Using Business Intelligence and Data Visualization to understand the characteristics of

Failed Appointments in Dental School Clinics

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ABSTRACT

Purpose/Objectives: Broken appointments are an important cause of waste in healthcare. Patients who fail to attend incur costs to providers, deny trainees learning opportunities, and impact their own health as well as that of other patients who are waiting for care.

Methods: 410,000 appointment records over three years were extracted from our electronic health record. We conducted exploratory data analysis and assessed correlations between appointment no-shows and other attributes of the appointment and the patient. The University of Michigan Medical School's Committee on Human Research reviewed the study and deemed that no IRB oversight was necessary for this quality improvement project that was, retrospectively, turned into a study with previously de-identified data.

Results: The patient's previous attendance record is the single most significant correlation with attendance. We found that patients who said they are "scared" of dental visits were 62% as likely to attend as someone reporting "no problem." Patients over 65 years of age have better attendance rates. There was a positive association between receiving email/text confirmation and attendance. A total of 94.9% of those emailed a reminder and 92.2% of those who were texted attended their appointment.

Conclusion(s): We were able to identify relationships of several variables to failed and attended appointments that we were previously unknown to us. This knowledge enabled us to implement interventions to support better attendance at Dental Clinics at the University of Michigan, improving patient health, student training, and efficient use of resources.

Keywords

Health care Access, Dental care access, Oral health care access, Patient Care management, Patient Expectations, Health care systems,

INTRODUCTION

Healthcare organizations the world over experience frustration from failed appointments and last minute cancellations.[1–3] Certainly, some circumstances dictate that a last minute change of plans for a patient may result in a wasted appointment for a healthcare provider. Unfortunately, this has a cascading effect in Dental School Clinics (DSC). Other patients must wait longer for their appointment and evidence suggests this may affect their health and well-being.[4] Moreover, the student misses an opportunity to learn and gain experience[5] during their limited time in dental school. Next, there are important financial ramifications if a DSC has high failed appointment rates. Finally, high levels of failed appointments lead to variable needs of staffing and resources which can lead to waste.

The definitions of "cancellation" vary between historical analyses but, generally speaking, the cancellations of concern are when the patient either does not attend the appointment ("no-show" or "failure to attend (FTA)") or cancels within the last 48 hours (CAN-48),[6] which makes it difficult for the healthcare organization to utilize that time productively. In a meta-analysis of studies of FTA patterns, Dantas et al noted that the reported prevalence of no-shows ranges widely, with an average rate of 23%.[3] Median FTA rates vary from 11.2% averaged over a variety of specialties, 14.6% in medical examination clinics, and 17.0% in pediatrics. FTA rates in dentistry have been reported between 3% and 21% in training clinics.[7–9]

The patient who fails or cancels an appointment can experience poorer health outcomes due to interrupted care or delayed care. Patients incur direct and indirect costs when they miss appointments - if patients miss too many appointments, practices may dismiss the patient, the patient could be charged a fee, or could suffer personal and economic consequences from quality of life and inability to work if unaddressed dental problems affect their well-being.

A limited number of articles have connected appointment-keeping to outcomes in very specialized fields: One example studied antiviral treatment for prisoners between those who were compelled to attend appointments with successful outcomes that improved with their length of confinement, to those after release, who were not compelled to attend and had poorer outcomes.[10] The most direct economic cost associated with missed appointments is lost provider income. Clinics with short appointments (for example a primary care office) can generally replace missed appointments with backlog easily, but even if every appointment is replaced, the administrative overhead is still estimated to be up to 3.3% of potential practice income.[11] More specialized clinics, student clinics, and those with long appointments can see a daily loss of up to 14% of the clinic's income.[8] For example, University of Michigan School of Dentistry has 3 hour or 90 minute pre-doctoral student appointments and a failed appointment represents a large loss of time compared to a private office. In a DSC, failed appointments can also deny/delay a student accomplishing a specific competency. For example, a dental student

who is completing a removable partial denture (RPD) competency very late and near graduation risks a delayed graduation if their patient fails or cancels at the last minute.

