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A STUDY OF THE MOST COMMON RETENTION PROTOCOLS PRESCRIBED IN THE UNITED STATES

by

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Submitted in partial fulfillment of the requirements for the degree of Master of Science in Dentistry

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A STUDY OF THE MOST COMMON RETENTION PROTOCOLS PRESCRIBED IN THE UNITED STATES

Abstract

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The purpose of this descriptive study was to use a carefully created and pilot-tested survey instrument to identify the most popular orthodontic retainers and retention protocols used in the United States as reported by active members of the American Association of Orthodontists. Two-thousand active members of the American Association of Orthodontists, stratified by region in which they practice, were randomly selected for the study. Information gathered included the type of retainers prescribed in the maxillary and mandibular arches, duration of full-time and part-time wear, use of fixed retainers, appliances fabricated in-office versus commercial labs, the number of debondings per year, and retention appointment schedules. In all, the survey consisted of twenty questions and data were gathered on a

categorical scale and analyzed using SPSS. Six hundred fifty-eight responses were received during a twelve week period. Maxillary Hawley retainers (58.2%) and mandibular fixed lingual retainers (40.2%) were most commonly used. Most orthodontists prescribed less than twelve months of full-time wear of removable retainers and, thereafter, typically advised part-time, lifetime wear. A majority of orthodontists did not instruct patients to have the fixed lingual retainers removed at a specific time (75.9%). Orthodontists who prescribed Hawley retainers were more likely to recommend a longer duration of full-time wear compared to the recommended protocol for clear thermoplastic retainers. The timing of scheduled retention appointments varied and was dependent on the number of years in practice, volume of patients debonded, and the type of prescribed retainer. The only regional difference associated with retainer design was the Northeast region where mandibular fixed retainers were less frequently used. Across gender, the only statistically significant difference in retainer design and protocol was a decreased utilization of mandibular fixed lingual retainers. Statistical significance was predetermined at $P < 0.05$ for all

comparisons. The conclusions drawn from this study were that maxillary Hawley retainers and mandibular fixed lingual retainers were the most commonly used retainers. This study is the first to describe retention protocols and the scheduling of retention appointments in the United States as reported by active members of the American Association of Orthodontists.

DEDICATION

To my lovely wife, Sara, who has encouraged me throughout residency. You are such a wonderful wife, and I look forward to the future with you by my side.

To the best parents in the world, Glenn and Patsy, who taught me to have a goal and never give up until I reach it. I would not be where I am today without your guidance, support, and love.

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INTRODUCTION

The retention of a corrected malocclusion is a vital component of successful orthodontic treatment. The degree of stability of each corrected malocclusion is unpredictable, and much effort is often required to maintain the final orthodontic position of the teeth. In 1934, Oppenheim stated that "retention is the most difficult problem in orthodontia; in fact, it is the problem." Many retainer appliances have been developed and varied retention protocols adopted in an effort to minimize relapse. In the absence of scientific evidence that demonstrating relative effectiveness of the appliances and protocols, it would appear that current prescriptions are based on personal preference.

The purpose of this descriptive study is to use a survey instrument to identify the most popular orthodontic retainer designs and retention protocols currently used in the United States as reported by active members of the American Association of Orthodontists.

REVIEW OF THE LITERATURE

Since the orthodontic specialty began over one hundred years ago, retention of a corrected malocclusion has been a challenge. Retention has been defined by Moyers (1973) as, "The holding of teeth following orthodontic treatment in the treated position for the period of time necessary for the maintenance of the result." Teeth that have been moved in or through bone by mechanical appliances have a tendency to return to their former positions. The purpose of retention is to counteract this tendency (Graber et al. 2005). In 1919, Hawley stated that he would give half of his fee to whomever would handle his retention patients, illustrating the clinical difficulties faced in this area of orthodontics (Melrose and Millett 1998). Proffit (2000) stated that retention was needed for all patients who had fixed orthodontic appliances to correct intra-arch irregularities. The available evidence points to the need for retention stemming from a need to "allow for periodontal and gingival reorganization; minimize changes from growth; permit neuromuscular adaptation to

the corrected tooth position; and maintain unstable tooth position, if such positioning is required for reasons of compromise or esthetics" (Blake and Bibby 1998).

Retainer Design

Retainers are appliances used after orthodontic treatment to maintain the final orthodontic result obtained. Examples of these appliances include fixed lingual retainers, Hawley appliances, spring aligners, clear thermoplastic retainers, and positioners. Each type of retainer has a different effect on the dentition during retention. Some allow more settling of the occlusion while others firmly hold the teeth into the final debonded position. It also appears that, there are numerous regimens for wear of these appliances which tend to vary from clinician to clinician and patient to patient.

A fixed lingual retainer consists of a segment of orthodontic arch wire bonded to the lingual surface of the anterior teeth. The retainer is attached to the lingual surface of the teeth using floss or a specially constructed jig and is bonded in position using a light-cured composite resin (Blake and Garvey 1998). Fixed retainers are usually bonded in either one of two ways.

They can be bonded on each of the anterior six teeth or bonded only on the canines. There are a variety of fixed lingual wires used by clinicians. Possible combinations include round versus spiral wire and thin, flexible wire versus thick, stiff wire. Typically, wires that are round and thick, 0.032 inch or 0.036 inch in diameter, are used when bonding only the canines. These retainers are good at maintaining intercanine width but are less effective at preventing individual tooth rotations (Stormann and Ehmer 2002). Fixed retainers bonded to all six anterior teeth are usually bonded with more flexible wire like 0.0175 inch or 0.0195 inch wire. Fixed retention is often used when intra-arch instability is likely and long-term retention is intended.

According to Josell (1999), there are four major indications for fixed orthodontic retention: (1) maintenance of lower incisor position during late stages of growth; (2) maintenance of diastema areas and other areas where naturally occurring spaces have been closed; (3) maintenance of pontic spaces; and, (4) maintenance of extraction areas where the space has been closed. In the presence of periodontal problems, fixed retention rather than removable is preferred (Blake and Garvey 1998). A

fixed retainer does not require patient compliance and offers good esthetics. It does, however, increase the difficulty of maintaining good oral hygiene as plaque has been shown to accumulate around the fixed lingual wire (Heier et al. 1997). However, there is no association between fixed lingual wires and the development of periodontal disease (Butler and Dowling 2005).

A removable orthodontic appliance is firmly attached to the supporting structures but easily removed for cleaning. A few popular removable retainers include Hawleys, spring aligners, clear thermoplastics, and positioners. Developed around one-hundred years ago, the Hawley retainer was one of the first removable appliances (Hawley 1919). It consists of an acrylic palatal cover on the maxillary design and acrylic lingual flange on the mandibular design. The Hawley retainer has an acrylic and wire framework with a labial bow made of round stainless steel. The labial bow often contacts the anterior teeth, and there is usually an adjustment loop in the canine area. Activation of the labial bow and/or incorporation of springs to the design allow for minor corrections to be made. A circumferential wire may by used so that occlusal interferences are minimized.

Clasps may be added for additional retention. The design may also be modified so that retentive clasps do not pass through extraction sites, which otherwise may reopen the closed extraction spaces (Joondeph and Reidel 2005). This appliance is believed to provide good retention as well as the possibility for the teeth to settle in a harmonious occlusion. This settling is beneficial according to Kahl-Nieke and Fischbach (1995) as good posterior intercuspation can help prevent relapse of anterior-posterior corrections. It does, however, create speech difficulties initially, and its poor esthetics may affect compliance (Blake and Garvey 1998). Lack of compliance due to esthetics may not be an issue for those who wear retainers only at night.

The spring aligner, another removable appliance, closely resembles the Hawley retainer. It has additional acrylic on the facial surface of the labial bow that allows precise movements to correct incisor alignment when minor relapse has occurred or when braces were removed without accomplishing complete anterior alignment. Mandibular spring aligners may be modified to only include a canine to canine retention. The canine-to-canine spring aligner is very small and may present an

aspiration risk. Joondeph and Reidel (2005) state that the spring aligner design should be incorporated into a larger Hawley appliance design in order to avoid the aspiration risk.

Another type of removable appliance, the clear thermoplastic retainer, was introduced by Sheridan et al. in 1993 and has become increasingly popular. The clear retainer is made of a thin, vacuum formed thermoplastic material that adapts closely to the lingual, facial, and occlusal surfaces without using clasps. It is esthetic, easy to fabricate, minimally interferes with speech, and does not require adjustments. It is, however, not as durable as other removable appliances (Sauget et al. 1997). By fitting completely around all the crowns of the teeth, the clear retainer does not allow full seating of the posterior occlusion or settling of the posterior teeth (Wang 1997). Lindauer and Shoff (1998) and Tibbetts (1994) stated that the clear thermoplastic Essix® retainer was as effective in controlling post-orthodontic movement as the traditional Hawley retainer. Sheridan et al. (1993) advocated part-time only wear for clear retainers because of a few reports of open bite occurring in some patients.

A positioner is similar in appearance to a mouthpiece used in athletics. Positioners have ideal tooth positions built into them. Patients are instructed to squeeze their teeth into the positioner for twenty to thirty seconds, relax, and then squeeze again (Blake and Garvey 1998). This is continued until the teeth settle into the proper positions built into the positioner. Sometimes orthodontic patients are debonded before an ideal occlusion has been established for a variety of reasons including poor oral hygiene, caries, patient relocation, etc. Positioners are then used to finalize ideal tooth position. Therefore, it may be more appropriate to consider positioners as active appliances instead of retentive appliances. However, after the teeth have been moved into the correct position, positioners could be used as retentive appliances until the fabrication of another type of retainer.

Effectiveness of Retainers

A few studies have evaluated the effectiveness of different types of retainers. The effectiveness of nighttime only wear of Hawley retainers was compared to full-time wear of Hawley retainers by Butler at Louisiana State University in 2003. He found that nighttime only

wear with Hawley retainers was just as efficient as full-time wear in maintaining a stable occlusion and preventing clinically significant relapse.

In 1998, Lindauer and Shoff performed one of the first prospective studies to compare Essix® to conventional Hawley retainers. Patients completing full orthodontic treatment at the Medical College of Virginia Orthodontic Clinic were alternately assigned to Essix® and Hawley retention groups. Patients who had posterior crossbites or anterior open bites before treatment were excluded from the study. Twenty-eight patients were assigned to each group and were observed during the first six months of active retention. The Essix® retainers were trimmed to fit only the anterior teeth from canine to canine. The Essix® retainer group was instructed to wear a mandibular Essix® retainer full-time and a maxillary Essix® retainer part-time for the first four weeks. Then both retainers were to be worn at night only for the remaining five months. The Hawley retainer group was instructed to wear both mandibular and maxillary retainers full-time for the first three months and then only at night for the final three months. Occlusal measurements taken from study casts were made before

treatment, after treatment, and after six months of retention. Little's Irregularity Index was used to assess anterior crowding (1975). Multivariate analysis of variance was used to test differences between groups. The analysis showed that there was no significant difference in incisor irregularity, overbite, or overjet at the end of six months between the two groups. The authors concluded that Essix® retainers serve as effectively as Hawley retainers in the first six months of active retention. There were, however, a few limitations to the study. Sixteen of the original fifty-six patients were eliminated from the study due to losing retainers, moving out of the area, not showing up for the six-month retention appointment, or requesting that a fixed retainer be placed. This left nineteen in the Essix® group and twenty-one in the Hawley group. These conclusions must be critically evaluated in light of the small sample size. Each retainer also had a different protocol of wear time among subjects. If the study were designed so that each retainer had the same protocol, a more accurate comparison of the retainers could be seen. Reliability of the clinicians that completed the measurements as well as which clinicians who made the

measurements was not reported. It was not reported if clinicians were blinded with respect to the two groups of patients. There were a large percentage of patients (29%) that started but did not finish the study. An important strength of this study was it being the first of its' kind to compare Essix® and Hawley retainers. This study did not examine post treatment settling among the two groups, but a study by Sauget et al. (1997) did examine posterior settling.

Sauget et al. (1997) termed undesirable changes that occur after debonding as "relapse" and desirable changes as "settling." Settling increases the number of occlusal contacts and, thus, improves the fit of the teeth. The prospective study used changes in occlusal contacts in order to examine the retention characteristics of Hawley and clear overlay Tru-Tain retainers over a three month period. Thirty consecutive patients from the Orthodontic Clinic at the University of the Pacific School of Dentistry were alternately prescribed Hawley retainers or clear overlay retainers. There was a small sample size with only fifteen patients in each group. To minimize confounders, the patients were matched by age, extraction, and gender. Retainers were delivered one

week after debonding. The clear overlay retainer included coverage of all teeth, including second molars. The clear retainer group was instructed to wear their retainers full-time for the first three days and nightly, thereafter, for three months. The Hawley group was instructed to wear them full-time for three months. Occlusal contacts were recorded with vinyl polysiloxane impression material. Bite registrations were labeled with a randomization identification code, and each was measured by the same individual. Reliability of the measurement technique and measurement accuracy was reported. The bite technique for recording occlusal contacts was highly reproducible. A paired t-test was used to compare means between the three different time points and between both groups. After three months of retention, there were significantly more contacts with the Hawley group. In contrast, for clear overlay retainers, there was no change in the number of occlusal contacts. Sauget et al. (1997) concluded that Hawley retainers increased the number of occlusal contacts in the initial period following appliance removal better than clear thermoplastic retainers. A major limitation to this study was the small sample size of each group.

Additionally, this study only looked at a three month retention period. Studying a longer retention period may yield different results.

A study by Tibbetts (1994) examined three different retainers, positioner and a bonded lower 3-3 retainer, Essix® retainer, and a Hawley retainer for a six month period. The purpose of the study was to determine if there were any significant differences between these three retention systems during a time period from debonding to six months after debonding. Thirty patients from SUNY/Buffalo School of Dental Medicine Orthodontic Clinic and two local orthodontic offices participated in the study. The examined criteria on study models included Angle classification of molars, overjet, overbite, maxillary and mandibular intercuspid width, maxillary and mandibular intermolar width, and maxillary and mandibular arch length. There were no statistically significant differences between treatment type nor retainer types during the six month retention period. This study concluded that all three retainers could equally provide adequate retention during a six month period following debonding.

Retention Protocols

The appliances discussed in the earlier section have been used for many years, but not much has been published about the protocols adopted with regards to the duration of wear. For the past century, there has been a lack of scientific evidence in regards to retention protocols, which has led orthodontists to develop retention protocols based on unscientific grounds. In 1919, Hawley stated that "the mistake had been to apply a guessed-at solution to the unsolved and undetermined problem of the instability of the treated malocclusions." He stated further that "the length of the period for which any case needs to be retained is admitted to be unknown [and] we have been arbitrarily fixing that time. We apply a fixed retention and at the end of a certain period-one year, two years, or longer as the case may be-we removed that retention."

Only a few studies, with inconclusive results, compared different retainers. Protocols can include full-time wear, part-time wear, nighttime only wear transitioning to a tapering two or three days per week, or others. Depending on the retainer, patients would be instructed to wear their retainers for differing lengths

of time. Clinicians likely base their retention protocols on cost, ease of fabrication, personal preference, and intuition.

Wide variation in retention protocol exists among clinicians. Blake and Garvey (1998) suggested full-time use of retainers for three to six months after debonding, followed by nighttime only wear for at least eighteen additional months. After the part-time wear for eighteen months, patients are to wear their retainers twice a week indefinitely. Proffit (2000) suggested that removable retainers should be worn full-time for the first 3-4 months, then part-time for at least twelve months, and continued part-time until completion of growth. Sheridan et al. (1993) advocated part-time only wear of clear retainers. Zachrisson (1997) cited the retention philosophy of Behrents that, for ultimate stability, the retention period for both adolescent and adult patients should be indefinite. As a general treatment policy, however, he did not consider this to be practical. He recommended that retention for males should continue into their mid-twenties and for females until their early twenties. This implies that the mandibular arch should be retained until the third molar situation has been

resolved and most of the facial remodeling is complete. For practical reasons, he also states that fixed, permanent retention should be restricted to comparatively few patients since long-term fixed retention must be constantly monitored.

Retainer Prevalence Among Clinicians

Two studies that have surveyed the usage of retainers are Wong and Freer (2004) and Gottlieb et al. (1996). In 2004, Wong and Freer surveyed three hundred Australian and seventy New Zealand orthodontists to determine the most commonly employed retainers. A 59% response rate, 217 of the total 370 surveyed, was obtained. The questionnaire was analyzed with cross-tabulation and Chi-square analysis. Five popular retainer types were selected for analysis among the possible eighteen different maxillary retainers and thirteen different mandibular retainers surveyed. They found that upper clear thermoplastic (31.4%) and lower canine-to-canine bonded (24.6%) retainers were the most commonly used retainers in their sample. The differences between Australian and New Zealand orthodontists' use of upper retainers were significantly different, with the main difference resulting from twice the use of the

"Wraparound I" retainer (with adjustment U-loop in the canine or premolar area) among New Zealand orthodontists. Despite this difference, both Australian and New Zealand orthodontists more frequently used upper invisible retainers. The most frequent lower retainer used was the canine-to-canine bonded (24.6%) retainer (bonded to canines only) followed by the invisible retainer at 22.3%. However, the difference between the most commonly used lower retainers among Australian and New Zealand orthodontists was large. Australian orthodontists used lower invisible retainers 25.1% of the time, and New Zealand orthodontists used lower canine-to-canine bonded retainers 54.8% of the time. There was a significant difference in the use of the five selected popular types of lower retainers among Australian and New Zealand orthodontists with the main difference resulting from 54.8% of New Zealand orthodontists and 16.8% of Australian orthodontists using canine-to-canine bonded retainers. The majority of orthodontists preferred multistrand stainless steel wire for bonded retainers with 0.0175 inch as the most common wire size. Thirty-two and nine tenths percent of orthodontists recommended a retention period of two years or more, but shorter than

lifetime while 21.3% recommended lifetime retention. Australian orthodontists more commonly recommended full-time retention followed by part-time retention. They concluded that retention procedures are variable and dependent largely on personal preferences. There did not seem to be any consistent pattern in the application of retention methodologies among clinicians. Of the respondents, 55.3% stated that they had made changes in their retention protocol over the past five years.

Critical review of the study reveals a few limitations. This study would have been strengthened if the overall sample size was larger. With only forty-seven New Zealand respondents, comparing the two countries needs to be evaluated critically, especially with the large number of variables in the survey. The selection and randomization of participants was not specifically detailed. There was no mention of the age or gender of respondents. There was also no mention if the respondents were all practicing orthodontists. Respondents could have been retired orthodontists, honorary orthodontists, associate orthodontists, affiliate orthodontists, or faculty orthodontists who did not treat patients. It would have been beneficial to

know the amount of experience and volume of patients treated by the respondents. Additionally, the questionnaire surveyed eighteen different maxillary retainers and thirteen different mandibular retainers. Six of the eighteen maxillary retainers were Hawley retainers but consisted of different Hawley retainer designs. In contrast, the clear thermoplastic retainer, or invisible retainer, had only one choice on the questionnaire. In their statistics, each of the six Hawley designs were analyzed separately, thereby spreading out the responses for Hawley retainers. If all six Hawley choices were grouped into one Hawley group, 43.7% of respondents would have selected Hawley retainers with 31.3% selecting invisible retainers. Therefore, Hawley retainers would have been the most popular maxillary retainer. Additionally, the mandibular bonded retainers were separated into three groups. By combining all bonded retainer responses into one group, 42.6% of respondents selected bonded retainers as the preferred mandibular retainer. The bonded retainer would have been nearly two times as prevalent as the invisible retainer at 22.3%. These results were, therefore, similar to Gottlieb's results in 1986, 1990, and 1996.

Gottlieb et al. completed a three-part comprehensive study of orthodontic diagnosis and treatment procedures in 1986, 1990, and 1996. Being a first of its kind, a questionnaire was mailed to "virtually all the specialty practitioners in the country." In the 1996 study, questionnaires were mailed to 9,175 orthodontists. Although the source of the list was not specified, it can be assumed that a major component of the list came from the AAO directory. The 2005 AAO directory consists of 8,169 active and life active members. Therefore, others must have been sent questionnaires. Included in the AAO member list, besides the active and life active members, are affiliate, honorary, retired, and associate members. Affiliate members are not orthodontists but practice orthodontics. Honorary members do not practice orthodontics. Retired members no longer see patients. Associate members are in their first year of practice and have not had time to finish cases. Including such members would be a weakness of the survey. The following question was asked on the questionnaire and represents an example of this limitation. Respondents were asked if they have treated at least one extraction case. Eight percent of respondents stated that they had not treated

an extraction case. For an actively practicing orthodontist, it is highly probable, if not a certainty, that at least one patient would have needed extractions. Therefore, the study would be strengthened if only actively practicing orthodontists were surveyed. A total of 1,032 questionnaires were returned, yielding a relatively poor response rate (11.2%) yet valuable because of the size of response. Responses were entered on computer by an independent company, which limited author bias. However, a test for measurement error for entering data into the computer was not reported. The median was often reported instead of the mean. Reporting the mean might have given a more accurate representation of the responses. Respondents were asked if they routinely used certain retainers. The following includes the percentage of routine use of retainers in the 1996 study. Hawley retainers were routinely prescribed by 77.4% of respondents. This number decreased from 86.7% reported in the 1986 study. Spring aligners were routinely prescribed by 36.5% of respondents, an increase from 23.8% in 1986. Clear slipover (invisible) retainers were routinely prescribed 26% of the time, a marked increase from 6% in 1986. Essix® retainers, 12.5%, were

studied separately from the clear slipover (invisible) retainers and were not studied in the 1986 or 1990 questionnaires. Fixed bonded 3-3 retainers were routinely prescribed by 36.8% of respondents, an increase from 27.7% in 1986. Maxillary and mandibular retainers were grouped together and were not studied separately. Twenty-four was the median number of months for a specific retention period, and a quarter of respondents indicated lifetime retention. Gottlieb et al. did not report the most commonly used retainers in each practice but reported whether or not each retainer was routinely used. The focus of these studies was not on retention but was an overall representation of orthodontic diagnosis and treatment procedures. This contributed to making a very lengthy questionnaire containing many variables of which only a small component of the study included retention and the routine use of different retainers. Retention protocols among clinicians were not surveyed. These studies were conducted at least eleven years ago and many changes in retention appliances and protocols may have taken place since 1996.

Establishing the Need for Retention

For well over a century, clinicians have theorized about the causes of relapse. Many studies lend evidence to support the idea that the cause of relapse is multifactorial. There are different theories and schools of thought that attempt to explain the causes of relapse. Some of these are the following: equilibrium theory; occlusion theory; musculature theory; apical base theory; mandibular incisor position theory; changes in intermolar width; changes in intercanine width; changes in mandibular arch form; late mandibular growth; changes in mandibular arch length; and, the role of third molars.

Overall stability of a dentition occurs when the forces from the periodontium, soft tissues, occlusion, and post-treatment growth are in equilibrium (Proffit 2000; Moss 1980a,b). Prior to orthodontic treatment, teeth have settled in a position in which forces acting on the teeth are in equilibrium (Proffit 2000). Frequently, a malocclusion is associated with this equilibrium. At the completion of orthodontic treatment, teeth have usually been moved away from a pre-treatment equilibrium position. Additionally, teeth tend to move back to their pre-treatment positions if they are not

retained (Ingervall 1988; Lyotard 2006). Lyotard (2006) evaluated the short-term stability of orthodontic treatment without retention. At the end of orthodontic treatment, final archwires were removed for a period of one month and stability of the dentitions without retention was evaluated. Mandibular incisor irregularity, overjet, and interproximal contacts worsened during the one month of no retention, but marginal ridges, occlusal contacts, and total ABO scores improved. Lyotard's study illustrated the need for retainers to hold teeth in their new position.

According to Graber (2005), four main schools of thought regarding retention were established at the beginning and middle of the last century: the occlusion school; the musculature school; the apical base school; and, the mandibular incisor school. Present day concepts generally combine several of these theories. Norman Kingsley (1880) stated that "the occlusion of the teeth was the most potent factor in determining the stability in a new position." Edward Angle (1907) and Calvin Case (1920) agreed with Kingsley that proper occlusion was the key in long-term stability.

Another theory as to the cause of relapse was introduced by Paul Rogers (1922). He stated that the key to developing a proper treatment response and in maintaining the finished result was to establish proper muscle balance. This balance to achieve long-term stability is similar to the equilibrium theory (Proffit 1978). Rogers believed that the primary etiology of a malocclusion was the absence of functional activity during growth and that, until the primary etiology was addressed, there was no reason to begin correcting the problem. He developed specific muscle exercises for patients as preliminaries to mechanical treatment. Ray Webster (1948) and Allan Brodie (1938) agreed with Rogers' school of thought. Soft tissues contribute other forces to the teeth that have been moved into different positions. Cheeks, lips, and the tongue can contribute forces that may lead to unwanted tooth movement (Proffit 2000). These soft tissues have a role in incisor stability. In 1973, Moyers found that abnormal functioning of the mentalis muscle was one of the major causes of posttreatment incisor relapse. Hovell (1956) found that in cases in which the overall space between

the jaws was reduced with surgery, incisor relapse was most often related to the rest position of the tongue.

A different theory was developed by Axel Lundstrom (1925) who stated that the apical base was the key to long-term stability. This theory drastically conflicted with Angle's teachings and the first theory proposed by Kingsley. According to Lundstrom (1925), normal occlusion was only possible when the position of the teeth and alveolar process are dependent on the form of the apical base. The final result would be unstable and more prone to relapse if there was just expansion of the arch itself. "The orthodontic correction must include also the moving of the whole region surrounding the apical base." He proposed two possible means of attaining a stable result. The first by opening the mid-palatal suture and the second by reconstructing the tissue around the roots of the teeth that have been moved. This idea was further supported by McCaulay (1944), Strang (1946), and Hays Nance (1947) who emphasized the importance of maintaining the original intercanine and intermolar widths. Additionally, a recent article by Rothe et al. (2006) concluded that

patients with thinner mandibular cortices were at an increased risk for dental relapse.

In 1944, Charles Tweed introduced another theory as to the cause of relapse. He stated that the mandibular incisors must be upright over the basal bone for optimal stability and esthetics. This idea came to Tweed when he decided to recall many of his patients to evaluate the long-term effects of his treatment. Up to that point in time, Tweed had treated his patients with the same philosophy as Angle and Kingsley; i.e., maintaining a full complement of teeth as often as possible. To his surprise, he could only classify 20% of his patients as long-term successes. After thorough evaluation of these patients, he proposed that stability occurred when the mandibular incisors were placed in an upright position over the basal bone. He came to the conclusion that "failures in treatment were caused by failure to correct all perverted axial inclinations and to establish normal relationship of the teeth to their respective bones." This was supported by findings from Brodie and Margolis who concluded that basal bone cannot be grown and that the normal angular variation of the mandibular incisors to the mandibular plane ranged from 85°-93° (Tweed 1944).

Excessive proclination of mandibular incisors has been shown to be a cause of relapse. Mills and Strahan (2005), Houston and Edler(1990), and Shields et al. (1985) concluded that, when lower incisors were advanced by treatment, they ultimately stabilize in a position between their initial and final position. However, due to the constantly changing soft and hard tissues of the face throughout one's lifetime (Behrents 1984), maintaining good anterior alignment after orthodontic treatment regardless of the amount of incisor proclination can be challenging. In fact, most patients eventually experience some degree of relapse even when the mandibular incisor position was maintained throughout treatment (Little et al. 1981; Little et al. 1988). Additionally, Sinclair (1983) found that incisor irregularity tends to increase during the teenage years, especially in females.

