 percent) and self-pay (19 percent; Table 2). The average age of block patients was 8.2 years old (± 4.22), with a plurality of six- to 13-year-olds (49 percent). The most common payment method for block patients was Medicaid/CHIP (78 percent), and they resided primarily in urban counties (76 percent). Among the nonblock patients, the average age was seven years old (± 4.47), more than half (51 percent) had Medicaid/CHIP, and most were from urban counties (65 percent).

Most patients having greater than or equal to 75 percent failed appointments were self-pay patients (73 percent), and only six percent of never-failed appointment patients were self-pay patients ($P < .001$; Table 2). Those with more failed appointments (greater than or equal to 75 percent) tended to be older than six years old and more likely to live in rural counties (67 percent) than those who had never failed an appointment ($P < .001$, $P < .001$, respectively). Bivariate comparisons of patients with many failed (greater than or equal to 75 percent) appointments vs patients with no failed (zero percent) appointments indicated that age, payor type, and living in a rural location may impact appointment failure. However, these analyses only consider one factor at a time and do not fully provide for the failed appointment outcome (ie, those with greater than zero percent or less than 75 percent failed appointments are not included in these comparisons).

To fully explore the factors related to appointment failure, multiple variable regressions were employed and are presented in Table 3. Using the rate of failed appointments (for all patients excluding block patients), self-payment, having a pediatric dental resident provider, rural residence, and older age were

all associated with an increase in the rate of failed appointments; only age was not statistically significant (Table 3, Model I). Similar results were observed for Models II and III, although only payment method was significant in Model II. In Models I, II, and III, self-pay was a significant factor in understanding appointment behavior, even after adjusting for age, provider type, and rural residence. In Model I, the rate of failed appointments was twice as great in self-pay patients versus public insurance patients (relative risk [RR]=2.0; 95% confidence interval [CI]=1.7-2.3) and when compared to private insurance (RR=2.2; 95% CI=1.8-2.5). Likewise, the odds of missing the next appointment at the beginning of the study period (Model II) and the end of the study period (Model III) were also increased for self-paying patients. In Models II and III, the odds of a failed appointment for self-pay was twice that of public insurance patients and more than four times that of private insurance.

Discussion

Identifying the variables that increase the likelihood of failed scheduled dental appointments can help in making policy recommendations to increase access to care and promote the establishment of a dental home for children. The authors evaluated the appointment-keeping behavior of 7,591 patients with a combined total of 48,932 appointments over a continuous 54-month period. This study is larger in scope than any previous U.S. study evaluating dental appointment-keeping behavior.^{4,8,18-21} It is also unique in specifically examining the differences in the behavior of patients by payment method of dental care (public insurance, self-pay, or private insurance) on a larger scale than any previous research.^{7,11}

The UK pediatric dentistry hospital clinic serves as a safety net clinic for the community in that all forms of insurance are accepted and low-income patients are frequently referred to the clinic for care. Overall, the payment method of patients is 53 percent public insurance, 19 percent self-pay, and 28 percent private insurance. The majority of patients whose dental care is covered by private insurance are children of UK employees who have purchased dental insurance as part of a benefit package. Most self-pay patients in this study were low-income families referred to the UK for dental care.

This study's results found that 73 percent of all self-pay patients, 21 percent of all public insurance patients, and 13 percent of all private insurance patients failed to keep more than 75 percent of their scheduled dental appointments ($P < .001$). This outcome does not agree with previous studies suggesting that public insurance patients are most likely to fail scheduled dental appointments.^{4,7,11} This finding has significant implications, because providers have cited failed appointments as a primary reason for not participating in government public insurance programs.¹²⁻¹⁶ In fact, this study's findings suggest that public insurance may actually increase the chances that a patient will keep a scheduled dental appointment.

Low socioeconomic status has been identified as a factor linked to high appointment failure rates.^{6,8-10,18} Uninsured children are least likely to utilize health care services, including dental care.²² Our results indicate that economically disadvantaged children who do not qualify for public insurance programs

were at the highest risk of failing scheduled appointments. Disturbingly, regardless of the age of the patient population, self-pay patients had the highest odds of failing in the greater than or equal to 75 percent failed appointments group versus children who had public or private insurance coverage for dental care. This study supports the efforts of the recent expansion of public insurance programs to include more children by 2014. This expansion has the potential to increase access to care for 44 million of the United States' 78.6 million children by providing them with public insurance.²³ Timely intervention and improving access to care for uninsured children younger than six years old is significant, because untreated dental decay increases in severity and ultimately necessitates more complex and expensive treatment of children who regularly fail scheduled dental appointments.

