Original Article

Behavioral and oral characteristics of patients in a general dental clinic in Japan –Focus on cancellation without notice–

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Abstract

Introduction;
Understanding patient behavior is important to ensure good clinical outcomes for patients and efficient use of resources. Few studies have investigated compliance of patients attending a general dental clinic with treatment requiring multiple visits. In Japan, general dental practitioners are the main providers of dental treatment. The objective of this study was to analyze information from dental patients first visit, with their subsequent attendance.

Methods;
The study involved 450 adult participants. Associations between data obtained from self-completed questionnaires, oral examination and subsequent attendance, were tested by logistic regression analyses. The main outcome examined was whether the patient failed to attend for further treatment (cancellation without notice).

Results;
The most common reason for subjects' initial visit was for a dental problem with definite symptoms. Cancellation without notice was significantly higher in younger patients, those without referrals, those with non-responses to medical questions, had severe periodontal disease and two or more decayed teeth.

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Discussion;
Certain patient characteristics are associated with the probability of subsequent failure to complete treatment. Those that present with two or more decayed teeth may be a useful indicator of requiring more intensive motivational intervention to prevent the risk of failing to complete dental treatment.

Introduction

In a general dental practice, it is important to understand patient behavior and motivation in order to provide effective treatment, establish a relationship and use resources efficiently. There are many surveys on the general population, medical institutions and health service providers, including studies that have focused on dental service providers, such as dental clinics and dentists[1]. On the other hand, there have been a few studies conducted on patients attending large-scale clinics, such as university hospitals[2,3], although some have focused on oral surgery areas in medical institutions[4], pediatric dentistry[5-7], and dentistry for people with disabilities[8]. In addition, there are few studies on patients attending general dental clinics[9,10], even though in Japan, these are the major providers of dental treatment[11]. There are about 69,000 dental clinics in Japan, about 80% of which are private clinics, with about 70% of practicing dentists having their own clinics[12].

It is widely held that dental diseases can be modifying factors for various other systemic diseases[13,14]. Due to their inherent nature, most oral diseases are not cured naturally. If left untreated therefore, they could have an effect not only on oral health but also on one's

overall general health. However, according to Japanese Survey of Dental Disease 2016, in all groups aged over 20 years, about 30% of people have untreated dental decay[11]. Further, Japan Dental Association reported in 2016, that 7.1% of patients to initially attend a dentist, fail to continue the full course of their recommended dental treatments[15]. Hence, by examining and understanding patient behavior and motivation, it becomes possible to provide more effective treatment, prevent dental diseases, and thereby improve the utilization of medical resources[16–18].

Since general dental clinics provide the greater majority of dental services in Japan, it is necessary to understand the motivation and behaviors of patients who are cared for at general dental clinics. Additionally, a better understanding of patients' behavior may contribute to the establishing a more trusting relationship between dentists and patients, which may then lead to dentists providing better oral health education and care to their patients.

Thus, the objective of this study was to analyze information gained from a medical questionnaire, the patient's responses and the findings of a complete oral examination to subsequent patient behavior, especially compliance to complete dental treatment, in a general dental clinic.

Methods

Participants
The participants were 450 adult patients visiting the general dental clinic in Shibuya Ward, Tokyo, Japan, for the first time between 2016 and 2017. Thirty-eight people out of 488 attending during this period were excluded as they were under the age of 20 years.

Medical Questionnaire
The participants completed a self-administered medical questionnaire at their first visit to the clinic. The medical questionnaire collected information on; age, sex, occupation, type of insurance, residential area, how to know the clinic, chief complaint, presence of any systemic disease, dental phobia, smoking history/ status, etc. Missing responses to any of these questions were counted and used as an independent variable (Non-responses in the medical questionnaire). Missing responses were followed up at the medical interview.