Previous research demonstrates that adolescents and young adults are less likely to keep appointments, as are children dependent on a caregiver for attendance.[12] Additionally, individuals from low socioeconomic backgrounds are more likely to fail appointments.[13] Research indicates that failed appointments and socioeconomic status are related to higher pediatric caries risk.[12] The patient's previous track-record of appointment-keeping has, not surprisingly, been shown to be a strong predictor of future failed appointments.[14–16] Other factors associated with FTA include male gender,[7,8,17] day of week,[10] longer time period between the appointment date and scheduling it;[13,14] student care providers;[8,16]availability of transportation[11] and time of year.[8] Specific procedures including surgery and endodontic or periodontic procedures are associated with dental FTAs.[5,6]

Patient-related barriers include psychological barriers, structural barriers, and low health literacy.[18] Patients who miss appointments are more likely to have negative feelings about going to see a medical professional and often have a level of anxiety about the procedure. If an issue that seemed pressing when the appointment was made resolves in the intervening days before the appointment, some patients may not attend.[19] Finally, patients who do not feel respected in the health care system are more likely to cancel, citing referral difficulties, long waits, dehumanizing waiting rooms, and rushed or distracted professionals.[18] They often misunderstand the scheduling system and do not know the impact of broken appointments on their health or on the clinic as a whole.[19]

The University of Michigan School of Dentistry operates 14 clinics, including four with pre-doctoral care providers, six with graduate student providers, a community health center, a private practice where fully qualified dentists practice, and a screening and emergency clinic with a mixture of pre-doctoral students and dentists. We have gathered data for over three years of appointments and explored it with the aim of identifying patterns that can lead the

school to take actions that will improve our attendance rates and reduce the impact of FTA, CAN-24 and CAN-48's on patient health, student learning, and the school's operations. Although this project was not designed as a research study, our post-hoc analyses revealed unexpected findings that may be useful for other dental school clinics to consider evaluating in their own institutions. We chose to focus on those who fail to attend or provide less than 48 hours' notice when cancelling. Our analyses differ from historic evaluations because we pooled all data related to the health history, treatment history, demographics and attendance into one data visualization tool.

Our objective for this paper is to serve as a descriptive study that provides a deep analysis of patterns we identified in patient attendance, failure and cancellation.

MethodS

We extracted data related to booked appointments from April 2016 – March 2019 for all clinics at the School of Dentistry. Patient information was de-identified and examined in aggregate for this analysis. The University of Michigan Medical School's Committee on Human Research reviewed the study and deemed that no IRB oversight was necessary for this quality improvement project that was, retrospectively, turned into a study with previously de-identified data.

We used Tableau, a business intelligence platform that attaches to existing data sets and provides tools for data visualization. Tableau is able to perform connections across otherwise disconnected databases, allowing for analysis that spans an organization's information ecosystem. The University of Michigan, School of Dentistry uses Tableau to integrate and analyze data from our electronic dental record, our financial systems, our learning management systems, and the University's financial and student records data warehouses.

Since we wanted to consider patient travel and demographic information, we mapped patient addresses to latitude/longitude degrees and then applied donut geomasking[20] to randomly shuffle the patient's location by 500 meters to ensure patient information remained protected. Each patient's address from axiUm was converted to latitude/longitude and then shuffled using the geomasking algorithm before we calculated travel times and available transportation modalities. In our application, we set boundaries of 500 meters and 1000 meters on the algorithm. We chose these values in order to retain enough information to correctly assess a patient's transportation options while shuffling enough given the population density in the studied areas. We acquired US Census data for education level,[21] insurance coverage,[22] and poverty data[23] by Zip Code and merged this information into the patient's record for demographic background. We used the R statistical toolset[24–26] for analysis and data visualization software, Tableau, to evaluate and study all of our data.

We grouped appointment status into four categories: 1. Fail –(FTA). 2. Appointments cancelled by the patient with 48 hours or less notice. 3. Appointments canceled by the patient with more than 48 hours of notice or for reasons out of their control (sick, weather, etc.) were collected as "Other Cancellations." 4. Appointments canceled by the school on behalf of the provider were collected as "Provider Cancellations." Appointment status was considered by several determinants, including the patient's age; the clinic they were scheduled to attend; their insurance status; education, insurance, and poverty rates in their home location; their previous cancellation patterns (when considering patient propensity for cancellation, we measured the ratio of a patient's cancelled appointments to all their appointments during the study period); their responses to questions about flossing and anxiety; their distance from the school; the number of times they appeared in our administrative systems for payment or behavioral issues; the length of their health histories; whether the appointment was confirmed; the medium we used for reminding patients of their appointments; and the number of days between the date the appointment was booked and the date of the appointment.

