The association between oral health literacy and failed appointments in adults attending a university based general dental clinic

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Abstract

Objectives—The purpose of this study is to determine the association between personal
characteristics, a person's oral health literacy, and failing to show for dental appointments at a
university dental clinic.

Methods—A secondary data analysis was conducted on data collected from 200 adults at a
university dental clinic between January, 2005 and December, 2006. In the original study, an oral
health literacy instrument, the Rapid Estimate of Adult Literacy in Medicine and Dentistry
(REALM-D), was administered, sociodemographic and health information seeking behavior
gathered, and electronic records reviewed.

Results—Descriptive and bivariate analyses, and a classification and regression tree (CART)
analysis were conducted. Seeking health information through fewer sources versus multiple
sources was the strongest predictor of failing to show. The subjects' oral health literacy, as
measured by the REALMD List 3 score was the next most significant variable. CART analyses
also selected gender, chief complaint, age, and payment type as predictor variables.

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Conclusions—Multiple factors contribute to failing to show for dental appointments. However, individuals who use fewer sources of oral health information, a subset of health literacy skills, are more likely to fail to show for dental appointments.

INTRODUCTION

Failing to show (FTS) rates are the percentage of patients who fail to appear at their appointments with no, or only a few hours, warning. FTS for dental appointments have important potential ramifications for the dental health care system and patients' oral health. When patients FTS for appointments dental practices generate less revenue/production, staff are less efficiently used, and patients who FTS access less dental care thereby increasing their risk of poor dental health (1, 2).

Published FTS rates for dental appointments in the United States vary from 7.3% at a university-based pediatric dental clinic (3) to 24% FTS of 57 safety-net dental clinics in Illinois (4), to 47.0% at a community pediatric dental clinic (1). Although we focus on the US in this paper, numerous researchers in other countries have also investigated FTS (2, 5-16). Forgetting the appointment and illness are frequently cited as reasons for FTS, however the literature is inconsistent as to other factors (1-5, 7-11, 13-22). Factors related to difficulty canceling appointment (e.g. no telephone, called but could not get through), a long lag time between appointments, and having conflicting time commitments (1, 2, 5, 9, 10, 14); not seeing the dental service as valuable (10, 18); lack of trust in the dental health care system (19); and health issues (e.g. illness, negative emotionality, mental health) (1, 2, 5, 8-11, 14, 16, 17) have been shown to be associated with an increased risk of FTS. Other factors have contradictory findings, with associations between FTS and attendance in some studies but not in others. These include factors related to difficulty in leaving work/school; sociodemographic factors (e.g. age, gender, ethnicity, parental education, and SES); dental fear, satisfaction with previous dental treatment, the nature of the dental treatment needed, and the use of public payment assistance (2-6, 8-10, 12, 13, 15, 16, 18-23). Although studies argue that public insurance (e.g. Medicaid in the U.S.) is an important factor in failing to show (4, 20), Farr (21) describes a wide range of failing to show rates for both Medicaid and non-Medicaid patients suggesting that people with public insurance may have multiple factors unrelated to payment source that contribute to failing to show.

Health literacy describes an individual's capacity to obtain, process, and understand written or verbal health information to make informed health decisions (24, 25). The U.S. Institute of Medicine defines health literacy as "… a shared function of social and individual factors, which emerges from the interaction of the skills of individuals and the demands of social systems"(26). Seeking health-related information includes being able to identify how to get needed health care, and then being able to understand and interpret that information in order to access dental care (27-36).The purpose of this study is to determine the association between personal characteristics, an individual's oral health literacy and failing to show for dental appointments.

