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Patient's satisfaction with orthodontic care from an academic clinical service

Al Balushi S, Mei L, Farella M

Abstract

Background and objectives: To investigate patients' satisfaction with the services provided by the orthodontic clinic at the Faculty of Dentistry, University of Otago, and to test the efficacy of corrective actions tailored on the basis of patients' feedback.

Methods: The study was designed as longitudinal study, which included two surveys and a corrective action. During the first survey, a questionnaire on patient's satisfaction was distributed to 59 patients and 43 parents attending the Orthodontic Clinic at the University of Otago School of Dentistry. On the basis of the survey results, a number of corrective actions where then implemented for four months. A second survey was then organized and the questionnaires were distributed again to an independent sample of 48 patients and 52 parents. The efficacy of the corrective actions was analysed by comparing the results of the two surveys.

Results: The satisfied areas by patients and parents included the way that clinicians communicated with them and how their emergencies were dealt with, the ease of making, cancelling and rescheduling appointments, treatment cost and the cleanliness of the clinic. Three areas of lower satisfaction were identified, including the magazines in the waiting area, sending a reminder prior to appointments, and giving an explanation if the appointment is delayed. The corrective actions were thus developed targeting on those three areas, and significantly improved the satisfaction about the magazines and explaining the reason of the delay (all $p < 0.05$). The improvement for the reminders was not significant.

Conclusion: Patients and parents were generally satisfied with the services provided by the Orthodontic Clinic of the University of Otago Dental School. The correction actions based on participants' feedback improved the quality of service.

Introduction

Quality systems become increasingly important in health sciences, and many healthcare organizations, including dental organizations, are moving their focus towards implementation of quality management systems that meet patient needs and expectations. The challenge with evaluation of quality in healthcare services is that quality is often intangible and hard to measure accurately. Hence, it is important to develop a standard set of quality indicators, which can be used to collect feedback and implement targeted corrective actions (Prahl-Andersen, 2000).

A framework of structure, process and outcome has been used widely to assess quality of health services (Donabedian, 1988). Structure refers to the organizational setting in which care is provided, process refers to the actual delivery of care and the interactions between the user and practitioner, and outcome refers to the effect or consequence of care on the health status of individuals as well as their knowledge and behaviour. Other indicators include access to care, efficacy of care, efficiency, equity and comprehensiveness (Campbell *et al*., 2000). Those indicators can be used to assess quality by means of patient satisfaction, peer review, clinical audit and continuing professional development and appraisal (Bondt and Zentner, 2007). Quality management systems ensure that the best service is delivered; hence patients' needs and expectations are met. Achieving patient satisfaction is aimed at by all healthcare practices, including dental practices.

In orthodontics, it has been reported that satisfied patients are more likely to adhere to instructions, comply with appointments, and hence achieve better orthodontic outcomes (Sinha *et al*., 1996). Conversely, unsatisfied patients find healthcare to be less effective compared with those who are satisfied with the services provided (Stewart and Spencer, 2005). It is therefore recommended that orthodontic practices undertake patient satisfaction questionnaires regularly to help in continuous quality improvement (Bondt and Zentner, 2007).

Patient satisfaction can be assessed using both qualitative and quantitative methods. Qualitative methods include observation by the clinician, employee feedback, patient interviews and focus groups. The most common quantitative method for measuring patient satisfaction is by a survey, in which participant can score on different aspects of services. Questionnaires are preferred over qualitative methods because they are quick and simple; patients are more likely to give honest feedback, and multiple aspects of the quality can be assessed in a single simple questionnaire (Nijo *et al.*, 2008).

Different quality questionnaire models have been used in orthodontics to assess patient satisfaction such as the SERVQUAL model and the STOPS model (Nijo *et al*., 2008). It is important to point out that any questionnaire that is used to measure patient satisfaction in orthodontics should include all the items of interest that can be improved, be suitable for the target group

and be simple to understand, especially given that a large number of orthodontic patients are adolescents.