Oral Examination
After the medical interview, the dentist conducted an oral examination. The following items were evaluated; number of present teeth, number of decayed teeth, severity of periodontal disease, and other dental diseases. The diagnosis of decayed teeth was based on Recommended Methods for Early Caries Diagnosis (Oral Health Association of Japan)[19]. Teeth with no defect on the surface of the enamel, but with a white spot or pigmentation were not included. Teeth with a small defect, limited to enamel, were included in the count. The diagnosis of the severity of periodontal disease was based on the Japanese Society of Periodontology (JSP) Clinical Practice Guideline for the Periodontal Treatment, 2015[20]. Periodontal disease included gingivitis and periodontitis. If there was inflammation in the gingival tissues without attachment loss, this was diagnosed as gingivitis. If the depth of the periodontal pocket was less than 4mm, this was diagnosed as mild periodontitis. If the periodontal pocket depth was between 4 to 6 mm, this was diagnosed as moderate periodontitis, where a periodontal pocket was 6 mm or more this was classed as severe periodontitis.

Cancellation Without Notice
After the first clinical visit, participants who needed further treatment made follow-up dental appointments. Those patients who did not inform the clinic that they would not keep their next appointment, would presumably not complete their needed dental treatment. "Cancellation without notice" was defined as the case where participants did not show up for the appointment and did not give prior notice before the appointment time. This outcome became the dependent variable in later analyses of associations. We did not count participants who cancelled before the given appointment time, or rescheduled their appointment by a telephone call.

Analysis
All questionnaire and clinical records were converted into electronic data. We first investigated the relationships between cancellation without notice and the characteristics including the medical questionnaire and oral examinations. Then, we plotted the Receiver Operating Characteristic (ROC) curve in order to evaluate the effects of the number of decayed teeth and the severity of periodontal disease on the sensitivity and the specificity of the occurrence of cancellations without notice. Statistical analysis was conducted with SPSS ver. 24 (IBM Japan, Tokyo).
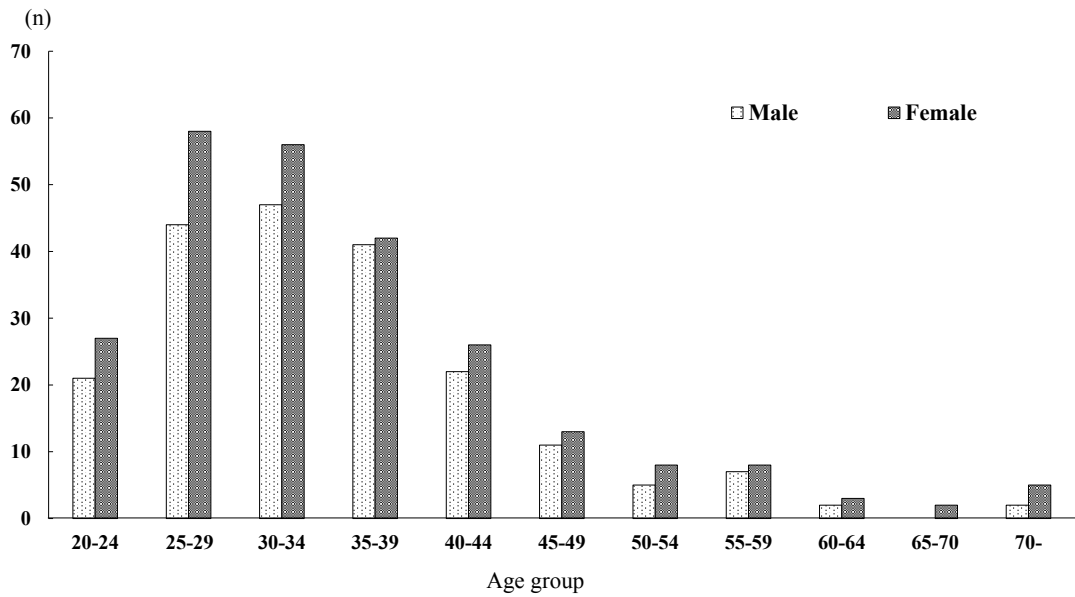
Figure 1. Number of patients in each five-year age group