Results

In the period of the study (April 2016 – March 2019), University of Michigan Dental School's

clinics had 410,767 appointments that were kept. A total of 58,169 unique patients contributed

to these appointments and many had more than one appointment. Overall, there were 59,942

(11%) failed appointments and a total of 81,516 (14%) cancellations attributable to the dental

patient. Additionally, there were 16,490 cancellations (3%) attributable to the dental provider.

Table 1 shows all attendance and cancellation types.

Those aged 41-65 represented the most failed (19,300) and the most attended appointments

(175,022) in our analyses (see Figure 1 and Table 2). Age group 19-25 (12.9% of all FTA by

volume) and 26-40 (28.5% by volume) were overrepresented and the over 65 age-group

(13.0% by volume) were underrepresented in the failed appointments group relative to the

number of appointments made in each age-group.

Email (94.9%) and text reminders (92.2%) had the highest attendance rate compared to a

traditional phone call (90.7%) – see Table 2.

The FTA rate among patients who did not respond to the question about their level of anxiety

about dental visits (see figure 2) was 14.3%. What was notable was that this was much worse

than the FTA rate for those who reported that they were "apprehensive" about dental care

(8.2%) or "scared" (11.4%). Among the insurances, those with private insurance were much

more likely to attend their appointments. Those with no insurance (41.4% of all FTA) and those

with public insurance (14.8% of all FTA). Not surprisingly, we found that there was a better

attendance rate among those whose appointments were booked only 1 week away.

Patient visits were deemed FTA when the appointment record indicated "Fail," or "Broken," or

that it was cancelled within 24 hours of the appointment. They were deemed CAN-48 when they

cancelled within 24-48 hours. Cancellations because a school provider requested the

cancellation were coded, "Provider." Any patient illness, cancellations indicating financial pressure, or cancellations with more than 48 hours of notice were coded "Other Cancellations."

Cancellations with more than 48 hours of notice do make up approximately 8.46% of all appointments, but they have less impact on the school and other patients than the FTA and CAN-24, as there is sufficient time to re-book another patient into their appointment slot. Inclement weather has a seasonal impact on appointments: January and February 2019 experienced 4.2% and 2.1% of appointments canceled due to weather, compared to normal monthly rates ranging between 0 and 1%.

Relationships Between Factors

There was no single factor that had a strong association with appointment attendance. The strongest correlation with appointment cancellation is the patient's historical attendance rate ($p < 0.001$) – i.e., those who have a history of cancelling appointments are most likely to cancel future appointments. There are other correlations as well. Figure 1 shows Appointment attendance by age and those who are over 65 were least likely to FTA (5.2%). Attendance is significantly better among patients who report that they floss at least three times per week ($p < 0.001$) or have private health insurance ($p < 0.001$).

Cancellation by modality of contact was evaluated. There was a positive association between receiving email or text confirmation and attendance (see Table 2). A total of 94.9% of those emailed a reminder and 92.2% of those who were texted a reminder attended their appointment.

We included all medical history data in an attempt to identify health characteristics related to FTA. However, there was no significant correlations that were identified. Patients who fail to attend have also failed to attend a mean of 42.6% of their other appointments, compared to those who do attend a given appointment (6.6%, $p < 0.001$).

University of Michigan School of Dentistry has 14 clinics and there is a high degree of variation in FTA across these clinics (see Table 2). The faculty practice (as distinct from the faculty orthodontics practice) had an FTA rate of 7.5% and the pre-doctoral clinics had an FTA rate of 6.4% which were the lowest rate of FTA. The pre-doctoral clinics are impacted by a high rate of other cancellations/rescheduling. Specific clinics, notably the New Patient Intake clinic (21.9%) and the hospital's outpatient clinic (13.6%) suffer high FTA rates.

Patients over 65 years of age have better attendance rates (only 5.2% FTA rate). Figure 1 shows patients in five-year age groups. The height of the columns show the number of appointments attended (units represented on left side y-axis) and the dotted green line shows the average failure rate at each age group (units represented on right side y-axis). Generally speaking, the graph shows that appointment attendance improves as patients become older, although there is a worsening of this rate as the patient exceeds 85 years. The FTA rate for patients under 10 years of age and between 20-35 is approximately 15%. In the adolescent age range (13-18), the rate is approximately 10%.