A good quality system has many benefits to both the patient and practitioner. It enhances patient satisfaction; hence better compliance with appointments and instructions, which is very important during the long course of orthodontic treatment, all of which improve the final treatment outcome. Orthodontic professional success is not only measured by the treatment of the malocclusion but also by addressing patients' expectations (Carneiro *et al.*, 2010). Donabedian (1988) claimed that patient satisfaction with the care and services provided is a valid measure to assess quality.

The aim of this study was to determine patients' satisfaction with orthodontic care at the University of Otago. This study will give an insight into the current level of quality by looking at patients' satisfaction with the services provided by, and the environment of, the Orthodontic Clinic. The feedback received from the patients will be used to start building a quality system by implementing some initial corrective actions. Moreover, it will provide a baseline upon which any future quality improvement procedures can be developed.

Materials and Methods

The study involved a longitudinal study carried out over a six-month period. Ethical approval was obtained from the University of Otago Human Ethics Committee (15/009). Furthermore, Māori consultation was obtained from the Ngāi Tahu Research Consultation Committee.

A pilot study was first carried out to explore the suitability of a survey questionnaire. Thereafter, the questionnaire was distributed to a patient sample randomly selected amongst patients attending the Orthodontic Clinic. According to the patients' feedback, a set of corrective actions was implemented over a period of four months. A second survey was then carried out to explore the efficacy of the corrective actions.

Questionnaire

The questionnaire used in this study was based on the SERVQUAL model (Parasuraman *et al*., 1985). The SERVQUAL model was modified by gathering information from interviewing focus groups (Asubonteng *et al*., 1996). The idea behind SERVQUAL is that there is a gap between what patients expect to receive and what they actually receive based on service performance. If this gap between expectations and performance is measured, a judgement on the level of service quality can be made. This gap represents customer perception of service quality. When performance meets or exceeds expectation, quality is judged to be high by customers. Similarly, if performance is reported to be lower than expectations, quality is judged to be low. The model originally had ten dimensions to measure, namely, reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding/knowing the customer, and tangibles. In a subsequent revision of the questionnaire, these were collapsed into five dimensions: reliability, assurance, tangibles, empathy and responsiveness. The questionnaire contains 22 items: four for tangibles, five for reliability, four for responsiveness, four for assurance, and five for empathy (Parasurman *et al*., 1991). It has been used in a variety of sectors including retail chains, banking, library services, telecommunication and healthcare (Ladhari, 2009). In healthcare, SERVQUAL has been used to evaluate patient satisfaction in both medical (Peprah and Atarah, 2014) and dental settings (Baldwin and Sohal, 2003; Palihawadana and Barnes, 2004; Dewi *et al*., 2011), including orthodontics.

The wording of the SERVQUAL model was modified to suit our participants. Also, some items were added and others removed depending on their applicability to orthodontics. Open-ended questions were added which were analysed by word clouds. Two versions of the questionnaire were used: one for patients and the other one for parents/guardians because there are some aspects that are experienced by one group but not the other. There were 19 items in the patient questionnaire and 16 items in the parent/guardian questionnaire. The areas investigated were waiting time and area, appointments, communication with orthodontist, cost, staff and emergency. A five-point Likert scale was used with the answers ranging from totally disagree (1 on Likert scale) to totally agree (5 on Likert scale). Both versions of the questionnaire contained the same open-ended questions. The focus of the questionnaire was on the participants' evaluation of the structure and process of the orthodontic clinic rather than the outcome of treatment.

Pilot study

The pilot study was done over two days and involved asking a small patient sample to fill in the questionnaire and then interviewing them. The sample was composed of 12 participants, 8 patients (5 females and 3 males) and 4 parents/guardians (3 females and 1 male). The questionnaire had been modified after completion of the pilot study and sent to the Ethics Committee for final approval. An item about the cost was added to parent/guardian questionnaire. Some items were removed and wording and order of a few other items were changed. One item of both versions of the questionnaire was removed yielding a total of 18 items in the patient questionnaire and 16 in parent/guardian questionnaire after addition of one item on the cost. During the pilot study, it was noted that participants younger than 12 years old were not very reliable at filling in the questionnaire, so they were excluded from the sample. Any patient or parent/guardian unwilling to fill in the questionnaire was excluded from the potential sample.