A study by Burton (1997) concurs with Mills and Strahan, Houston and Edler, and Shields et al. Burton evaluated the treatment and post-treatment changes in patients with class II division I malocclusions who received orthodontic treatment and were out of retention a minimum of three years. Intermolar width, intercanine

width, and incisor alignment were measured to an accuracy of 0.01 mm on study model casts. The following was stated. Arch changes were independent of the type of orthodontic treatment. Arch form changed following the completion of all forms of active orthodontic treatment. This "relapse" in orthodontic treatment appeared to be a function of the degree of orthodontic tooth movement. This study concluded that retainers were mandatory to maintain the changes subsequent to active orthodontic treatment because teeth tended to relapse back to a position somewhere between their pre-treatment and post-treatment positions. When the cheek, lip, and/or tongue pressures are not in balance with the final orthodontic positioning of teeth, it is likely that some post-treatment relapse back to the original position of the teeth will be observed if they are not retained following debonding (Ingervall 1988).

Tissue Reorganization Following Orthodontic Treatment

After orthodontic treatment, the periodontal tissue is in a state of reorganize to accommodate the new position of the teeth. For six months to one year after removal of fixed appliances is when new bone forms around

mobile teeth (Tibbetts 1994). Furthermore, the gingival collagen-fiber network typically takes up to four to six months to be remodeled (Reitan 1969). Gingival changes occur after closure of an extraction space or after rotational movements. When extraction spaces are closed, and teeth are brought into contact, gingival tissue between teeth is squeezed together and can result in an enlarged interdental papilla. This tissue accumulation results from both retraction of the gingiva with tooth movement and gingival compression on space closure (McCollum 1980). A similar process occurs when teeth are rotated. The gingiva and tooth rotate the same amount, which causes the rotated gingiva to be compressed in the interdental area in the direction of rotation (Redlich et al. 1999). These tooth movements along with stretching and compression of the gingiva may lead to relapse by reopening of the extraction spaces or by rotated teeth returning to their original positions. In 1959, Reitan studied histologic sections of orthodontically rotated teeth in dogs. Teeth were rotated 50-70° over an 8-12 week period and retained for 15-232 days. The periodontal ligament fibers in the apical two-thirds of the roots were completely rearranged after 147 days. The

fibers in the coronal one-third of the roots and the gingival fibers were only partially rearranged after 232 days. Reitan concluded that transaction of marginal region fibers may help reduce relapse of rotated teeth. Therefore, it would be wise for clinicians to base their retention protocols on such studies.

Mandibular Intercanine, Intermolar, and Arch Form Changes

Another potential cause of relapse was described by Strang (1949). He studied cases determined successful many years after treatment. These cases had not had mechanical retention for years. He concluded that a characteristic of long-term successful cases without retention was that intercanine and intermolar widths were maintained during treatment. He stated that teeth remained stable due to the balance of the muscular forces acting on the teeth. There must be an equilibrium and balance of all surrounding forces around the teeth to maintain stability. This observation led Strang to change the way he practiced. After forming archwires to the pretreatment intercanine and intermolar widths, he found an increase in stability among his finished cases. This led him to conclude that muscular forces remain the same and that treatment should be aimed at preserving

muscular balance by maintaining intercanine and intermolar width. Housley et al. (2003) studied twenty-nine patients that were treated non-extraction and had expanded mandibular lingual arches during treatment. They found an average 1.52 mm increase in mandibular intercanine width during treatment followed by a 0.80 mm decrease in width six years postretention. Housley et al. concluded that the only way to maintain expanded intercanine width was with fixed retention. McCauley (1944) found that intercanine width tended to return to its pre-treatment value during the post-retention period. Burke et al. (1998) conducted a meta-analysis of the stability of increasing intercanine width. Twenty-six studies and 1,233 patients were evaluated. Regardless of the original malocclusion or treatment modality, all groups expanded during treatment and constricted after treatment.

It has been advocated that the mandibular arch form should be maintained throughout treatment. Changes in the arch form have been associated with post treatment instability and relapse (Riedel 1960). However, maintenance of the arch form and maintenance of

intercanine and intermolar widths does not guarantee stability (Little et al. 1988).

Mandibular Growth and Mandibular Arch Length Changes

It is known that the mandible continues to grow throughout life (Behrents 1984). Typically, there is a significant amount of growth remaining when orthodontic treatment is completed. This late mandibular growth is a significant force that may lead to instability of teeth, especially the mandibular anterior teeth. As indicated by Reitan in 1967, orthodontists had not reached a consensus as to how long to use retention appliances. In many orthodontic circles, long-term retention is the accepted reality (Parker 1989). Many ask how long patients should wear a retention device? A common answer is the following: "for as long as patients wish to maintain the orthodontic correction" (Graber 2005). Nanda and Nanda (1992) suggested that any skeletal change occurring during the retention phase might contribute to an unstable dentoskeletal relationship. With the understanding that the face and associated bones and soft tissues continue to change throughout life, many clinicians advocate lifetime retention.

Studies have shown a reduction in mandibular arch length with time (Vego 1962; Fisk 1966; Little 1975). Maxillary and mandibular arch perimeters have been shown to decrease by 3 mm from the time period between late mixed and early permanent dentitions to eight years later (Brust and McNamara 1995; McNamara et al. 2003). In the normally developing child, there is an increase in arch width development until the permanent canines erupt (Moorrees 1959; DeKock 1972). However, after the eruption of the permanent canines, there is a continual reduction of intercanine width over time (Moorrees 1969; Sinclair, Little 1983; 1985). Changes in arch length over a forty-five year span were investigated by Bishara (1995) who observed an increase in maxillary arch length up to thirteen years of age and an increase in mandibular arch length up to eight years of age. From age 13-45, there was an average 5 mm decrease in the mandibular arch length of both males and females.

Role of Third Molars

A controversial theory on the cause of mandibular incisor relapse among patients, lay people, and clinicians is the role that third molars play. Many clinicians advise all patients that they must have wisdom

teeth extracted to prevent relapse. Vego (1962) studied a group of untreated subjects that had bilateral agenesis of third molars with a group of untreated subjects having all third molars present. His results stated that there was a 0.8 mm difference in arch perimeter after five years of observation. Vego concluded that third molars exert a force that may cause crowding. However, these results are probably not clinically significant, and there were flaws in the study design. Vego's study did not match subjects, and the initial crowding in the group with third molars present was more severe. Lindqvist and Thilander (1982) observed patients over a three year period that had one third molar extracted and found that there was a mean difference of 0.16 mm more crowding on the non-extraction side. This study had a short observation period and did not find a clinically significant difference in crowding.

Others suggest that if third molars have space to erupt into proper occlusion, then there is no need for extractions. However, patients who have congenitally missing third molars still exhibit relapse (Harradine et al. 1988; Ades et al. 1990). Harradine et al. studied seventy-seven patients that were randomly assigned to

have third molars extracted or not. At five years postretention, Harradine et al. found a non-significant difference of 0.3 mm between the two groups and concluded that third molars do not contribute to anterior relapse. This conclusion was supported by Ades et al. (1990). Ades et al. compared four groups of patients who were a minimum of ten years out of retention. The third molar status of the four groups consisted of the following: third molars erupted into good alignment and function; third molar agenesis; third molar impaction; and, third molar extraction at least ten years before postretention records. They found no differences in mandibular incisor crowding, arch length, intercanine width, and eruption patterns of mandibular incisors and molars between the groups. This study suggested that the recommendation for mandibular third molar removal, with the objective of alleviating or preventing mandibular incisor irregularity, may not be justified.

Summary

The cause of orthodontic relapse is multifactorial. There are many theories and schools of thought as to what are the most important causes of relapse. Regardless of the many causes, retainers appear needed in order to

preserve the final position of orthodontically moved teeth. Thus, retention plays a vital role in orthodontic cases.

There is much variation among clinicians as to the type of retainers used and retention protocols prescribed. Most retention protocols followed by the clinician are largely dependent upon personal preferences. Fixed retainers are often used to eliminate patient compliance (Zachrisson 1997). Removable retainers are often used to transfer responsibility of maintaining the treated dentition to the patient. By using removable retainers, there is no question as to whom retainer maintenance "belongs" long after the removal of orthodontic appliances (Sheridan et al. 2005). No report was found as to which retainers are most often used and the most common retention protocols followed in the United States. What Kingsley said more than one-hundred years ago still rings true today; that "…the success of orthodontia as a science and an art now lies in the retainer" (Weinberger 1926). One way to answer some of our clinical orthodontic questions is to seek the collective wisdom of practitioners. In order to accomplish this, a nationwide survey is needed to

determine the most commonly used retainer and retention protocols in the United States.

A study of the most common retention protocols prescribed in the United States

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Abstract

Introduction: The purpose of this descriptive study was to use a carefully constructed, pilot-tested survey instrument to identify the most common orthodontic retainers and retention protocols prescribed in the United States as reported by active members of the American Association of Orthodontists (AAO). **Methods:** 2000 active members of the AAO, stratified by region practiced in, were randomly selected for the study. Information gathered included, but was not limited to, the type of retainers prescribed in the maxillary and mandibular arches, duration of full-time and part-time wear, use of fixed retainers, appliances fabricated in-office versus commercial labs, the number of debonds per year, and retention appointment schedules. In all, the survey consisted of 20 questions. Data were gathered on a categorical scale and analyzed using SPSS®. **Results:** 658 (32.9%) responses were received during a 12 week period. Maxillary Hawley retainers (58.2%) and mandibular fixed lingual retainers (40.2%) are the most commonly used. Most orthodontists prescribe less than 9 months of full-time wear of removable retainers and thereafter advise part-time, but lifetime wear. A majority of orthodontists do not instruct patients to have the fixed lingual retainers removed at a specific time (75.9%). A greater percentage of orthodontists who prescribe Hawley retainers recommend a longer duration of full-time wear as compared to clear thermoplastic retainers. The timing of scheduled retention appointments is variable among clinicians and is dependent on the number of years in practice, volume of patients debonded, and the type of prescribed retainer. The only regional difference associated with retainer design was the Northeast region utilizing mandibular fixed lingual retainers less frequently. A decreased utilization of mandibular fixed lingual retainers was also observed among female orthodontists. **Conclusions:** Maxillary Hawley retainers and mandibular fixed lingual retainers are the most commonly used retainers. This study is the first to describe retention protocols and the scheduling of retention appointments in the United States.

INTRODUCTION

Retention of patients' corrected malocclusion is a vital component of successful orthodontic treatment[1]. The degree of stability of each corrected malocclusion is unpredictable, and much effort is often required to maintain the final orthodontic position of the teeth. Teeth tend to move back to their pre-treatment positions if they are not retained[1,2]. Several retainer designs have evolved over time and varied retention protocols adopted in an effort to minimize relapse. A few studies have examined the relative effectiveness of appliances[3,4,5,6]. Given the lack of scientific evidence, it appears that current recommendations are based largely on personal preference and non-scientific criterion[7]. This has led to the use of different retainers and different retention protocols prescribed[8,9,10,11].

Two studies, one by Wong and Freer[12] and another Gottlieb et al.[13,14,15], have shed light on retainer designs and protocols. In 2004, Wong and Freer[12] surveyed orthodontists from Australia and New Zealand with the objective to identify consistencies in retention procedures and found that the most commonly used retainers are maxillary invisible retainers and mandibular canine-to-canine bonded retainers. In their study, orthodontists most commonly recommended a regular retention period of more than two years and defined permanent retention as "lifetime". Gottlieb et al.[13,14,15] completed a three part comprehensive study intended to gather information on a range of orthodontic issues from diagnosis and treatment procedures to wires and softwares used. Their sample was recruited from orthodontists in the United States in 1986, 1990, and 1996. The Hawley retainers

declined in use from 1986 to 1996 whereas spring aligners, invisible retainers, and fixed bonded canine-to-canine retainers increased. Essix® retainers were introduced by Sheridan[16] in 1993 and were only evaluated in the 1996 study. The retainer of choice appeared to change during the ten-year period. Retention protocols were not evaluated in either study.

The purpose of this descriptive study was to use a carefully constructed and pilot-tested survey instrument to identify the most popular orthodontic retainer designs and retention protocols currently used in the United States as reported by active members of the American Association of Orthodontists. As far as we are aware, this is the only study of its kind.

MATERIALS AND METHODS

The procedures and protocol for this study were approved by the Institutional Review Board at Case Western Reserve University. Following a critical review of the literature, commonly employed retainer devices and protocols were identified and noted. In order to strengthen our initial survey instrument, 25 orthodontists from different regions of the United States were interviewed by telephone regarding the retention devices and protocols commonly prescribed in their offices. A finite set of retention devices and protocols employed formed the back bone of our survey instrument. The preliminary survey was next pilot tested on 65 orthodontists at the Cleveland Society of Orthodontists meeting in October, 2006. Their responses were analyzed to develop our final survey instrument and converted into SNAP® survey scanning module (figure 1). The final survey consisted of 20 questions, 4 to

characterize our sample and 16 to help answer our question. The average time to complete the survey was three minutes. Each orthodontist that responded to the CSO survey was excluded from the final mailing.

In order to attain statistical significance, a total of 370 responses would be required. This was based on approximately 10,000 active members of the AAO, a 95% confidence interval, and a ±5 percent sampling error[17]. Similar to the United States Census Bureau, orthodontists were subdivided into four U.S. regions:

1. Northeast (CT, MA, ME, NH, NJ, NY, PA, RI, VT)
2. South (AL, AR, DE, D.C., FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV)
3. Midwest (IA, IL, IN, KS, MI, MN, MO, NE, ND, OH, SD, WI)
4. West (AK, AR, CA, CO, HI, ID, MT, NE, NM, OR, UT, WA, WY).

In order to have an equal number of respondents from each region, a total of 400 respondents, 100 for each of the four regions, were needed. With an anticipated 20% response rate, a total of 2000 orthodontists, 500 from each region, were mailed copies of the surveys with self addressed, pre-stamped envelopes. A table of random numbers was used to select a stratified, random sample of 2000 active orthodontists from the 2005 year AAO directory. We excluded affiliate, associate, honorary, international, and retired orthodontists. Selected orthodontists were mailed the survey with a pre-paid return envelope enclosed. Twelve weeks later responses were scanned by a single operator into SNAP® for statistical analyses. Each scanned survey was compared to the hard copy for accuracy. Responses that did not scan

properly due to notations and/or corrections made were assessed and manually corrected. The number of responses corrected was recorded. Data was then exported into SPSS® for statistical analyses.

Frequencies, percentages, and Chi-square tests were used to analyze the data. Responses to questions were further sub-grouped based on the frequencies. E.g., the most popular maxillary retainers were collapsed into three groups, Clear, Hawley, and Other. Likewise, the most popular mandibular retainers were collapsed into five groups, Clear, Hawley, Spring Aligners, Fixed, and Other. Cross-tabulation tables and Chi-square tests were used to detect differences between the independent variables (Questions 1-4) and dependent variables (Questions 5-20) as well as to detect differences between types of retainers (Questions 5 and 9) and the prescribed protocols (Questions 6-8, 10-12, 16-20) associated with each retainer. Significance for all Chi-square tests was predetermined at $P < 0.05$.

RESULTS

658 (32.9%) completed surveys were received out of the 2000 mailed surveys. There were 13,160 questions scanned by the SNAP® scanning module and 190 scanning mistakes manually corrected, representing 1.44% of responses.

Table I describes the sample characteristics (Questions 1-4) and provides the region of practice, gender, number of years practiced, and number of debonds in 2006.

Table II is a summary of surveyed retainer and retention protocol variables (Questions 5-15). The Table represents the collapsed data.

Table III summarizes retention appointment schedules (Questions 16-20).

Table IV illustrates the statistically significant differences among the four characteristic variables of orthodontists (Questions 1-4), the type of retainers most commonly prescribed (Questions 5 and 9) and the surveyed retainer and retention protocol variables (Questions 5-20).

DISCUSSION

Strengths of this study are the systematic method by which the survey instrument was created, the stratified random sample used, and the number of respondents. As far as we are aware, this is the only study of its kind. The only similar publication by Wong and Freer[12] on Australian and New Zealand orthodontists did not detail some of the issues mentioned above. In our sample study, maxillary Hawley retainers (58.2%) are most common. On the surface it may appear that our results differ from Wong and Freer's[12] conclusions. However, the authors chose to give respondents six different Hawley designs to choose from in their study design and survey. As a result, they reported the most common maxillary retainer to be the clear thermoplastic device. Our study found 40.2% of respondents use mandibular fixed lingual retainers and are therefore the most popular lower retainer. Once again, direct comparisons with Wong and Freer[12] are difficult as they separated the fixed retainers based on wire types and sizes, bonded versus banded, and number of teeth included in the retainer design. However when the fixed retainer responses are collapsed into one group, similar results are found. In regard to the popularity of Hawley retainers, our results are similar to Gottlieb et al.'s[15] results.

Given the objectives of Gottlieb et al.[13,14,15], it is understandable that their questions pertaining to retention were not as comprehensive as the current study. Their data on retention was limited to two questions, the type of retainer routinely used and the duration of retention. They did not include any data on retention protocols. Of the 1032 respondents in the 1996 study, Hawley retainers were most popular, followed by fixed bonded 3-3 retainers, spring aligners, clear slipover retainers, and finally Essix® retainers. Maxillary and mandibular retainers were studied together.

Our study reveals that the Hawley retainer (58.2%) and the clear thermoplastic retainer (30.4%) are the most common appliances used for the maxillary dentition followed by the fixed palatal retainer (2.4%) and spring aligners (1.1%). 38.6% of Hawley retainers are made in the orthodontist's lab with the remaining 61.4% of Hawley retainers made at a commercial lab. As expected, the vast majority of clear thermoplastic retainers are made in the office lab (97.5%). We speculate that this is due to the ease, quick fabrication, and lower costs of fabricating clear retainers.

The most commonly used mandibular retainers are fixed lingual retainers (40.2%) followed by Hawley retainers (28.1%), clear thermoplastic retainers (18.2%), and spring aligners (8.9%). The popularity of fixed lingual retainers may be attributed to the minimal need for patient compliance, the clinician's concern about an area highly susceptible to relapse[18,19], and the esthetic advantages. Our study found a higher percentage of mandibular Hawley retainers (28.1%) used than Wong and Freer[12] reported (6.5%).

81% of orthodontists prescribe a period of full-time wear for removable retainers, which may be related to the type of retainer prescribed. A greater percentage of patients given Hawley retainers are prescribed a period of full-time wear (88.1%) compared to patients prescribed clear thermoplastic retainers (70.5%). The length of full-time wear also appears dependent on the type of removable retainer prescribed. Patients prescribed Hawley retainers typically had a longer full-time wear period ranging between 3 months and 9 months (61.3%) as compared to clear thermoplastic retainers typically less than 3 months (55.7%). In contrast to Hawley retainers that allow controlled settling of teeth, Sheridan[10] states that the clear retainers should be worn at nights only to prevent an open bite from occurring. This could be an explanation for the difference in clinicians' choices on the duration of wear. Additionally, Reitan[20] showed that in rotated teeth the periodontal fibers in the coronal one-third of the roots and the gingival fibers are only partially rearranged after eight months. This may explain the biologic rationale for most clinicians adopting a period of full-time wear of 3-9 months.

The most common part-time wear schedule advised is 8 hours a day (67%). We make the assumption that most clinicians in this group are advising night time wear. The advantages are obvious; it does not interfere with patients' daily activities, becomes a habit, and therefore make patients more likely to comply. Patients are also less likely to loose them.

We found that 84.2% of the orthodontists who use removable retainers also recommend lifetime retainers use. Wong and Freer[12] reported that most orthodontists

preferred a retention period of more than two years, and Gottlieb et al.[15] reported that about half of the surveyed orthodontists used a specific retention period with a median of two years. 75.9% of the orthodontists using fixed lingual retainers instruct patients to keep them on forever. It does appear, however, that the trend toward lifetime retention is gaining momentum, especially among younger orthodontists. A greater proportion of orthodontists who have practiced less than 16 years instruct lifetime retention than orthodontists who have practiced over 25 years.

Our study is the first to evaluate the retention protocols among clinicians and the timing of retention appointments. Larger practices and practices in which the orthodontist had practiced less than 16 years scheduled longer intervals between retention appointments. There was a significant difference in the type of maxillary retainer prescribed and the timing of retention appointments. A greater proportion of orthodontists who most commonly prescribe clear thermoplastic maxillary retainers schedule longer intervals between retention appointments and dismiss patients earlier than those orthodontists who prescribe maxillary Hawley retainers. Surprisingly, there was no significant difference observed between the type of prescribed mandibular retainers and the timing of retention protocols. Despite many orthodontists employing fixed lingual retainers (40.2%), their retention appointment schedules were no different than their colleagues who preferred removable lower retainers. Clinicians across the different regions also maintain similar retention appointment schedules. Most orthodontists (65.4%) schedule the first retention appointment 1-2 months after debonding, the second appointment 3-5 months

(47.7%) later, and the 3rd and 4th retention appointments 6-11 months later. By the fifth retention appointment, 46.2% of patients have been dismissed.

Orthodontists showed statistically significant differences based on the region they practice in and the choice of mandibular retainers. Orthodontists in the Northeast region prescribe less mandibular fixed lingual (26.6%) retainers than the other three regions, South (46.0%), Midwest (43.6%), and West (42.6%). In our sample over two-thirds of the orthodontists reported debonding over 150 patients a year with one-fifth debonding over 300 a year. There were statistically significant differences in the number of debonds per year based on the regions. 24.4% of the orthodontists in the South and 27.2% in the Midwest reported debonding over 300 patients a year, compared to 14.4% in the Northeast and 14.8% in the West.

86.7% of our respondents were males. This distribution is similar to the AAO membership (83.4%). 74.5% of the males in our study had practiced over 15 years compared to 42.3% of females, and 44% of males had practiced over 25 years compared to 9.4% of females. Orthodontists showed statistically significant differences based on their gender and the type of mandibular retainer prescribed. A greater percentage of males (42.7%) use mandibular fixed lingual retainers than females (24.4%), and a greater percentage of females (40.7%) use Hawley retainers than males (26.2%). Additionally, males reported debonding more patients per year than females. However, given the relatively small number of responses from female orthodontists, the validity of these observed trends is hard to establish.

All survey based studies suffer from a non-response error. We did not attempt to compare the response group with the non-response group. The only variable we would have been able to answer with precision would be the region as we could locate it in the AAO directory. The remaining three independent variables could not be accurately estimated from the limited information available.

CONCLUSIONS

The most commonly used retainers in the United States among active AAO members are the maxillary Hawley retainer and the mandibular fixed lingual retainer. Most orthodontists prescribe a period of full-time wear for removable retainers. Orthodontists more often prescribe a full-time wear period for Hawley retainers as compared to clear thermoplastic retainers, and they prescribe a longer full-time wear period for Hawley retainers as compared to clear thermoplastic retainers. For patients prescribed removable retainers, most orthodontists instruct patients to wear retainers forever. A majority of orthodontists also do not instruct patients to have the fixed lingual retainers removed at a specific time, thus indicating lifetime retention. The timing of scheduled retention appointments is variable among clinicians and is dependent on the number of years practiced, volume of patients seen, and the type of prescribed retainer.

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Figure 1.--Survey

Do you know the most commonly used retainer and retention protocol in the United States?

Given the lack of data on this critical aspect of orthodontics, researchers at Case Western Reserve University are conducting a nationwide survey on retainers and retention protocols. Since orthodontics is both a science and an art, one way to answer some of our clinical questions is to seek the collective wisdom of practitioners. As part of this process we are asking AAO members nationwide to take a few minutes to complete this survey. Please choose the answer that best relates to your practice. Thank you in advance for your cooperation, and if you have any questions about the survey or this process please feel free to contact Dr. Manish Valiathan at 216-368-0673 or by email at mxv13@case.edu

Q1 Your Name:

Q2 Gender:

- ☐ *Male*
- ☐ *Female*

Q3 How many years have you practiced orthodontics?

- ☐ *0-5 years*
- ☐ *6-15 years*
- ☐ *16-25 years*
- ☐ *>25 years*

Q4 What was the estimated number of debonds in your practice last year?

- ☐ *<150 debonds*
- ☐ *150-300 debonds*
- ☐ *>300 debonds*

QUESTIONS #5-8 REGARD MAXILLARY RETAINERS AND QUESTIONS #9-12 REGARD MANDIBULAR RETAINERS:

Figure 1.--Survey continued

Q5 What MAXILLARY retainer is MOST COMMONLY used in your practice following comprehensive full treatment? Is the most commonly used maxillary retainer made in your office lab or at a commercial lab? Please choose only one answer.

- ☐ *Clear Thermoplastic (made in your office lab)*
- ☐ *Clear Thermoplastic (made at a commercial lab)*
- ☐ *Hawley (made in your office lab)*
- ☐ *Hawley (made at a commercial lab)*
- ☐ *Spring Aligner (made in your office lab)*
- ☐ *Spring Aligner (made at a commercial lab)*
- ☐ *Fixed Lingual (If fixed lingual is chosen, please skip to Question #9)*
- ☐ *Clear Thermoplastic (made in your office lab) and a Fixed Lingual*
- ☐ *Clear Thermoplastic (made at a commercial lab) and a Fixed Lingual*
- ☐ *Clear Thermoplastic followed by Hawley (both retainers made in your office lab)*
- ☐ *Clear Thermoplastic followed by Hawley (both retainers made at a commercial lab)*
- ☐ *Clear Thermoplastic (made in your office lab) followed by Hawley (made at a commercial lab)*
- ☐ *Clear Thermoplastic (made at a commercial lab) followed by Hawley (made in your office lab)*

Q6 If a REMOVABLE maxillary retainer was checked in the previous question, do you prescribe a period of FULL TIME wear (more than 20 hours per day)?

- ☐ *Yes*
- ☐ *No (If "No," please skip to Question #8)* Go to Q8

Q7 Maxillary REMOVABLE retainer FULL TIME wear:

- ☐ *Full time for <3months*
- ☐ *Full time for 3months-9months*
- ☐ *Full time for 10months-2years*
- ☐ *Full time for >2years*

Q8 Please choose the Maxillary REMOVABLE retainer PART TIME wear protocol (anything less than 20 hours per day) that most closely resembles what you prescribe for your patients:

- ☐ *Around 16 hours/day*
- ☐ *Around 8 hours/day*
- ☐ *Tapering from 16 hours/day to occasional wear*
- ☐ *Tapering from 8 hours/day to occasional wear*
- ☐ *Patient decides amount of wear time*

Q9 What MANDIBULAR retainer is MOST COMMONLY used in your practice following comprehensive full treatment? Is the most commonly used mandibular retainer made in your office lab or at a commercial lab? Please choose only one answer.

- ☐ *Clear Thermoplastic (made in your office lab)*
- ☐ *Clear Thermoplastic (made at a commercial lab)*
- ☐ *Hawley (made in your office lab)*
- ☐ *Hawley (made at a commercial lab)*
- ☐ *Spring Aligner (made in your office lab)*
- ☐ *Spring Aligner (made at a commercial lab)*
- ☐ *Fixed Lingual (If fixed lingual is chosen, please skip to Question #13)*
- ☐ *Clear Thermoplastic (made in your office lab) and a Fixed Lingual*
- ☐ *Clear Thermoplastic (made at a commercial lab) and a Fixed Lingual*
- ☐ *Clear Thermoplastic followed by Hawley (both retainers made in your office lab)*
- ☐ *Clear Thermoplastic followed by Hawley (both retainers made at a commercial lab)*
- ☐ *Clear Thermoplastic (made in your office lab) followed by Hawley (made at a commercial lab)*
- ☐ *Clear Thermoplastic (made at a commercial lab) followed by Hawley (made in your office lab)*

Q10 If a REMOVABLE mandibular retainer was checked in the previous question, do you prescribe a period of FULL TIME wear (more than 20 hours per day)?