Logistic Regression Modeling

Using the binomial dependent variable of whether the appointment failed or not, we performed logistic regression over the data set, considering explanatory variables for whole-week wait times, overall wait days, patient age, contact type, the patient's reported level of dental anxiety, the appointment clinic, whether a patient had a physician, and the type of dental insurance the patient reported. We converted Patient Age to a categorical variable for this analysis. Detailed results of these analyses are in Table 2. Generally speaking, the odds ratios fall in the same range whether a variable is considered in isolation or in concert with the other variables.

Discussion

Little is known about the characteristics of failed appointments in the dental office, although the implications are large. For example, Michigan Medicine has over 6,000 clinic visits each day[27] and the costs of a 10% FTA rate could easily be absorbed by the other 5,400 visits. However, dental offices are much smaller enterprises - only 8% of offices have 20 or more providers.[28] A small practice may have 10-30 appointments in a day and 10% FTA rate will have important implications for productivity, waste and revenues.

In the current study, we considered relationships between various factors and cancellation within 24 hours or failure to attend the appointment. We identified important patterns: FTAs are associated with patient age (the youngest and the oldest are most likely to attend); refusal to respond to questions about dental anxiety; and longer waits for the appointment. Contrastingly, we also found that appointments booked a whole number of weeks away from the time of booking are more likely to be kept (ie. for example, an appointment scheduled on a Friday for a subsequent Friday (any number of weeks away) had a spike in attendance rate (OR 1.27, CI 1.24-1.29, p<0,01)). Figure 3 shows the differences between a wait time that is a multiple of 7 days versus when it was not.

University of Michigan School of Dentistry is committed to becoming a Learning Health System that seeks continuous improvement and rapid iterative change. In that light we implemented several small changes that, collectively, had important positive effects on clinical operations.

Firstly, each DSC within an academic teaching center can be completely different. There is variability in the procedures completed, the provider type (student, resident or faculty) and the demographics of the patients. Subsequently, it is no surprise that variability in patterns of appointment attendance exist between clinics. However, when we looked more closely we noted that there were better attendance rates that were co-occurring with clinics that were using text messaging as their mode of reminders. Other clinics used traditional phone calls as

the reminder method.

<u>FTA by Insurance Status</u>

Our study data revealed an alignment with existing literature demonstrating patients with public insurance are less likely to attend medical appointments. The solution to this problem is complex and various factors must be considered such as health literacy, transportation limitations, family responsibilities and ability to pay copayment. The complex nature of this problem started a discussion that lead to the hiring of a social worker at the School of Dentistry. We hope that on-site, real-time partnering with a social worker will help address some of these issues.

<u>FTA By Method of Contacting the Patient</u>

Using text messaging to imbibe health education to patients has been shown to be effective,[29] however, less evidence is available on the impact on appointment reminders. Although previous research has shown that phone reminders are equally as effective as text reminders,[30] we found that patients who receive SMS text reminders for their appointments are 1.22 times as likely to attend as those who received a phone call (CI 1.07 – 1.40, $p < 0.001$). However, text reminders are only sent for approximately 1% of our appointments because collecting cell numbers and text consent wasn't a priority when registering patients. With this information we have begun a project to migrate all patients to text reminders. This is a complex project that involves issues of compliance, HIPAA, technology and an outside vendor who manages our reminder calls. Many vendors can now offer text reminders with various features such as linking to educational videos, signing consents and completing medical histories remotely. The future may involve utilizing text reminders improve efficiency and time spent by patient in the dental office.

Seven Day Spike

When we examined the FTA rate for appointments in terms of the time between when the appointment was booked and the appointment itself we found some notable relationships between factors (see Figure 3). Appointments have a higher failure rate the further they are from the date of booking ($p < 0.001$) with one exception – appointments that were booked a multiple of 7 days away. In keeping with the common dental convention of patient recall appointments for hygiene and follow-up, attendance rates also improved in the vicinity of a 180-day wait time (i.e. 6 months away). However, we discovered that when the number of days between the booking and the appointment is evenly divisible by seven – that is, when the appointment is for exactly *n* weeks from today – it is more likely to be kept. We also realized we had a system that made it very difficult for our student providers to re-book patients in exactly *n* weeks. To book a patient, students would have to tentatively make an appointment with the patient and then request the appointment from our administrative staff. Frequently, when the administrative staff saw the request for *n* weeks away, it was already fully booked and students would have to settle for a different day. It was common for patients to attend on a variety of different days of the week to complete their treatment plan – a method that our business intelligence data showed was associated with failed appointments.