MATERIALS AND METHODS

Study Sample

A secondary data analysis was conducted on data collected from 200 adults seeking care for the first time from a university adult general clinic between January, 2005 and June, 2006 (37). Subjects in the study were screened by a clinic coordinator based on information from the health forms patients completed. Eligibility criteria included being > 18 years of age; no cognitive, vision or hearing impairment; and the ability to complete an informed consent to participate in the study in English. Eligible subjects were given a letter in English describing the study and inviting them to participate. The letter was read to each participant. It was stressed that participation was voluntary; the subject could withdraw if they so desired; and they would receive $5.00 for completing the survey. Other than requiring subjects to read and pronounce the words in the REALM-D instrument, responses to survey questions were obtained via interviews of subjects. Further details of subject recruitment and administration protocol of the original study are published elsewhere (37).

Variables

Patient reported variables—Oral health literacy was assessed with the 84-item Rapid Estimate of Adult Literacy in Medicine and Dentistry (REALM-D), a validated and reliable (Cronbach's alpha=0.958) word recognition screening instrument in which dental terms were added to the existing 66 item Rapid Estimate of Adult Literacy in Medicine (REALM) to create an instrument that quantifies both medical and dental health literacy (37). The structure of the REALM-D consists of three lists (List 1, List 2, and List 3) of 28-words each of increasing difficulty, ranging from one syllable words in List 1 to the most difficult words in List 3. Reliability of the three lists were $\alpha=0.900$, $\alpha=0.915$, and $\alpha=0.893$, respectively (37). Subjects are asked to read each word, and one point was given for those pronounced correctly. Zero points are given for those mispronounced or not attempted. Scores for each list (1-3) are computed individually and, used as independent List scores or summed to create a total REALM-D score.

Sociodemographic information asked of each participant included age, race, gender, primary language, and educational attainment. Subjects were also asked to indicate all health information resources (magazines, television, newspapers and/or the internet) that they used. The number of resources was summed 0-4.

Electronic health record variables—The electronic chart provided information on the subject's chief complaint, insurance status, and failing to show during the first six months after initial screening/acceptance to the dental clinic. The subject's chief complaint was recorded as either no chief complaint at their initial screening or recorded verbatim and then categorized as urgent (pain or presence of infection) or non-urgent (all other reasons). Payment type refers to how the patient's dental treatment was paid. The university dental clinic requires upfront payment for all patients except those on Medicaid (Public Insurance) and those having Delta Dental insurance (Private Insurance) which assigns the university benefits. All other patients are combined into one payment type (Cash). The subjects' attendance was categorized into 1 of 3 mutually exclusive groups: 1) no follow-up

appointment within 6 months after the individual's initial screening appointment (No Follow-up), 2) subject attendance or prior cancellation for all scheduled appointments (Completed), and 3) failure to show to at least one scheduled appointment (Failed). Though it is school policy for student dentists to confirm appointments the electronic record does not collect information on how or when the patient was reminded of the appointment by the care provider.

Statistical Analysis

Descriptive, bivariate and multivariate analyses were conducted, evaluating the associations between subject factors (age, race, gender, primary language, education, payment type, chief complaint, the number of health information resources used, and oral health literacy as measured by the REALM-D) and dental attendance behavior. Proportions were compared across the three dental attendance categories (No Follow-up, Completed, Failure To Show) using Fishers exact test. Mean scores for age, number of health information sources used and REALM-D and REALM-D List 3 scores across the 3 dental attendance categories were compared using Analysis of Variance (ANOVA) or the non parametric Kruskal-Wallis test.

The simultaneous ability of all 10 potential predictors including each of the three component lists of the REALM-D instrument to predict completers versus those failing to show was evaluated using a multivariate classification tree model (CART – Classification and regression tree) (38)(Figure 1). Subjects who did not follow up with any appointment after the initial screening were excluded. The CART, a computer based predictive modeling algorthim, is a sensitive, non-parametric technique that can identify subgroups that mostly fail to show or mostly complete. The CART tree is formed by looking at all possible variable values and finding those variable values that best separate those who fail to show from those who complete. Initially, the best variable value overall is chosen, splitting the data into two subsets (child nodes). The process is repeated in each child node, further splitting the data until no further splits are statistically significant (node homogeneity). In the CART analysis, the most important variable is the variable chosen to make the first (overall) split. Variables chosen in subsequent splits in the subset nodes are sequentially less important. A cross tabulation of the tree compared predicted categories versus the actual categories to determine the tree model accuracy. Overall CART accuracy is defined as the unweighted average of the percent correctly classified in each category.