- ☐ *Yes*
- ☐ *No (If "No," please skip to Question #12)* Go to Q12

Q11 Mandibular REMOVABLE retainer FULL TIME wear:

- ☐ *Full time for <3months*
- ☐ *Full time for 3months-9months*
- ☐ *Full time for 10months-2years*
- ☐ *Full time for >2years*

Q12 Please choose the Mandibular REMOVABLE retainer PART TIME wear protocol (anything less than 20 hours per day) that most closely resembles what you prescribe for your patients:

- ☐ *Around 16 hours/day*
- ☐ *Around 8 hours/day*
- ☐ *Tapering from 16 hours/day to occasional wear*
- ☐ *Tapering from 8 hours/day to occasional wear*
- ☐ *Patient decides amount of wear time*

Figure 1.--Survey continued

Q13 For REMOVABLE retainers, do you instruct your patients that they can stop wearing their removable retainers at a specific time?

- ☐ *No, wear retainers forever*
- ☐ *Yes, ≤2years after debond*
- ☐ *Yes, 5 years after debond*
- ☐ *Yes, After 3rd molars are extracted*

Q14 For patients given FIXED LINGUAL retainers, do you instruct them to have the fixed retainer removed at any time?

- ☐ *Yes*
- ☐ *No (If "No," please skip to Question #16)* Go to Q16

Q15 If "Yes" to the previous question (Question #14), when do you instruct them to have the fixed lingual retainer removed?

- ☐ *<2 years after debonding*
- ☐ *2-5 years after debonding*
- ☐ *>5 years after debonding*
- ☐ *After 3rd molars are extracted*

FOR THE LAST FEW QUESTIONS, PLEASE INDICATE WHAT IS YOUR TYPICAL SCHEDULE FOR RETENTION CHECKS:

Q16 The 1st appointment is scheduled how long after the debonding appointment?

- ☐ *Less than 4 weeks after the debonding appointment*
- ☐ *Between 1 month to 2 months after the debonding appointment*
- ☐ *Greater than 2 months after the debonding appointment*
- ☐ *There are no retention appointments; Patient has been dismissed.*

Q17 The 2nd appointment is scheduled how long after the 1st appointment?

- ☐ *Less than 3 months after the 1st appointment*
- ☐ *3-5 months after the 1st appointment*
- ☐ *6 months or greater after the 1st appointment*
- ☐ *No 2nd appointment; Patient has been dismissed*

Q18 The 3rd appointment is scheduled how long after the 2nd appointment?

- ☐ *Less than 6 months after the 2nd appointment*
- ☐ *6 months to 11 months after the 2nd appointment*
- ☐ *1 year or greater after the 2nd appointment*
- ☐ *No 3rd appointment; Patient has been dismissed*

Q19 The 4th appointment is scheduled how long after the 3rd appointment?

- ☐ *Less than 6 months after the 3rd appointment*
- ☐ *6 months to 11 months after the 3rd appointment*
- ☐ *1 year or greater after the 3rd appointment*
- ☐ *No 4th appointment; Patient has been dismissed*

Q20 The 5th appointment is scheduled how long after the 4th appointment?

- ☐ *Less than 6 months after the 4th appointment*
- ☐ *6 months to 11 months after the 4th appointment*
- ☐ *1 year or greater after the 4th appointment*
- ☐ *No 5th appointment; Patient has been dismissed*

Thank you for taking time to complete this questionnaire. Your assistance in providing this information is much appreciated.

Table I - Summary of Characteristic Variables among Surveyed Orthodontists (Q1-Q4)

Variables	Total n	Percentage (%)
Q1-Regions:		
1. Northeast	144	21.9%
2. South	164	24.9%
3. Midwest	196	29.8%
4. West	149	22.6%
Q2-Gender:		
1. Male	568	86.7%
2. Female	87	13.3%
Q3-# of Years Practiced:		
1. 0-5 years	26	4.0%
2. 6-15 years	169	25.8%
3. 16-25 years	203	30.9%
4. >25 years	258	39.3%
Q3 (Collapsed): # of Years Practiced:		
1. 0-15 years	195	29.7%
2. 16-25 years	203	30.9%
3. >25 years	258	39.3%
Q4-# of Debonds:		
1. <150	202	31.2%
2. 150-300	310	47.8%
3. >300	136	21.0%

Table II – (Collapsed) Summary of Surveyed Retainer and Retention Protocol Variables (Collapsed Q5-Q15)

Variables	Total n	Percentage (%)
Q5-Maxillary arch retainer:		
1. Clear thermoplastic	199	30.4%
2. Hawley	381	58.2%
3. Other	75	11.5%
Q6-Maxillary retainer period of Full time wear:		
1. Yes	515	81.5%
2. No	117	18.5%
Q7-Maxillary retainer Full time wear:		
1. Full time <3months	147	28.3%
2. Full time 3months-9months	279	53.7%
3. Full time >9months	94	18.1%
Q8-Maxillary retainer Part time wear:		
1. Around 16 hours/day	64	12.0%
2. Around 8 hours/day	358	66.9%
3. Other	113	21.1%
Q9-Mandibular arch retainer:		
1. Clear thermoplastic	119	18.2%
2. Hawley	184	28.1%
3. Spring Aligner	58	8.9%
4. Fixed lingual	263	40.2%
5. Other	30	4.6%
Q10-Mandibular retainer period of Full time wear:		
1. Yes	312	80.4%
2. No	76	19.6%
Q11-Mandibular retainer Full time wear:		
1. Full time <3months	91	29.3%
2. Full time 3months-9months	166	53.4%
3. Full time >9months	54	17.4%
Q12-Mandibular retainer Part time wear:		
1. Around 16 hours/day	41	12.6%
2. Around 8 hours/day	217	66.6%
3. Other	68	20.9%
Q13-Instruct to stop wearing removable retainers:		
1. No, wear retainers forever	501	84.2%
2. Yes, ≤2years after debond	30	5.0%
3. Yes, 5 years after debond	26	4.4%
4. Yes, After 3rd molars are extracted	38	6.4%
Q14-Instruct to have fixed retainers removed:		
1. Yes	138	24.1%
2. No	435	75.9%
Q15-When do you instruct to have fixed lingual retainer removed:		
1. <2years after debonding	11	8.3%
2. 2-5 years after debonding	38	28.6%
3. >5 years after debonding	40	30.1%
4. After 3rd molars are extracted	44	33.1%

Table III - Summary of Surveyed Retention Schedule Variables (Q16-Q20)

Variables	Total n	Percentage (%)
Q16-1st appt after debonding:		
1. Less than 4 weeks after debonding	126	19.2%
2. Between 1month to 2 months after debonding	429	65.4%
3. Greater than 2 months after debonding	100	15.2%
4. No retention appts; patient has been dismissed	1	0.2%
Q17-2nd appt after debonding:		
1. Less than 3 months after the 1st appt	160	24.3%
2. 3-5 months after the 1st appt	314	47.7%
3. 6 months or greater after the 1st appt	171	26.0%
4. No 2nd appt; patient has been dismissed	13	2.0%
Q18-3rd appt after debonding:		
1. Less than 6 months after the 2nd appt	212	32.9%
2. 6 months to 11 months after the 2nd appt	326	50.6%
3. 1 year or greater after the 2nd appt	81	12.6%
4. No 3rd appt; patient has been dismissed	25	3.9%
Q19-4th appt after debonding:		
1. Less than 6 months after the 3rd appt	97	15.7%
2. 6 months to 11 months after the 3rd appt	258	41.7%
3. 1 year or greater after the 3rd appt	165	26.7%
4. No 4th appt; patient has been dismissed	98	15.9%
Q20-5th appt after debonding:		
1. Less than 6 months after the 4th appt	51	9.9%
2. 6 months to 11 months after the 4th appt	170	32.9%
3. 1 year or greater after the 4th appt	171	33.1%
4. No 5th appt; patient has been dismissed	125	24.2%

Table IV - Summary of Chi-Square Tests

Variables	Q1	Q2	Q3	Q4	Q5	Q9
Q1		X^2=4.081 P-value=0.253	X^2=9.922 P-value=0.357	X^2=14.405 P-value=0.025*	X^2=6.330 P-value=0.387	X^2=22.312 P-value=0.034*
Q2	X^2=4.081 P-value=0.253		X^2=49.130 P-value=0.000*	X^2=16.726 P-value=0.000*	X^2=1.010 P-value=0.603	X^2=19.966 P-value=0.001*
Q3	X^2=9.922 P-value=0.357	X^2=49.130 P-value=0.000*		X^2=4.833 P-value=0.565	X^2=1.043 P-value=0.903	X^2=6.173 P-value=0.628
Q4	X^2=14.405 P-value=0.025*	X^2=16.726 P-value=0.000*	X^2=4.833 P-value=0.565		X^2=6.188 P-value=0.186	X^2=13.090 P-value=0.109
Q5	X^2=6.330 P-value=0.387	X^2=1.010 P-value=0.603	X^2=1.043 P-value=0.903	X^2=6.188 P-value=0.186		X^2=473.881 P-value=0.000*
Q6	X^2=0.059 P-value=0.996	X^2=5.328 P-value=0.021*	X^2=0.977 P-value=0.614	X^2=3.679 P-value=0.159	X^2=27.307 P-value=0.000*	
Q7	X^2=4.104 P-value=0.663	X^2=0.168 P-value=0.919	X^2=16.182 P-value=0.003*	X^2=3.300 P-value=0.509	X^2=72.013 P-value=0.000*	
Q8	X^2=5.347 P-value=0.500	X^2=3.468 P-value=0.177	X^2=6.694 P-value=0.153	X^2=6.246 P-value=0.181	X^2=3.196 P-value=0.525	
Q9	X^2=22.312 P-value=0.034*	X^2=19.966 P-value=0.001*	X^2=6.173 P-value=0.628	X^2=13.090 P-value=0.109	X^2=473.881 P-value=0.000*	
Q10	X^2=3.660 P-value=0.301	X^2=3.933 P-value=0.047*	X^2=3.562 P-value=0.168	X^2=2.108 P-value=0.349		X^2=17.496 P-value=0.001*
Q11	X^2=0.199 P-value=1.000	X^2=1.766 P-value=0.414	X^2=17.442 P-value=0.002*	X^2=9.533 P-value=0.049*		X^2=58.612 P-value=0.000*
Q12	X^2=4.022 P-value=0.674	X^2=0.270 P-value=0.874	X^2=4.235 P-value=0.375	X^2=8.614 P-value=0.071		X^2=5.309 P-value=0.505
Q13	X^2=14.704 P-value=0.099	X^2=1.906 P-value=0.592	X^2=23.934 P-value=0.001*	X^2=1.303 P-value=0.972		
Q14	X^2=5.543 P-value=0.136	X^2=4.743 P-value=0.018*	X^2=14.382 P-value=0.001*	X^2=2.074 P-value=0.355		
Q15	X^2=10.530 P-value=0.309	X^2=5.929 P-value=0.115	X^2=3.786 P-value=0.706	X^2=5.832 P-value=0.422		
Q16	X^2=8.196 P-value=0.515	X^2=2.399 P-value=0.494	X^2=13.121 P-value=0.041*	X^2=34.053 P-value=0.000*	X^2=15.750 P-value=0.015*	X^2=11.514 P-value=0.485
Q17	X^2=12.396 P-value=0.192	X^2=8.590 P-value=0.035*	X^2=14.197 P-value=0.028*	X^2=40.447 P-value=0.000*	X^2=10.531 P-value=0.104*	X^2=19.621 P-value=0.075
Q18	X^2=8.762 P-value=0.460	X^2=3.688 P-value=0.297	X^2=8.137 P-value=0.228	X^2=47.286 P-value=0.000*	X^2=19.404 P-value=0.004*	X^2=19.277 P-value=0.082
Q19	X^2=12.548 P-value=0.184	X^2=5.692 P-value=0.128	X^2=8.563 P-value=0.200	X^2=14.103 P-value=0.029*	X^2=16.221 P-value=0.013*	X^2=15.523 P-value=0.214
Q20	X^2=3.637 P-value=0.934	X^2=4.249 P-value=0.236	X^2=13.537 P-value=0.035*	X^2=14.907 P-value=0.021*	X^2=17.810 P-value=0.007*	X^2=24.676 P-value=0.016*

(*) Statistically significant at $P < 0.05$

APPENDIX 1

Raw Data

TABLE 1.-- Regional Frequencies and Percentages

Q1-Your Name:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		5	0.8	0.8	0.8
	1 Northeast	144	21.9	21.9	22.6
	2 South	164	24.9	24.9	47.6
	3 Midwest	196	29.8	29.8	77.4
	4 West	149	22.6	22.6	100.0
	Total	658	100.0	100.0	

TABLE 2.--Gender Frequencies and Percentages

Q2-Gender:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	568	86.3	86.7	86.7
	Female	87	13.2	13.3	100.0
	Total	655	99.5	100.0	
Missing	System	3	0.5		
Total		658	100.0		

TABLE 3.--Reported Number of Years Practiced among Orthodontists in Frequencies and Percentages

Q3-How many years have you practiced orthodontics?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-5 years	26	4.0	4.0	4.0
	6-15 years	169	25.7	25.8	29.7
	16-25 years	203	30.9	30.9	60.7
	>25 years	258	39.2	39.3	100.0
	Total	656	99.7	100.0	
Missing	System	2	0.3		
Total		658	100.0		

TABLE 4.--Collapsed Reported Number of Years Practiced among Orthodontists in Frequencies and Percentages

Q3-categorized: How many years have you practiced orthodontics?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-15 years	195	29.6	29.7	29.7
	16-25 years	203	30.9	30.9	60.7
	>25 years	258	39.2	39.3	100.0
	Total	656	99.7	100.0	
Missing	System	2	0.3		
Total		658	100.0		

TABLE 5.--Reported Number of Debonds among Orthodontists last year in Frequencies and Percentages

Q4-What was the estimated number of debonds in your practice last year?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<150 debonds	202	30.7	31.2	31.2
	150-300 debonds	310	47.1	47.8	79.0
	>300 debonds	136	20.7	21.0	100.0
	Total	648	98.5	100.0	
Missing	System	10	1.5		
Total		658	100.0		

TABLE 6.--Most Commonly Used Maxillary Retainer in Frequencies and Percentages

Q5-What MAXILLARY retainer is MOST COMMONLY used in your practice following comprehensive full treatment? Is the most commonly used maxillary retainer made in your office lab or at a commercial lab? Please choose only one answer.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Clear Thermoplastic (made in your office lab)	194	29.5	29.6	29.6
	Clear Thermoplastic (made at a commercial lab)	5	0.8	0.8	30.4
	Hawley (made in your office lab)	147	22.3	22.4	52.8
	Hawley (made at a commercial lab)	234	35.6	35.7	88.5
	Spring Aligner (made in your office lab)	2	0.3	0.3	88.9
	Spring Aligner (made at a commercial lab)	5	0.8	0.8	89.6
	Fixed Lingual (If fixed lingual is chosen, please skip to Qu	16	2.4	2.4	92.1
	Clear Thermoplastic (made in your office lab) and a Fixed Li	10	1.5	1.5	93.6
	Clear Thermoplastic (made at a commercial lab) and a Fixed L	4	0.6	0.6	94.2
	Clear Thermoplastic followed by Hawley (both retainers made	5	0.8	0.8	95.0
	Clear Thermoplastic followed by Hawley (both retainers made	4	0.6	0.6	95.6
	Clear Thermoplastic (made in your office lab) followed by Ha	29	4.4	4.4	100.0
	Total	655	99.5	100.0	
Missing	System	3	0.5		
Total		658	100.0		

TABLE 7.--Collapsed Most Commonly Used Maxillary Retainer in Frequencies and Percentages

Q5-categorized: What MAXILLARY retainer is MOST COMMONLY used in your practice following comprehensive full treatment? Is the most commonly used maxillary retainer made in your office lab or at a commercial lab? Please choose only one answer.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Clear	199	30.2	30.4	30.4
	Hawley	381	57.9	58.2	88.5
	Other	75	11.4	11.5	100.0
	Total	655	99.5	100.0	
Missing	System	3	0.5		
Total		658	100.0		

TABLE 8.--Reported Full Time wear Prescribed for Maxillary Removable Retainers by Orthodontists in Frequencies and Percentages

Q6-If a REMOVABLE maxillary retainer was checked in the previous question, do you prescribe a period of FULL TIME wear (more than 20 hours per day)?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	515	78.3	81.5	81.5
	No	117	17.8	18.5	100.0
	Total	632	96.0	100.0	
Missing	System	26	4.0		
Total		658	100.0		

TABLE 9.--Full time Maxillary retainer wear period in Frequencies and Percentages

Q7-Maxillary REMOVABLE retainer FULL TIME wear:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Full time for <3months	147	22.3	28.3	28.3
	Full time for 3months-9months	279	42.4	53.7	81.9
	Full time for 10months-2years	86	13.1	16.5	98.5
	Full time for >2years	8	1.2	1.5	100.0
	Total	520	79.0	100.0	
Missing	System	138	21.0		
Total		658	100.0		

TABLE 10.--Collapsed Full time Maxillary retainer wear period in Frequencies and Percentages

Q7-categorized: Maxillary REMOVABLE retainer FULL TIME wear:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Full time for <3months	147	22.3	28.3	28.3
	Full time for 3months-9months	279	42.4	53.7	81.9
	Full time for >9months	94	14.3	18.1	100.0
	Total	520	79.0	100.0	
Missing	System	138	21.0		
Total		658	100.0		

TABLE 11.--Mandibular Removable retainer Part Time wear protocol in Frequencies and Percentages

Q8-Please choose the Maxillary REMOVABLE retainer PART TIME wear protocol (anything less than 20 hours per day) that most closely resembles what you prescribe for your patients.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Around 16 hours/day	64	9.7	12.0	12.0
	Around 8 hours/day	358	54.4	66.9	78.9
	Tapering from 16 hours/day to occasional wear	63	9.6	11.8	90.7
	Tapering from 8 hours/day to occasional wear	50	7.6	9.3	100.0
	Total	535	81.3	100.0	
Missing	System	123	18.7		
Total		658	100.0		

TABLE 12.--Collapsed Mandibular Removable retainer Part Time wear protocol in Frequencies and Percentages

Q8-categorized: Please choose the Maxillary REMOVABLE retainer PART TIME wear protocol (anything less than 20 hours per day) that most closely resembles what you prescribe for your patients.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Around 16 hours/day	64	9.7	12.0	12.0
	Around 8 hours/day	358	54.4	66.9	78.9
	Other	113	17.2	21.1	100.0
	Total	535	81.3	100.0	
Missing	System	123	18.7		
Total		658	100.0		

TABLE 13.--Most Commonly Used Mandibular Retainer in Frequencies and Percentages

Q9-What MANDIBULAR retainer is MOST COMMONLY used in your practice following comprehensive full treatment? Is the most commonly used mandibular retainer made in your office lab or at a commercial lab? Please choose only one answer.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Clear Thermoplastic (made in your office lab)	116	17.6	17.7	17.7
	Clear Thermoplastic (made at a commercial lab)	3	0.5	0.5	18.2
	Hawley (made in your office lab)	59	9.0	9.0	27.2
	Hawley (made at a commercial lab)	125	19.0	19.1	46.3
	Spring Aligner (made in your office lab)	12	1.8	1.8	48.2
	Spring Aligner (made at a commercial lab)	46	7.0	7.0	55.2
	Fixed Lingual (If fixed lingual is chosen, please skip to Qu	263	40.0	40.2	95.4
	Clear Thermoplastic (made in your office lab) and a Fixed Li	10	1.5	1.5	96.9
	Clear Thermoplastic (made at a commercial lab) and a Fixed L	2	0.3	0.3	97.2
	Clear Thermoplastic followed by Hawley (both retainers made	2	0.3	0.3	97.6
	Clear Thermoplastic followed by Hawley (both retainers made	2	0.3	0.3	97.9
	Clear Thermoplastic (made in your office lab) followed by Ha	14	2.1	2.1	100.0
	Total	654	99.4	100.0	
Missing	System	4	0.6		
Total		658	100.0		

TABLE 14.--Collapsed Most Commonly Used Mandibular Retainer in Frequencies and Percentages

Q9-categorized: What MANDIBULAR retainer is MOST COMMONLY used in your practice following comprehensive full treatment? Is the most commonly used mandibular retainer made in your office lab or at a commercial lab? Please choose only one answer.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Clear	119	18.1	18.2	18.2
	Hawley	184	28.0	28.1	46.3
	Spring Aligner	58	8.8	8.9	55.2
	Fixed Lingual	263	40.0	40.2	95.4
	Other	30	4.6	4.6	100.0
	Total	654	99.4	100.0	
Missing	System	4	0.6		
Total		658	100.0		

TABLE 15.--Reported Full Time wear Prescribed for Mandibular Removable Retainers by Orthodontists in Frequencies and Percentages

Q10-If a REMOVABLE mandibular retainer was checked in the previous question, do you prescribe a period of FULL TIME wear (more than 20 hours per day)?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	312	47.4	80.4	80.4
	No	76	11.6	19.6	100.0
	Total	388	59.0	100.0	
Missing	System	270	41.0		
Total		658	100.0		

TABLE 16.--Full time Mandibular retainer wear period in Frequencies and Percentages

Q11-Mandibular REMOVABLE retainer FULL TIME wear:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Full time for <3months	91	13.8	29.3	29.3
	Full time for 3months-9months	166	25.2	53.4	82.6
	Full time for 10months-2years	49	7.4	15.8	98.4
	Full time for >2years	5	0.8	1.6	100.0
	Total	311	47.3	100.0	
Missing	System	347	52.7		
Total		658	100.0		

TABLE 17.--Collapsed Full time Mandibular retainer wear period in Frequencies and Percentages

Q11-categorized: Mandibular REMOVABLE retainer FULL TIME wear:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Full time for <3months	91	13.8	29.3	29.3
	Full time for 3months-9months	166	25.2	53.4	82.6
	Full time for >9months	54	8.2	17.4	100.0
	Total	311	47.3	100.0	
Missing	System	347	52.7		
Total		658	100.0		

TABLE 18.--Mandibular Removable retainer Part Time wear protocol in Frequencies and Percentages

Q12-Please choose the Mandibular REMOVABLE retainer PART TIME wear protocol (anything less than 20 hours per day) that most closely resembles what you prescribe for your patients.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Around 16 hours/day	41	6.2	12.6	12.6
	Around 8 hours/day	217	33.0	66.6	79.1
	Tapering from 16 hours/day to occasional wear	41	6.2	12.6	91.7
	Tapering from 8 hours/day to occasional wear	25	3.8	7.7	99.4
	Patient decides amount of wear time	2	0.3	0.6	100.0
	Total	326	49.5	100.0	
Missing	System	332	50.5		
Total		658	100.0		

TABLE 19.--Collapsed Mandibular Removable retainer Part Time wear protocol in Frequencies and Percentages

Q12-categorized: Please choose the Mandibular REMOVABLE retainer PART TIME wear protocol (anything less than 20 hours per day) that most closely resembles what you prescribe for your patients.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Around 16 hours/day	41	6.2	12.6	12.6
	Around 8 hours/day	217	33.0	66.6	79.1
	Other	68	10.3	20.9	100.0
	Total	326	49.5	100.0	
Missing	System	332	50.5		
Total		658	100.0		

TABLE 20.--Summary of Orthodontists Instructions that Patients may or may not Stop wearing their Removable Retainers at a Specific Time in Frequencies and Percentages

Q13-For REMOVABLE retainers, do you instruct your patients that they can stop wearing their removable retainers at a specific time?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No, wear retainers forever	501	76.1	84.2	84.2
	Yes, <2years after debond	30	4.6	5.0	89.2
	Yes, 5 years after debond	26	4.0	4.4	93.6
	Yes, After 3rd molars are extracted	38	5.8	6.4	100.0
	Total	595	90.4	100.0	
Missing	System	63	9.6		
Total		658	100.0		

TABLE 21.--Orthodontists Instructions that Patients should have their Fixed Retainer removed at any time in Frequencies and Percentages

Q14-For patients given FIXED LINGUAL retainers, do you instruct them to have the fixed retainer removed at any time?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	138	21.0	24.1	24.1
	No	435	66.1	75.9	100.0
	Total	573	87.1	100.0	
Missing	System	85	12.9		
Total		658	100.0		

TABLE 22.--Period of time after Debonding that Orthodontists Instruct Patients to have their Fixed Lingual retainers removed in Frequencies and Percentages

Q15-If "Yes" to the previous question (Question #14), when do you instruct them to have the fixed lingual retainer removed?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<2 years after debonding	11	1.7	8.3	8.3
	2-5 years after debonding	38	5.8	28.6	36.8
	>5 years after debonding	40	6.1	30.1	66.9
	After 3rd molars are extracted	44	6.7	33.1	100.0
	Total	133	20.2	100.0	
Missing	System	525	79.8		
Total		658	100.0		

TABLE 23.--Analysis of Q1,Q5

Q1, Q5categorized Crosstabulation

			Q5categorized			
			Clear	Hawley	Other	Total
Q1	1 Northeast	Count	39	91	13	143
		% within Q1	27.3%	63.6%	9.1%	100.0%
		% within Q5categorized	19.7%	24.1%	17.6%	22.0%
	2 South	Count	56	90	18	164
		% within Q1	34.1%	54.9%	11.0%	100.0%
		% within Q5categorized	28.3%	23.8%	24.3%	25.2%
	3 Midwest	Count	65	104	25	194
		% within Q1	33.5%	53.6%	12.9%	100.0%
		% within Q5categorized	32.8%	27.5%	33.8%	29.8%
	4 West	Count	38	93	18	149
		% within Q1	25.5%	62.4%	12.1%	100.0%
		% within Q5categorized	19.2%	24.6%	24.3%	22.9%
Total		Count	198	378	74	650
		% within Q1	30.5%	58.2%	11.4%	100.0%
		% within Q5categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.330(a)	6	0.387
Likelihood Ratio	6.396	6	0.380
N of Valid Cases	650		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 16.28.

TABLE 24.--Analysis of Q1,Q6

Q1,Q6 Crosstabulation

			Q6		Total
			Yes	No	
Q1	1 Northeast	Count	115	26	141
		% within Q1	81.6%	18.4%	100.0%
		% within Q6	22.5%	22.6%	22.5%
	2 South	Count	126	28	154
		% within Q1	81.8%	18.2%	100.0%
		% within Q6	24.6%	24.3%	24.6%
	3 Midwest	Count	151	35	186
		% within Q1:	81.2%	18.8%	100.0%
		% within Q6	29.5%	30.4%	29.7%
	4 West	Count	120	26	146
		% within Q1:	82.2%	17.8%	100.0%
		% within Q6	23.4%	22.6%	23.3%
Total		Count	512	115	627
		% within Q1:	81.7%	18.3%	100.0%
		% within Q6	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.059(a)	3	0.996
Likelihood Ratio	0.059	3	0.996
N of Valid Cases	627		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 25.86.

TABLE 25.--Analysis of Q1,Q7

Q1,Q7categorized Crosstabulation

			Q7categorized			
			Full time for <3months	Full time for 3months-9months	Full time for >9months	Total
Q1	1 Northeast	Count	37	62	19	118
		% within Q1	31.4%	52.5%	16.1%	100.0%
		% within Q7categorized	25.3%	22.4%	20.2%	22.8%
	2 South	Count	39	70	19	128
		% within Q1	30.5%	54.7%	14.8%	100.0%
		% within Q7categorized	26.7%	25.3%	20.2%	24.8%
	3 Midwest	Count	42	81	29	152
		% within Q1	27.6%	53.3%	19.1%	100.0%
		% within Q7categorized	28.8%	29.2%	30.9%	29.4%
	4 West	Count	28	64	27	119
		% within Q1	23.5%	53.8%	22.7%	100.0%
		% within Q7categorized	19.2%	23.1%	28.7%	23.0%
Total		Count	146	277	94	517
		% within Q1	28.2%	53.6%	18.2%	100.0%
		% within Q7categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.104(a)	6	0.663
Likelihood Ratio	4.107	6	0.662
N of Valid Cases	517		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 21.45.

