

Orthodontists' perceptions of and adaptations to nonspecialist and direct-to-consumer orthodontic service providers

Matthew Brown^a; William Wiltshire^b; Fabio Henrique de Sa Leitao Pinheiro; Dieter J. Schönwetter^d

ABSTRACT

Objectives: To evaluate orthodontists' perceived impacts on their practices as a result of general practitioners (GPs) and direct-to-consumer (DTC) orthodontic care providers and the adaptational changes implemented in the past 10 years.

Materials and Methods: An electronic survey was administered to 270 orthodontists in Canada and the United States to determine demographic background, perception of perceived impact, and specific changes implemented to improve practice competitiveness.

Results: More experienced orthodontists ($P = .0001$) and males ($P = .027$) were more likely to indicate a perceived impact from GP orthodontics. American orthodontists were significantly more likely than Canadian orthodontists to perceive an impact from DTC providers ($P = .017$). There was a positive association with orthodontists' years of experience and having implemented adaptational changes to their practice for a period greater than 10 years across multiple categories. Female orthodontists were more likely to have implemented adaptational changes for a period of less than 10 years across multiple categories.

Conclusions: The perceived impact of GPs providing orthodontic care was greater than that of DTC providers. American orthodontists were significantly more likely to perceive an impact from DTC providers. Orthodontists have experienced a reduction in referrals from GPs and an increase in referred case difficulty. Less experienced and female orthodontists have made the most adaptive changes to their practices in the past 10 years. (*Angle Orthod.* 2022;92:446–462.)

KEY WORDS: Direct-to-consumer; General dentist orthodontics; Orthodontic practices

^a Orthodontic Resident, Department of Preventive Dental Science, Division of Orthodontics, Dr. Gerald Niznick College of Dentistry, Rady Faculty of Health Sciences, University of Manitoba, Winnipeg, Manitoba, Canada.

^b Professor and Head and Program Director, Graduate Orthodontic Program, Department of Preventive Dental Science, Dr. Gerald Niznick College of Dentistry, Rady Faculty of Health Sciences, University of Manitoba, Winnipeg, Manitoba, Canada.

^c Assistant Professor, Dr. Gerald Niznick College of Dentistry, Rady Faculty of Health Sciences, University of Manitoba, Winnipeg, Manitoba, Canada.

^d Professor and Director of Student Affairs and Academic Services, Dr. Gerald Niznick College of Dentistry, Rady Faculty of Health Sciences, University of Manitoba, Winnipeg, Manitoba, Canada.

Corresponding author: Dr. Matthew Brown, Department of Preventive Dental Science, 790 Bannatyne Avenue, Room D356, Winnipeg, MB, R3E 0W3, Canada (e-mail: brownm4@myumanitoba.ca)

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INTRODUCTION

The setting in which orthodontic practices exist has changed dramatically during the previous decades. Orthodontic practices have functioned as small businesses and had near absolute influence on the provision of orthodontic care. A shift in this balance occurred when contemporary edgewise appliances made orthodontics more accessible to general practitioners (GPs). Recently, a new equilibrium emerged after the advent of teledentistry and the growth of clear aligner therapy (CAT), allowing more GPs and direct-to-consumer (DTC) companies to provide orthodontic care.

Teledentistry facilitates delivery of dental care by overcoming geographic constraints.¹ Advantages include increased access to care for remote populations and collaboration among health care professionals.² Many orthodontists use some form of teledentistry, such as online forums and continuing education.³ This has led to the possibility of remote monitoring and scheduling in-office appointments personalized for treatment progression.⁴

The development of CAT, whose main advantages are fewer appointments and reduced chair time, has been popularized worldwide.⁵ In 1997, Align Technology was founded and began developing their version of CAT.⁵ Originally, their system was marketed solely to orthodontists.⁶ However, after a few years, Align Technology marketed the Invisalign technique to certify GPs in its use.⁶ Treatment with CAT has increased in popularity, with the majority of market share being consumed by Align Technology.