Table 1. Baseline Characteristics of the Participants

	n=450	%
Occupation		
Employee	365	81.1
Not Employed or Student	53	11.8
Non-response	32	7.1
Type of Insurance		
Social insurance (personal)	304	67.6
Social insurance (family)	46	10.2
National health insurance (including elderly)	100	22.2
Residential Area		
Shibuya	162	36.0
Minato	31	6.9
Meguro	29	6.4
Other 23 boroughs in Tokyo	124	27.6
Suburban Tokyo	26	5.8
Outside Tokyo	78	17.3

	n=450	%
How to know the clinic		
Internet search	238	53.1
Referral from other clinic or customer	81	18.0
Neighborhood or saw the Signboard	20	4.4
Other	7	1.6
Non-response	104	23.1
Systemic Diseases		
Yes	83	18.4
No	360	80.0
Non-response	7	1.6
Dental Phobia		
Yes	9	2.0
No	441	98.0
Smoking history/status		
Current Smoker	94	20.9
Past Smoker	55	12.2
Non Smoker	266	59.1
Non-response	35	7.8

Ethical Aspects

The study was conducted with the approval of the ethics committee of Tokyo Medical and Dental University (approval number: M2016 282). The notice of this study was posted in the clinic's waiting area and on the website of the clinic. The authors have no conflicts of interest to declare.

Results

Characteristics of Participants

Figure 1 shows the number of patients in each five-year age group. Of the 450 participants, 202 were males (mean age: 34.9 ±10.0 years) and 248 females (mean age: 35.1 ±11.2 years). The mean age of all participants was 35.0±10.6 years, with the most frequent age groups for both males and females between 25 to 34 years.

Table 2. Chief Complaint at the First Clinical Visit

		n=450	%
Definite symptoms or Oral problems	Tooth pain	125	27.8
	Gum swelling or bleeding	40	8.9
Detached crown or filling		79	17.6
Scaling		54	12.0
Dental checkup		42	9.3
Chipped teeth		32	7.1
Wisdom teeth		13	2.9
Denture		5	1.1
Other		57	12.7
Not identified		3	0.7

Table 3. Non-responses in the Medical Questionnaire

	n=450	%
Age	53	11.8
Phonetic spelling of name	61	13.6
Phone number	6	1.3
Occupation	130	28.9
How to know the clinic	113	25.1

Table 4. Results of Oral Examination

Number of decayed teeth	n=450	%
0	180	40.0
1	121	26.9
2	62	13.8
3	29	6.4
4	19	4.2
5	6	1.3
6	2	0.4
7	4	0.9
8	6	1.3
9	3	0.7
10 ~	18	4.0
Severity of Periodontal Diseases		
Gingivitis	115	25.6
Early Periodontitis	144	32.0
Moderate Periodontitis	54	12.0
Severe Periodontitis	3	0.7
Healthy Gingival (No inflammation)	134	29.8
Other Dental Diseases		
Temporomandibular joint disorder	20	4.4
Bruxism (severe)	16	3.6
Soft-tissue disease	24	5.3
Occlusion collapse	19	4.2
Halitosis (significant)	17	3.8

Table 1 shows the Baseline Characteristics of the Participants. About 81.1% of the people attending the clinic for the initial visit were company employees. Many of them worked in companies near the clinic. All participants had health insurance. There were 288 people (64.0%) who were residents outside the Shibuya Ward area, and 81 participants (18.0%) who had been referred or introduced from other clinics or other patients/family.

Table 2 shows the presentation Chief Complaint at the First Clinical Visit. The most common reason was for a dental problem with definite symptoms such as a painful tooth, swollen or bleeding gums (36.6%).

Non-responses in the Medical Questionnaire

In the medical questionnaire, 215 participants completely answered all of the questions (47.8%). Non-responses in the medical questionnaire were found in 235 participants' medical questions (52.2%). There were 134 (29.8%) participants with one non-response, 81 participants (18.0%) with two non-responses, and 20 participants (4.4%) with three or more non-responses.

Table 3 summarizes Non-responses in the Medical Questionnaire by patient characteristics. The highest proportion of non-responses were as follows; for occupation, there were 130 participants (28.9%), there were 113 participants (25.1%) who did not give a reason for selecting visiting this clinic (how to know the clinic), and age was missing for 53 participants (11.8%).