TABLE 26.--Analysis of Q1,Q8

Q1, Q8categorized Crosstabulation

			Q8categorized			
			Around 16 hours/day	Around 8 hours/day	Other	Total
Q1	1 Northeast	Count	18	75	25	118
		% within Q1	15.3%	63.6%	21.2%	100.0%
		% within Q8categorized	28.1%	21.1%	22.3%	22.2%
	2 South	Count	14	91	22	127
		% within Q1	11.0%	71.7%	17.3%	100.0%
		% within Q8categorized	21.9%	25.6%	19.6%	23.9%
	3 Midwest	Count	19	112	32	163
		% within Q1	11.7%	68.7%	19.6%	100.0%
		% within Q8categorized	29.7%	31.5%	28.6%	30.7%
	4 West	Count	13	77	33	123
		% within Q1	10.6%	62.6%	26.8%	100.0%
		% within Q8categorized	20.3%	21.7%	29.5%	23.2%
Total		Count	64	355	112	531
		% within Q1	12.1%	66.9%	21.1%	100.0%
		% within Q8categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.347(a)	6	0.500
Likelihood Ratio	5.188	6	0.520
N of Valid Cases	531		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.22.

TABLE 27.--Analysis of Q1,Q9

Q1, Q9categorized Crosstabulation

			Q9categorized					
			Clear	Hawley	Spring Aligner	Fixed Lingual	Other	Total
Q1	1 Northeast	Count	29	52	16	38	8	143
		% within Q1	20.3%	36.4%	11.2%	26.6%	5.6%	100.0%
		% within Q9categorized	24.6%	28.4%	28.1%	14.6%	26.7%	22.0%
	2 South	Count	28	41	11	75	8	163
		% within Q1	17.2%	25.2%	6.7%	46.0%	4.9%	100.0%
		% within Q9categorized	23.7%	22.4%	19.3%	28.7%	26.7%	25.1%
	3 Midwest	Count	39	44	21	85	6	195
		% within Q1	20.0%	22.6%	10.8%	43.6%	3.1%	100.0%
		% within Q9categorized	33.1%	24.0%	36.8%	32.6%	20.0%	30.0%
	4 West	Count	22	46	9	63	8	148
		% within Q1	14.9%	31.1%	6.1%	42.6%	5.4%	100.0%
		% within Q9categorized	18.6%	25.1%	15.8%	24.1%	26.7%	22.8%
Total		Count	118	183	57	261	30	649
		% within Q1	18.2%	28.2%	8.8%	40.2%	4.6%	100.0%
		% within Q9categorized	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.312(a)	12	0.034
Likelihood Ratio	23.251	12	0.026
N of Valid Cases	649		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.61.

TABLE 28.--Analysis of Q1,Q10

Q1,Q10 Crosstabulation

			Q10		
			Yes	No	Total
Q1	1 Northeast	Count	82	22	104
		% within Q1:	78.8%	21.2%	100.0%
		% within Q10	26.5%	29.3%	27.0%
	2 South	Count	75	12	87
		% within Q1:	86.2%	13.8%	100.0%
		% within Q10	24.2%	16.0%	22.6%
	3 Midwest	Count	82	26	108
		% within Q1:	75.9%	24.1%	100.0%
		% within Q10	26.5%	34.7%	28.1%
	4 West	Count	71	15	86
		% within Q1:	82.6%	17.4%	100.0%
		% within Q10	22.9%	20.0%	22.3%
Total		Count	310	75	385
		% within Q1:	80.5%	19.5%	100.0%
		% within Q10	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.660(a)	3	0.301
Likelihood Ratio	3.744	3	0.290
N of Valid Cases	385		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 16.75.

TABLE 29.--Analysis of Q1,Q11

Q1, Q11categorized Crosstabulation

			Q11categorized			
			Full time for <3months	Full time for 3months-9months	Full time for >9months	Total
Q1	1 Northeast	Count	24	44	14	82
		% within Q1:	29.3%	53.7%	17.1%	100.0%
		% within Q11categorized	26.7%	26.7%	25.9%	26.5%
	2 South	Count	21	41	13	75
		% within Q1:	28.0%	54.7%	17.3%	100.0%
		% within Q11categorized	23.3%	24.8%	24.1%	24.3%
	3 Midwest	Count	25	43	14	82
		% within Q1:	30.5%	52.4%	17.1%	100.0%
		% within Q11categorized	27.8%	26.1%	25.9%	26.5%
	4 West	Count	20	37	13	70
		% within Q1:	28.6%	52.9%	18.6%	100.0%
		% within Q11categorized	22.2%	22.4%	24.1%	22.7%
Total		Count	90	165	54	309
		% within Q1:	29.1%	53.4%	17.5%	100.0%
		% within Q11categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.199(a)	6	1.000
Likelihood Ratio	0.197	6	1.000
N of Valid Cases	309		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.23.

TABLE 30.--Analysis of Q1,Q12

Q1, Q12categorized Crosstabulation

			Q12categorized			
			Around 16 hours/day	Around 8 hours/day	Other	Total
Q1	1 Northeast	Count	13	50	22	85
		% within Q1	15.3%	58.8%	25.9%	100.0%
		% within Q12categorized	31.7%	23.3%	32.8%	26.3%
	2 South	Count	9	47	12	68
		% within Q1	13.2%	69.1%	17.6%	100.0%
		% within Q12categorized	22.0%	21.9%	17.9%	21.1%
	3 Midwest	Count	12	63	19	94
		% within Q1	12.8%	67.0%	20.2%	100.0%
		% within Q12categorized	29.3%	29.3%	28.4%	29.1%
	4 West	Count	7	55	14	76
		% within Q1	9.2%	72.4%	18.4%	100.0%
		% within Q12categorized	17.1%	25.6%	20.9%	23.5%
Total		Count	41	215	67	323
		% within Q1	12.7%	66.6%	20.7%	100.0%
		% within Q12categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.022(a)	6	0.674
Likelihood Ratio	4.036	6	0.672
N of Valid Cases	323		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.63.

TABLE 31.--Analysis of Q1,Q13

Q1,Q13 Crosstabulation

			Q13				
			No, wear retainers forever	Yes, <2years after debond	Yes, 5 years after debond	Yes, After 3rd molars are extracted	Total
Q1	1 Northeast	Count	108	9	7	10	134
		% within Q1	80.6%	6.7%	5.2%	7.5%	100.0%
		% within Q13	21.7%	30.0%	28.0%	26.3%	22.7%
	2 South	Count	130	10	4	4	148
		% within Q1	87.8%	6.8%	2.7%	2.7%	100.0%
		% within Q13	26.2%	33.3%	16.0%	10.5%	25.1%
	3 Midwest	Count	143	7	12	15	177
		% within Q1	80.8%	4.0%	6.8%	8.5%	100.0%
		% within Q13	28.8%	23.3%	48.0%	39.5%	30.0%
	4 West	Count	116	4	2	9	131
		% within Q1	88.5%	3.1%	1.5%	6.9%	100.0%
		% within Q13	23.3%	13.3%	8.0%	23.7%	22.2%
Total		Count	497	30	25	38	590
		% within Q1	84.2%	5.1%	4.2%	6.4%	100.0%
		% within Q13	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.704(a)	9	0.099
Likelihood Ratio	15.997	9	0.067
N of Valid Cases	590		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.55.

TABLE 32.--Analysis of Q1,Q14

Q1,Q14 Crosstabulation

			Q14		
			Yes	No	Total
Q1	1 Northeast	Count	34	88	122
		% within Q1	27.9%	72.1%	100.0%
		% within Q14	24.6%	20.4%	21.4%
	2 South	Count	27	120	147
		% within Q1:	18.4%	81.6%	100.0%
		% within Q14	19.6%	27.8%	25.8%
	3 Midwest	Count	48	121	169
		% within Q1:	28.4%	71.6%	100.0%
		% within Q14	34.8%	28.1%	29.7%
	4 West	Count	29	102	131
		% within Q1:	22.1%	77.9%	100.0%
		% within Q14	21.0%	23.7%	23.0%
Total		Count	138	431	569
		% within Q1:	24.3%	75.7%	100.0%
		% within Q14	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.543(a)	3	0.136
Likelihood Ratio	5.644	3	0.130
N of Valid Cases	569		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 29.59.

TABLE 33.--Analysis of Q1,Q15

Q1,Q15 Crosstabulation

			Q15				
			<2 years after debonding	2-5 years after debonding	>5 years after debonding	After 3rd molars are extracted	Total
Q1	1 Northeast	Count	3	9	5	15	32
		% within Q1	9.4%	28.1%	15.6%	46.9%	100.0%
		% within Q15	27.3%	23.7%	12.5%	34.1%	24.1%
	2 South	Count	2	5	10	7	24
		% within Q1	8.3%	20.8%	41.7%	29.2%	100.0%
		% within Q15	18.2%	13.2%	25.0%	15.9%	18.0%
	3 Midwest	Count	4	12	19	14	49
		% within Q1	8.2%	24.5%	38.8%	28.6%	100.0%
		% within Q15	36.4%	31.6%	47.5%	31.8%	36.8%
	4 West	Count	2	12	6	8	28
		% within Q1	7.1%	42.9%	21.4%	28.6%	100.0%
		% within Q15	18.2%	31.6%	15.0%	18.2%	21.1%
Total		Count	11	38	40	44	133
		% within Q1	8.3%	28.6%	30.1%	33.1%	100.0%
		% Q15	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.530(a)	9	0.309
Likelihood Ratio	10.480	9	0.313
N of Valid Cases	133		

a. 4 cells (25.0%) have expected count less than 5. The minimum expected count is 1.98.

TABLE 34.--Analysis of Q2,Q5

Q2, Q5categorized Crosstabulation

			Q5categorized			
			Clear	Hawley	Other	Total
Q2	Male	Count	176	327	63	566
		% within Q2:	31.1%	57.8%	11.1%	100.0%
		% within Q5categorized	88.4%	86.5%	84.0%	86.8%
	Female	Count	23	51	12	86
		% within Q2:	26.7%	59.3%	14.0%	100.0%
		% within Q5categorized	11.6%	13.5%	16.0%	13.2%
Total		Count	199	378	75	652
		% within Q2:	30.5%	58.0%	11.5%	100.0%
		% within Q5categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.010(a)	2	0.603
Likelihood Ratio	0.999	2	0.607
Linear-by-Linear Association	0.999	1	0.318
N of Valid Cases	652		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.89.

TABLE 35.--Analysis of Q2,Q6

Q2,Q6 Crosstabulation

			Q6		
			Yes	No	Total
Q2	Male	Count	436	108	544
		% within Q2	80.1%	19.9%	100.0%
		% within Q6	85.0%	93.1%	86.5%
	Female	Count	77	8	85
		% within Q2	90.6%	9.4%	100.0%
		% within Q6	15.0%	6.9%	13.5%
Total		Count	513	116	629
		% within Q2	81.6%	18.4%	100.0%
		% within Q6	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.328(b)	1	0.021		
Continuity Correction(a)	4.657	1	0.031		
Likelihood Ratio	6.115	1	0.013		
Fisher's Exact Test				0.023	0.012
Linear-by-Linear Association	5.320	1	0.021		
N of Valid Cases	629				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.68.

TABLE 36.--Analysis of Q2,Q7

Q2, Q7categorized Crosstabulation

			Q7categorized			Total
			Full time for <3months	Full time for 3months-9months	Full time for >9months	
Q2	Male	Count	125	238	78	441
		% within Q2	28.3%	54.0%	17.7%	100.0%
		% within Q7categorized	85.0%	85.6%	83.9%	85.1%
	Female	Count	22	40	15	77
		% within Q2	28.6%	51.9%	19.5%	100.0%
		% within Q7categorized	15.0%	14.4%	16.1%	14.9%
Total		Count	147	278	93	518
		% within Q2:	28.4%	53.7%	18.0%	100.0%
		% within Q7categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.168(a)	2	0.919
Likelihood Ratio	0.166	2	0.920
Linear-by-Linear Association	0.035	1	0.851
N of Valid Cases	518		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.82.

TABLE 37.--Analysis of Q2,Q8

Q2, Q8categorized Crosstabulation

			Q8categorized			Total
			1.00	2.00	3.00	
Q2	Male	Count	56	318	93	467
		% within Q2	12.0%	68.1%	19.9%	100.0%
		% within Q8categorized	88.9%	88.8%	82.3%	87.5%
	Female	Count	7	40	20	67
		% within Q2	10.4%	59.7%	29.9%	100.0%
		% within Q8categorized	11.1%	11.2%	17.7%	12.5%
Total		Count	63	358	113	534
		% within Q2	11.8%	67.0%	21.2%	100.0%
		% within Q8categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.468(a)	2	0.177
Likelihood Ratio	3.226	2	0.199
Linear-by-Linear Association	2.402	1	0.121
N of Valid Cases	534		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.90.

TABLE 38.--Analysis of Q2,Q9

Q2, Q9categorized Crosstabulation

			Q9categorized					
			Clear	Hawley	Spring Aligner	Fixed Lingual	Other	Total
Q2	Male	Count	108	148	46	241	22	565
		% within Q2	19.1%	26.2%	8.1%	42.7%	3.9%	100.0%
		% within Q9categorized	90.8%	80.9%	80.7%	92.0%	73.3%	86.8%
	Female	Count	11	35	11	21	8	86
		% within Q2	12.8%	40.7%	12.8%	24.4%	9.3%	100.0%
		% within Q9categorized	9.2%	19.1%	19.3%	8.0%	26.7%	13.2%
Total		Count	119	183	57	262	30	651
		% within Q2	18.3%	28.1%	8.8%	40.2%	4.6%	100.0%
		% within Q9categorized	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.966(a)	4	0.001
Likelihood Ratio	19.314	4	0.001
Linear-by-Linear Association	0.407	1	0.524
N of Valid Cases	651		

a. 1 cells (10.0%) have expected count less than 5. The minimum expected count is 3.96.

TABLE 39.--Analysis of Q2,Q10

Q2,Q10 Crosstabulation

			Q10		Total
			Yes	No	
Q2	Male	Count	252	69	321
		% within Q2	78.5%	21.5%	100.0%
		% within Q10	81.3%	90.8%	83.2%
	Female	Count	58	7	65
		% within Q2	89.2%	10.8%	100.0%
		% Q10	18.7%	9.2%	16.8%
Total		Count	310	76	386
		% within Q2	80.3%	19.7%	100.0%
		% within Q10	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.933(b)	1	0.047		
Continuity Correction(a)	3.284	1	0.070		
Likelihood Ratio	4.418	1	0.036		
Fisher's Exact Test				0.059	0.030
Linear-by-Linear Association	3.923	1	0.048		
N of Valid Cases	386				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.80.

TABLE 40.--Analysis of Q2,Q11

Q2, Q11categorized Crosstabulation

			Q11categorized			
			Full time for <3months	Full time for 3months-9months	Full time for >9months	Total
Q2	Male	Count	78	133	41	252
		% within Q2	31.0%	52.8%	16.3%	100.0%
		% within Q11categorized	85.7%	80.6%	77.4%	81.6%
	Female	Count	13	32	12	57
		% within Q2	22.8%	56.1%	21.1%	100.0%
		% within Q11categorized	14.3%	19.4%	22.6%	18.4%
Total		Count	91	165	53	309
		% within Q2	29.4%	53.4%	17.2%	100.0%
		% within Q11categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.766(a)	2	0.414
Likelihood Ratio	1.801	2	0.406
Linear-by-Linear Association	1.718	1	0.190
N of Valid Cases	309		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.78.

TABLE 41.--Analysis of Q2,Q12

Q2, Q12categorized Crosstabulation

			Q12categorized			
			Around 16 hours/day	Around 8 hours/day	Other	Total
Q2	Male	Count	35	184	56	275
		% within Q2	12.7%	66.9%	20.4%	100.0%
		% within Q12categorized	85.4%	84.8%	82.4%	84.4%
	Female	Count	6	33	12	51
		% within Q2	11.8%	64.7%	23.5%	100.0%
		% within Q12categorized	14.6%	15.2%	17.6%	15.6%
Total		Count	41	217	68	326
		% within Q2	12.6%	66.6%	20.9%	100.0%
		% within Q12categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.270(a)	2	0.874
Likelihood Ratio	0.264	2	0.876
Linear-by-Linear Association	0.223	1	0.637
N of Valid Cases	326		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.41.

TABLE 42.--Analysis of Q2,Q13

Q2,Q13 Crosstabulation

			Q13				
			No, wear retainers forever	Yes, <2years after debond	Yes, 5 years after debond	Yes, After 3rd molars are extracted	Total
Q2	Male	Count	426	27	21	34	508
		% within Q2	83.9%	5.3%	4.1%	6.7%	100.0%
		% within Q13	85.2%	93.1%	84.0%	89.5%	85.8%
	Female	Count	74	2	4	4	84
		% within Q2	88.1%	2.4%	4.8%	4.8%	100.0%
		% within Q13	14.8%	6.9%	16.0%	10.5%	14.2%
Total		Count	500	29	25	38	592
		% within Q2	84.5%	4.9%	4.2%	6.4%	100.0%
		% within Q13	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.906(a)	3	0.592
Likelihood Ratio	2.189	3	0.534
Linear-by-Linear Association	0.583	1	0.445
N of Valid Cases	592		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 3.55.

TABLE 44.--Analysis of Q2,Q15

Q2,Q15 Crosstabulation

			Q15				
			<2 years after debonding	2-5 years after debonding	>5 years after debonding	After 3rd molars are extracted	Total
Q2	Male	Count	8	35	38	41	122
		% within Q2	6.6%	28.7%	31.1%	33.6%	100.0%
		% within Q15	72.7%	92.1%	95.0%	93.2%	91.7%
	Female	Count	3	3	2	3	11
		% within Q2	27.3%	27.3%	18.2%	27.3%	100.0%
		% within Q15	27.3%	7.9%	5.0%	6.8%	8.3%
Total		Count	11	38	40	44	133
		% within Q2	8.3%	28.6%	30.1%	33.1%	100.0%
		% within Q15	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.929(a)	3	0.115
Likelihood Ratio	4.231	3	0.238
Linear-by-Linear Association	2.306	1	0.129
N of Valid Cases	133		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .91.

TABLE 45.--Analysis of Q3,Q5

Q3categorized * Q5categorized Crosstabulation

			Q5categorized			
			Clear	Hawley	Other	Total
Q3categorized	0-15 years	Count	64	108	23	195
		% within Q3categorized	32.8%	55.4%	11.8%	100.0%
		% within Q5categorized	32.2%	28.4%	30.7%	29.8%
	16-25 years	Count	61	119	22	202
		% within Q3categorized	30.2%	58.9%	10.9%	100.0%
		% within Q5categorized	30.7%	31.3%	29.3%	30.9%
	>25 years	Count	74	153	30	257
		% within Q3categorized	28.8%	59.5%	11.7%	100.0%
		% within Q5categorized	37.2%	40.3%	40.0%	39.3%
Total		Count	199	380	75	654
		% within Q3categorized	30.4%	58.1%	11.5%	100.0%
		% within Q5categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.043(a)	4	0.903
Likelihood Ratio	1.042	4	0.903
Linear-by-Linear Association	0.448	1	0.503
N of Valid Cases	654		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.36.

TABLE 46.--Analysis of Q3,Q6

Q3categorized,Q6 Crosstabulation

			Q6		
			Yes	No	Total
Q3categorized	0-15 years	Count	156	35	191
		% within Q3categorized	81.7%	18.3%	100.0%
		% within Q6	30.4%	29.9%	30.3%
	16-25 years	Count	165	33	198
		% within Q3categorized	83.3%	16.7%	100.0%
		% within Q6	32.2%	28.2%	31.4%
	>25 years	Count	192	49	241
		% within Q3categorized	79.7%	20.3%	100.0%
		% within Q6	37.4%	41.9%	38.3%
Total		Count	513	117	630
		% within Q3categorized	81.4%	18.6%	100.0%
		% within Q6	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.977(a)	2	0.614
Likelihood Ratio	0.978	2	0.613
Linear-by-Linear Association	0.343	1	0.558
N of Valid Cases	630		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 35.47.

TABLE 47.--Analysis of Q3,Q7

Q3categorized * Q7categorized Crosstabulation

			Q7categorized			
			Full time for <3months	Full time for 3months-9months	Full time for >9months	Total
Q3categorized	0-15 years	Count	49	90	18	157
		% within Q3categorized	31.2%	57.3%	11.5%	100.0%
		% within Q7categorized	33.3%	32.4%	19.4%	30.3%
	16-25 years	Count	39	100	26	165
		% within Q3categorized	23.6%	60.6%	15.8%	100.0%
		% within Q7categorized	26.5%	36.0%	28.0%	31.9%
	>25 years	Count	59	88	49	196
		% within Q3categorized	30.1%	44.9%	25.0%	100.0%
		% within Q7categorized	40.1%	31.7%	52.7%	37.8%
Total		Count	147	278	93	518
		% within Q3categorized	28.4%	53.7%	18.0%	100.0%
		% within Q7categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.182(a)	4	0.003
Likelihood Ratio	16.312	4	0.003
Linear-by-Linear Association	3.959	1	0.047
N of Valid Cases	518		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 28.19.

TABLE 48.--Analysis of Q3,Q8

Q3categorized * Q8categorized Crosstabulation

			Q8categorized			
			Around 16 hours/day	Around 8 hours/day	Other	Total
Q3categorized	0-15 years	Count	15	104	44	163
		% within Q3categorized	9.2%	63.8%	27.0%	100.0%
		% within Q8categorized	23.4%	29.1%	38.9%	30.5%
	16-25 years	Count	24	106	31	161
		% within Q3categorized	14.9%	65.8%	19.3%	100.0%
		% within Q8categorized	37.5%	29.6%	27.4%	30.1%
	>25 years	Count	25	148	38	211
		% within Q3categorized	11.8%	70.1%	18.0%	100.0%
		% within Q8categorized	39.1%	41.3%	33.6%	39.4%
Total		Count	64	358	113	535
		% within Q3categorized	12.0%	66.9%	21.1%	100.0%
		% within Q8categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.694(a)	4	0.153
Likelihood Ratio	6.540	4	0.162
Linear-by-Linear Association	3.483	1	0.062
N of Valid Cases	535		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 19.26.

TABLE 49.--Analysis of Q3,Q9

Q3categorized * Q9categorized Crosstabulation

			Q9categorized					
			Clear	Hawley	Spring Aligner	Fixed Lingual	Other	Total
Q3categorized	0-15 years	Count	41	56	15	71	12	195
		% within Q3categorized	21.0%	28.7%	7.7%	36.4%	6.2%	100.0%
		% within Q9categorized	34.5%	30.6%	25.9%	27.1%	40.0%	29.9%
	16-25 years	Count	31	59	17	85	10	202
		% within Q3categorized	15.3%	29.2%	8.4%	42.1%	5.0%	100.0%
		% within Q9categorized	26.1%	32.2%	29.3%	32.4%	33.3%	31.0%
	>25 years	Count	47	68	26	106	8	255
		% within Q3categorized	18.4%	26.7%	10.2%	41.6%	3.1%	100.0%
		% within Q9categorized	39.5%	37.2%	44.8%	40.5%	26.7%	39.1%
Total		Count	119	183	58	262	30	652
		% within Q3categorized	18.3%	28.1%	8.9%	40.2%	4.6%	100.0%
		% within Q9categorized	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.173(a)	8	0.628
Likelihood Ratio	6.253	8	0.619
Linear-by-Linear Association	0.209	1	0.647
N of Valid Cases	652		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.97.

TABLE 50.--Analysis of Q3,Q10

Q3categorized ,Q10 Crosstabulation

			Q10		Total
			Yes	No	
Q3categorized	0-15 years	Count	103	20	123
		% within Q3categorized	83.7%	16.3%	100.0%
		% within q10	33.1%	26.3%	31.8%
	16-25 years	Count	97	20	117
		% within Q3categorized	82.9%	17.1%	100.0%
		% within q10	31.2%	26.3%	30.2%
	>25 years	Count	111	36	147
		% within Q3categorized	75.5%	24.5%	100.0%
		% within q10	35.7%	47.4%	38.0%
Total		Count	311	76	387
		% within Q3categorized	80.4%	19.6%	100.0%
		% within q10	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.562(a)	2	0.168
Likelihood Ratio	3.501	2	0.174
Linear-by-Linear Association	2.999	1	0.083
N of Valid Cases	387		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.98.

TABLE 51.--Analysis of Q3,Q11

Q3categorized * Q11categorized Crosstabulation

			Q11categorized			
			Full time for <3months	Full time for 3months-9months	Full time for >9months	Total
Q3categorized	0-15 years	Count	35	59	9	103
		% within Q3categorized	34.0%	57.3%	8.7%	100.0%
		% within Q11categorized	38.5%	35.5%	17.0%	33.2%
	16-25 years	Count	22	60	14	96
		% within Q3categorized	22.9%	62.5%	14.6%	100.0%
		% within Q11categorized	24.2%	36.1%	26.4%	31.0%
	>25 years	Count	34	47	30	111
		% within Q3categorized	30.6%	42.3%	27.0%	100.0%
		% within Q11categorized	37.4%	28.3%	56.6%	35.8%
Total		Count	91	166	53	310
		% within Q3categorized	29.4%	53.5%	17.1%	100.0%
		% within Q11categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.442(a)	4	0.002
Likelihood Ratio	17.616	4	0.001
Linear-by-Linear Association	5.478	1	0.019
N of Valid Cases	310		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 16.41.

TABLE 52.--Analysis of Q3,Q12

Q3categorized * Q12categorized Crosstabulation

			Q12categorized			
			Around 16 hours/day	Around 8 hours/day	Other	Total
Q3categorized	0-15 years	Count	10	68	26	104
		% within Q3categorized	9.6%	65.4%	25.0%	100.0%
		% within Q12categorized	24.4%	31.3%	38.2%	31.9%
	16-25 years	Count	15	65	14	94
		% within Q3categorized	16.0%	69.1%	14.9%	100.0%
		% within Q12categorized	36.6%	30.0%	20.6%	28.8%
	>25 years	Count	16	84	28	128
		% within Q3categorized	12.5%	65.6%	21.9%	100.0%
		% within Q12categorized	39.0%	38.7%	41.2%	39.3%
Total		Count	41	217	68	326
		% within Q3categorized	12.6%	66.6%	20.9%	100.0%
		% within Q12categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.235(a)	4	0.375
Likelihood Ratio	4.358	4	0.360
Linear-by-Linear Association	0.474	1	0.491
N of Valid Cases	326		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.82.

TABLE 53.--Analysis of Q3,Q13

Q3categorized,Q13 Crosstabulation

			Q13				
			No, wear retainers forever	Yes, <2years after debond	Yes, 5 years after debond	Yes, After 3rd molars are extracted	Total
Q3categorized	0-15 years	Count	166	4	5	5	180
		% within Q3categorized	92.2%	2.2%	2.8%	2.8%	100.0%
		% withinQ13	33.3%	13.3%	19.2%	13.2%	30.4%
	16-25 years	Count	160	9	7	8	184
		% within Q3categorized	87.0%	4.9%	3.8%	4.3%	100.0%
		% within Q13	32.1%	30.0%	26.9%	21.1%	31.0%
	>25 years	Count	173	17	14	25	229
		% within Q3categorized	75.5%	7.4%	6.1%	10.9%	100.0%
		% within Q13	34.7%	56.7%	53.8%	65.8%	38.6%
Total		Count	499	30	26	38	593
		% within Q3categorized	84.1%	5.1%	4.4%	6.4%	100.0%
		% within Q13	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	23.934(a)	6	0.001
Likelihood Ratio	24.289	6	0.000
Linear-by-Linear Association	19.893	1	0.000
N of Valid Cases	593		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.89.