In addition, students were not trained in scheduling and used arbitrary methods to select the "next" appointment – we have integrated knowledge on attendance patterns into our clinic orientation sessions. Finally, in our system, students can schedule on any day and at any time – students value this kind of flexibility, but it leads to high variability and a mixture of extremely busy and extremely quiet days in clinics (we have previously published how Fridays were the least busy days in our clinics)[31]. We are moving to a model where students have scheduled days to treat their patients. This reduces variability and enables administrative staff to book patients into regular slots – for example, one patient may always prefer to attend on a Friday morning –

this kind of regularity was not possible in our previous model and our data has shown that this is associated with better attendance.

Different care pathways for Anxious Patients

Dental anxiety can lead patients to avoid booking, cancel, or fail to appear for appointments.[32] We found that patients who report high levels of anxiety, as well as those who opt not to answer the health history question about anxiety associated with dental visits, had higher fail rates (11.4% and 14.3% respectively). In a related finding, investigators have shown that high rates of patient anxiety are also associated with failed appointment-keeping.[5,6,8,15] In the current study, we found that patients who answer, "No Problem" make a disproportionate number of appointments relative to their share of the overall patient population – while they are 26% of our patient community, they make 40% of the appointments. This information compelled us to pursue an improved response rate to this question and to build a customized pathway from the screening clinic for anxious patients. The regular process involves a screening appointment where patient suitability for a teaching clinic is evaluated. Then, patients are dismissed from the clinic and will be contacted by their assigned student in 2-3 weeks. However, for anxious patients, we now endeavor to introduce them to their student provider on the day of their screening. The sample size is very small and there are no statistically significant results to report, but the attendance rate was higher than our institutional rate of 69%. After meeting their student provider, if both had time, we allowed comprehensive examination and cleaning on the same day. Anecdotally, this has also increased satisfaction among patients.

Special protocol for the Oral Surgery procedures

While FTA has major effects on any clinic, the impact on our surgical procedures in oral surgery is particularly important. Appointments for surgical procedures under intravenous sedation include dedication of an extended amount of time for a clinician, a registered nurse and a dental

assistant. Therefore, FTAs in this clinic have a large economic impact on the Department of Oral Surgery and the School of Dentistry. This is coupled with a large waiting time for patients to schedule a surgical appointment of 72 days which means there is a negative impact on the care of other patients. Diving into the data and interviewing staff in oral surgery revealed that many FTAs were occurring among patients who realized late that Medicaid only covered the cost of tooth extractions and that they could not afford to pay the cost of sedation at the time of surgery. A new protocol was implemented where patients would have to pay anticipated copayments at their evaluation appointment. Once again, changing the protocol was not trivial and involved careful communication with staff, faculty, the billing team and students. After implementation of the new protocol, the cancellation rate due to finances reduced from 25.4 per month to 6.0 per month. Additionally, the large waiting time for a surgical appointment dropped from 72 days to 45 days.

Youngest and Oldest patients are most likely to keep appointments

Our data revealed statistically significantly better attendance rates among young (under 12 years of age) and over 65. As a state institution and a teaching dental center, we welcome all age groups. However, a private office could use this information to focus their practice on the very old and very young. For instance, building more access to pediatric dentists and geriatric specialists could be a marketing strategy that grows a portion of the practice that attends their appointments more frequently. Clearly, business intelligence data could be utilized in the private industry to improve the efficiency of operations and profitability.

Variation between clinics

All clinics at the University of Michigan, School of Dentistry use an automated reminder service, however, there are major differences between the attendance rates across the Pre-doctoral,

Graduate and Faculty clinics. While all of our Pre-doctoral and Graduate clinics have about 30% of patients using private insurances, the vast majority (70%) are uninsured or use public insurance. Table 2 shows that attendance rate is superior among those with private insurance – this is in alignment with previous research.[16,33,34] Insurance status seems to be the most important factor affecting variation in attendance rates across the clinics.

Deans of Clinical Operations, Clinic Directors and Clinic Managers should consider specialized management pathways for patients reporting anxiety with dental visits. Additionally, keeping each patients' appointment during the same day of the week seems to be beneficial to attendance rate. Creating transparency on copayment and insurance limitations could be beneficial to reduce last minute cancellations. Finally, text message reminders seem to improve confirmation rate and attendance rates.