An interesting result of this study was that patients were more likely to fail an appointment if care was being provided by a pediatric dentistry resident (50 percent) versus a pediatric dentistry faculty member (38 percent; $P < .001$). This is possibly attributable to the difficulty in establishing continuity of care with pediatric dentistry residents. The American Academy of Pediatric Dentistry's definition of a dental home is "the ongoing relationship between the dentist and the patient, inclusive of all aspects of oral health care delivered in a comprehensive, continuously accessible, coordinated, and family centered way."²⁴ Pediatric dentistry residents have rotations, classes, and a limited time in residency, all of which impede the development of a continuing relationship with patients and their families. By contrast, pediatric dentistry faculty members, although limited in their number of practice days, are continuously available to patients and families through time. Parents and children have the opportunity to establish a continuous doctor-patient relationship with a pediatric dentistry faculty member.

In the typical clinic protocol, patients are scheduled with the first available dentist unless a specific provider is requested by the family. Interestingly, the majority of privately insured families ask for a faculty member to provide care for their children. Some of these requests may derive from a parent's preference for an experienced dentist. However, given that the majority of privately insured patients are children of employees of the University and presumably not transient, this again reinforces the value that patients place on development of the doctor-patient relationship with a single, consistent dentist. This finding has implications for large group practices, public health clinics, and institution-based clinics. In clinical settings with multiple dentists available, it appears that establishing continuity of care with the same dentist will increase the likelihood of the patient returning for scheduled appointments, completing any required treatment, and valuing the clinic as a dental home.

Deyo found that a patient's risk of failing an appointment decreased with increasing age.¹⁰ Skaret evaluated 12- to 18-year-old patients and found that the prevalence of failed appointments increased with age.²¹ This present study produced similar findings in that the older children were more likely to have failed appointments than younger children. This may be potentially attributable to the growing autonomy of older children. This finding is significant, as the number of children who fail to seek dental care also increases with age.^{22,25} As the uninsured child ages, the more likely it is that the patient will fail an appointment, seeking dental care will decrease, and the expense of treatment will potentially increase with time.

Previous literature has suggested that distance travelled had a negative effect on appointment attendance and that children living in rural areas are more likely to have unmet dental needs.^{26,27} However, some studies have found distance travelled to not be a variable influencing the likelihood of patients failing appointments.^{28,29} This study is consistent with findings of previous research indicating that distance traveled, or traveling to the clinic from rural counties, may have a deleterious effect on a patient's ability to keep scheduled dental appointments. Unlike previous studies, which found that males were significantly more likely than females to miss appointments,^{8,21,25} this study found no significant difference in the sex of patients who failed appointments.

While the size of this dataset provides a unique perspective to the failed appointments literature, it is not without limitations. The dataset is an appointment database used in the daily management of appointments and scheduling. Therefore, extensive characterization of patients is not available. Furthermore, the number of appointments for an individual patient varied greatly. In an effort to deal with this potential problem, we considered the failed appointment in three ways: (1) as a rate; (2) as a binary variable for missing the next appointment; and (3) based on classification as a block patient. A prospective research database would have defined these a priori. However, the multiple outcome approach and consistent findings, regardless of the analysis approach for a patient with failed appointments, indicated that the results are not simply due to the creation of an outcome variable describing the visit distribution of patients.

Conclusions

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

1. Access to care for children may be improved by increasing availability to public insurance in order to meet the dental needs of uninsured children.
2. The establishment of a dental home and its relationship to a child receiving continuous care within an institutional setting is dependent upon the child and family establishing a relationship with a specific dentist as opposed to receiving treatment in the same physical location.
3. Children who failed more than 75 percent of their scheduled appointments were more likely to be self-paying and unable to obtain the dental treatment needed, which may necessitate more costly treatment in the future.

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