Oral Examination

The mean number of present teeth in the survey population was 27.3 ±2.1(mean ±SD), with 351 participants (78.0%) having 28 teeth (excluding wisdom teeth) and one participant (0.2%) had no natural teeth. With respect to dental diseases, the mean number of decayed teeth for all participants was 1.80 ±3.2(mean ±SD) with 180 participants (40.0%) not having any teeth with active dental caries. Table 4 shows the distribution of participants according to the number of decayed teeth. With respect to periodontal disease, 316 participants (70.2%) were diagnosed with one or more periodontal conditions, 115 participants (25.6%) had gingivitis, 144 participants (32.0%) had early periodontitis, 54

Table 5. Results of Multiple Logistic Regression Analysis in the Presence/Absence of Cancellation Without Notice

|	-2 log-likelihood of the reduced model	χ^2	Degrees of freedom	p value
Constant	224.627a	0	0	.
Sex (male=0, female=1)	226.584	1.957	1	0.162
Five-year age group	246.900	22.273	10	0.014
Referral (presence/absence)	236.870	12.243	1	<0.001
Age (Non-response in the medical questionnaire)	232.889	8.261	1	0.004
Phonetic spelling of name (Non-response in the medical questionnaire)	229.405	4.778	1	0.029
Number of decayed teeth	278.578	53.951	18	<0.001
Severity of periodontal disease	261.638	37.010	4	<0.001
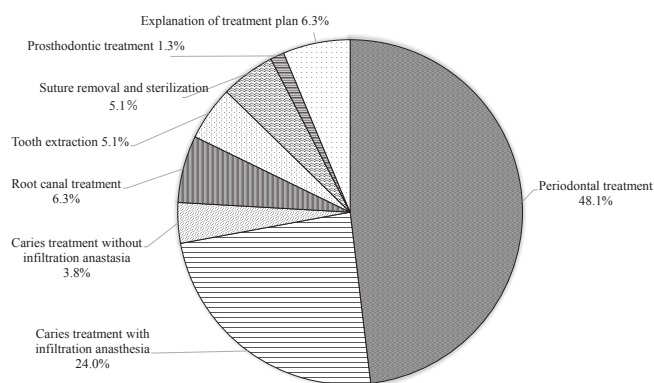
Figure 2. The planned treatment for participants who cancelled without notice

participants (12.0%) had moderate periodontitis, and three participants (0.7%) had severe periodontitis. One hundred and thirty-four participants (29.8%) had healthy periodontal tissues. Other dental diseases noted are shown in Table 4.

Cancellation Without Notice

A total of 320 participants (71.1%) out of the 450 needed several dental appointments. Of those needing additional treatment appointments, 70 participants (15.6%) cancelled once without notice, and nine participants (2.0%) cancelled multiple times without notice. The appointments were much frequently cancelled without notice by male participants (n=42; 20.8%), compared to female participants (n=37; 14.9%). The types of treatment planned for participants that were cancelled are shown in Figure2. Almost half were for periodontal treatments (38 participants; 48.1%).

Multiple logistic regression analysis was performed in order to predict "cancellations without notice" patient characteristic variables. The results gave a Nagelkerke

$R^2 = 0.482$, which is viewed as a quite predictable outcome. Characteristic factors (sex, age, referrals, non-responses in the medical questionnaire, number of decayed teeth and severity of periodontal disease) were selected – from a clinical point of view – to be closely related to "cancellation without notice". In order to avoid multicollinearity, we performed correlation analysis and checked the correlations of each factor. No distinctive correlation was observed between each factor within the model, and the highest Pearson's correlation coefficient was 0.290 (between age and severity of periodontal disease). Table 5 shows the parameters of the multiple logistic regression analysis in the presence/absence of the independent variable "cancellation without notice".