The advancement of teleorthodontics has indirectly facilitated the creation of “do-it-yourself” (DIY) orthodontics that advertise DTC. The main advertised appeal is twofold: convenience via elimination of fixed appointments and reduced cost.² With DTC providers, patients are altering their dentition without direct orthodontist supervision.² Patients may be unaware of the implications of such methods of orthodontic tooth movement, such as the inherent risks of the omitted clinical exam by a licensed practitioner.⁷

Multiple dental and orthodontic associations have issued statements or consumer alerts to educate patients on the risks associated with DIY orthodontics.^{8,9} These organizations expressed concern regarding the lack of professional oversight in the initial clinical examination and ongoing treatment supervision by DTC providers. Statements and certain views expressed by these entities has led to legal action by some DTC providers.¹⁰

Given the changes to the orthodontic environment, the purpose of this study was to evaluate orthodontists' opinions regarding the profession by discerning if they have perceived a negative impact to their practice and noting adaptational changes they may have made to their practice in the past 10 years. This information may provide orthodontists with an armamentarium to remain competitive in this new environment.

MATERIALS AND METHODS

Health Research Ethics Board approval was obtained by the University of Manitoba ethics board (No. H2020:028). An original 16-question survey (Appendix 1) was developed by two orthodontists, one orthodontic resident, and a psychometrician. The electronic survey was distributed online via an orthodontic forum, an email to university alumni, and the American Association of Orthodontists' Partners in Research Program. The target population was orthodontists practicing in the United States of America and Canada. A total of 270 individuals participated in the survey from February through September 2020.

The survey was designed so participants could not return to previous questions. This prohibited altering answers to earlier questions after progressing through

the survey. In addition, responses from individuals who selected the same answer choice continually were excluded.

The survey questions were designed to establish participants' (1) demographic background, (2) relative practice size and location, (3) perceived impact from GPs and DTC orthodontic providers, and (4) the changes made to their practice in the past 10 years.

Statistical Analysis

The Pearson chi-square test was used to identify and evaluate demographic factors that influenced participants' perceptions of the effects on their practice from GP and DTC providers and the changes providers have made to the administration of their practices. Analysis was performed using IBM SPSS Statistics for Windows (version 27.0; IBM Corp, Armonk, N.Y.). The significance level was set at 0.05. When suitable, linear-by-linear and likelihood ratio testing were undertaken to aid with interpretation of significance.

RESULTS

A total of 270 orthodontists completed the questionnaire. Regarding the participants' demographics, 189 (70.0%) were men, 79 (29.3%) were women, and 2 (0.7%) preferred not to say. Participants' years in practice was evenly distributed with a slight decreasing trend toward greater experience. Regarding nationality, 203 (75.5%) practiced in the United States vs 66 (24.5%) in Canada. Regarding community size, 88 (32.7%) practiced in a city, 120 (44.6%) in a suburban area, 57 (21.2%) in a small city or town, and 4 (1.5%) in a rural area. Most participants (218, 82.0%) had 3000 or fewer patients in their practice.

When asked if they had perceived an impact on their practice attributed to the increased numbers of GPs providing orthodontic services, 182 (67.7%) participants said yes, 52 (19.3%) said no, and 35 (13.0%) were unsure. More experienced orthodontists ($P = .0001$) and men ($P = .027$) were more likely to have indicated a perceived impact from GP orthodontics (Table 1). The sentiment was less focused when considering the effect of DTC providers. A total of 108 (40.1%) indicated a perceived impact from DTC providers, 89 (33.1%) indicated no effect, and 72 (26.8%) were unsure. Orthodontists in the United States were more likely to have indicated a perceived impact from DTC orthodontic providers ($P = .017$; Table 2).

When reporting if they had observed a reduction in GP referrals in the past 10 years, 165 (61.1%) participants indicated affirmatively, 63 (23.3%) indicated no, and 42 (5.6%) were unsure. Orthodontists with more years of experience were more likely to report a