First Survey

The questionnaire was distributed to consecutive patients attending the Orthodontic Clinic at the University of Otago over four weeks in March 2015. The sample was a convenience sample from the patients undergoing

orthodontic treatment and their parents/guardians. This stage was meant to be explorative and descriptive for overall patient satisfaction.

The survey data were analysed and the three items with the lowest satisfaction ranks were used for targeting corrective actions. The ranking was determined on the basis of the proportion of patients/parents who answered "agree" and "strongly agree".

Corrective Actions

The results of the first survey were disclosed to orthodontic staff during a meeting. During that meeting, the weaker and stronger areas of the group were discussed and a number of recommendations for corrective actions were made. These recommendations were also sent in writing by email to all orthodontic staff and students, along with a report of the survey results. Reminders were sent regularly to the staff through emails, to encourage implementation of the corrective actions. The areas of corrective actions were implemented for four months (May to August 2015).

Second Survey

The second survey commenced in August 2015 and continued for four weeks. The last stage commenced while the third stage was still going to avoid influencing the results of the second questionnaire. Patients and parents surveyed in the first survey were not surveyed on the second round.

Statistical analysis

Statistical Package for the Social Sciences (SPSS version 21 for Mac OS) software was used for statistical analysis. Chi-square test was used to compare proportions. General inductive technique was used for the qualitative analysis and Wordclouds were drawn using online applications for visual representation of qualitative data and to facilitate presenting the qualitative results, especially to the orthodontic staff.

Results

Study sample

The sample of the first survey consisted of 102 participants and included 59 (58%) patients, 36 girls and 23 boys, and 43 (42%) parents/guardians, 36 females and 7 males. The age of the patients ranged from 12 to 41 years, while the age of the parents/guardians ranged from 35 to 72 years. The sample of the second survey consisted of 100 participants and included 48 (48%) patients, 29 girls and 19 boys, and 52 (52%) parents/guardians, 40 females and 12 males. The age of the patients ranged from 13 to 54 years, while the age of the parents/guardians ranged from 30 to 67 years.

Participants' satisfaction with the services provided by the orthodontic clinic

The results of the first survey showed that both patients' and parents/guardians' were generally very satisfied with the way the orthodontists and staff communicated

Figure 1. Wordcloud of patients' and parents' answers to "*What did you like most about your orthodontic visit?*" during the first survey.

with them and how their emergencies were dealt with. They were also satisfied with the ease of making, cancelling and rescheduling appointments, treatment cost and the cleanliness of the clinic. Table 1 shows the number of patients/guardians who 'strongly agreed' and 'agreed' with each item. All patients who made their own appointments were satisfied with the ease of cancelling or rescheduling appointments to another time. The items in the dimensions of communication with orthodontist, staff, emergency and cost showed a proportion of high satisfaction (*i.e.* items with "Strongly Agree" or Agree") ranging between 56% to 95%, for both groups. Participants further emphasized their satisfaction by commenting that they liked the friendliness of the staff and the flexibility of the appointments as well as that their teeth are getting fixed (Figure 1).

Patients were least satisfied with the magazines in the waiting area. Similarly, parents/guardians were not satisfied about the magazines as only 20% strongly agreed/agreed that the magazines in the waiting area are interesting. They, however, showed the least satisfaction for the item "staff explain to me what is happening if my appointment is delayed". Both groups were not satisfied with the reminders they receive from the clinic,

Figure 2. Wordcloud of patients' and parents' answers to "*What do you think could be improved?*" during the first survey.

only 41% of patients and 14% of parents/guardians strongly agreed/agreed with the item on reminders (Table 1 and Table 2). Patients were also not satisfied with the long period between the first orthodontic visit and when they started treatment. For the waiting time, 71% of the patients and 67% of the parents reported that they had to wait for more than ten minutes to see the orthodontist. Both groups hoped waiting times could be improved. Waiting times included the waiting time to start the appointment, the waiting time for a specialist orthodontist to check the work, and, lastly, the waiting time between the screening appointment and the beginning of active treatment, as well as waiting area (Figure 2).