Following the bivariate logistic regression analysis, significant differences were seen with the same factors (sex, age, referrals, non-responses in the medical questionnaire, number of decayed teeth and severity of periodontal disease). The results gave a Nagelkerke R^2 = 0.252. In the five-year interval age groups, younger participants had significantly more cancellations without notice (P = 0.004) than the other age-groups. With respect to the presence/absence of referrals from other clinics or patients/family, participants without referrals had significantly more cancellations without notice (P = 0.009) and those participants with non-responses in the medical questionnaire. Cancellations without notice were significantly higher when there were non-responses in the medical questionnaire of age (P = 0.002) or phonetic spelling of the patient's name (P = 0.003). With respect to decayed teeth, cancellations without notice were significantly higher when the number of decayed teeth was high (P = 0.001), and when periodontal diseases were more severe (P < 0.001). Table 6 presents the parameters of the bivariate logistic regression analysis in the presence/absence of cancellation without notice.

Table 6. Results of Bivariate Logistic Regression Analysis in the Presence/Absence of Cancellation Without Notice

|	β	Standard error	Wald	Degrees of freedom	p value	Odds ratio
Sex (male=0, female=1)	-0.224	0.278	0.646	1	0.421	0.800
Five-year age group	-0.049	0.017	8.407	1	0.004	0.952
Referral (presence/absence)	-1.485	0.568	6.848	1	0.009	0.226
Age (Non-response in the medical questionnaire)	1.112	0.365	9.291	1	0.002	3.041
Phonetic spelling of name (Non-response in the medical questionnaire)	1.011	0.344	8.638	1	0.003	2.749
Number of decayed teeth	0.123	0.037	11.849	1	0.001	1.134
Severity of periodontal disease	0.617	0.150	17.003	1	<0.001	1.854
Constant	-1.002	0.669	2.245	1	0.134	0.367
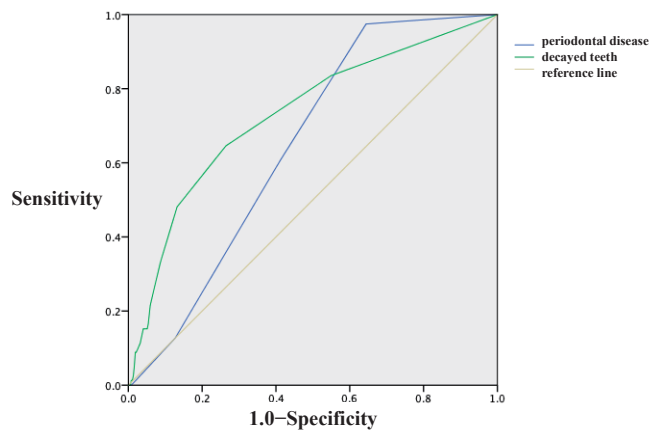
Figure 3. ROC curve for the relationship between the number of caries teeth, the severity of periodontal disease and cancellations without notice

In addition, we plotted the ROC curve for the relationship between the number of decayed teeth, the severity of periodontal disease and cancellations without notice (Figure 3). The area under the ROC curve (AUC) of the number of decayed teeth and cancellation without notice (0.731) was larger than the severity of periodontal disease and cancellation without notice (0.647). When the cutoff value was set to one decayed tooth, sensitivity was 0.835 and specificity was 0.450. When the cutoff value was set to two decayed teeth, sensitivity was 0.640, specificity was 0.736. We chose two decayed teeth as the appropriate cut off value (Table7).

Table 7. The coordinates of the ROC curve

		Sensitivity	1.0– Specificity
Number of decayed teeth	0	1.000	1.000
	1	0.835	0.550
	2	0.646	0.264
	3	0.481	0.132
	4	0.329	0.086
	5	0.215	0.059
	6	0.165	0.054
	7	0.152	0.051
	8	0.152	0.040
	9	0.114	0.032
	10	0.101	0.027
	11	0.089	0.022
	12	0.089	0.019
	13	0.051	0.016
	15	0.025	0.013
	16	0.013	0.011
	17	0.013	0.008
	18	0.000	0.005
	23	0.000	0.003
	29	0.000	0.000
Severity of periodontal disease	0	1.000	1.000
	1	0.975	0.644
	2	0.608	0.412
	3	0.127	0.127
	4	0.000	0.008
	5	0.000	0.000

Discussion

This study revealed the characteristics of patients in a general dental clinic in Japan located in downtown Shibuya Ward, Tokyo. Patients of this clinic are relatively young, (age: 35.0±10.6) and most of them work for companies around the clinic. It should also be noted that there are 10 or more dental clinics in a radius of 200 meters in the neighborhood, which is an overcrowded area for dental clinics.