Table 1. Participants' Perceived Impact From GPs

| Demographic Characteristics | Yes, n (%) | No, n (%) | Unsure, n (%) | df ^a | P Value |
|---------------------------------|------------|-----------|---------------|-----------------|--------------------|
| Years in practice | | | | 8 | .0001 ^b |
| <10 | 51 (62.2) | 9 (11.0) | 22 (26.8) | | |
| 10–20 | 46 (59.0) | 25 (32.1) | 7 (9.0) | | |
| 20–30 | 43 (78.2) | 7 (12.7) | 5 (9.1) | | |
| 30–40 | 27 (73.0) | 9 (24.3) | 1 (2.7) | | |
| >40 | 14 (87.5) | 2 (12.5) | 0 (0.0) | | |
| Gender | | | | 4 | .027 ^b |
| Male | 135 (71.8) | 36 (19.1) | 17 (9.0) | | |
| Female | 46 (58.2) | 15 (19.0) | 18 (22.8) | | |
| Prefer not to say | 1 (50.0) | 1 (50.0) | 0 (0.0) | | |
| Community size | | | | 4 | .847 |
| Metropolitan area | 62 (70.5) | 16 (18.2) | 10 (11.4) | | |
| Suburban/outside principal city | 79 (66.4) | 22 (18.5) | 18 (15.1) | | |
| Small city/town | 40 (65.6) | 14 (23.0) | 7 (11.5) | | |
| Nationality | | | | 2 | .724 |
| Canadian | 47 (71.2) | 12 (18.2) | 7 (10.6) | | |
| American | 134 (66.3) | 40 (19.8) | 28 (13.9) | | |
| Patient population | | | | 8 | .295 |
| <1000 | 64 (70.3) | 15 (16.5) | 12 (13.2) | | |
| 1000–2000 | 56 (70.9) | 11 (13.9) | 12 (15.2) | | |
| 2000–3000 | 31 (66.0) | 10 (21.3) | 6 (12.8) | | |
| 3000–4000 | 10 (50.0) | 8 (40.0) | 2 (10.0) | | |
| >4000 | 18 (64.3) | 8 (28.6) | 2 (7.1) | | |

^a *df* indicates degrees of freedom.

^b Chi-square *P* value statistically significant if $\leq .05$.

reduction in GP referrals in the past 10 years ($P = .0001$; Table 3). When asked if they had observed an increase in referred case difficulty, 160 (59.3%) indicated “yes”, 72 (26.7%) indicated “no”, and 38 (14.1%) were “unsure”. When asked if they felt a need to make their practice more competitive, 185 (74.0%) indicated

“yes”, and 65 (26.0%) indicated “no”. There was an inverse relationship between years in practice and the perceived need to be more competitive ($P = .021$; Table 4).

Participants were asked questions regarding the way they managed their practice. Possible changes and

Table 2. Participants' Perceived Impact From DTC Providers

| Demographic Characteristics | Yes, n (%) | No, n (%) | Unsure, n (%) | df | P Value |
|---------------------------------|------------|-----------|---------------|----|-------------------|
| Years in practice | | | | 8 | .007 ^a |
| <10 | 31 (37.8) | 17 (20.7) | 34 (41.5) | | |
| 10–20 | 29 (37.2) | 37 (47.4) | 12 (15.4) | | |
| 20–30 | 24 (43.6) | 16 (29.1) | 15 (27.3) | | |
| 30–40 | 17 (45.9) | 13 (35.1) | 7 (18.9) | | |
| >40 | 6 (37.5) | 6 (37.5) | 4 (25.0) | | |
| Gender | | | | 4 | .439 |
| Male | 78 (41.5) | 65 (34.6) | 45 (23.9) | | |
| Female | 29 (36.7) | 23 (29.1) | 27 (34.2) | | |
| Prefer not to say | 1 (50.0) | 1 (50.0) | 0 (0.0) | | |
| Community size | | | | 4 | .868 |
| Metropolitan area | 35 (39.8) | 27 (30.7) | 26 (29.5) | | |
| Suburban/outside principal city | 46 (38.7) | 42 (35.3) | 31 (26.1) | | |
| Small city/town | 27 (44.3) | 20 (32.8) | 13 (23.0) | | |
| Nationality | | | | 2 | .017 ^a |
| Canadian | 17 (25.8) | 29 (43.9) | 20 (30.3) | | |
| American | 91 (45.0) | 60 (29.7) | 51 (25.2) | | |
| Patient population | | | | 8 | .249 |
| <1000 | 35 (38.5) | 26 (28.6) | 30 (33.3) | | |
| 1000–2000 | 33 (41.8) | 25 (31.6) | 21 (26.6) | | |
| 2000–3000 | 22 (46.8) | 16 (34.0) | 9 (19.1) | | |
| 3000–4000 | 5 (25.0) | 12 (60.0) | 3 (15.0) | | |
| >4000 | 12 (42.9) | 9 (32.1) | 7 (25.0) | | |

^a Chi-square *P* value statistically significant if $\leq .05$.