TABLE 54.--Analysis of Q3,Q14

Q3categorized,Q14 Crosstabulation

			Q14		
			Yes	No	Total
Q3categorized	0-15 years	Count	27	152	179
		% within Q3categorized	15.1%	84.9%	100.0%
		% within Q14	19.6%	35.0%	31.3%
	16-25 years	Count	43	134	177
		% within Q3categorized	24.3%	75.7%	100.0%
		% within Q14	31.2%	30.9%	30.9%
	>25 years	Count	68	148	216
		% within Q3categorized	31.5%	68.5%	100.0%
		% within Q14	49.3%	34.1%	37.8%
Total		Count	138	434	572
		% within Q3categorized	24.1%	75.9%	100.0%
		% within Q14	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.382(a)	2	0.001
Likelihood Ratio	14.876	2	0.001
Linear-by-Linear Association	14.289	1	0.000
N of Valid Cases	572		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 42.70.

TABLE 55.--Analysis of Q3,Q15

Q3categorized,Q15 Crosstabulation

			Q15				
			<2 years after debonding	2-5 years after debonding	>5 years after debonding	After 3rd molars are extracted	Total
Q3categorized	0-15 years	Count	4	7	8	7	26
		% within Q3categorized	15.4%	26.9%	30.8%	26.9%	100.0%
		% within Q15	36.4%	18.4%	20.0%	15.9%	19.5%
	16-25 years	Count	3	15	12	13	43
		% within Q3categorized	7.0%	34.9%	27.9%	30.2%	100.0%
		% within Q15	27.3%	39.5%	30.0%	29.5%	32.3%
	>25 years	Count	4	16	20	24	64
		% within Q3categorized	6.3%	25.0%	31.3%	37.5%	100.0%
		% within Q15	36.4%	42.1%	50.0%	54.5%	48.1%
Total		Count	11	38	40	44	133
		% within Q3categorized	8.3%	28.6%	30.1%	33.1%	100.0%
		% within Q15	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.786(a)	6	0.706
Likelihood Ratio	3.478	6	0.747
Linear-by-Linear Association	2.124	1	0.145
N of Valid Cases	133		

a. 2 cells (16.7%) have expected count less than 5. The minimum expected count is 2.15.

TABLE 56.--Analysis of Q4,Q5

Q4, Q5categorized Crosstabulation

			Q5categorized			
			Clear	Hawley	Other	Total
Q4	<150 debonds	Count	63	120	19	202
		% within Q4	31.2%	59.4%	9.4%	100.0%
		% within Q5categorized	31.8%	32.2%	25.7%	31.3%
	150-300 debonds	Count	92	184	32	308
		% Q4	29.9%	59.7%	10.4%	100.0%
		% within Q5categorized	46.5%	49.3%	43.2%	47.8%
	>300 debonds	Count	43	69	23	135
		% within Q4	31.9%	51.1%	17.0%	100.0%
		% within Q5categorized	21.7%	18.5%	31.1%	20.9%
Total		Count	198	373	74	645
		% within Q4	30.7%	57.8%	11.5%	100.0%
		% within Q5categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.188(a)	4	0.186
Likelihood Ratio	5.811	4	0.214
Linear-by-Linear Association	0.972	1	0.324
N of Valid Cases	645		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.49.

TABLE 57.--Analysis of Q4,Q6

Q4,Q6 Crosstabulation

			Q6		
			Yes	No	Total
Q4	<150 debonds	Count	168	31	199
		% within Q4	84.4%	15.6%	100.0%
		% within Q6	33.1%	27.0%	31.9%
	150-300 debonds	Count	245	54	299
		% within Q4	81.9%	18.1%	100.0%
		% within Q6	48.2%	47.0%	48.0%
	>300 debonds	Count	95	30	125
		% within Q4	76.0%	24.0%	100.0%
		% within Q6	18.7%	26.1%	20.1%
Total		Count	508	115	623
		% within Q4	81.5%	18.5%	100.0%
		% within Q6	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.679(a)	2	0.159
Likelihood Ratio	3.557	2	0.169
Linear-by-Linear Association	3.373	1	0.066
N of Valid Cases	623		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 23.07.

TABLE 58.--Analysis of Q4,Q7

Q4, Q7categorized Crosstabulation

			Q7categorized			
			Full time for <3months	Full time for 3months-9months	Full time for >9months	Total
Q4	<150 debonds	Count	42	92	34	168
		% within Q4	25.0%	54.8%	20.2%	100.0%
		% within Q7categorized	28.8%	33.6%	37.0%	32.8%
	150-300 debonds	Count	71	136	42	249
		% within Q4	28.5%	54.6%	16.9%	100.0%
		% within Q7categorized	48.6%	49.6%	45.7%	48.6%
	>300 debonds	Count	33	46	16	95
		% within Q4	34.7%	48.4%	16.8%	100.0%
		% within Q7categorized	22.6%	16.8%	17.4%	18.6%
Total		Count	146	274	92	512
		% within Q4	28.5%	53.5%	18.0%	100.0%
		% within Q7categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.300(a)	4	0.509
Likelihood Ratio	3.248	4	0.517
Linear-by-Linear Association	2.428	1	0.119
N of Valid Cases	512		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 17.07.

TABLE 59.--Analysis of Q4,Q8

Q4, Q8categorized Crosstabulation

			Q8categorized			
			Around 16 hours/day	Around 8 hours/day	Other	Total
Q4	<150 debonds	Count	20	99	37	156
		% within Q4	12.8%	63.5%	23.7%	100.0%
		% within Q8categorized	31.7%	28.0%	33.3%	29.6%
	150-300 debonds	Count	27	178	60	265
		% within Q4	10.2%	67.2%	22.6%	100.0%
		% within Q8categorized	42.9%	50.4%	54.1%	50.3%
	>300 debonds	Count	16	76	14	106
		% within Q4	15.1%	71.7%	13.2%	100.0%
		% within Q8categorized	25.4%	21.5%	12.6%	20.1%
Total		Count	63	353	111	527
		% within Q4	12.0%	67.0%	21.1%	100.0%
		% within Q8categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.246(a)	4	0.181
Likelihood Ratio	6.662	4	0.155
Linear-by-Linear Association	2.515	1	0.113
N of Valid Cases	527		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.67.

TABLE 60.--Analysis of Q4,Q9

Q4, Q9categorized Crosstabulation

			Q9categorized					
			Clear	Hawley	Spring Aligner	Fixed Lingual	Other	Total
Q4	<150 debonds	Count	42	65	21	66	7	201
		% within Q4	20.9%	32.3%	10.4%	32.8%	3.5%	100.0%
		% within Q9categorized	35.9%	36.5%	36.2%	25.2%	24.1%	31.2%
	150-300 debonds	Count	54	84	22	131	16	307
		% within Q4	17.6%	27.4%	7.2%	42.7%	5.2%	100.0%
		% within Q9categorized	46.2%	47.2%	37.9%	50.0%	55.2%	47.7%
	>300 debonds	Count	21	29	15	65	6	136
		% within Q4	15.4%	21.3%	11.0%	47.8%	4.4%	100.0%
		% within Q9categorized	17.9%	16.3%	25.9%	24.8%	20.7%	21.1%
Total		Count	117	178	58	262	29	644
		% within Q4	18.2%	27.6%	9.0%	40.7%	4.5%	100.0%
		% within Q9categorized	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.090(a)	8	0.109
Likelihood Ratio	13.336	8	0.101
Linear-by-Linear Association	8.313	1	0.004
N of Valid Cases	644		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.12.

TABLE 61.--Analysis of Q4,Q10

Q4,Q10 Crosstabulation

			Q10		
			Yes	No	Total
Q4	<150 debonds	Count	114	21	135
		% within Q4	84.4%	15.6%	100.0%
		% within Q10	37.4%	28.4%	35.6%
	150-300 debonds	Count	136	38	174
		% within Q4	78.2%	21.8%	100.0%
		% within Q10	44.6%	51.4%	45.9%
	>300 debonds	Count	55	15	70
		% within Q4	78.6%	21.4%	100.0%
		% within Q10	18.0%	20.3%	18.5%
Total		Count	305	74	379
		% within Q4	80.5%	19.5%	100.0%
		% within Q10	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.108(a)	2	0.349
Likelihood Ratio	2.166	2	0.339
Linear-by-Linear Association	1.466	1	0.226
N of Valid Cases	379		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.67.

TABLE 62.--Analysis of Q4,Q11

Q4, Q11categorized Crosstabulation

			Q11categorized			
			Full time for <3months	Full time for 3months-9months	Full time for >9months	Total
Q4	<150 debonds	Count	27	61	26	114
		% within Q4	23.7%	53.5%	22.8%	100.0%
		% within Q11categorized	30.0%	37.7%	50.0%	37.5%
	150-300 debonds	Count	40	78	18	136
		% within Q4	29.4%	57.4%	13.2%	100.0%
		% within Q11categorized	44.4%	48.1%	34.6%	44.7%
	>300 debonds	Count	23	23	8	54
		% within Q4	42.6%	42.6%	14.8%	100.0%
		% within Q11categorized	25.6%	14.2%	15.4%	17.8%
Total		Count	90	162	52	304
		% within Q4	29.6%	53.3%	17.1%	100.0%
		% within Q11categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.533(a)	4	0.049
Likelihood Ratio	9.241	4	0.055
Linear-by-Linear Association	6.535	1	0.011
N of Valid Cases	304		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.24.

TABLE 63.--Analysis of Q4,Q12

Q4,Q12categorized Crosstabulation

			Q12categorized			
			Around 16 hours/day	Around 8 hours/day	Other	Total
Q4	<150 debonds	Count	14	65	27	106
		% within Q4	13.2%	61.3%	25.5%	100.0%
		% within Q12categorized	35.0%	30.7%	40.3%	33.2%
	150-300 debonds	Count	14	112	32	158
		% within Q4	8.9%	70.9%	20.3%	100.0%
		% within Q12categorized	35.0%	52.8%	47.8%	49.5%
	>300 debonds	Count	12	35	8	55
		% within Q4	21.8%	63.6%	14.5%	100.0%
		% within Q12categorized	30.0%	16.5%	11.9%	17.2%
Total		Count	40	212	67	319
		% within Q4	12.5%	66.5%	21.0%	100.0%
		% within Q12categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.614(a)	4	0.071
Likelihood Ratio	8.191	4	0.085
Linear-by-Linear Association	3.196	1	0.074
N of Valid Cases	319		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.90.

TABLE 64.--Analysis of Q4,Q13

Q4,Q13 Crosstabulation

			Q13				
			No, wear retainers forever	Yes, <2years after debond	Yes, 5 years after debond	Yes, After 3rd molars are extracted	Total
Q4	<150 debonds	Count	154	11	8	13	186
		% within Q4	82.8%	5.9%	4.3%	7.0%	100.0%
		% within Q13	31.3%	37.9%	30.8%	34.2%	31.8%
	150-300 debonds	Count	234	14	13	17	278
		% within Q4	84.2%	5.0%	4.7%	6.1%	100.0%
		% within Q13	47.6%	48.3%	50.0%	44.7%	47.5%
	>300 debonds	Count	104	4	5	8	121
		% within Q4	86.0%	3.3%	4.1%	6.6%	100.0%
		% within Q13	21.1%	13.8%	19.2%	21.1%	20.7%
Total		Count	492	29	26	38	585
		% within Q4	84.1%	5.0%	4.4%	6.5%	100.0%
		% within Q13	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.303(a)	6	0.972
Likelihood Ratio	1.371	6	0.968
Linear-by-Linear Association	0.191	1	0.662
N of Valid Cases	585		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.38.

TABLE 65.--Analysis of Q4,Q14

Q4,Q14 Crosstabulation

			Q14		
			Yes	No	Total
Q4	<150 debonds	Count	37	131	168
		% within Q4	22.0%	78.0%	100.0%
		% within Q14	26.8%	30.7%	29.7%
	150-300 debonds	Count	75	202	277
		% within Q4	27.1%	72.9%	100.0%
		% within Q14	54.3%	47.3%	49.0%
	>300 debonds	Count	26	94	120
		% within Q4	21.7%	78.3%	100.0%
		% within Q14	18.8%	22.0%	21.2%
Total		Count	138	427	565
		% within Q4	24.4%	75.6%	100.0%
		% within Q14	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.074(a)	2	0.355
Likelihood Ratio	2.075	2	0.354
Linear-by-Linear Association	0.010	1	0.920
N of Valid Cases	565		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 29.31.

TABLE 66.--Analysis of Q4,Q15

Q4,Q15 Crosstabulation

			Q15				
			<2 years after debonding	2-5 years after debonding	>5 years after debonding	After 3rd molars are extracted	Total
Q4	<150 debonds	Count	3	8	10	13	34
		% within Q4	8.8%	23.5%	29.4%	38.2%	100.0%
		% within Q15	27.3%	21.1%	25.0%	29.5%	25.6%
	150-300 debonds	Count	6	21	26	19	72
		% within Q4	8.3%	29.2%	36.1%	26.4%	100.0%
		% within Q15	54.5%	55.3%	65.0%	43.2%	54.1%
	>300 debonds	Count	2	9	4	12	27
		% within Q4	7.4%	33.3%	14.8%	44.4%	100.0%
		% within Q15	18.2%	23.7%	10.0%	27.3%	20.3%
Total		Count	11	38	40	44	133
		% within Q4	8.3%	28.6%	30.1%	33.1%	100.0%
		% within Q15	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.832(a)	6	0.442
Likelihood Ratio	6.231	6	0.398
Linear-by-Linear Association	0.012	1	0.911
N of Valid Cases	133		

a. 2 cells (16.7%) have expected count less than 5. The minimum expected count is 2.23.

TABLE 67.--Summary of the Time Period between the Debonding and the 1st Retention Appointment in Frequencies and Percentages

Q16-The 1st appointment is scheduled how long after the debonding appointment?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 4 weeks after the debonding appointment	126	19.1	19.2	19.2
	Between 1 month to 2 months after the debonding appointment	429	65.2	65.4	84.6
	Greater than 2 months after the debonding appointment	100	15.2	15.2	99.8
	There are no retention appointments; Patient has been dismis	1	0.2	0.2	100.0
	Total	656	99.7	100.0	
Missing	System	2	0.3		
Total		658	100.0		

TABLE 68.--Summary of the Time Period between the 1st Retention Appointment and 2nd Retention Appointment in Frequencies and Percentages

Q17-The 2nd appointment is scheduled how long after the 1st after appointment?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 3 months after the 1st appointment	160	24.3	24.3	24.3
	3-5 months after the 1st appointment	314	47.7	47.7	72.0
	6 months or greater after the 1st appointment	171	26.0	26.0	98.0
	No 2nd appointment; Patient has been dismissed	13	2.0	2.0	100.0
	Total	658	100.0	100.0	

TABLE 69.--Summary of the Time Period between the 2nd Retention Appointment and 3rd Retention Appointment in Frequencies and Percentages

Q18-The 3rd appointment is scheduled how long after the 2nd appointment?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 6 months after the 2nd appointment	212	32.2	32.9	32.9
	6 months to 11 months after the 2nd appointment	326	49.5	50.6	83.5
	1 year or greater after the 2nd appointment	81	12.3	12.6	96.1
	No 3rd appointment; Patient has been dismissed	25	3.8	3.9	100.0
	Total	644	97.9	100.0	
Missing	System	14	2.1		
Total		658	100.0		

TABLE 70.--Summary of the Time Period between the 3rd Retention Appointment and 4th Retention Appointment in Frequencies and Percentages

Q19-The 4th appointment is scheduled how long after the 3rd appointment?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 6 months after the 3rd appointment	97	14.7	15.7	15.7
	6 months to 11 months after the 3rd appointment	258	39.2	41.7	57.4
	1 year or greater after the 3rd appointment	165	25.1	26.7	84.1
	No 4th appointment; Patient has been dismissed	98	14.9	15.9	100.0
	Total	618	93.9	100.0	
Missing	System	40	6.1		
Total		658	100.0		

TABLE 71.--Summary of the Time Period between the 4th Retention Appointment and 5th Retention Appointment in Frequencies and Percentages

Q20-The 5th appointment is scheduled how long after the 4th appointment?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 6 months after the 4th appointment	51	7.8	9.9	9.9
	6 months to 11 months after the 4th appointment	170	25.8	32.9	42.7
	1 year or greater after the 4th appointment	171	26.0	33.1	75.8
	No 5th appointment; Patient has been dismissed	125	19.0	24.2	100.0
	Total	517	78.6	100.0	
Missing	System	141	21.4		
Total		658	100.0		

TABLE 72.--Analysis of Q1,Q16

Q1,Q16 Crosstabulation

			Q16				
			Less than 4 weeks after the debonding appointment	Between 1 month to 2 months after the debonding appointment	Greater than 2 months after the debonding appointment	There are no retention appointments; Patient has been dismis	Total
Q1	1 Northeast	Count	25	104	15	0	144
		% within Q1	17.4%	72.2%	10.4%	0.0%	100.0%
		% within Q16	19.8%	24.4%	15.3%	0.0%	22.1%
	2 South	Count	32	103	26	1	162
		% within Q1	19.8%	63.6%	16.0%	0.6%	100.0%
		% within Q16	25.4%	24.2%	26.5%	100.0%	24.9%
	3 Midwest	Count	37	124	35	0	196
		% within Q1	18.9%	63.3%	17.9%	0.0%	100.0%
		% within Q16	29.4%	29.1%	35.7%	0.0%	30.1%
	4 West	Count	32	95	22	0	149
		% within Q1:	21.5%	63.8%	14.8%	0.0%	100.0%
		% within Q16	25.4%	22.3%	22.4%	0.0%	22.9%
Total		Count	126	426	98	1	651
		% within Q1:	19.4%	65.4%	15.1%	0.2%	100.0%
		% within Q16	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.196(a)	9	0.515
Likelihood Ratio	8.119	9	0.522
N of Valid Cases	651		

a. 4 cells (25.0%) have expected count less than 5. The minimum expected count is .22.

TABLE 73.--Analysis of Q1,Q17

Q1,Q17 Crosstabulation

			Q17				
			Less than 3 months after the 1st appointment	3-5 months after the 1st appointment	6 months or greater after the 1st appointment	No 2nd appointment; Patient has been dismissed	Total
Q1	1 Northeast	Count	39	70	34	1	144
		% within Q1	27.1%	48.6%	23.6%	0.7%	100.0%
		% within Q17	24.4%	22.5%	20.1%	7.7%	22.1%
	2 South	Count	46	76	36	6	164
		% within Q1	28.0%	46.3%	22.0%	3.7%	100.0%
		% within Q17	28.8%	24.4%	21.3%	46.2%	25.1%
	3 Midwest	Count	46	85	62	3	196
		% within Q1	23.5%	43.4%	31.6%	1.5%	100.0%
		% within Q17	28.8%	27.3%	36.7%	23.1%	30.0%
	4 West	Count	29	80	37	3	149
		% within Q1	19.5%	53.7%	24.8%	2.0%	100.0%
		% within Q17	18.1%	25.7%	21.9%	23.1%	22.8%
Total		Count	160	311	169	13	653
		% within Q1	24.5%	47.6%	25.9%	2.0%	100.0%
		% within Q17	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.396(a)	9	0.192
Likelihood Ratio	12.309	9	0.196
N of Valid Cases	653		

a. 4 cells (25.0%) have expected count less than 5. The minimum expected count is 2.87.

TABLE 74.--Analysis of Q1,Q18

Q1,Q18 Crosstabulation

			Q18				
			Less than 6 months after the 2nd appointment	6 months to 11 months after the 2nd appointment	1 year or greater after the 2nd appointment	No 3rd appointment; Patient has been dismissed	Total
Q1	1 Northeast	Count	57	65	18	3	143
		% within Q1	39.9%	45.5%	12.6%	2.1%	100.0%
		% within Q18	26.9%	20.2%	22.5%	12.0%	22.4%
	2 South	Count	48	82	19	8	157
		% within Q1	30.6%	52.2%	12.1%	5.1%	100.0%
		% within Q18	22.6%	25.5%	23.8%	32.0%	24.6%
	3 Midwest	Count	59	97	30	7	193
		% within Q1	30.6%	50.3%	15.5%	3.6%	100.0%
		% within Q18	27.8%	30.1%	37.5%	28.0%	30.2%
	4 West	Count	48	78	13	7	146
		% within Q1	32.9%	53.4%	8.9%	4.8%	100.0%
		% within Q18	22.6%	24.2%	16.3%	28.0%	22.8%
Total		Count	212	322	80	25	639
		% within Q1	33.2%	50.4%	12.5%	3.9%	100.0%
		% within Q18	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.762(a)	9	0.460
Likelihood Ratio	8.931	9	0.444
N of Valid Cases	639		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.59.

TABLE 75.--Analysis of Q1,Q19

Q1,Q19 Crosstabulation

			Q19				
			Less than 6 months after the 3rd appointment	6 months to 11 months after the 3rd appointment	1 year or greater after the 3rd appointment	No 4th appointment; Patient has been dismissed	Total
Q1	1 Northeast	Count	24	62	35	19	140
		% within Q1	17.1%	44.3%	25.0%	13.6%	100.0%
		% within Q19	24.7%	24.2%	21.5%	19.6%	22.8%
	2 South	Count	21	58	38	32	149
		% within Q1	14.1%	38.9%	25.5%	21.5%	100.0%
		% within Q19	21.6%	22.7%	23.3%	33.0%	24.3%
	3 Midwest	Count	24	88	46	27	185
		% within Q1	13.0%	47.6%	24.9%	14.6%	100.0%
		% within Q19	24.7%	34.4%	28.2%	27.8%	30.2%
	4 West	Count	28	48	44	19	139
		% within Q1	20.1%	34.5%	31.7%	13.7%	100.0%
		% within Q19	28.9%	18.8%	27.0%	19.6%	22.7%
Total		Count	97	256	163	97	613
		% within Q1	15.8%	41.8%	26.6%	15.8%	100.0%
		% within Q19	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.548(a)	9	0.184
Likelihood Ratio	12.206	9	0.202
N of Valid Cases	613		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.00.

TABLE 76.--Analysis of Q1,Q20

Q1,Q20 Crosstabulation

			Q20				
			Less than 6 months after the 4th appointment	6 months to 11 months after the 4th appointment	1 year or greater after the 4th appointment	No 5th appointment; Patient has been dismissed	Total
Q1	1 Northeast	Count	13	38	39	30	120
		% within Q1	10.8%	31.7%	32.5%	25.0%	100.0%
		% within Q20	25.5%	22.5%	23.1%	24.2%	23.4%
	2 South	Count	13	32	41	31	117
		% within Q1	11.1%	27.4%	35.0%	26.5%	100.0%
		% within Q20	25.5%	18.9%	24.3%	25.0%	22.8%
	3 Midwest	Count	13	59	51	35	158
		% within Q1	8.2%	37.3%	32.3%	22.2%	100.0%
		% within Q20	25.5%	34.9%	30.2%	28.2%	30.8%
	4 West	Count	12	40	38	28	118
		% within Q1	10.2%	33.9%	32.2%	23.7%	100.0%
		% within Q20	23.5%	23.7%	22.5%	22.6%	23.0%
Total		Count	51	169	169	124	513
		% within Q1	9.9%	32.9%	32.9%	24.2%	100.0%
		% within Q20	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.637(a)	9	0.934
Likelihood Ratio	3.685	9	0.931
N of Valid Cases	513		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.63.

TABLE 77.--Analysis of Q2,Q16

Q2,Q16 Crosstabulation

			Q16				
			Less than 4 weeks after the debonding appointment	Between 1 month to 2 months after the debonding appointment	Greater than 2 months after the debonding appointment	There are no retention appointments; Patient has been dismissed	Total
Q2	Male	Count	113	363	89	1	566
		% within Q2	20.0%	64.1%	15.7%	0.2%	100.0%
		% within Q16	89.7%	85.2%	89.0%	100.0%	86.7%
	Female	Count	13	63	11	0	87
		% within Q2	14.9%	72.4%	12.6%	0.0%	100.0%
		% within Q16	10.3%	14.8%	11.0%	0.0%	13.3%
Total		Count	126	426	100	1	653
		% within Q2	19.3%	65.2%	15.3%	0.2%	100.0%
		% within Q16	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.399(a)	3	0.494
Likelihood Ratio	2.605	3	0.457
Linear-by-Linear Association	0.054	1	0.816
N of Valid Cases	653		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is .13.

TABLE 78.--Analysis of Q2,Q17

Q2,Q17 Crosstabulation

			Q17				
			Less than 3 months after the 1st appointment	3-5 months after the 1st appointment	6 months or greater after the 1st appointment	No 2nd appointment; Patient has been dismissed	Total
Q2	Male	Count	143	259	155	11	568
		% within Q2	25.2%	45.6%	27.3%	1.9%	100.0%
		% within Q17	90.5%	82.7%	90.6%	84.6%	86.7%
	Female	Count	15	54	16	2	87
		% within Q2	17.2%	62.1%	18.4%	2.3%	100.0%
		% within Q17	9.5%	17.3%	9.4%	15.4%	13.3%
Total		Count	158	313	171	13	655
		% within Q2	24.1%	47.8%	26.1%	2.0%	100.0%
		% within Q17	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.590(a)	3	0.035
Likelihood Ratio	8.687	3	0.034
Linear-by-Linear Association	0.001	1	0.978
N of Valid Cases	655		

a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 1.73.

TABLE 79.--Analysis of Q2,Q18

Q2,Q18 Crosstabulation

			Q18				
			Less than 6 months after the 2nd appointment	6 months to 11 months after the 2nd appointment	1 year or greater after the 2nd appointment	No 3rd appointment; Patient has been dismissed	Total
Q2	Male	Count	184	275	73	24	556
		% within Q2	33.1%	49.5%	13.1%	4.3%	100.0%
		% within Q18	87.2%	84.9%	90.1%	96.0%	86.7%
	Female	Count	27	49	8	1	85
		% within Q2	31.8%	57.6%	9.4%	1.2%	100.0%
		% within Q18	12.8%	15.1%	9.9%	4.0%	13.3%
Total		Count	211	324	81	25	641
		% within Q2	32.9%	50.5%	12.6%	3.9%	100.0%
		% within Q18	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.688(a)	3	0.297
Likelihood Ratio	4.327	3	0.228
Linear-by-Linear Association	0.928	1	0.335
N of Valid Cases	641		

a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 3.32.

TABLE 80.--Analysis of Q2,Q19

Q2,Q19 Crosstabulation

			Q19				
			Less than 6 months after the 3rd appointment	6 months to 11 months after the 3rd appointment	1 year or greater after the 3rd appointment	No 4th appointment; Patient has been dismissed	Total
Q2	Male	Count	84	229	140	78	531
		% within Q2	15.8%	43.1%	26.4%	14.7%	100.0%
		% within Q19	87.5%	89.1%	85.4%	79.6%	86.3%
	Female	Count	12	28	24	20	84
		% within Q2	14.3%	33.3%	28.6%	23.8%	100.0%
		% within Q19	12.5%	10.9%	14.6%	20.4%	13.7%
Total		Count	96	257	164	98	615
		% within Q2	15.6%	41.8%	26.7%	15.9%	100.0%
		% within Q19	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.692(a)	3	0.128
Likelihood Ratio	5.377	3	0.146
Linear-by-Linear Association	3.994	1	0.046
N of Valid Cases	615		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.11.

TABLE 81.--Analysis of Q2,Q20

Q2,Q20 Crosstabulation

			Q20				
			Less than 6 months after the 4th appointment	6 months to 11 months after the 4th appointment	1 year or greater after the 4th appointment	No 5th appointment; Patient has been dismissed	Total
Q2	Male	Count	45	153	149	103	450
		% within Q2	10.0%	34.0%	33.1%	22.9%	100.0%
		% within Q20	88.2%	91.1%	87.1%	83.1%	87.5%
	Female	Count	6	15	22	21	64
		% within Q2	9.4%	23.4%	34.4%	32.8%	100.0%
		% within Q20	11.8%	8.9%	12.9%	16.9%	12.5%
Total		Count	51	168	171	124	514
		% within Q2	9.9%	32.7%	33.3%	24.1%	100.0%
		% within Q20	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.249(a)	3	0.236
Likelihood Ratio	4.231	3	0.238
Linear-by-Linear Association	2.988	1	0.084
N of Valid Cases	514		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.35.