RESULTS

Sample description

Table 1 describes the characteristics of the subjects by the three dental attendance categories. Sixty-seven of the 200 subjects failed to show for one or more dental appointment(s) (Range 1-8, mean 1.85) during the first six months after their initial acceptance into the adult dental clinic. The majority of these subjects (56.7%) failed only one appointment, 23.9 % failed two appointments, and 19.4 % failed more than two appointments. The sample was 54.5% male, 72.5% with college/post college education, a mean age 48.6 years, and ethnically diverse (42.5% Non-white and 57.5% White). Subjects primarily paid via Cash (72.0%); 9.5% were on Public Insurance (Medicaid), and 18.5% had

Private Insurance. Thirty-three (16.5%) subjects did not report any chief complaint at their initial screening, 115 (57.5%) reported a non-urgent chief complaint, and 52 (26.0%) reported an urgent chief complaint. Subjects reported a mean of 1.7 (s.d. of 1.4) of the four types of health information resources. The mean oral health literacy as measured by the REALMD, List 3 score was 24.6 (s.d. of 4.2) of a total of 28. There were no significant patient characteristics differences between the three dental attendance groups, although a trend was observed for number of health information sources used and health literacy as measured by the REALMD List 3.Table 2 describes the association between health literacy scores and the type of health information source used (television, magazines, newspapers, internet). The source most commonly sought for health information was the internet (n= 100). However, subjects with low oral health literacy scores (21.5 REALMD, List 3) were significantly less likely to use the internet than those with high health literacy scores (>21.5 REALMD, List 3) (p=0.007). A similar trend was observed for those with high oral health literacy and the use of magazines for health information (p=0.056).

Classification and Regression Tree (CART) model

CART analysis was conducted on the 161 Failed and Completed subjects. Of the 10 potential predictors considered, the CART model selected six predictor variables: health information used, gender, oral health literacy as measured by the REALM-D List 3 score, chief complaint, age and payment type (Figure 1). Using the six predictor variables, the model found 10 subgroups (terminal nodes), five of which predict FTS and five that predict Completed subjects. Of the 94 subjects who Completed their appointments, 83 (88%) were correctly classified by the CART model. Of the 67 FTS, 44 (66%) were correctly classified. The overall accuracy of the CART model is therefore (88%+66%)/2 = 77% (Table 3).

The most important predictor in the CART analysis was the number of health information sources used (first split, p=0.007), which split the sample into those who used more than 1 source of information (n=68) and those who used one or fewer sources of health information (n=93)(Figure 1). Among the 93 people reporting 1 or fewer health information seeking sources, 47 Failed (50.5%) compared to 20 Failed (29%) for those using more than 1 health resources. Thus, Failed individuals tend to seek health information from fewer sources than people who show up for appointments or reschedule their appointments when required. Conditional on using 1 or fewer sources, gender was the next most significant variable (p=0.003) as 71% of females Failed versus 39% of males (sources × gender interaction). In contrast, for those using more than one source, oral health literacy was the next most important predictor with 83.3% failure for low OHL scores compared to 24.2% failure for higher OHL scores (sources × OHL interaction). Given knowledge of resources, OHL and gender, age and chief complaint were less important, but significant predictors. Considering the 93 subjects with 1 or fewer sources of information, among the 59 male subjects with an urgent chief complaint, 10 of 16 men Failed (62.5%) compared to 13 (30.2%) of the 43 with no urgent chief complaint. Among the 16 males with an urgent chief complaint, age was the final significant (terminal) node, with 81.8% failure in men 54.5 years of age or younger compared to 20% for those older than 54.5 years of age. For women with 1 or fewer sources of information, CART made two splits in the sample of 34 subjects using age, first splitting women at age 29.5 years, and then splitting women older than 29.5 years at 37 years.