CONCLUSIONS

Through business intelligence data we were able to identify relationships of various factors to failed and attended appointments that we were not aware of previously. This knowledge enabled us to implement interventions to support better attendance at Dental School Clinics at the University of Michigan. Business intelligence data associated with failed and attended appointments has potential to improve the operations of a dental clinic and expand access to the patients it serves.

ACKNOWLEDGMENTS

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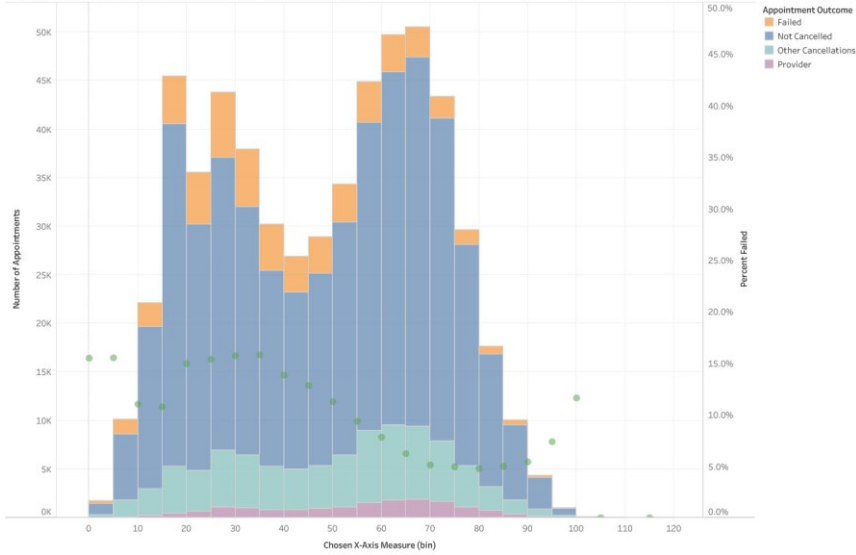
Appointment Attendance by Age
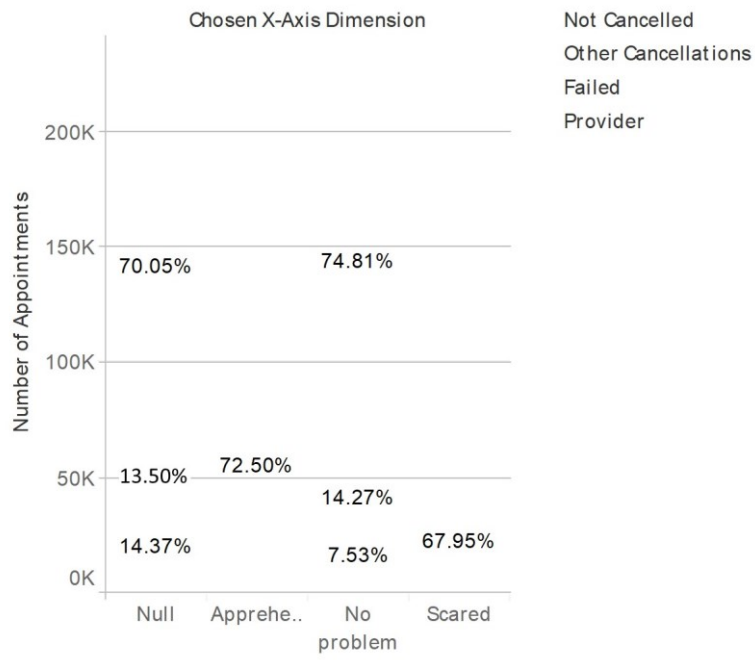
FIGURE 1