TABLE 82.--Analysis of Q3,Q16

Q3categorized,Q16 Crosstabulation

			Q16				
			Less than 4 weeks after the debonding appointment	Between 1 month to 2 months after the debonding appointment	Greater than 2 months after the debonding appointment	There are no retention appointments ; Patient has been dismissed	Total
Q3categorized	0-15 years	Count	27	135	31	0	193
		% within Q3categorized	14.0%	69.9%	16.1%	0.0%	100.0 %
		% within Q16	21.4%	31.6%	31.0%	0.0%	29.5%
	16-25 years	Count	33	139	31	0	203
		% within Q3categorized	16.3%	68.5%	15.3%	0.0%	100.0 %
		% within Q16	26.2%	32.6%	31.0%	0.0%	31.0%
	>25 years	Count	66	153	38	1	258
		% within Q3categorized	25.6%	59.3%	14.7%	0.4%	100.0 %
		% within Q16	52.4%	35.8%	38.0%	100.0%	39.4%
Total		Count	126	427	100	1	654
		% within Q3categorized	19.3%	65.3%	15.3%	0.2%	100.0 %
		% within Q16	100.0%	100.0%	100.0%	100.0%	100.0 %

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.121(a)	6	0.041
Likelihood Ratio	13.319	6	0.038
Linear-by-Linear Association	4.889	1	0.027
N of Valid Cases	654		

a. 3 cells (25.0%) have expected count less than 5. The minimum expected count is .30.

TABLE 83.--Analysis of Q3,Q17

Q3categorized,Q17 Crosstabulation

			Q17				
			Less than 3 months after the 1st appointment	3-5 months after the 1st appointment	6 months or greater after the 1st appointment	No 2nd appointment ; Patient has been dismissed	Total
Q3categorized	0-15 years	Count	35	101	58	1	195
		% within Q3categorized	17.9%	51.8%	29.7%	0.5%	100.0%
		% within Q17	21.9%	32.4%	33.9%	7.7%	29.7%
	16-25 years	Count	51	103	45	4	203
		% within Q3categorized	25.1%	50.7%	22.2%	2.0%	100.0%
		% within Q17	31.9%	33.0%	26.3%	30.8%	30.9%
	>25 years	Count	74	108	68	8	258
		% within Q3categorized	28.7%	41.9%	26.4%	3.1%	100.0%
		% within Q17	46.3%	34.6%	39.8%	61.5%	39.3%
Total		Count	160	312	171	13	656
		% within Q3categorized	24.4%	47.6%	26.1%	2.0%	100.0%
		% within Q17	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.197(a)	6	0.028
Likelihood Ratio	15.154	6	0.019
Linear-by-Linear Association	1.324	1	0.250
N of Valid Cases	656		

a. 2 cells (16.7%) have expected count less than 5. The minimum expected count is 3.86.

TABLE 84.--Analysis of Q3,Q18

Q3categorized,Q18 Crosstabulation

			Q18				
			Less than 6 months after the 2nd appointment	6 months to 11 months after the 2nd appointment	1 year or greater after the 2nd appointment	No 3rd appointment ; Patient has been dismissed	Total
Q3categorized	0-15 years	Count	54	102	27	11	194
		% within Q3categorized	27.8%	52.6%	13.9%	5.7%	100.0%
		% within Q18	25.5%	31.5%	33.3%	44.0%	30.2%
	16-25 years	Count	73	102	18	6	199
		% within Q3categorized	36.7%	51.3%	9.0%	3.0%	100.0%
		% within Q18	34.4%	31.5%	22.2%	24.0%	31.0%
	>25 years	Count	85	120	36	8	249
		% within Q3categorized	34.1%	48.2%	14.5%	3.2%	100.0%
		% within Q18	40.1%	37.0%	44.4%	32.0%	38.8%
Total		Count	212	324	81	25	642
		% within Q3categorized	33.0%	50.5%	12.6%	3.9%	100.0%
		% within Q18	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.137(a)	6	0.228
Likelihood Ratio	8.239	6	0.221
Linear-by-Linear Association	1.695	1	0.193
N of Valid Cases	642		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.55.

TABLE 85.--Analysis of Q3,Q19

Q3categorized,Q19 Crosstabulation

			Q19				
			Less than 6 months after the 3rd appointment	6 months to 11 months after the 3rd appointment	1 year or greater after the 3rd appointment	No 4th appointment ; Patient has been dismissed	Total
Q3categorized	0-15 years	Count	23	78	46	35	182
		% within Q3categorized	12.6%	42.9%	25.3%	19.2%	100.0%
		% within Q19	23.7%	30.2%	28.0%	36.1%	29.5%
	16-25 years	Count	39	72	57	25	193
		% within Q3categorized	20.2%	37.3%	29.5%	13.0%	100.0%
		% within Q19	40.2%	27.9%	34.8%	25.8%	31.3%
	>25 years	Count	35	108	61	37	241
		% within Q3categorized	14.5%	44.8%	25.3%	15.4%	100.0%
		% within Q19	36.1%	41.9%	37.2%	38.1%	39.1%
Total		Count	97	258	164	97	616
		% within Q3categorized	15.7%	41.9%	26.6%	15.7%	100.0%
		% within Q19	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.563(a)	6	0.200
Likelihood Ratio	8.427	6	0.208
Linear-by-Linear Association	0.887	1	0.346
N of Valid Cases	616		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 28.66.

TABLE 86.--Analysis of Q3,Q20

Q3categorized,Q20 Crosstabulation

			Q20				
			Less than 6 months after the 4th appointment	6 months to 11 months after the 4th appointment	1 year or greater after the 4th appointment	No 5th appointment ; Patient has been dismissed	Total
Q3categorized	0-15 years	Count	7	47	51	41	146
		% within Q3categorized	4.8%	32.2%	34.9%	28.1%	100.0%
		% within Q20	13.7%	27.6%	30.0%	32.8%	28.3%
	16-25 years	Count	26	51	48	42	167
		% within Q3categorized	15.6%	30.5%	28.7%	25.1%	100.0%
		% within Q20	51.0%	30.0%	28.2%	33.6%	32.4%
	>25 years	Count	18	72	71	42	203
		% within Q3categorized	8.9%	35.5%	35.0%	20.7%	100.0%
		% within Q20	35.3%	42.4%	41.8%	33.6%	39.3%
Total		Count	51	170	170	125	516
		% within Q3categorized	9.9%	32.9%	32.9%	24.2%	100.0%
		% within Q20	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.537(a)	6	0.035
Likelihood Ratio	13.671	6	0.034
Linear-by-Linear Association	2.912	1	0.088
N of Valid Cases	516		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.43.

TABLE 87.--Analysis of Q4,Q16

Q4,Q16 Crosstabulation

			Q16				
			Less than 4 weeks after the debonding appointment	Between 1 month to 2 months after the debonding appointment	Greater than 2 months after the debonding appointment	There are no retention appointments; Patient has been dismis	Total
Q4	<150 debonds	Count	46	144	11	0	201
		% within Q4	22.9%	71.6%	5.5%	0.0%	100.0%
		% within Q16	38.3%	33.7%	11.2%	0.0%	31.1%
	150-300 debonds	Count	55	204	51	0	310
		% within Q4	17.7%	65.8%	16.5%	0.0%	100.0%
		% within Q16	45.8%	47.8%	52.0%	0.0%	48.0%
	>300 debonds	Count	19	79	36	1	135
		% within Q4	14.1%	58.5%	26.7%	0.7%	100.0%
		% within Q16	15.8%	18.5%	36.7%	100.0%	20.9%
Total		Count	120	427	98	1	646
		% within Q4	18.6%	66.1%	15.2%	0.2%	100.0%
		% within Q16	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	34.053(a)	6	0.000
Likelihood Ratio	35.316	6	0.000
Linear-by-Linear Association	23.887	1	0.000
N of Valid Cases	646		

a. 3 cells (25.0%) have expected count less than 5. The minimum expected count is .21.

TABLE 88.--Analysis of Q4,Q17

Q4,Q17 Crosstabulation

			Q17				
			Less than 3 months after the 1st appointment	3-5 months after the 1st appointment	6 months or greater after the 1st appointment	No 2nd appointment; Patient has been dismissed	Total
Q4	<150 debonds	Count	70	102	30	0	202
		% within Q4	34.7%	50.5%	14.9%	0.0%	100.0%
		% within Q17	44.9%	32.7%	18.0%	0.0%	31.2%
	150-300 debonds	Count	62	152	90	6	310
		% within Q4	20.0%	49.0%	29.0%	1.9%	100.0%
		% within Q17	39.7%	48.7%	53.9%	46.2%	47.8%
	>300 debonds	Count	24	58	47	7	136
		% within Q4	17.6%	42.6%	34.6%	5.1%	100.0%
		% within Q17	15.4%	18.6%	28.1%	53.8%	21.0%
Total		Count	156	312	167	13	648
		% within Q4	24.1%	48.1%	25.8%	2.0%	100.0%
		% within Q17	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	40.447(a)	6	0.000
Likelihood Ratio	42.979	6	0.000
Linear-by-Linear Association	34.168	1	0.000
N of Valid Cases	648		

a. 2 cells (16.7%) have expected count less than 5. The minimum expected count is 2.73.

TABLE 89.--Analysis of Q4,Q18

Q4,Q18 Crosstabulation

			Q18				
			Less than 6 months after the 2nd appointment	6 months to 11 months after the 2nd appointment	1 year or greater after the 2nd appointment	No 3rd appointment; Patient has been dismissed	Total
Q4	<150 debonds	Count	94	91	13	4	202
		% within Q4	46.5%	45.0%	6.4%	2.0%	100.0%
		% within Q18	44.5%	28.4%	16.3%	17.4%	31.9%
	150-300 debonds	Count	90	167	38	8	303
		% within Q4	29.7%	55.1%	12.5%	2.6%	100.0%
		% within Q18	42.7%	52.2%	47.5%	34.8%	47.8%
	>300 debonds	Count	27	62	29	11	129
		% within Q4	20.9%	48.1%	22.5%	8.5%	100.0%
		% within Q18	12.8%	19.4%	36.3%	47.8%	20.3%
Total		Count	211	320	80	23	634
		% within Q4	33.3%	50.5%	12.6%	3.6%	100.0%
		% within Q18	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	47.286(a)	6	0.000
Likelihood Ratio	44.533	6	0.000
Linear-by-Linear Association	40.163	1	0.000
N of Valid Cases	634		

a. 1 cells (8.3%) have expected count less than 5. The minimum expected count is 4.68.

TABLE 90.--Analysis of Q4,Q19

Q4,Q19 Crosstabulation

			Q19				
			Less than 6 months after the 3rd appointment	6 months to 11 months after the 3rd appointment	1 year or greater after the 3rd appointment	No 4th appointment; Patient has been dismissed	Total
Q4	<150 debonds	Count	44	81	47	26	198
		% within Q4	22.2%	40.9%	23.7%	13.1%	100.0%
		% within Q19	45.8%	31.9%	29.0%	26.5%	32.5%
	150-300 debonds	Count	43	123	77	51	294
		% within Q4	14.6%	41.8%	26.2%	17.3%	100.0%
		% within Q19	44.8%	48.4%	47.5%	52.0%	48.2%
	>300 debonds	Count	9	50	38	21	118
		% within Q4	7.6%	42.4%	32.2%	17.8%	100.0%
		% within Q19	9.4%	19.7%	23.5%	21.4%	19.3%
Total		Count	96	254	162	98	610
		% within Q4	15.7%	41.6%	26.6%	16.1%	100.0%
		% within Q19	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.103(a)	6	0.029
Likelihood Ratio	14.660	6	0.023
Linear-by-Linear Association	9.406	1	0.002
N of Valid Cases	610		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.57.

TABLE 91.--Analysis of Q4,Q20

Q4,Q20 Crosstabulation

			Q20				
			Less than 6 months after the 4th appointment	6 months to 11 months after the 4th appointment	1 year or greater after the 4th appointment	No 5th appointment; Patient has been dismissed	Total
Q20	<150 debonds	Count	25	59	52	35	171
		% within Q4	14.6%	34.5%	30.4%	20.5%	100.0%
		% within Q20	50.0%	35.1%	31.1%	28.2%	33.6%
	150-300 debonds	Count	22	78	86	56	242
		% within Q4	9.1%	32.2%	35.5%	23.1%	100.0%
		% within Q20	44.0%	46.4%	51.5%	45.2%	47.5%
	>300 debonds	Count	3	31	29	33	96
		% within Q4	3.1%	32.3%	30.2%	34.4%	100.0%
		% within Q20	6.0%	18.5%	17.4%	26.6%	18.9%
Total		Count	50	168	167	124	509
		% within Q4	9.8%	33.0%	32.8%	24.4%	100.0%
		% within Q20	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.907(a)	6	0.021
Likelihood Ratio	15.597	6	0.016
Linear-by-Linear Association	10.466	1	0.001
N of Valid Cases	509		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.43.

TABLE 92.--Analysis of Q5,Q6

Q5categorized,Q6 Crosstabulation

			Q6		Total
			Yes	No	
Q5categorized	Clear	Count	136	57	193
		% within Q5categorized	70.5%	29.5%	100.0%
		% within Q6	26.5%	49.6%	30.7%
	Hawley	Count	333	45	378
		% within Q5categorized	88.1%	11.9%	100.0%
		% within Q6	64.8%	39.1%	60.1%
	Other	Count	45	13	58
		% within Q5categorized	77.6%	22.4%	100.0%
		% within Q6	8.8%	11.3%	9.2%
Total		Count	514	115	629
		% within Q5categorized	81.7%	18.3%	100.0%
		% within Q6	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	27.307(a)	2	0.000
Likelihood Ratio	26.448	2	0.000
Linear-by-Linear Association	11.232	1	0.001
N of Valid Cases	629		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.60.

TABLE 93.--Analysis of Q5,Q7

Q5categorized * Q7categorized Crosstabulation

			Q7categorized			
			Full time for <3months	Full time for 3months-9months	Full time for >9months	Total
Q5categorized	Clear	Count	78	48	14	140
		% within Q5categorized	55.7%	34.3%	10.0%	100.0%
		% within Q7categorized	53.1%	17.2%	15.1%	27.0%
	Hawley	Count	58	204	71	333
		% within Q5categorized	17.4%	61.3%	21.3%	100.0%
		% within Q7categorized	39.5%	73.1%	76.3%	64.2%
	Other	Count	11	27	8	46
		% within Q5categorized	23.9%	58.7%	17.4%	100.0%
		% within Q7categorized	7.5%	9.7%	8.6%	8.9%
Total		Count	147	279	93	519
		% within Q5categorized	28.3%	53.8%	17.9%	100.0%
		% within Q7categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	72.013(a)	4	0.000
Likelihood Ratio	68.172	4	0.000
Linear-by-Linear Association	34.313	1	0.000
N of Valid Cases	519		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.24.

TABLE 94.--Analysis of Q5,Q8

Q5categorized * Q8categorized Crosstabulation

			Q8categorized			
			Around 16 hours/day	Around 8 hours/day	Other	Total
Q5categorized	Clear	Count	19	121	44	184
		% within Q5categorized	10.3%	65.8%	23.9%	100.0%
		% within Q8categorized	29.7%	34.0%	38.9%	34.5%
	Hawley	Count	37	208	61	306
		% within Q5categorized	12.1%	68.0%	19.9%	100.0%
		% within Q8categorized	57.8%	58.4%	54.0%	57.4%
	Other	Count	8	27	8	43
		% within Q5categorized	18.6%	62.8%	18.6%	100.0%
		% within Q8categorized	12.5%	7.6%	7.1%	8.1%
Total		Count	64	356	113	533
		% within Q5categorized	12.0%	66.8%	21.2%	100.0%
		% within Q8categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.196(a)	4	0.525
Likelihood Ratio	2.979	4	0.561
Linear-by-Linear Association	2.356	1	0.125
N of Valid Cases	533		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.16.

TABLE 95.--Analysis of Q5,Q9

Q5categorized * Q9categorized Crosstabulation

			Q9categorized					
			Clear	Hawley	Spring Aligner	Fixed Lingual	Other	Total
Q5categorized	Clear	Count	111	9	6	66	7	199
		% within Q5categorized	55.8%	4.5%	3.0%	33.2%	3.5%	100.0%
		% within Q9categorized	93.3%	4.9%	10.3%	25.2%	23.3%	30.5%
	Hawley	Count	6	174	45	154	0	379
		% within Q5categorized	1.6%	45.9%	11.9%	40.6%	0.0%	100.0%
		% within Q9categorized	5.0%	95.1%	77.6%	58.8%	0.0%	58.1%
	Other	Count	2	0	7	42	23	74
		% within Q5categorized	2.7%	0.0%	9.5%	56.8%	31.1%	100.0%
		% within Q9categorized	1.7%	0.0%	12.1%	16.0%	76.7%	11.3%
Total		Count	119	183	58	262	30	652
		% within Q5categorized	18.3%	28.1%	8.9%	40.2%	4.6%	100.0%
		% within Q9categorized	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	473.881(a)	8	0.000
Likelihood Ratio	454.479	8	0.000
Linear-by-Linear Association	118.898	1	0.000
N of Valid Cases	652		

a. 1 cells (6.7%) have expected count less than 5. The minimum expected count is 3.40.

TABLE 96.--Analysis of Q5,Q16

Q5categorized,Q16 Crosstabulation

			Q16				
			Less than 4 weeks after the debonding appointment	Between 1 month to 2 months after the debonding appointment	Greater than 2 months after the debonding appointment	There are no retention appointments ; Patient has been dismis	Total
Q5categorized	Clear	Count	38	121	38	1	198
		% within Q5categorized	19.2%	61.1%	19.2%	0.5%	100.0 %
		% within Q16	30.4%	28.3%	38.4%	100.0%	30.3%
	Hawley	Count	66	268	46	0	380
		% within Q5categorized	17.4%	70.5%	12.1%	0.0%	100.0 %
		% within Q16	52.8%	62.6%	46.5%	0.0%	58.2%
	Other	Count	21	39	15	0	75
		% within Q5categorized	28.0%	52.0%	20.0%	0.0%	100.0 %
		% within Q16	16.8%	9.1%	15.2%	0.0%	11.5%
Total		Count	125	428	99	1	653
		% within Q5categorized	19.1%	65.5%	15.2%	0.2%	100.0 %
		% within Q16	100.0%	100.0%	100.0%	100.0%	100.0 %

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.750(a)	6	0.015
Likelihood Ratio	15.513	6	0.017
Linear-by-Linear Association	1.801	1	0.180
N of Valid Cases	653		

a. 3 cells (25.0%) have expected count less than 5. The minimum expected count is .11.

TABLE 97.--Analysis of Q5,Q17

Q5categorized,Q17 Crosstabulation

			Q17				
			Less than 3 months after the 1st appointment	3-5 months after the 1st appointment	6 months or greater after the 1st appointment	No 2nd appointment ; Patient has been dismissed	Total
Q5categorized	Clear	Count	38	98	57	6	199
		% within Q5categorized	19.1%	49.2%	28.6%	3.0%	100.0%
		% within Q17	23.9%	31.3%	33.5%	46.2%	30.4%
	Hawley	Count	101	187	88	5	381
		% within Q5categorized	26.5%	49.1%	23.1%	1.3%	100.0%
		% within Q17	63.5%	59.7%	51.8%	38.5%	58.2%
	Other	Count	20	28	25	2	75
		% within Q5categorized	26.7%	37.3%	33.3%	2.7%	100.0%
		% within Q17	12.6%	8.9%	14.7%	15.4%	11.5%
Total		Count	159	313	170	13	655
		% within Q5categorized	24.3%	47.8%	26.0%	2.0%	100.0%
		% within Q17	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.531(a)	6	0.104
Likelihood Ratio	10.668	6	0.099
Linear-by-Linear Association	1.549	1	0.213
N of Valid Cases	655		

a. 2 cells (16.7%) have expected count less than 5. The minimum expected count is 1.49.

TABLE 98.--Analysis of Q5,Q18

Q5categorized,Q18 Crosstabulation

			Q18				
			Less than 6 months after the 2nd appointment	6 months to 11 months after the 2nd appointment	1 year or greater after the 2nd appointment	No 3rd appointment ; Patient has been dismissed	Total
Q5categorized	Clear	Count	50	103	31	8	192
		% within Q5categorized	26.0%	53.6%	16.1%	4.2%	100.0%
		% within Q18	23.7%	31.7%	38.8%	32.0%	30.0%
	Hawley	Count	137	188	42	9	376
		% within Q5categorized	36.4%	50.0%	11.2%	2.4%	100.0%
		% within Q18	64.9%	57.8%	52.5%	36.0%	58.7%
	Other	Count	24	34	7	8	73
		% within Q5categorized	32.9%	46.6%	9.6%	11.0%	100.0%
		% within Q18	11.4%	10.5%	8.8%	32.0%	11.4%
Total		Count	211	325	80	25	641
		% within Q5categorized	32.9%	50.7%	12.5%	3.9%	100.0%
		% within Q18	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.404(a)	6	0.004
Likelihood Ratio	16.708	6	0.010
Linear-by-Linear Association	1.176	1	0.278
N of Valid Cases	641		

a. 1 cells (8.3%) have expected count less than 5. The minimum expected count is 2.85.

TABLE 99.--Analysis of Q5,Q19

Q5categorized,Q19 Crosstabulation

			Q19				
			Less than 6 months after the 3rd appointment	6 months to 11 months after the 3rd appointment	1 year or greater after the 3rd appointment	No 4th appointment ; Patient has been dismissed	Total
Q5categorized	Clear	Count	27	66	51	40	184
		% within Q5categorized	14.7%	35.9%	27.7%	21.7%	100.0%
		% within Q19	27.8%	25.7%	30.9%	41.7%	29.9%
	Hawley	Count	56	161	105	44	366
		% within Q5categorized	15.3%	44.0%	28.7%	12.0%	100.0%
		% within Q19	57.7%	62.6%	63.6%	45.8%	59.5%
	Other	Count	14	30	9	12	65
		% within Q5categorized	21.5%	46.2%	13.8%	18.5%	100.0%
		% within Q19	14.4%	11.7%	5.5%	12.5%	10.6%
Total		Count	97	257	165	96	615
		% within Q5categorized	15.8%	41.8%	26.8%	15.6%	100.0%
		% within Q19	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.221(a)	6	0.013
Likelihood Ratio	16.777	6	0.010
Linear-by-Linear Association	6.100	1	0.014
N of Valid Cases	615		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.15.

TABLE 100.--Analysis of Q5,Q20

Q5categorized,Q20 Crosstabulation

			Q20				
			Less than 6 months after the 4th appointment	6 months to 11 months after the 4th appointment	1 year or greater after the 4th appointment	No 5th appointment ; Patient has been dismissed	Total
Q5categorized	Clear	Count	16	43	37	47	143
		% within Q5categorized	11.2%	30.1%	25.9%	32.9%	100.0%
		% within Q20	31.4%	25.4%	21.6%	37.6%	27.7%
	Hawley	Count	29	107	123	61	320
		% within Q5categorized	9.1%	33.4%	38.4%	19.1%	100.0%
		% within Q20	56.9%	63.3%	71.9%	48.8%	62.0%
	Other	Count	6	19	11	17	53
		% within Q5categorized	11.3%	35.8%	20.8%	32.1%	100.0%
		% within Q20	11.8%	11.2%	6.4%	13.6%	10.3%
Total		Count	51	169	171	125	516
		% within Q5categorized	9.9%	32.8%	33.1%	24.2%	100.0%
		% within The 5th appointment is scheduled how long after the 4th a...	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.810(a)	6	0.007
Likelihood Ratio	17.946	6	0.006
Linear-by-Linear Association	0.822	1	0.365
N of Valid Cases	516		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.24.

TABLE 101.--Analysis of Q9,Q10

Q9categorized,Q10 Crosstabulation

			Q10		
			Yes	No	Total
Q9categorized	Clear	Count	80	36	116
		% within Q9categorized	69.0%	31.0%	100.0%
		% within Q10	25.6%	48.6%	30.1%
	Hawley	Count	160	24	184
		% within Q9categorized	87.0%	13.0%	100.0%
		% within Q10	51.3%	32.4%	47.7%
	Spring Aligner	Count	51	7	58
		% within Q9categorized	87.9%	12.1%	100.0%
		% within Q10	16.3%	9.5%	15.0%
	Other	Count	21	7	28
		% within Q9categorized	75.0%	25.0%	100.0%
		% within Q10	6.7%	9.5%	7.3%
Total		Count	312	74	386
		% within Q9categorized	80.8%	19.2%	100.0%
		% within Q10	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.496(a)	3	0.001
Likelihood Ratio	16.868	3	0.001
Linear-by-Linear Association	2.558	1	0.110
N of Valid Cases	386		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.37.

TABLE 102.--Analysis of Q9,Q11

Q9categorized * Q11categorized Crosstabulation

			Q11categorized			
			Full time for <3months	Full time for 3months-9months	Full time for >9months	Total
Q9categorized	Clear	Count	48	30	3	81
		% within Q9categorized	59.3%	37.0%	3.7%	100.0%
		% within Q11categorized	52.7%	18.1%	5.6%	26.0%
	Hawley	Count	23	95	40	158
		% within Q9categorized	14.6%	60.1%	25.3%	100.0%
		% within Q11categorized	25.3%	57.2%	74.1%	50.8%
	Spring Aligner	Count	12	30	9	51
		% within Q9categorized	23.5%	58.8%	17.6%	100.0%
		% within Q11categorized	13.2%	18.1%	16.7%	16.4%
	Other	Count	8	11	2	21
		% within Q9categorized	38.1%	52.4%	9.5%	100.0%
		% within Q11categorized	8.8%	6.6%	3.7%	6.8%
Total		Count	91	166	54	311
		% within Q9categorized	29.3%	53.4%	17.4%	100.0%
		% within Q11categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	58.612(a)	6	0.000
Likelihood Ratio	59.523	6	0.000
Linear-by-Linear Association	5.416	1	0.020
N of Valid Cases	311		

a. 1 cells (8.3%) have expected count less than 5. The minimum expected count is 3.65.

TABLE 103.--Analysis of Q9,Q12

Q9categorized * Q12categorized Crosstabulation

			Q12categorized			
			Around 16 hours/day	Around 8 hours/day	Other	Total
Q9categorized	Clear	Count	9	75	27	111
		% within Q9categorized	8.1%	67.6%	24.3%	100.0%
		% within Q12categorized	22.0%	34.9%	39.7%	34.3%
	Hawley	Count	24	96	29	149
		% within Q9categorized	16.1%	64.4%	19.5%	100.0%
		% within Q12categorized	58.5%	44.7%	42.6%	46.0%
	Spring Aligner	Count	5	32	7	44
		% within Q9categorized	11.4%	72.7%	15.9%	100.0%
		% within Q12categorized	12.2%	14.9%	10.3%	13.6%
	Other	Count	3	12	5	20
		% within Q9categorized	15.0%	60.0%	25.0%	100.0%
		% within Q12categorized	7.3%	5.6%	7.4%	6.2%
Total		Count	41	215	68	324
		% within Q9categorized	12.7%	66.4%	21.0%	100.0%
		% within Q12categorized	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.309(a)	6	0.505
Likelihood Ratio	5.473	6	0.485
Linear-by-Linear Association	0.801	1	0.371
N of Valid Cases	324		

a. 2 cells (16.7%) have expected count less than 5. The minimum expected count is 2.53.