Corrective actions

The three items that were least strongly agreed/agreed with were targeted to introduce changes. Thus, the areas of corrective actions that were targeted were; the magazines in the waiting area, reminder prior to appointments, and explanation to patients and/or parents if the appointment is delayed. It was not possible to introduce changes to lessen the waiting period between the first orthodontic treatment and the start of actual

Table 1. Patients' satisfaction with the services provided by the orthodontic clinic before and after implementation of the corrective actions.

Items	Number of "Agree" and "Strongly Agree" % (i.e. Likert scale 4 and 5)	
	Before Corrective Action (n= 59)	After Corrective Action (n=48)
Waiting time and area		
1) I don't have to wait long before I see my orthodontist	32 (54%)	28 (58%)
2) I find the magazines in the waiting area interesting	13 (22%)[a]	11 (23%)
3) I thought that the waiting period between my first orthodontic appointment and when I started my treatment was not too long	24 (41%)	20 (42%)
4) I think the orthodontic clinic looks clean and tidy	56 (95%)	42 (88%)
5) Have you ever had to wait more than 10 minutes to see your orthodontist?	Yes = 42 No = 17	Yes = 42 No = 6
If you answered yes to Question 5, please answer the following question:		
5a) Staff explain to me what is happening if my appointment is delayed	21 (50%)	22 (52%)
Appointments		
6) Did you make your own appointment (example: did you call the dental school yourself)? If you answered yes to Question 6, please answer the two following questions:	Yes = 14 No = 45	Yes = 15 No = 33
6a) I can easily make a new appointment	13 (93%)	14 (93%)
6b) I can easily cancel or reschedule an appointment to another time	14 (100%)	12 (80%)
7) I always have my appointments at times that suit me	31 (53%)	33 (69%)
8) I receive a reminder prior to my appointment	24 (41%)	10 (21%) *
Communication with orthodontist		
9) My orthodontist explains things to me in words that I can understand	52 (88%)	43 (90%)
10) My orthodontist always asks me if I have any dental problems	41 (69%)	43 (90%) **
11) My orthodontist tries his/her best to fix my dental problem	54 (92%)	45 (94%)
12) My orthodontist always asks me about my well-being	46 (78%)	41 (85%)
13) My orthodontist explains to me what I should do at home to take care of my teeth/braces	54 (92%)	41 (85%)
14) My orthodontist makes sure I am sitting comfortably on the chair	45 (76%)	38 (84%)
15) My orthodontist explained to me how long my complete orthodontic treatment would take (e.g. the length of time until my braces can be removed)	45 (76%)	36 (75%)
Staff		
16) Staff are helpful	56 (95%)	45 (94%)
17) Staff tell me which chair I should go to	53 (90%)	41 (85%)
Emergency		
18) Have you ever needed emergency orthodontic treatment?	Yes = 16 No = 43	Yes = 14 No = 34
If yes, please answer the following question:		
18a) I was able to make an appointment to see my orthodontist as soon as I needed to	14 (88%)	12 (86%)

orthodontic treatment due to time constraints of the research.

New magazines, such as Woman's Day, Woman's Weekly and car and sports magazines were ordered online. It was recommended to the postgraduate students to call the patients or parents/guardians the day prior to the appointment. They could use any of the phones available in the clinic and staff offices. Alternatively, they could use a service called multiTXT where the university email address can be used to send text messages; hence no personal information is displayed to patients. An email was sent to all the staff with the instructions of how to use this service. They were also encouraged to talk to the patients/parents and explain to them the reason for the delay if it happens or at least apologise for the delay. They were advised to give the patient an estimate of how long the delay would be for or they could notify the receptionist that there would be a delay, so that the receptionist could inform patient/parent upon arrival. They were also advised to start their clinics on time and not overbook, so that appointments could start on time or with minimal delay.