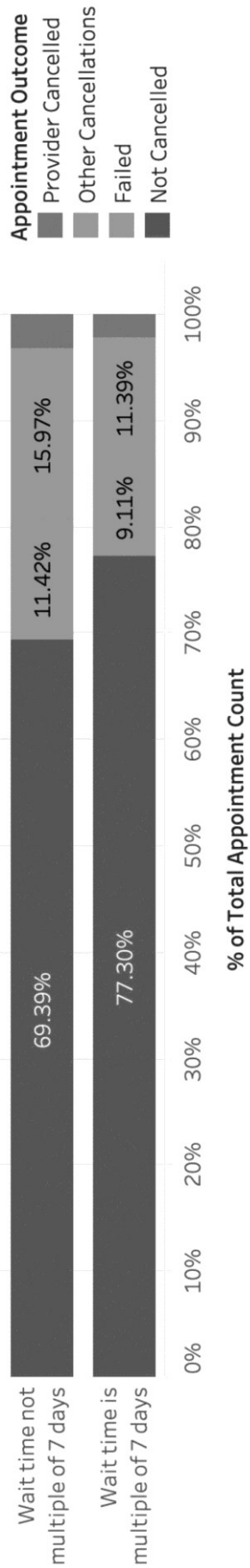Appointment Attendance by Anxiety Level

FIGURE 2

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FIGURE 3

Table 1

	Code	Description	BY PATIENT						BY APPOINTMENT					
			Attended	Failed to Attend	Other Pt Cancellations	Provider Cancellation	Total	Percent of Total	Attended	Failed to Attend	Other Pt Cancellations	Provider Cancellation	Total	Percent of Total
Not Failed	ATTENDED	Patient Attended	58,169				**58,169**	60%	410,767				**410,767**	72%
		Attended Total	**58,169**						**410,767**					
	CAN-24	Cancelled W/ 24-48 Hour Notice			3,897		**3,897**	4%			19,383		**19,383**	3%
	CAN-48	Cancelled > 48 Hour Notice			4,920		**4,920**	5%			23,886		**23,886**	4%
	CAN-ER	Cancelled-Entry Error			933		**933**	1%			6,146		**6,146**	1%
	FINAN	Patient Unable to Pay			463		**463**	0%			1,550		**1,550**	0%
	FINANI	Cancelled Due To Insur Changes			154		**154**	0%			466		**466**	0%
	GUARDN	Appt Cancelled-Guardian Issues			37		**37**	0%			252		**252**	0%
	INC	Inclement						0%						1

Code	Description						
LEM	Weather Pat. Cancel	280	**280**	%	3,026	**3,026**	%
NO_ID	Patient Could not Provide ID	16	**16**	0%	36	**36**	0%
SDR	SDR	32	**32**	0%	183	**183**	0%
SICK	Patient Sick	525	**525**	1%	4,617	**4,617**	1%
SICK24	Cancelled-Sick>24 Hrs Notice	197	**197**	0%	1,548	**1,548**	0%
TELVOX	Cancelled Via Televox	1,588	**1,588**	2%	4,867	**4,867**	1%
W-NOT	Cancelled with Notice	3,264	**3,264**	3%	15,556	**15,556**	3%
	Cancelled Total	**16,306**			**81,516**		
PR-CON	Prov Cancel-Schedule Conflict	1,071	**1,071**	1%	11,819	**11,819**	2%
PR-ILL	Prov Cancel-Illness	231	**231**	0%	1,858	**1,858**	0%
PR-LAB	Prov Cancel-Lab Concern	74	**74**	0%	2,201	**2,201**	0%
PR-PE	Prov Cancel PE	52	**52**	0%	612	**612**	0%
	Provider Cancelled Total	**1,428**			**16,490**		
Failed							
FAIL	Patient Failed to Attend	16,564	**16,564**	17%	37,456	**37,456**	7%
BROK	Patient Cancelled	4,3	**4,**	4%	21,4	**21,**	4%

EN	Same Day	29	**329**	66	**466**
PA RK	Patient Could not find Parking	32	**32** **0%**	109	**109** **0%**
TR AN SP	Cancelled-Transportation Issue	17 6	**17 6** **0%**	911	**911** **0%**
	Failed to Attend Total	**21,101**		**59,942**	
	GRAND TOTAL		**97,004**		**568,715**
	Percent of Total	60% 22% 17% 1%		72% 11% 14% 3%	