TABLE 104.--Analysis of Q9,Q16

Q9categorized,Q16 Crosstabulation

			Q16				
			Less than 4 weeks after the debonding appointment	Between 1 month to 2 months after the debonding appointment	Greater than 2 months after the debonding appointment	There are no retention appointments; Patient has been dismis	Total
Q9categorized	Clear	Count	26	70	21	1	118
		% within Q9categorized	22.0%	59.3%	17.8%	0.8%	100.0 %
		% within Q16	21.0%	16.4%	21.2%	100.0%	18.1%
	Hawley	Count	32	130	22	0	184
		% within Q9categorized	17.4%	70.7%	12.0%	0.0%	100.0 %
		% within Q16	25.8%	30.4%	22.2%	0.0%	28.2%
	Spring Aligner	Count	11	38	8	0	57
		% within Q9categorized	19.3%	66.7%	14.0%	0.0%	100.0 %
		% within Q16	8.9%	8.9%	8.1%	0.0%	8.7%
	Fixed Lingual	Count	48	169	46	0	263
		% within Q9categorized	18.3%	64.3%	17.5%	0.0%	100.0 %
		% within Q16	38.7%	39.5%	46.5%	0.0%	40.3%
	Other	Count	7	21	2	0	30
		% within Q9categorized	23.3%	70.0%	6.7%	0.0%	100.0 %
		% within Q16	5.6%	4.9%	2.0%	0.0%	4.6%
Total		Count	124	428	99	1	652
		% within Q9categorized	19.0%	65.6%	15.2%	0.2%	100.0 %
		% within Q16	100.0%	100.0%	100.0%	100.0%	100.0 %

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.514(a)	12	0.485
Likelihood Ratio	10.789	12	0.547
Linear-by-Linear Association	0.001	1	0.976
N of Valid Cases	652		

a. 6 cells (30.0%) have expected count less than 5. The minimum expected count is .05.

TABLE 105.--Analysis of Q9,Q17

Q9categorized,Q17 Crosstabulation

			Q17				
			Less than 3 months after the 1st appointment	3-5 months after the 1st appointment	6 months or greater after the 1st appointment	No 2nd appointment ; Patient has been dismissed	Total
Q9categorized	Clear	Count	26	57	32	4	119
		% within Q9categorized	21.8%	47.9%	26.9%	3.4%	100.0 %
		% within Q17	16.4%	18.3%	18.8%	30.8%	18.2%
	Hawley	Count	50	96	35	3	184
		% within Q9categorized	27.2%	52.2%	19.0%	1.6%	100.0 %
		% within Q17	31.4%	30.8%	20.6%	23.1%	28.1%
	Spring Aligner	Count	18	25	12	3	58
		% within Q9categorized	31.0%	43.1%	20.7%	5.2%	100.0 %
		% within Q17	11.3%	8.0%	7.1%	23.1%	8.9%
	Fixed Lingual	Count	59	116	85	3	263
		% within Q9categorized	22.4%	44.1%	32.3%	1.1%	100.0 %
		% within Q17	37.1%	37.2%	50.0%	23.1%	40.2%
	Other	Count	6	18	6	0	30
		% within Q9categorized	20.0%	60.0%	20.0%	0.0%	100.0 %
		% within Q17	3.8%	5.8%	3.5%	0.0%	4.6%
Total		Count	159	312	170	13	654
		% within Q9categorized	24.3%	47.7%	26.0%	2.0%	100.0 %
		% within Q17	100.0%	100.0%	100.0%	100.0%	100.0 %

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.621(a)	12	0.075
Likelihood Ratio	19.291	12	0.082
Linear-by-Linear Association	0.580	1	0.446
N of Valid Cases	654		

a. 4 cells (20.0%) have expected count less than 5. The minimum expected count is .60.

TABLE 106.--Analysis of Q9,Q18

Q9categorized,Q18 Crosstabulation

			Q18				
			Less than 6 months after the 2nd appointment	6 months to 11 months after the 2nd appointment	1 year or greater after the 2nd appointment	No 3rd appointment; Patient has been dismissed	Total
Q9categorized	Clear	Count	33	58	18	5	114
		% within Q9categorized	28.9%	50.9%	15.8%	4.4%	100.0%
		% within Q18	15.6%	18.0%	22.2%	20.0%	17.8%
	Hawley	Count	69	93	16	3	181
		% within Q9categorized	38.1%	51.4%	8.8%	1.7%	100.0%
		% within Q18	32.7%	28.8%	19.8%	12.0%	28.3%
	Spring Aligner	Count	27	21	6	1	55
		% within Q9categorized	49.1%	38.2%	10.9%	1.8%	100.0%
		% within Q18	12.8%	6.5%	7.4%	4.0%	8.6%
	Fixed Lingual	Count	73	135	38	14	260
		% within Q9categorized	28.1%	51.9%	14.6%	5.4%	100.0%
		% within Q18	34.6%	41.8%	46.9%	56.0%	40.6%
	Other	Count	9	16	3	2	30
		% within Q9categorized	30.0%	53.3%	10.0%	6.7%	100.0%
		% within Q18	4.3%	5.0%	3.7%	8.0%	4.7%
Total		Count	211	323	81	25	640
		% within Q9categorized	33.0%	50.5%	12.7%	3.9%	100.0%
		% within Q18	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.277(a)	12	0.082
Likelihood Ratio	19.623	12	0.075
Linear-by-Linear Association	2.025	1	0.155
N of Valid Cases	640		

a. 4 cells (20.0%) have expected count less than 5. The minimum expected count is 1.17.

TABLE 107.--Analysis of Q9,Q19

Q9categorized,Q19 Crosstabulation

			Q19				
			Less than 6 months after the 3rd appointment	6 months to 11 months after the 3rd appointment	1 year or greater after the 3rd appointment	No 4th appointment; Patient has been dismissed	Total
Q9categorized	Clear	Count	19	44	27	19	109
		% within Q9categorized	17.4%	40.4%	24.8%	17.4%	100.0%
		% within Q19	19.6%	17.3%	16.4%	19.6%	17.8%
	Hawley	Count	28	76	51	23	178
		% within Q9categorized	15.7%	42.7%	28.7%	12.9%	100.0%
		% within Q19	28.9%	29.8%	30.9%	23.7%	29.0%
	Spring Aligner	Count	15	21	12	6	54
		% within Q9categorized	27.8%	38.9%	22.2%	11.1%	100.0%
		% within Q19	15.5%	8.2%	7.3%	6.2%	8.8%
	Fixed Lingual	Count	32	103	70	40	245
		% within Q9categorized	13.1%	42.0%	28.6%	16.3%	100.0%
		% within Q19	33.0%	40.4%	42.4%	41.2%	39.9%
	Other	Count	3	11	5	9	28
		% within Q9categorized	10.7%	39.3%	17.9%	32.1%	100.0%
		% within Q19	3.1%	4.3%	3.0%	9.3%	4.6%
Total		Count	97	255	165	97	614
		% within Q9categorized	15.8%	41.5%	26.9%	15.8%	100.0%
		% within Q19	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.523(a)	12	0.214
Likelihood Ratio	13.917	12	0.306
Linear-by-Linear Association	1.678	1	0.195
N of Valid Cases	614		

a. 2 cells (10.0%) have expected count less than 5. The minimum expected count is 4.42.

TABLE 108.--Analysis of Q9,Q20

Q9categorized,Q20 Crosstabulation

			Q20				
			Less than 6 months after the 4th appointment	6 months to 11 months after the 4th appointment	1 year or greater after the 4th appointment	No 5th appointment; Patient has been dismissed	Total
Q9categorized	Clear	Count	10	29	23	27	89
		% within Q9categorized	11.2%	32.6%	25.8%	30.3%	100.0%
		% within Q20	19.6%	17.2%	13.6%	21.6%	17.3%
	Hawley	Count	14	53	48	39	154
		% within Q9categorized	9.1%	34.4%	31.2%	25.3%	100.0%
		% within Q20	27.5%	31.4%	28.4%	31.2%	30.0%
	Spring Aligner	Count	8	19	10	10	47
		% within Q9categorized	17.0%	40.4%	21.3%	21.3%	100.0%
		% within Q20	15.7%	11.2%	5.9%	8.0%	9.1%
	Fixed Lingual	Count	18	63	85	39	205
		% within Q9categorized	8.8%	30.7%	41.5%	19.0%	100.0%
		% within Q20	35.3%	37.3%	50.3%	31.2%	39.9%
	Other	Count	1	5	3	10	19
		% within Q9categorized	5.3%	26.3%	15.8%	52.6%	100.0%
		% within Q20	2.0%	3.0%	1.8%	8.0%	3.7%
Total		Count	51	169	169	125	514
		% within Q9categorized	9.9%	32.9%	32.9%	24.3%	100.0%
		% within Q20	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.676(a)	12	0.016
Likelihood Ratio	23.272	12	0.026
Linear-by-Linear Association	0.065	1	0.798
N of Valid Cases	514		

a. 3 cells (15.0%) have expected count less than 5. The minimum expected count is 1.89.

TABLE 109.--Analysis of Q1,Q2

Q1,Q2: Crosstabulation

			Q2		
			Male	Female	Total
Q1	1 Northeast	Count	118	24	142
		% within Q1	83.1%	16.9%	100.0%
		% within Q2	20.9%	27.9%	21.8%
	2 South	Count	139	25	164
		% within Q1	84.8%	15.2%	100.0%
		% within Q2	24.6%	29.1%	25.2%
	3 Midwest	Count	174	21	195
		% within Q1	89.2%	10.8%	100.0%
		% within Q2	30.9%	24.4%	30.0%
	4 West	Count	133	16	149
		% within Q1	89.3%	10.7%	100.0%
		% within Q2	23.6%	18.6%	22.9%
Total		Count	564	86	650
		% within Q1	86.8%	13.2%	100.0%
		% within Q2	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.081(a)	3	0.253
Likelihood Ratio	4.051	3	0.256
N of Valid Cases	650		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.79.

TABLE 110.--Analysis of Q1,Q3

Q1,Q3: Crosstabulation

			Q3				
			0-5 years	6-15 years	16-25 years	>25 years	Total
Q1	1 Northeast	Count	3	35	49	56	143
		% within Q1	2.1%	24.5%	34.3%	39.2%	100.0%
		% within Q3	11.5%	21.0%	24.3%	21.8%	21.9%
	2 South	Count	12	41	50	61	164
		% within Q1	7.3%	25.0%	30.5%	37.2%	100.0%
		% within Q3	46.2%	24.6%	24.8%	23.7%	25.2%
	3 Midwest	Count	6	47	57	86	196
		% within Q1	3.1%	24.0%	29.1%	43.9%	100.0%
		% within Q3	23.1%	28.1%	28.2%	33.5%	30.1%
	4 West	Count	5	44	46	54	149
		% within Q1	3.4%	29.5%	30.9%	36.2%	100.0%
		% within Q3	19.2%	26.3%	22.8%	21.0%	22.9%
Total		Count	26	167	202	257	652
		% within Q1	4.0%	25.6%	31.0%	39.4%	100.0%
		% within Q3	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.922(a)	9	0.357
Likelihood Ratio	9.258	9	0.414
N of Valid Cases	652		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.70.

TABLE 111.--Analysis of Q1,Q4

Q1,Q4: Crosstabulation

			Q4			
			<150 debonds	150-300 debonds	>300 debonds	Total
Q1	1 Northeast	Count	49	70	20	139
		% within Q1	35.3%	50.4%	14.4%	100.0%
		% within Q4	24.5%	22.7%	14.9%	21.6%
	2 South	Count	52	69	39	160
		% within Q1	32.5%	43.1%	24.4%	100.0%
		% within Q4	26.0%	22.3%	29.1%	24.9%
	3 Midwest	Count	51	91	53	195
		% within Q1	26.2%	46.7%	27.2%	100.0%
		% within Q4	25.5%	29.4%	39.6%	30.3%
	4 West	Count	48	79	22	149
		% within Q1	32.2%	53.0%	14.8%	100.0%
		% within Q4	24.0%	25.6%	16.4%	23.2%
Total		Count	200	309	134	643
		% within Q1	31.1%	48.1%	20.8%	100.0%
		% within Q4	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.405(a)	6	0.025
Likelihood Ratio	14.722	6	0.023
N of Valid Cases	643		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 28.97.

TABLE 112.--Analysis of Q2,Q3

Q2,Q3: Crosstabulation

			Q3				
			0-5 years	6-15 years	16-25 years	>25 years	Total
Q2	Male	Count	21	123	172	248	564
		% within Q2	3.7%	21.8%	30.5%	44.0%	100.0%
		% within Q3	80.8%	73.7%	86.0%	96.9%	86.9%
	Female	Count	5	44	28	8	85
		% within Q2	5.9%	51.8%	32.9%	9.4%	100.0%
		% within Q3	19.2%	26.3%	14.0%	3.1%	13.1%
Total		Count	26	167	200	256	649
		% within Q2	4.0%	25.7%	30.8%	39.4%	100.0%
		% within Q3	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	49.130(a)	3	0.000
Likelihood Ratio	52.675	3	0.000
Linear-by-Linear Association	43.208	1	0.000
N of Valid Cases	649		

a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 3.41.

TABLE 113.--Analysis of Q2,Q4

Q2,Q4: Crosstabulation

			Q4			
			<150 debonds	150-300 debonds	>300 debonds	Total
Q2	Male	Count	156	277	123	556
		% within Q2	28.1%	49.8%	22.1%	100.0%
		% within Q4	78.8%	89.9%	91.8%	86.9%
	Female	Count	42	31	11	84
		% within Q2	50.0%	36.9%	13.1%	100.0%
		% within Q4	21.2%	10.1%	8.2%	13.1%
Total		Count	198	308	134	640
		% within Q2	30.9%	48.1%	20.9%	100.0%
		% within Q4	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.726(a)	2	0.000
Likelihood Ratio	15.775	2	0.000
Linear-by-Linear Association	13.736	1	0.000
N of Valid Cases	640		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 17.59.

TABLE 114.--Analysis of Q3,Q4

Q3,Q4: Crosstabulation

			Q4			
			<150 debonds	150-300 debonds	>300 debonds	Total
Q3	0-5 years	Count	11	10	3	24
		% Q3	45.8%	41.7%	12.5%	100.0%
		% within Q4	5.5%	3.2%	2.2%	3.7%
	6-15 years	Count	47	76	41	164
		% within Q3	28.7%	46.3%	25.0%	100.0%
		% within Q4	23.5%	24.7%	30.6%	25.5%
	16-25 years	Count	63	97	41	201
		% within Q3	31.3%	48.3%	20.4%	100.0%
		% within Q4	31.5%	31.5%	30.6%	31.3%
	>25 years	Count	79	125	49	253
		% within Q3	31.2%	49.4%	19.4%	100.0%
		% within Q4	39.5%	40.6%	36.6%	39.4%
Total		Count	200	308	134	642
		% within Q3	31.2%	48.0%	20.9%	100.0%
		% within Q4	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.833(a)	6	0.565
Likelihood Ratio	4.702	6	0.583
Linear-by-Linear Association	0.055	1	0.815
N of Valid Cases	642		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.01.

APPENDIX 2

Tables

Table 115.--Characteristic Variables

Variables	n	(%)
Q1-Regions:		
1. Northeast	144	21.9%
2. South	164	24.9%
3. 3.Midwest	196	29.8%
4. 4.West	149	22.6%
Q2-Gender:		
1. Male	568	86.7%
2. Female	87	13.3%
Q3-# of Years Practiced:		
1. 0-5 years	26	4.0%
2. 6-15 years	169	25.8%
3. 16-25 years	203	30.9%
4. >25 years	258	39.3%
Q4-# of Debonds:		
1. <150	202	31.2%
2. 150-300	310	47.8%
3. >300	136	21.0%

Table 116.--Collapsed Characteristic Variables

Variables	n	(%)
Q1-Region		
1. Northeast	144	21.9%
2. South	164	24.9%
3. Midwest	196	29.8%
4. West	149	22.6%
Q2-Gender:		
1. Male	568	86.7%
2. Female	87	13.3%
Q3-# of Years Practiced:		
1. 0-15 years	195	29.7%
2. 16-25 years	203	30.9%
3. >25 years	258	39.3%
Q4-# of Debonds:		
1. <150	202	31.2%
2. 150-300	310	47.8%
3. >300	136	21.0%

Table 117.-- Retainer and Protocol Variables

Variables	n	(%)
Q5-Maxillary arch retainer:		
1. Clear thermoplastic (office lab)	194	29.6%
2. Clear thermoplastic (commercial lab)	5	0.8%
3. Hawley (office lab)	147	22.4%
4. Hawley (commercial lab)	234	35.7%
5. Spring Aligner (office lab)	2	0.3%
6. Spring Aligner (commercial lab)	5	0.8%
7. Fixed Lingual	16	2.4%
8. Clear thermoplastic (office lab) and a Fixed Lingual	10	1.5%
9. Clear thermoplastic (commercial lab) and a Fixed lingual	4	0.6%
10. Clear thermoplastic followed by Hawley (both made in office lab)	5	0.8%
11. Clear thermoplastic followed by Hawley (both made in commercial lab)	4	0.6%
12. Clear thermoplastic (office lab) followed by Hawley (commercial lab)	29	4.4%
13. Clear thermoplastic (commercial lab) followed by Hawley (office lab)	0	0.0%
Q6-Maxillary retainer Full-time wear:		
1. Yes	515	81.5%
2. No	117	18.5%
Q7-Maxillary Full-time wear:		
1. Full-time for <3months	147	28.3%
2. Full-time for 3months-9months	279	53.7%
3. Full-time for 10months-2years	86	16.5%
4. Full-time for >2years	8	1.5%
Q8-Maxillary Part-time wear:		
1. Around 16 hours/day	64	12.0%
2. Around 8 hours/day	358	66.9%
3. Tapering from 16 hours/day to occasional wear	63	11.8%
4. Tapering from 8 hours/day to occasional wear	50	9.3%
5. Patient decides amount of wear time	0	0.0%
Q9-Mandibular arch retainer:		
1. Clear thermoplastic (office lab)	116	17.7%
2. Clear thermoplastic (commercial lab)	3	0.5%
3. Hawley (office lab)	59	9.0%
4. Hawley (commercial lab)	125	19.1%
5. Spring Aligner (office lab)	12	1.8%
6. Spring Aligner (commercial lab)	46	7.0%
7. Fixed Lingual	263	40.2%
8. Clear thermoplastic (office lab) and a Fixed Lingual	10	1.5%
9. Clear thermoplastic (commercial lab) and a Fixed lingual	2	0.3%
10. 10.Clear thermoplastic followed by Hawley (both made in office lab)	2	0.3%
11. Clear thermoplastic followed by Hawley (both made in commercial lab)	2	0.3%
12. Clear thermoplastic (office lab) followed by Hawley (commercial lab)	14	2.1%
13. Clear thermoplastic (commercial lab) followed by Hawley (office lab)	0	0.0%
Q10-Mandibular Full-time wear:		
1. Yes	312	70.4%
2. No	76	19.6%
Q11-Mandibular arch Full-time wear:		
1. Full-time for <3months	91	29.3%
2. Full-time for 3months-9months	166	53.4%
3. Full-time for 9months-2years	49	15.8%
4. Full-time for >2years	5	1.6%

Table 117.-- Retainer and Protocol Variables

Q12-Mandibular Part-time wear:		
1. Around 16 hours/day	41	12.6%
2. Around 8 hours/day	217	66.6%
3. Tapering from 16 hours/day to occasional wear	41	12.6%
4. Tapering from 8 hours/day to occasional wear	25	7.7%
5. Patient decides amount of wear time	2	0.6%
Q13-Instruct to stop wearing removable retainers:		
1. No, wear retainers forever	501	84.2%
2. Yes, ≤2years after debond	30	5.0%
3. Yes, 5years after debond	26	4.4%
4. Yes, after 3rd molars are extracted	38	6.4%
Q14-Instruct to have fixed retainers removed:		
1. Yes	138	24.1%
2. No	435	75.9%
Q15-When do you instruct to have fixed lingual retainer removed?		
1. <2years after debonding	11	8.3%
2. 2-5 years after debonding	38	28.6%
3. >5years after debonding	40	30.1%
4. After 3rd molars are extracted	44	33.1%

Table 118.--Collapsed Retainer and Protocol Variables

Variables	n	(%)
Q5-Maxillary arch retainer:		
1. Clear thermoplastic	199	30.4%
2. Hawley	381	58.2%
3. Other	75	11.5%
Q6-Maxillary retainer period of Full-time wear:		
1. Yes	515	81.5%
2. No	117	18.5%
Q7-Maxillary retainer Full-time wear:		
1. Full-time <3months	147	28.3%
2. Full-time 3months-9months	279	53.7%
3. Full-time >9months	94	18.1%
Q8-Maxillary retainer Part-time wear:		
1. Around 16 hours/day	64	12.0%
2. Around 8 hours/day	358	66.9%
3. Other	113	21.1%
Q9-Mandibular arch retainer:		
1. Clear thermoplastic	119	18.2%
2. Hawley	184	28.1%
3. Spring Aligner	58	8.9%
4. Fixed lingual	263	40.2%
5. Other	30	4.6%
Q10-Mandibular retainer period of Full-time wear:		
1. Yes	312	80.4%
2. No	76	19.6%
Q11-Mandibular retainer Full-time wear:		
1. Full-time <3months	91	29.3%
2. Full-time 3months-9months	166	53.4%
3. Full-time >9months	54	17.4%
Q12-Mandibular retainer Part-time wear:		
1. Around 16 hours/day	41	12.6%
2. Around 8 hours/day	217	66.6%
3. Other	68	20.9%
Q13-Instruct to stop wearing removable retainers:		
1. No, wear retainers forever	501	84.2%
2. Yes, ≤2years after debond	30	5.0%
3. Yes, 5 years after debond	26	4.4%
4. Yes, After 3rd molars are extracted	38	6.4%
Q14-Instruct to have fixed retainers removed:		
1. Yes	138	24.1%
2. No	435	75.9%
Q15-When do you instruct to have fixed lingual retainer removed:		
1. <2years after debonding	11	8.3%
2. 2-5 years after debonding	38	28.6%
3. >5 years after debonding	40	30.1%
4. After 3rd molars are extracted	44	33.1%

Table 119.--Regions of Orthodontist Practices and Various Protocol Variables

Variables	Northeast	South	Midwest	West	X^2	p-value
Q5-Maxillary arch retainer:					6.330	0.387
1. Clear thermoplastic	39	56	65	38		
2. Hawley	91	90	104	93		
3. Other	13	18	25	18		
Q6-Maxillary retainer period of Full-time wear:					0.059	0.996
1. Yes	115	126	151	120		
2. No	26	28	35	26		
Q7-Maxillary retainer Full-time wear:					4.104	0.663
1. Full-time <3months	37	39	42	28		
2. Full-time 3months-9months	62	70	81	64		
3. Full-time >9months	19	19	29	27		
Q8-Maxillary retainer Part-time wear:					5.347	0.500
1. Around 16 hours/day	18	14	19	13		
2. Around 8 hours/day	75	91	112	77		
3. Other	25	22	32	33		
Q9-Mandibular arch retainer:					22.312	0.034*
1. Clear thermoplastic	29	28	39	22		
2. Hawley	52	41	44	46		
3. Spring Aligner	16	11	21	9		
4. Fixed lingual	38	75	85	63		
5. Other	8	8	6	8		
Q10-Mandibular retainer period of Full-time wear:					3.660	0.301
1. Yes	82	75	82	71		
2. No	22	12	26	15		
Q11-Mandibular retainer Full-time wear:					0.199	1.000
1. Full-time <3months	24	21	25	20		
2. Full-time 3months-9months	44	41	43	37		
3. Full-time >9months	14	13	14	13		
Q12-Mandibular retainer Part-time wear:					4.022	0.674
1. Around 16 hours/day	13	9	12	7		
2. Around 8 hours/day	50	47	63	55		
3. Other	22	12	19	14		
Q13-Instruct to stop wearing removable retainers:					14.704	0.099
1. No, wear retainers forever	108	130	143	116		
2. Yes, ≤2years after debond	9	10	7	4		
3. Yes, 5 years after debond	7	4	12	2		
4. Yes, After 3rd molars are extracted	10	4	15	9		
Q14-Instruct to have fixed retainers removed:					5.543	0.136
1. Yes	34	27	48	29		
2. No	88	120	121	102		
Q15-When do you instruct to have fixed lingual retainer removed:					10.530	0.309
1. <2years after debonding	3	2	4	2		
2. 2-5 years after debonding	9	5	12	12		
3. >5 years after debonding	5	10	19	6		
4. After 3rd molars are extracted	15	7	14	8		

(*) Statistical significance at $P < 0.05$

Table 120.--Gender and Various Protocol Variables

Variables	Male	Female	X^2	p-value
Q5-Maxillary arch retainer:			1.010	0.603
1. Clear thermoplastic	176	23		
2. Hawley	327	51		
3. Other	63	12		
Q6-Maxillary retainer period of Full-time wear:			5.328	0.021*
1. Yes	436	77		
2. No	108	8		
Q7-Maxillary retainer Full-time wear:			0.168	0.919
1. Full-time <3months	125	22		
2. Full-time 3months-9months	238	40		
3. Full-time >9months	78	15		
Q8-Maxillary retainer Part-time wear:			3.468	0.177
1. Around 16 hours/day	56	7		
2. Around 8 hours/day	318	40		
3. Other	93	20		
Q9-Mandibular arch retainer:			19.966	0.001*
1. Clear thermoplastic	108	11		
2. Hawley	148	35		
3. Spring Aligner	46	11		
4. Fixed lingual	241	21		
5. Other	22	8		
Q10-Mandibular retainer period of Full-time wear:			3.933	0.047*
1. Yes	252	58		
2. No	69	7		
Q11-Mandibular retainer Full-time wear:			1.766	0.414
1. Full-time <3months	78	13		
2. Full-time 3months-9months	133	32		
3. Full-time >9months	41	12		
Q12-Mandibular retainer Part-time wear:			0.270	0.874
1. Around 16 hours/day	35	6		
2. Around 8 hours/day	184	33		
3. Other	56	12		
Q13-Instruct to stop wearing removable retainers:			1.906	0.592
1. No, wear retainers forever	426	74		
2. Yes, ≤2years after debond	27	2		
3. Yes, 5 years after debond	21	4		
4. Yes, After 3rd molars are extracted	34	4		
Q14-Instruct to have fixed retainers removed:			4.743	0.018*
1. Yes	127	11		
2. No	367	66		
Q15-When do you instruct to have fixed lingual retainer removed:			5.929	0.115
1. <2years after debonding	8	3		
2. 2-5 years after debonding	35	3		
3. >5 years after debonding	38	2		
4. After 3rd molars are extracted	41	3		

(*) Statistical significance at $P < 0.05$

Table 121.--Number of Years Practiced and Various Protocol Variables

Variables	0-15 years practiced	16-25 years practiced	>25 years practiced	X^2	p-value
Q5-Maxillary arch retainer:				1.043	0.903
1. Clear thermoplastic	64	61	74		
2. Hawley	108	119	153		
3. Other	23	22	30		
Q6-Maxillary retainer period of Full-time wear:				0.977	0.614
1. Yes	156	165	192		
2. No	35	33	49		
Q7-Maxillary retainer Full-time wear:				16.182	0.003*
1. Full-time <3months	49	39	59		
2. Full-time 3months-9months	90	100	88		
3. Full-time >9months	18	26	49		
Q8-Maxillary retainer Part-time wear:				6.694	0.153
1. Around 16 hours/day	15	24	25		
2. Around 8 hours/day	104	106	148		
3. Other	44	31	38		
Q9-Mandibular arch retainer:				6.173	0.628
1. Clear thermoplastic	41	31	47		
2. Hawley	56	59	68		
3. Spring Aligner	15	17	26		
4. Fixed lingual	71	85	106		
5. Other	12	10	8		
Q10-Mandibular retainer period of Full-time wear:				3.562	0.168
1. Yes	103	97	111		
2. No	20	20	36		
Q11-Mandibular retainer Full-time wear:				17.442	0.002*
1. Full-time <3months	35	22	34		
2. Full-time 3months-9months	59	60	47		
3. Full-time >9months	9	14	30		
Q12-Mandibular retainer Part-time wear:				4.235	0.375
1. Around 16 hours/day	10	15	16		
2. Around 8 hours/day	68	65	84		
3. Other	26	14	28		
Q13-Instruct to stop wearing removable retainers:				23.934	0.001*
1. No, wear retainers forever					
2. Yes, ≤2years after debond	166	160	173		
3. Yes, 5 years after debond	4	9	17		
4. Yes, After 3rd molars are extracted	5 5	7 8	14 25		
Q14-Instruct to have fixed retainers removed:				14.382	0.001*
1. Yes	27	43	68		
2. No	152	134	148		
Q15-When do you instruct to have fixed lingual retainer removed:				3.786	0.706
1. <2years after debonding	4	3	4		
2. 2-5 years after debonding	7	15	16		
3. >5 years after debonding	8	12	20		
4. After 3rd molars are extracted	7	13	24		

(*) Statistical significance at $P < 0.05$

Table 122.--Number of Debonds and Various Protocol Variables

Variables	<150 debonds	150-300 debonds	>300 debonds	X^2	p-value
Q5-Maxillary arch retainer:				6.188	0.186
1. Clear thermoplastic	63	92	43		
2. Hawley	120	184	69		
3. Other	19	32	23		
Q6-Maxillary retainer period of Full-time wear:				3.679	0.159
1. Yes	168	245	95		
2. No	31	54	30		
Q7-Maxillary retainer Full-time wear:				3.300	0.509
1. Full-time <3months	42	71	33		
2. Full-time 3months-9months	92	136	46		
3. Full-time >9months	34	42	16		
Q8-Maxillary retainer Part-time wear:				6.246	0.181
1. Around 16 hours/day	20	27	16		
2. Around 8 hours/day	99	178	76		
3. Other	37	60	14		
Q9-Mandibular arch retainer:				13.090	0.109
1. Clear thermoplastic	42	54	21		
2. Hawley	65	84	29		
3. Spring Aligner	21	22	15		
4. Fixed lingual	66	131	65		
5. Other	7	16	6		
Q10-Mandibular retainer period of Full-time wear:				2.108	0.349
1. Yes	114	136	55		
2. No	21	38	15		
Q11-Mandibular retainer Full-time wear:				9.533	0.049*
1. Full-time <3months	27	40	23		
2. Full-time 3months-9months	61	78	23		
3. Full-time >9months	26	18	8		
Q12-Mandibular retainer Part-time wear:				8.614	0.071
1. Around 16 hours/day	14	14	12		
2. Around 8 hours/day	65	112	35		
3. Other	27	32	8		
Q13-Instruct to stop wearing removable retainers:				1.303	0.972
1. No, wear retainers forever	154	234	104		
2. Yes, ≤2years after debond	11	14	4		
3. Yes, 5 years after debond	8	13	5		
4. Yes, After 3rd molars are extracted	13	17	8		
Q14-Instruct to have fixed retainers removed:				2.074	0.355
1. Yes	37	75	26		
2. No	131	202	94		
Q15-When do you instruct to have fixed lingual retainer removed:				5.832	0.422
1. <2years after debonding	3	6	2		
2. 2-5 years after debonding	8	21	9		
3. >5 years after debonding	10	26	4		
4. After 3rd molars are extracted	13	19	12		

(*) Statistical significance at $P < 0.05$

Table 123.--Retention Schedule Variables.