Of the 68 subjects who reported using more than 1 sources of health information, the most significant variable chosen was the subject's oral health literacy, as measured by the REALMD List 3 score (p=.002). Five of six subjects (83%) Failed with a low REALM-D List 3 (equal to or below 21.5) compared to 15 of 62 (24%) with a high REALM-D List 3 score. Age and payment type were less important, but significant predictors conditional on more than one source and REALM-D List 3. Among the 62 subjects with high REALM-D List 3 scores, the next significant predictors were age (p=0.018) with subjects less than or equal to 40.5 years with a 0.05% Failed rate compared to 14 of 62 Failed (32.6%) among those older than 40.5 years. Considering those older than 40.5 years, Payment type (p= 0.035) split the sample with 8 Fails among the 33 subjects paying Cash (24.2%) compared to 6 of 10 (60%) among those subjects having either Private or Public Insurance.

DISCUSSION

Using a **tree** analysis, our findings show that the number of sources a subject uses to seek health information, the subject's oral health literacy, gender, age, insurance status, and chief complaint were associated significantly with whether or not the subject followed through (Completed) or failed to attend (Failed) their dental appointments. Seeking health information, a component of health literacy, through fewer sources versus multiple sources was the strongest predictor of FTS. For individuals using multiple sources of health information, low oral health literacy score was the next strongest predictor of FTS. In this decision tree, other factors, such as gender, age, urgent need, and payment type also showed some association, but it was seeking health information that split the group and placed 70% of all people who FTS into one group. Similar to other investigators, we found that public insurance (Medicaid) was not a strong predictor of FTS for dental visits (17,20,23).

These findings emphasize the importance of oral health literacy for successful utilization of health care (25, 39). People who have poor health literacy may have fewer health information sources for a variety of reasons including financial and time constraints or difficulty understanding written materials that discourages reading and internet searches, and cultural biases which may encourage reliance on family members or health care professionals. These same limitations (financial, time, difficulty with written materials, cultural biases) may contribute to difficulty attending or rescheduling dental appointments. In this sample significantly fewer low health literacy subjects (28.1%) reported using the internet than those with high health literacy (54.2%). American adults who do not use the internet report they do not find it's information valuable (42%); that computers are too difficult to use (21%); or lack access to a computer(18%) (40). Specific interventions to reduce FTS may not be universally effective given the great variability in the factors which influence FTS (3, 23). However, efforts to improve written and verbal communications within health care organizations may be helpful. Studies have demonstrated reminding patients of their appointment with calls or mailed reminders (1, 6, 13, 41); requiring the patient call and confirm their appointment 2 days prior (42), and reducing the gap between scheduling appointments and the appointment date by scheduling only 2 to 5 weeks in advance(8) to all be effective. Schmalzried (43) describes a holistic program that instructs patients who frequently FTS how and when to cancel an appointment, how to obtain help with medication and transportation barriers, and about the effect of FTS on their health

costs. This approach reduced the FTS rate from a high of 54% in 2003 to 15% in 2010, reduced staffing costs and improved clinic services.

We observed a trend in our sample among male participants to FTS despite having an urgent chief complaint as seen by other investigators (12). Though the reason for this association is not known, it may reflect the finding by other studies that dental treatment is a low priority or that oral diseases are viewed as not serious problems or are deferrable (8, 11, 13). Improved written and verbal communications may improve patients' understanding of the risks of deferring care and benefits of timely and preventive dental care and be particularly helpful for patients who have difficulty understanding risks and benefits of health decisions, a characteristic of low health literacy (44).