		Failed	Not Failed	Odds Ratio (univariable)	Odds Ratio (multivariable)
Whole Week Wait	FALSE	41677 (11.1)	333493 (88.9)	-	-
	TRUE	18266 (9.0)	185141 (91.0)	1.27 (1.24-1.29, p<0.001)	1.34 (1.31-1.36, p<0.001)
Patient Age	19-25	7726 (14.8)	44637 (85.2)	-	-
	0-11	2657 (14.6)	15535 (85.4)	1.01 (0.96-1.06, p=0.624)	1.98 (1.88-2.09, p<0.001)
	12-18	5402 (10.1)	47824 (89.9)	1.53 (1.48-1.59, p<0.001)	1.88 (1.80-1.95, p<0.001)
	26-40	17083 (15.3)	94451 (84.7)	0.96 (0.93-0.99, p=0.003)	0.91 (0.88-0.94, p<0.001)
	41-65	19300 (9.9)	175022 (90.1)	1.57 (1.53-1.61, p<0.001)	1.37 (1.33-1.41, p<0.001)
	Over 65	7775 (5.2)	141164 (94.8)	3.14 (3.04-3.25, p<0.001)	2.40 (2.32-2.49, p<0.001)
Contact Type	Call	9945 (9.3)	96729 (90.7)	-	-
	Email	45 (5.1)	846 (94.9)	1.93 (1.45-2.65, p<0.001)	1.49 (1.11-2.05, p=0.010)
	No Data	49710 (10.6)	418176 (89.4)	0.86 (0.85-0.88, p<0.001)	0.90 (0.88-0.92, p<0.001)
	Text	243 (7.8)	2883 (92.2)	1.22 (1.07-1.40, p=0.003)	1.26 (1.10-1.45, p=0.001)
Patient Anxiety	No problem	17329 (7.3)	218625 (92.7)	-	-
	Apprehensive	7300 (8.2)	81614 (91.8)	0.89 (0.86-0.91, p<0.001)	0.95 (0.92-0.97, p<0.001)
	Scared	3912 (11.4)	30364 (88.6)	0.62 (0.59-0.64, p<0.001)	0.79 (0.76-0.82, p<0.001)
	No Response	31402 (14.3)	188031 (85.7)	0.47 (0.47-0.48, p<0.001)	1.00 (0.96-1.05, p=0.853)
Clinic	Faculty Clinics	3236 (7.5)	39895 (92.5)	-	-
	Main Pre-Doctoral Clinics	11783 (6.4)	172998 (93.6)	1.19 (1.14-1.24, p<0.001)	1.24 (1.18-1.29, p<0.001)
	Other Pre-Doctoral Clinics	2383 (18.4)	10538 (81.6)	0.36 (0.34-0.38, p<0.001)	0.57 (0.54-0.61, p<0.001)
	Faculty Orthodontics	658 (9.8)	6059 (90.2)	0.75 (0.68-0.82, p<0.001)	1.16 (1.06-1.27, p=0.002)
	Student Orthodontics	3820 (9.5)	36444 (90.5)	0.77 (0.74-0.81, p<0.001)	0.87 (0.82-0.92, p<0.001)
	Student Periodontics	2252 (7.8)	26489 (92.2)	0.95 (0.90-1.01, p=0.100)	0.96 (0.90-1.01, p=0.141)
	Other Specialty Clinics	16310 (12.2)	117422 (87.8)	0.58 (0.56-0.61, p<0.001)	0.76 (0.72-0.79, p<0.001)
	Hospital	8906 (13.6)	56414 (86.4)	0.51 (0.49-0.54, p<0.001)	1.54 (1.46-1.61, p<0.001)
	Intake Clinics	7910 (21.9)	28256 (78.1)	0.29 (0.28-0.30, p<0.001)	0.37 (0.35-0.38, p<0.001)
	Other	2685 (10.0)	24119 (90.0)	0.73 (0.69-0.77, p<0.001)	1.01 (0.96-1.07, p=0.606)
Insurance	Private	20714 (8.6)	220861 (91.4)	-	-
	Public	8865 (15.2)	49336 (84.8)	0.52 (0.51-0.54, p<0.001)	0.60 (0.59-0.62, p<0.001)
	None	24814 (10.6)	210141 (89.4)	0.79 (0.78-0.81, p<0.001)	0.83 (0.81-0.85, p<0.001)
	Both	5550 (12.7)	38296 (87.3)	0.65 (0.63-0.67, p<0.001)	0.67 (0.65-0.69, p<0.001)

Number in dataframe = 578577, Number in model = 578576, Missing = 1, AIC = 355901.2,

C-statistic = 0.69, H&L = Chi-sq(8) 381.63 (p<0.001)

Grey rows indicate baseline values for each explanatory variable

Table 2 - Logistic Regression of Select Variables vs. Likelihood of Attending an Appointment