Table 2. Parents' satisfaction with the services provided by the orthodontic clinic before and after implementation of the corrective actions.

Items	Number of "Agree" and "Strongly Agree" % (i.e. Likert scale 4 and 5)	
	Before Corrective Action (n= 43)	After Corrective Action (n=52)
Waiting time and area		
1) I do not have to wait long until my child can see the orthodontist	28 (65%)	36 (69%)
2) I find the magazines in the waiting area interesting	8 (2 NA) (20%)	22 (42%) *
3) I thought that the waiting period between my child's first orthodontic appointment and when he/she started treatment was not too long	21 (49%)	20 (38%)
4) I think the orthodontic clinic looks clean and tidy	35 (81%)	48 (92%)
5) Have you ever had to wait more than 10 minutes before your child sees the orthodontist?	Yes = 29 No = 14	Yes = 33 No = 19
If you answered yes to Question 5, please answer the following question:		
5a) Staff explain to me what is happening if my child's appointment is delayed	4 (14%)	13 (39%) *
Appointments		
6) Did you make your child's appointment?	Yes = 17 No = 26	Yes = 26 No = 26
If yes, please answer the two following questions:		
6a) I can easily make a new appointment for my child	12 (71%)	23 (88%)
6b) I can easily cancel or reschedule an appointment to another time	14 (82%)	23 (88%)
7) My child always has his/her appointments at convenient times	19 (44%)	22 (42%)
8) I receive a reminder prior to appointment	12 (28%)	10 (19%)
Communication with orthodontist		
9) The orthodontist explains things to me in words that I can understand	41 (95%)	49 (94%)
10) The orthodontist always asks me if my child has any dental problems	28 (65%)	40 (77%)
11) The orthodontist tries his/her best to fix my child's dental problem	41 (95%)	47 (90%)
12) The orthodontist explains to me what my child should do at home to take care of his/her teeth/braces	40 (93%)	43 (83%)
13) The orthodontist explained to me how long my child's complete orthodontic treatment would take (e.g. the length of time until my child's braces can be removed)	36 (84%)	41 (79%)
Staff		
Staff are helpful	37 (86%)	45 (87%)
Emergency		
15) Has your child ever needed emergency orthodontic treatment?	Yes = 9 No = 34	Yes = 9 No = 43
If yes, please answer the following question:		
15a) I was able to make an appointment for my child to see the orthodontist as soon as I needed	5 (56%)	9 (100%)
Cost		
16) I think that the orthodontic fees are fair and appropriate	25 (81%)[a]	34 (67%)[a]

*Chi-square test: $p<0.05$
**Chi-square test: $p<0.01$
a One response was "Not Applicable"

Efficacy of the corrective actions

The efficacy of the implemented corrective actions was examined in the second questionnaire. No change was experienced by patients with the magazines, as still only 23% strongly agreed/agreed with the item on magazines, similar to that reported in the first questionnaire in Table 1 (*i.e.* 22%; $p > 0.05$). Parents, however, showed a much improved satisfaction with the magazines as 42% ($p < 0.05$) strongly agreed/agreed that the magazines are interesting (Table 2).

Although the number of parents/guardians who strongly agreed/agreed with the item "staff explain to me what is happening if my child's appointment is delayed" was still low, there is a significant difference between the first and second survey. The item was strongly agreed/agreed by only 14% in the first survey, but by 39% ($p < 0.05$) in the second survey (Table 2).

A significant drop (from 41% to 21%; $p < 0.05$) was seen in the proportions of strongly agree/agree in relation to the reminders as shown in Table 2. Both patients and parents/guardians commented that they would like to see more text and phone call reminders as well as more convenient appointments.

Although the item "My orthodontist always asks me if I have any dental problems" was not targeted in the corrective actions, a noticeable improvement is evident for both groups, especially patients (Tables 1 and 2). Patients had a 21% difference between the first and second survey (from 69% to 90%) and parents had 12% difference (from 65% to 77%).