Variables	n	(%)
Q16-1st appt after debonding:		
1. Less than 4 weeks after debonding	126	19.2%
2. Between 1month to 2 months after debonding	429	65.4%
3. Greater than 2 months after debonding	100	15.2%
4. No retention appts; patient has been dismissed	1	0.2%
Q17-2nd appt after debonding:		
1. Less than 3 months after the 1st appt	160	24.3%
2. 3-5 months after the 1st appt	314	47.7%
3. 6 months or greater after the 1st appt	171	26.0%
4. No 2nd appt; patient has been dismissed	13	2.0%
Q18-3rd appt after debonding:		
1. Less than 6 months after the 2nd appt	212	32.9%
2. 6 months to 11 months after the 2nd appt	326	50.6%
3. 1 year or greater after the 2nd appt	81	12.6%
4. No 3rd appt; patient has been dismissed	25	3.9%
Q19-4th appt after debonding:		
1. Less than 6 months after the 3rd appt	97	15.7%
2. 6 months to 11 months after the 3rd appt	258	41.7%
3. 1 year or greater after the 3rd appt	165	26.7%
4. No 4th appt; patient has been dismissed	98	15.9%
Q20-5th appt after debonding:		
1. Less than 6 months after the 4th appt	51	9.9%
2. 6 months to 11 months after the 4th appt	170	32.9%
3. 1 year or greater after the 4th appt	171	33.1%
4. No 5th appt; patient has been dismissed	125	24.2%

Table 124.--Regions of Orthodontist Practices and Retention Schedule Variables

Variables	Northeast	South	Midwest	West	X^2	p-value
Q16-1st appt after debonding:					8.196	0.515
1. Less than 4 weeks after debonding	25	32	37	32		
2. Between 1month to 2 months after debonding	104	103	124	95		
3. Greater than 2 months after debonding	15	26	35	22		
4. No retention appts; patient has been dismissed	0	1	0	0		
Q17-2nd appt after debonding:					12.396	0.192
1. Less than 3 months after the 1st appt	39	46	46	29		
2. 3-5 months after the 1st appt	70	76	85	80		
3. 6 months or greater after the 1st appt	34	36	62	37		
4. No 2nd appt; patient has been dismissed	1	6	3	3		
Q18-3rd appt after debonding:					8.762	0.460
1. Less than 6 months after the 2nd appt	57	48	59	48		
2. 6 months to 11 months after the 2nd appt	65	82	97	78		
3. 1 year or greater after the 2nd appt	18	19	30	13		
4. No 3rd appt; patient has been dismissed	3	8	7	7		
Q19-4th appt after debonding:					12.548	0.184
1. Less than 6 months after the 3rd appt	24	21	24	28		
2. 6 months to 11 months after the 3rd appt	62	58	88	48		
3. 1 year or greater after the 3rd appt	35	38	46	44		
4. No 4th appt; patient has been dismissed	19	32	27	19		
Q20-5th appt after debonding:					3.637	0.934
1. Less than 6 months after the 4th appt	13	13	13	12		
2. 6 months to 11 months after the 4th appt	38	32	59	40		
3. 1 year or greater after the 4th appt	39	41	51	38		
4. No 5th appt; patient has been dismissed	30	31	35	28		

(*) Statistical significance at $P < 0.05$

Table 125.--Gender and Retention Schedule Variables

Variables	Male	Female	X^2	p-value
Q16-1st appt after debonding:			2.399	0.494
1. Less than 4 weeks after debonding	113	13		
2. Between 1month to 2 months after debonding	363	63		
3. Greater than 2 months after debonding	89	11		
4. No retention appts; patient has been dismissed	1	0		
Q17-2nd appt after debonding:			8.590	0.035*
1. Less than 3 months after the 1st appt	143	15		
2. 3-5 months after the 1st appt	259	54		
3. 6 months or greater after the 1st appt	155	16		
4. No 2nd appt; patient has been dismissed	11	2		
Q18-3rd appt after debonding:			3.688	0.297
1. Less than 6 months after the 2nd appt	184	27		
2. 6 months to 11 months after the 2nd appt	275	49		
3. 1 year or greater after the 2nd appt	73	8		
4. No 3rd appt; patient has been dismissed	24	1		
Q19-4th appt after debonding:			5.692	0.128
1. Less than 6 months after the 3rd appt	84	12		
2. 6 months to 11 months after the 3rd appt	229	28		
3. 1 year or greater after the 3rd appt	140	24		
4. No 4th appt; patient has been dismissed	78	20		
Q20-5th appt after debonding:			4.249	0.236
1. Less than 6 months after the 4th appt	45	6		
2. 6 months to 11 months after the 4th appt	153	15		
3. 1 year or greater after the 4th appt	149	22		
4. No 5th appt; patient has been dismissed	103	21		

(*) Statistical significance at $P < 0.05$

Table 126.--Number Years Practiced and Retention Schedule Variables

Variables	0-15 years practiced	16-25 years practiced	>25 years practiced	X^2	p-value
Q16-1st appt after debonding:				13.121	0.041*
1. Less than 4 weeks after debonding	27	33	66		
2. Between 1month to 2 months after debonding	135	139	153		
3. Greater than 2 months after debonding	31	31	38		
4. No retention appts; patient has been dismissed	0	0	1		
Q17-2nd appt after debonding:				14.197	0.028*
1. Less than 3 months after the 1st appt	35	51	74		
2. 3-5 months after the 1st appt	101	103	108		
3. 6 months or greater after the 1st appt	58	45	68		
4. No 2nd appt; patient has been dismissed	1	4	8		
Q18-3rd appt after debonding:				8.137	0.228
1. Less than 6 months after the 2nd appt	54	73	85		
2. 6 months to 11 months after the 2nd appt	102	102	120		
3. 1 year or greater after the 2nd appt	27	18	36		
4. No 3rd appt; patient has been dismissed	11	6	8		
Q19-4th appt after debonding:				8.563	0.200
1. Less than 6 months after the 3rd appt	23	39	35		
2. 6 months to 11 months after the 3rd appt	78	72	108		
3. 1 year or greater after the 3rd appt	46	57	61		
4. No 4th appt; patient has been dismissed	35	25	37		
Q20-5th appt after debonding:				13.537	0.035*
1. Less than 6 months after the 4th appt	7	26	18		
2. 6 months to 11 months after the 4th appt	47	51	72		
3. 1 year or greater after the 4th appt	51	48	71		
4. No 5th appt; patient has been dismissed	41	42	42		

(*) Statistical significance at $P < 0.05$

Table 127.--Number of Debonds and Retention Schedule Variables

Variables	<150 debonds	150-300 debonds	>300 debonds	X^2	p-value
Q16-1st appt after debonding:				34.053	0.000*
1. Less than 4 weeks after debonding	46	55	19		
2. Between 1month to 2 months after debonding	144	204	79		
3. Greater than 2 months after debonding	11	51	36		
4. No retention appts; patient has been dismissed	0	0	1		
Q17-2nd appt after debonding:				40.447	0.000*
1. Less than 3 months after the 1st appt	70	62	24		
2. 3-5 months after the 1st appt	102	152	58		
3. 6 months or greater after the 1st appt	30	90	47		
4. No 2nd appt; patient has been dismissed	0	6	7		
Q18-3rd appt after debonding:				47.286	0.000*
1. Less than 6 months after the 2nd appt	94	90	27		
2. 6 months to 11 months after the 2nd appt	91	167	62		
3. 1 year or greater after the 2nd appt	13	38	29		
4. No 3rd appt; patient has been dismissed	4	8	11		
Q19-4th appt after debonding:				14.103	0.029*
1. Less than 6 months after the 3rd appt	44	43	9		
2. 6 months to 11 months after the 3rd appt	81	123	50		
3. 1 year or greater after the 3rd appt	47	77	38		
4. No 4th appt; patient has been dismissed	26	51	21		
Q20-5th appt after debonding:				14.907	0.021*
1. Less than 6 months after the 4th appt	25	22	3		
2. 6 months to 11 months after the 4th appt	59	78	31		
3. 1 year or greater after the 4th appt	52	86 5	29		
4. No 5th appt; patient has been dismissed	35	6	33		

(*) Statistical significance at $P < 0.05$

Table 128.--Maxillary Retainers and Various Protocol Variables

Variables	Clear	Hawley	Other	X^2	p-value
Q6-Maxillary retainer period of Full-time wear:				27.307	0.000*
1. Yes	136	333	45		
2. No	57	45	13		
Q7-Maxillary retainer Full-time wear:					0.000*
1. Full-time <3months	78	58	11	72.013	
2. Full-time 3months-9months	48	204	27		
3. Full-time >9months	14	71	8		
Q8-Maxillary retainer Part-time wear:				3.196	0.525
1. Around 16 hours/day	19	37	8		
2. Around 8 hours/day	121	208	27		
3. Other	44	61	8		
Q9-Mandibular arch retainer:				473.881	0.000*
1. Clear thermoplastic	111	6	2		
2. Hawley	9	174	0		
3. Spring Aligner	6	45	7		
4. Fixed lingual	66	154	42		
5. Other	7	0	23		
Q16-1st appt after debonding:				15.750	0.015*
1. Less than 4 weeks after debonding	38	66	21		
2. Between 1month to 2 months after debonding	121	268	39		
3. Greater than 2 months after debonding	38	46	15		
4. No retention appts; patient has been dismissed	1	0	0		
Q17-2nd appt after debonding:				10.531	0.104
1. Less than 3 months after the 1st appt	38	101	20		
2. 3-5 months after the 1st appt	98	187	28		
3. 6 months or greater after the 1st appt	57	88	25		
4. No 2nd appt; patient has been dismissed	6	5	2		
Q18-3rd appt after debonding:				19.404	0.004*
1. Less than 6 months after the 2nd appt	50	137	24		
2. 6 months to 11 months after the 2nd appt	103	188	34		
3. 1 year or greater after the 2nd appt	31	42	7		
4. No 3rd appt; patient has been dismissed	8	9	8		
Q19-4th appt after debonding:				16.221	0.013*
1. Less than 6 months after the 3rd appt	27	56	14		
2. 6 months to 11 months after the 3rd appt	66	161	30		
3. 1 year or greater after the 3rd appt	51	105	9		
4. No 4th appt; patient has been dismissed	40	44	12		
Q20-5th appt after debonding:				17.810	0.007*
1. Less than 6 months after the 4th appt	16	29	6		
2. 6 months to 11 months after the 4th appt	43	107	19		
3. 1 year or greater after the 4th appt	37	123	11		
4. No 5th appt; patient has been dismissed	47	61	17		

(*) Statistical significance at $P < 0.05$

Table 129.--Mandibular retainers and Various Protocol Variables

Variables	Clear	Hawley	Spring Aligner	Fixed	Other	X^2	p-value
Q10-Mandibular retainer period of Full-time wear:						17.496	0.001*
1. Yes	80	160	51		21		
2. No	36	24	7		7		
Q11-Mandibular retainer Full-time wear:						58.612	0.000*
1. Full-time <3months	48	23	12		8		
2. Full-time 3months-9months	30	95	30		11		
3. Full-time >9months	3	40	9		2		
Q12-Mandibular retainer Part-time wear:						5.309	0.505
1. Around 16 hours/day	9	24	5		3		
2. Around 8 hours/day	75	96	32		12		
3. Other	27	29	7		5		
Q16-1st appt after debonding:						11.514	0.485
1. Less than 4 weeks after debonding	26	32	11	48	7		
2. Between 1month to 2 months after debonding	70	130	38	169	21		
3. Greater than 2 months after debonding	21	22	8	46	2		
4. No retention appts; patient has been dismissed	1	0	0	0	0		
Q17-2nd appt after debonding:						19.621	0.075
1. Less than 3 months after the 1st appt	26	50	18	59	6		
2. 3-5 months after the 1st appt	57	96	25	116	18		
3. 6 months or greater after the 1st appt	32	35	12	85	6		
4. No 2nd appt; patient has been dismissed	4	3	3	3	0		
Q18-3rd appt after debonding:						19.277	0.082
1. Less than 6 months after the 2nd appt	33	69	27	73	9		
2. 6 months to 11 months after the 2nd appt	58	93	21	135	16		
3. 1 year or greater after the 2nd appt	18	16	6	38	3		
4. No 3rd appt; patient has been dismissed	5	3	1	14	2		
Q19-4th appt after debonding:						15.523	0.214
1. Less than 6 months after the 3rd appt	19	28	15	32	3		
2. 6 months to 11 months after the 3rd appt	44	76	21	103	11		
3. 1 year or greater after the 3rd appt	27	51	12	70	5		
4. No 4th appt; patient has been dismissed	19	23	6	40	9		
Q20-5th appt after debonding:						24.676	0.016*
1. Less than 6 months after the 4th appt	10	14	8	18	1		
2. 6 months to 11 months after the 4th appt	29	53	19	63	5		
3. 1 year or greater after the 4th appt	23	48	10	85	3		
4. No 5th appt; patient has been dismissed	27	39	10	39	10		

(*) Statistical significance at $P < 0.05$

Table 130.--Maxillary and Mandibular Retainers

Variables	Maxillary Clear thermoplastic	Maxillary Hawley	Maxillary Other	X^2	p-value
Q9-Mandibular arch retainer:				473.881	0.000*
1. Clear thermoplastic	111	6	2		
2. Hawley	9	174	0		
3. Spring Aligner	6	45	7		
4. Fixed lingual	66	154	42		
5. Other	7	0	23		

Table 131.--AAO members by Gender based on year 2006

Variables	n	%
Male	12712	83.4%
Female	2523	16.6%
Total	15235	100.0%

Table 132.--Summary of Chi-Square Tests

Variables	Q1	Q2	Q3	Q4	Q5	Q9
Q1		X^2=4.081 P-value=0.253	X^2=9.922 P-value=0.357	X^2=14.405 P-value=0.025*	X^2=6.330 P-value=0.387	X^2=22.312 P-value=0.034*
Q2	X^2=4.081 P-value=0.253		X^2=49.130 P-value=0.000*	X^2=16.726 P-value=0.000*	X^2=1.010 P-value=0.603	X^2=19.966 P-value=0.001*
Q3	X^2=9.922 P-value=0.357	X^2=49.130 P-value=0.000*		X^2=4.833 P-value=0.565	X^2=1.043 P-value=0.903	X^2=6.173 P-value=0.628
Q4	X^2=14.405 P-value=0.025*	X^2=16.726 P-value=0.000*	X^2=4.833 P-value=0.565		X^2=6.188 P-value=0.186	X^2=13.090 P-value=0.109
Q5	X^2=6.330 P-value=0.387	X^2=1.010 P-value=0.603	X^2=1.043 P-value=0.903	X^2=6.188 P-value=0.186		X^2=473.881 P-value=0.000*
Q6	X^2=0.059 P-value=0.996	X^2=5.328 P-value=0.021*	X^2=0.977 P-value=0.614	X^2=3.679 P-value=0.159	X^2=27.307 P-value=0.000*	
Q7	X^2=4.104 P-value=0.663	X^2=0.168 P-value=0.919	X^2=16.182 P-value=0.003*	X^2=3.300 P-value=0.509	X^2=72.013 P-value=0.000*	
Q8	X^2=5.347 P-value=0.500	X^2=3.468 P-value=0.177	X^2=6.694 P-value=0.153	X^2=6.246 P-value=0.181	X^2=3.196 P-value=0.525	
Q9	X^2=22.312 P-value=0.034*	X^2=19.966 P-value=0.001*	X^2=6.173 P-value=0.628	X^2=13.090 P-value=0.109	X^2=473.881 P-value=0.000*	
Q10	X^2=3.660 P-value=0.301	X^2=3.933 P-value=0.047*	X^2=3.562 P-value=0.168	X^2=2.108 P-value=0.349		X^2=17.496 P-value=0.001*
Q11	X^2=0.199 P-value=1.000	X^2=1.766 P-value=0.414	X^2=17.442 P-value=0.002*	X^2=9.533 P-value=0.049*		X^2=58.612 P-value=0.000*
Q12	X^2=4.022 P-value=0.674	X^2=0.270 P-value=0.874	X^2=4.235 P-value=0.375	X^2=8.614 P-value=0.071		X^2=5.309 P-value=0.505
Q13	X^2=14.704 P-value=0.099	X^2=1.906 P-value=0.592	X^2=23.934 P-value=0.001*	X^2=1.303 P-value=0.972		
Q14	X^2=5.543 P-value=0.136	X^2=4.743 P-value=0.018*	X^2=14.382 P-value=0.001*	X^2=2.074 P-value=0.355		
Q15	X^2=10.530 P-value=0.309	X^2=5.929 P-value=0.115	X^2=3.786 P-value=0.706	X^2=5.832 P-value=0.422		
Q16	X^2=8.196 P-value=0.515	X^2=2.399 P-value=0.494	X^2=13.121 P-value=0.041*	X^2=34.053 P-value=0.000*	X^2=15.750 P-value=0.015*	X^2=11.514 P-value=0.485
Q17	X^2=12.396 P-value=0.192	X^2=8.590 P-value=0.035*	X^2=14.197 P-value=0.028*	X^2=40.447 P-value=0.000*	X^2=10.531 P-value=0.104*	X^2=19.621 P-value=0.075
Q18	X^2=8.762 P-value=0.460	X^2=3.688 P-value=0.297	X^2=8.137 P-value=0.228	X^2=47.286 P-value=0.000*	X^2=19.404 P-value=0.004*	X^2=19.277 P-value=0.082
Q19	X^2=12.548 P-value=0.184	X^2=5.692 P-value=0.128	X^2=8.563 P-value=0.200	X^2=14.103 P-value=0.029*	X^2=16.221 P-value=0.013*	X^2=15.523 P-value=0.214
Q20	X^2=3.637 P-value=0.934	X^2=4.249 P-value=0.236	X^2=13.537 P-value=0.035*	X^2=14.907 P-value=0.021*	X^2=17.810 P-value=0.007*	X^2=24.676 P-value=0.016*

(*) Statistically significant at $P < 0.05$

APPENDIX 3

Statistically Significant Questions

Summarized Statistically Significant Differences:

Q1,Q4: >300 debonds=S(24.4%), MW(27.2%), W(14.8%), NE(14.4%)
Q1,Q9: Mand fixed linguals=S(46.0%), MW(43.6%), W(42.6%), NE(26.6%)

Q2,Q3: >25years practiced=M(44.0%)/F(9.4%); >15years practiced=M(74.5%)/F(42.3%)
Q2,Q4: >300debonds=M(22.1%)/F(13.1%); <150debonds=M(28.1%)/F(50.0%)
Q2,Q6: Prescribe max full-time wear (Yes)=M(80.1%)/F(90.6%)
Q2,Q9: Mand fixed linguals=M(42.7%)/F(24.4%); Mand Hawleys=M(26.2%)/F(40.7%)
Q2,Q10: Prescribe mand full-time wear=M(78.5%)/F(89.2%)
Q2,Q14: Do not instruct to remove fixed linguals=M(74.3%)/F(85.7%)
Q2,Q17: no pattern

Q3,Q2: >25years practiced=M(44.0%)/F(9.4%); >15years practiced=M(74.5%)/F(42.3%)
Q3,Q7: >9months max full-time wear=>25years(25.0%)/<16years(11.5%)
Q3,Q11: >9months mand full-time wear=>25years(27.0%)/<16years(8.7%)
Q3,Q13: Wear removable retainers forever=>25years(75.5%)/<16years(92.2%)
Q3,Q14: Do not instruct to remove fixed linguals=>25years(68.5%)/<16years(84.9%)
Q3,Q16: 1st appt scheduled less than 4weeks=>25years(25.6%)/<16years(14.0%)
Q3,Q17: 2nd appt scheduled less than 3months=>25years(28.7%)/<16years(17.9%)
Q3,Q20: no pattern

Q4,Q1: >300 debonds=S(24.4%), MW(27.2%), W(14.8%), NE(14.4%)
Q4,Q2: >300debonds=M(22.1%)/F(13.1%);<150debonds=M(28.1%)/F(50.0%)
Q4,Q11: <3months mand full-time wear=>300debonds(42.6%)/<150debonds(23.7%)
>9months mand full-time wear=>300debonds(14.8%)/<150debonds(22.8%)
Q4,Q16: the more debonds=the longer between appts
Q4,Q17: the more debonds=the longer between appts
Q4,Q18: the more debonds=the longer between appts
Q4,Q19: the more debonds=the longer between appts
Q4,Q20: the more debonds=the longer between appts

Q5,Q6: Prescribe full-time wear period (Yes)=Clear(70.5%)/Hawley(88.1%)
Q5,Q7: Full-time wear period <3months=Clear(55.7%)/Hawley(17.4%)
Full-time wear period 3-9months=Clear(34.3%)/Hawley(61.3%)
Full-time wear period >9months=Clear(10.0%)/Hawley(21.3%)
Q5,Q9: Max Clear prescribed mand clear; Max Hawley prescribed mand Hawley
Q5,Q16: 1st appt scheduled >2months=Clear(19.2%)/Hawley(12.1%)
Q5,Q18: 3rd appt scheduled <6months=Clear(26.0%)/Hawley(36.4%)
Q5,Q19: no 4th appt scheduled=Clear(21.7%)/Hawley(12.0%)
Q5,Q20: no 5th appt scheduled=Clear(32.9%)/Hawley(19.1%)

Q9,Q1: Mand fixed linguals=S(46.0%), MW(43.6%), W(42.6%), NE(26.6%)
Q9,Q2: Mand fixed linguals=M(42.7%)/F(24.4%); Mand Hawleys=M(26.2%)/F(40.7%)
Q9,Q5: Max Clear prescribed mand clear; Max Hawley prescribed mand Hawley
Q9,Q10: Prescribe full-time wear period (Yes)=Clear(69.0%),Hawley(87.0%)
Q9,Q11: Full-time wear <3months=Clear(59.3%), Hawley(14.6%), SpA(23.5%)
Full-time wear 3-9months=Clear(37.0%), Hawley(60.1%), SpA(58.8%)
Full-time wear >9months=Clear(3.7%), Hawley(25.3%), SpA(17.6%)
Q9,Q20: no pattern

APPENDIX 4

Institutional Review Board Approval

Case Western Reserve University
Institutional Review Board
Notice of Approval

Responsible Investigator:	**Manish Valiathan**
From:	**Case Western Reserve University, Institutional Review Board**
Re:	**IRB Protocol Number 20060908**
Co-Investigator:	**Eric Hughes**

After careful review of your protocol application, and policy review for the above-referenced protocol, it has been determined that your protocol – as presented to this office – does **not** fit the definition of human subject research per 45 CFR 46.102. This protocol, therefore, does **not** require an exemption status, further IRB review, or IRB approval.

This protocol, as you have indicated, involves collecting identifiable/linked data. However, you will not be collecting identifiable **private** information; and therefore does **not** fit the federal definition of human subject research. The Common Rule or 45 CFR 46 defines a human subject as "a living individual about whom an investigator (whether professional or student) conducting research obtains data through (1) intervention or interaction with the individual or (2) identifiable private information."

Private information includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information that has been provided for specific purposes by an individual and that the individual can reasonably expect will not be made public (for example, a medical record).

Private information must be **individually identifiable** (i.e., the identity of the subject is or may readily be ascertained by the investigator or associated with the information) in order for obtaining the information to constitute research involving human subjects - 45 CFR 46.402(f).

Moreover, this protocol does not appear to meet the definition of research. The Common Rule – 45 CFR 46 – defines research as "a systematic investigation, including research development, testing, and evaluation, designed to develop or contribute to generalizable knowledge." Your protocol represents a program evaluation that is specific only to CMSD teachers and students.

The data you are collecting does NOT include identifiable private information and the protocol does not meet the definition of research. You may continue moving your project forward. You will never be contacted by the Case IRB office for this protocol.

At this point, we realize that we cannot compel you to do anything; however, we strongly recommend and encourage you to continue to consent subjects in the name of ethical research practices and good record keeping. Also note that you have the responsibility to destroy identifiers the moment you no longer need them and participants should be assured of this.

Please note that if the nature of your study changes, e.g., you wish to collect identifiable private information and/or you wish to expand your subject population, contact our office **immediately** and we will be more than happy to assist you. We would have to determine if an IRB review and approval is necessary **prior** to any additional research. We hope this helps and please contact this office with any questions and/or concerns you may have. Thanks so much for your attention and patience in this matter and good luck with your study. Take care.

This is the official notice that ***20060908 – A Study of the Most Common Retention Protocols and Appliances among Orthodontists in the United States*** has been formally closed out.

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