Limitations

This secondary data analysis was constrained by the availability of variables already collected and did not allow for the inclusion of all potential factors that have been shown to contribute to FTS. It would be useful for future studies to include a broad range of psychosocial, environmental and enabling factors as well as sociodemographic characteristics. In addition, the generalizability of the study findings are limited by having a subject pool that reflects the dental school clinic population and not necessarily the community of people with lower education and multiple payment sources. Finally, our sample size only allows confirmation of the major predictors, not weaker potential predictors.

Conclusion

This report confirms the association between oral health literacy and failing to show for dental appointments. Specifically, our finding that individuals who use fewer sources of health information are more likely to FTS suggests a complexity of factors consistent with the conceptual framework of oral health literacy contribute to failing to show (FTS) for dental appointments.

Acknowledgments

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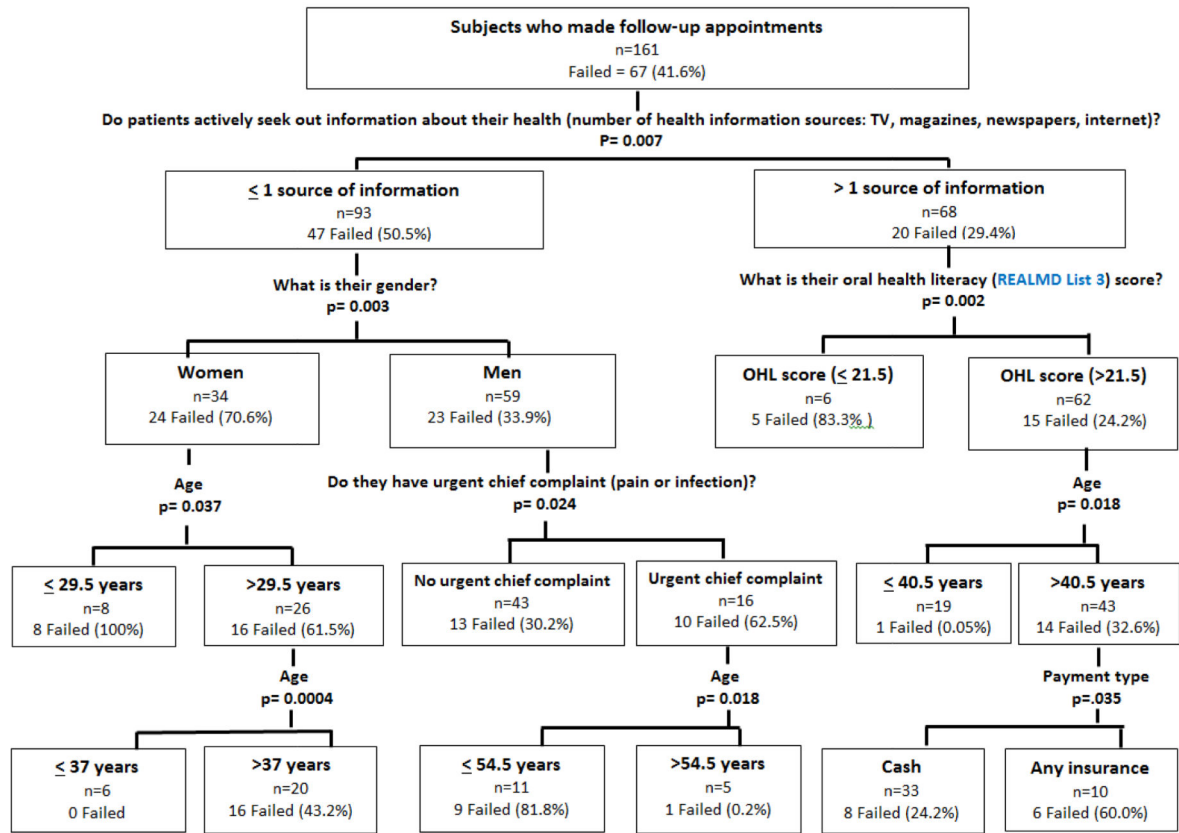
Figure 1.
Classification and Regression Tree Model which Describes Dental Attendance Behavior of
Study Subjects