Discussion

The study aimed to investigate patients' satisfaction with the services provided by the orthodontic clinic, introduce and implement corrective actions based on the feedback from the patients and their parents/guardians, and, finally, test the efficacy of the actions implemented. The study included two main surveys before and after corrective actions. The first survey revealed three main areas with lower patient's satisfaction, which included the magazines in the waiting area, reminder prior to appointments and explanation to patients and/or parents if an appointment is delayed. After three-month implementation of the corrective actions, satisfaction with magazines significantly improved for parents/guardians but not for patients. Also, there was much improvement for explanation to patients and/or parents if an appointment is delayed. Neither patients nor parents/guardians reported any improvement with reminders.

The magazines at the orthodontic clinic were old and unappealing. Concerning the new set of magazines brought to the waiting area, parents/guardians were satisfied. However, no change was noticed by patients. This may be because most orthodontic patients are adolescents who tend to be less attracted to magazines and more to technology. Much of their waiting time is spent on mobile phones or personal laptops. It could also be because the new magazines are still not attractive to patients.

The duration of an orthodontic visit cannot be always predicted and sometimes takes longer than expected. This can result in a delayed appointment for the next patient and a relatively longer duration of waiting period, with the orthodontist perhaps too busy to go and explain to the patient or parent/guardian the reason for the delay; and parents/guardians were not satisfied about unexplained delays. After implementation of the corrective actions, results showed they were more satisfied about explanations given by the orthodontists; however, the result was still low. It could be because the time given for implementation of the corrective action was not enough for parents/guardians to notice the change. Moreover, it could be that not all postgraduate students complied with the advice given about how to avoid the delay or did not explain to patients and parents/guardians why a delay happened. Considering more than half of the participants reported that they had to wait for more than ten minutes to see the orthodontist, a 10-minute longer interval for orthodontic visits can be considered when making appointments with each patient.

There is no reminder system operating in the orthodontic clinic, so patients and parents/guardians do not receive any reminders other than the appointment sheet printed off on the previous appointment. Therefore, neither group was satisfied with the reminders. Following the implementation period and analysis of the second questionnaire, they were still unsatisfied, and satisfaction was even lower than at baseline. This can be explained mainly by non-compliance of postgraduate orthodontic students to sending reminders to their patients, although they were advised to call their patients or send them a text reminder via the multiTXT system. Also, the short implementation period may have meant that patients may have had only two appointments, which are clearly not enough to observe the change even if the postgraduate students had actually sent a reminder prior to appointment. At the time of writing this article, the orthodontic clinic implemented an automatic text delivery system to remind patients of their appointments, which resulted in a 20% reduction in failure to attend (unpublished observations). In addition, considering the problem with clinician's compliance to send multiTXT reminders to the patients, the installation of a system that can automatically deliver text reminders to patients before their appointments would be beneficial to patients and clinicians.

The waiting area is small relative to the number of patients and parents/guardians per day. However, this is the amount of space given by the dental school for the clinic. Perhaps with the new school, the waiting area can be designed to accommodate more people. Parents/guardians want their children's appointments to be outside of school hours, and adult patients would

like more convenient appointments that suit their work schedule. Most orthodontic patients are adolescents who go to school and it is hard to schedule everyone outside school hours. This is made clear to the parents/guardians by the notes in the waiting area. Similarly, it is not always easy to schedule working adult appointments at perfect times that suit their schedule. Orthodontic treatment requires longer appointments at the start, but once the treatment is underway, the length of the appointments shortens. However, efforts should be made to schedule convenient appointments for the patients and also inform patients about the reason why this is not always possible.

It was hypothesised that there would be some degree of dissatisfaction with certain aspects of orthodontic services. Respondents were not satisfied about all dimensions in the questionnaire; however, overall there were more aspects of orthodontic services that they were satisfied with. The corrective actions that were implemented were hypothesised to be effective and to improve patient satisfaction. Although not all of them proved to be effective, due to other limiting factors such as time and compliance of the staff, some did improve participants' satisfaction.