In this study, we found that the most common reasons for visits to the dental clinic were the presence of obvious symptoms such as pain, swelling, and bleeding (36.6%). This finding is a similar result to a previous study[15] (32.3%).

In many cases, patients attending the dental clinic for the first time did not finish treatment at that visit. Generally, those that completed their care in one visit only required a dental check-up or a simple procedure. More than two-thirds of the patients (71.1%) required several clinical visits to complete their treatment. However, some patients never complete their required dental treatment.

One important finding of this study concerned those patients who cancelled their appointment(s) without prior notice. Previous studies in pediatric dentistry[7] have shown a negative correlation between cancellation of appointments without notice and the time needed to get to the hospital. However, in this study, there was little correlation between residential area and cancellation without notice, because many patients worked nearby. Instead, this research revealed that the probability of cancellation without notice was significantly higher in patients who were younger, without referrals from another clinic or patient/friend, had non-responses in the medical questionnaire, and severe periodontal disease. Cancellations also increased according to the number of decayed teeth, which appeared to be an important and simple characteristic associated with failure to complete all required dental treatment.

For general dental treatment, it is proposed that there should be simple indices to help dentists evaluate patients who have a high probability of withdrawing before treatment is completed. In our study, we focused on the number of decayed teeth, and examined whether this could be used as an index as it may be difficult for patients to judge the severity of periodontal disease by themselves, but self-reports of the number of decayed teeth are effective[21]. As an interpretation of the ROC curve, if a patient had two or more decayed teeth during at his or her first visit, there was high predictability

that the patient would cancel without notice and the treatment plan might not be completed. Thus, the number of decayed teeth could be used as an indicator to evaluate whether at the first visit patients will comply with required treatment, it is suggested therefore that a special response to high risk non-compliance patients could be taken to improve treatment efficiency. In other words, it became clear that the patient's condition at the time of the first visit could predict the subsequent treatment behavior to some extent, and special supports to these patients could improve efficiencies in dental care. After determining which patients are more likely to exhibit certain behaviors, interventions and education or health guidance could then be provided to those high risk patients before their condition becomes severe and they develop multiple decayed teeth. For example, dentists could explain the importance of dental treatment to patients and the specific plan to efficiently perform treatment at the planned appointment times. Then they could seek the patient's cooperation and commitment to see their required treatment completed.

One of the limitations in the present study is that it was conducted at only one dental clinic. Therefore, future research should involve multiple clinics and different residential areas. Another limitation is the possibility that the patients who "cancelled without notice" at this dental clinic, visited another clinic for further dental care. As a future development, we could improve the accuracy of assessing the risk of treatment interruptions by adding behavioral science-designated items into the questionnaire. We will conduct a follow-up study to track whether or not the participants who cancelled without notice visited other medical or dental institutions. This could be possible by obtaining information from insurers regarding the use of dental health services of these patients.

There have been few studies that have focused on cancellation of dental appointments which lead to incomplete patient care and poor use of resources. Thus, this research will be useful for general dentists in planning better oral health outcomes for their patients and better use of health resources.

Conclusion

This study revealed the relationship of certain patient characteristics and behavior of new patients to a general dental clinic and their probability of "cancellation of appointments without notice" which limited treatment completion. It became clear that the probability of cancellation without notice was significantly higher in

patients who were young, had no referral from another clinic or other patients/friends, did not complete the medical questionnaire, had two or more decayed teeth, and had severe periodontal disease. It is suggested that the number of decayed teeth can be used by the dentists as a predictive indicator to determine who is more likely to stop dental treatment prematurely. Identification of these patients would allow more attention and encouragement to be given to them to complete their treatment.

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