Table 1

Subject attendance behavior by gender, education, chief complaint, payment type, number of health information resources used, age, and oral health literacy score

	Entire Sample (N=200)	Dental Attendance			p-value
		Failed (N=67)	Completed (N=94)	No Follow-up (N=39)	
	Freq (%)	Freq (%)	Freq (%)	Freq (%)	
Gender					0.2444
Female	91 (45.5%)	35 (52.2%)	37 (39.4%)	19 (48.7)	
Male	109 (54.5%)	32 (47.8%)	57 (60.6%)	20 (51.2%)	
Race					0.5674
Non-white	85 (42,5%)	25 (37.3%)	42 (44.7%)	18 (46.2%)	
White	115 (57.5%)	42 (62.7%)	52 (55.3%)	21 (53.8%)	
English primary language					0.5141
No	40 (20.0%)	14 (20.9%)	16 (17.0%)	10 (25.6%)	
Yes	160 (80.0%)	53 (79.1%)	78 (83.0%)	29 (74.4%)	
Education					0.4732
High School	55 (27.5%)	21 (31.3%)	22 (23.4%)	12 (30.8%)	
College/post college	145 (72.5%)	46 (68.7%)	72 (76.6%)	27 (69.2%)	
Chief complaint					0.1394
Not urgent	115 (57.5%)	36 (53.7%)	55 (58.5%)	24 (61.5%)	
Urgent	52 (26.0%)	24(35.8%)	19 (20.2%)	9 (23.1%)	
Unknown (missing in patient record)	33 (16.5%)	7(10.4%)	20 (21.3%)	6 (15.4%)	
Payment Type					0.5153
Cash	144 (72.0%)	44 (65.7%)	69 (73.4%)	31 (79.5%)	
Public Insurance (Medicaid)	19 (9.5%)	7 (10.4%)	10 (10.6%)	2 (5.1%)	
Private Insur. (Delta Dental)	37 (18.5%)	16 (23.9%)	15 (16.0%)	6 (15.4%)	
	mean (sd)	mean (sd)	mean (sd)	mean (sd)	
Number of health information resources used	1.8 (1.4)	1.4 (1.3)	1.9 (1.4)	1.9 (1.3)	0.1515
Age (years)	48.6 (17.0)	50.6 (17.5)	47.5 (16.4)	47.7 (17.4)	0.4836
Health literacy score, REALMD (List 3)	24.6 (4.2)	24.1 (4.0)	24.8 (3.9)	25.0 (5.0)	0.082[*]

[*] Non-parametric

Table 2

Comparison of sources of health information for subjects with low and high health literacy scores

Gets health information from …	Low health literacy (REALMD list 3 ≤21.5) (N=32)	High health literacy (REALMD list 3 ≥21.5) (N=168)	Pearson Chi-Square, (df=1)
	N (%)	N (%)	
TV			0.630
No	19 (59.4%)	92 (54.8%)	
Yes	13 (40.6%)	76 (45.2%)	
Magazines			0.056
No	23 (71.9%)	90 (53.6%)	
Yes	9 (28.1%)	78 (46.4%)	
Newspapers			0.140
No	24 (75.0%)	103 (61.3%)	
Yes	8 (25.0%)	65 (38.7%)	
The internet			0.007
No	23 (71.9%)	77 (45.8%)	
Yes	9 (28.1%)	91 (54.2%)	
Total Number of Sources of Info			0.0071
1	25 (78.1%)	88 (52.4%)	
>1	7 (21.9%)	80 (47.6%)	
Median Sources of Info	1	1	

Table 3

Prediction of attendance, based on multivariate classification and regression tree (CART) model

Group		Actual Category		Total
		Completed	Failed	
Predicted Category	Completed	**83 (88%)**	23	106
	Failed	11	**44 (66%)**	55
Total		94	67	161

Bold values indicate the correct category on which the statistical analysis is based