The focus of the study was on the participants' evaluation of the structure and process of the orthodontic clinic rather than the outcome of treatment. This study is different from other published studies in that it has implemented the corrective actions and evaluated their efficacy. Most studies investigated patient satisfaction and made recommendations without implementing any corrective actions immediately after analysing patients' feedback. This study has also looked at satisfaction from the parents/guardians' perspective.

This is the first survey on patient satisfaction conducted in the orthodontic clinic at the Faculty of Dentistry, University of Otago. It gave us an insight into patients' perceptions of the quality of the services provided by the clinic. With the new school under construction, the orthodontic clinic can be designed in such a way that patients' and parents/guardians' comments about the setting, such as waiting area, are taken into consideration. The questionnaire can be used again in the future to assess the service quality and introduce changes if required.

The study is also applicable to other fields of dentistry. Patient satisfaction is the ultimate goal of all dental facilities, and undergoing such studies can help greatly in improving the quality of the services provided.

Parents/guardians do not necessarily come with their children to every visit. Some of them have only been a few times to the orthodontic clinic. Also, there were more females than males in the parents/guardians sample. This may have influenced the results to some degree. Ideally, the same sample should be used to compare efficacy of the corrective actions, but due to the practical difficulty this was not possible. There was a chance of a loss of sample if the same sample was used in both questionnaires.

Although the questionnaire can be applied to other fields of dentistry with minor changes to its wording, the results of this study are not generalizable to the other clinics in the school. They are exclusive to the orthodontic clinic because other clinics operate differently; hence patients' perspective of the services may differ significantly. Also, the age group of patients is different from other clinics. Orthodontic patients are mostly adolescents, whereas other clinics have more adults and elderly patients.

The time given for implementation of the corrective actions was possibly not enough to observe major changes, but due to the limited time available for the study, the last stage had to start. Patients may have had only two visits during this period, which is clearly not enough to observe the change. The questionnaire can be distributed again at another time later next year to see if there is more improvement.

The results of this study can be used as a baseline upon which any future quality assessment studies can be compared and quality improvement projects developed. Perhaps in future patient satisfaction questionnaires, a larger sample of a relatively even number of both sexes can be included. Also, more sex- and age-specific analysis can be undertaken. In future quality improvement projects, enough time should be given in order to be able to observe changes before taking the next quality assessment questionnaire.

It is important to point out that the corrective actions implemented in this study were based only on patient satisfaction. Quality can be assessed by assessing the satisfaction of the inner customers (*i.e.* staff), external customers (*i.e.* patients) and suppliers (Atta, 1999). In the future, the orthodontic clinic can extend its research to include more quality indicators alongside patient satisfaction. A comprehensive quality system concerning patients, administrative staff, orthodontists, setting of the clinic, process and treatment outcome should be looked at by the orthodontic clinic in the future.

Orthodontic professional success is not only measured by the treatment of the malocclusion but, more importantly, by addressing patients' expectations. Therefore, research into patient satisfaction should be looked at on a routine basis as part of the operation of any health facility, and efforts should be made to improve the quality of the services provided.

Conclusion

Patients and parents were generally satisfied with the services provided by the Orthodontic Clinic at the University of Otago School of Dentistry. The correction actions based on participants' feedbacks could improve the quality of service.

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Authors details

Sharifa Al Balushi
BDS (Hons), Sir John Walsh Research Institute, Faculty of Dentistry,
University of Otago, Dunedin, New Zealand.
310 Great King Street, Dunedin, 9016, New Zealand.

Li Mei
PhD, Senior Lecturer, Discipline of Orthodontics, Department of Oral Sciences,
Sir John Walsh Research Institute, Faculty of Dentistry, University of Otago, New Zealand.
310 Great King Street, Dunedin, 9016, New Zealand.

Corresponding author-
Email: li.mei@otago.ac.nz
Tel: +64 3 479 7480
Fax: +64 3 479 7070

Mauro Farella
PhD, Professor, Head of Orthodontics, Department of Oral Sciences,
Sir John Walsh Research Institute, Faculty of Dentistry, University of Otago, New Zealand.
310 Great King Street, Dunedin, 9016, New Zealand.