Table 3. Participant Perception of Number of Referrals

| Demographic Characteristics | Yes, n (%) | No, n (%) | Unsure, n (%) | df | P Value |
|---------------------------------|------------|-----------|---------------|----|--------------------|
| Years in practice | | | | 8 | .0001 ^a |
| <10 | 34 (41.5) | 18 (22.0) | 30 (36.6) | | |
| 10–20 | 51 (64.4) | 22 (28.2) | 5 (6.4) | | |
| 20–30 | 34 (61.8) | 19 (34.5) | 2 (3.6) | | |
| 30–40 | 28 (73.7) | 10 (26.3) | 0 (0.0) | | |
| >40 | 12 (75.0) | 3 (18.8) | 1 (6.3) | | |
| Gender | | | | 4 | .935 |
| Male | 113 (59.8) | 50 (26.5) | 26 (13.8) | | |
| Female | 46 (58.2) | 21 (26.6) | 12 (15.2) | | |
| Prefer not to say | 1 (50.0) | 1 (50.0) | 0 (0.0) | | |
| Community size | | | | 4 | .74 |
| Metropolitan area | 53 (60.2) | 23 (26.1) | 12 (13.6) | | |
| Suburban/outside principal city | 70 (58.3) | 30 (25.0) | 20 (16.7) | | |
| Small city/town | 36 (59.0) | 19 (31.1) | 6 (9.8) | | |
| Nationality | | | | 2 | .532 |
| Canadian | 38 (57.6) | 16 (24.2) | 12 (18.2) | | |
| American | 121 (59.6) | 56 (27.6) | 26 (12.8) | | |
| Patient population | | | | 8 | .814 |
| <1000 | 56 (61.5) | 22 (24.2) | 13 (14.3) | | |
| 1000–2000 | 46 (57.5) | 21 (26.3) | 13 (16.3) | | |
| 2000–3000 | 31 (66.0) | 12 (25.5) | 4 (8.5) | | |
| 3000–4000 | 12 (60.0) | 6 (30.0) | 2 (10.0) | | |
| >4000 | 13 (46.4) | 9 (32.1) | 6 (21.4) | | |

^a Chi-square *P* value statistically significant if $\leq .05$.

policies were presented to participants, and they specified if they had implemented such alterations in their practice. In addition, participants were asked to identify whether they had implemented each change in the previous 10 years.

The participants' implementation of patient-centered practices was significantly associated with three

demographic variables (Figure 1, Table 5). There was a positive association between years of experience and offering patient family discounts ($P = .0001$) and new patient incentives ($P = .0001$) for more than 10 years. There was a positive association between being male and implementing a referral reward program ($P = .001$) and offering patient family discounts ($P = .0001$)

Table 4. Participant Perception of Need to Be More Competitive

| Demographic Characteristics | Yes, n (%) | No, n (%) | df | P Value |
|---------------------------------|------------|-----------|----|-------------------|
| Years in practice | | | 4 | .021 ^a |
| <10 | 60 (82.2) | 13 (17.8) | | |
| 10–20 | 55 (75.3) | 18 (24.7) | | |
| 20–30 | 40 (76.9) | 12 (23.1) | | |
| 30–40 | 19 (52.8) | 17 (47.2) | | |
| >40 | 11 (68.8) | 5 (31.3) | | |
| Gender | | | 2 | .492 |
| Male | 127 (72.6) | 48 (27.4) | | |
| Female | 57 (78.1) | 16 (21.9) | | |
| Prefer not to say | 1 (50.0) | 1 (50.0) | | |
| Community size | | | 2 | .764 |
| Metropolitan area | 58 (71.6) | 23 (28.4) | | |
| Suburban/outside principal city | 83 (76.1) | 26 (23.9) | | |
| Small city/town | 43 (72.9) | 16 (27.1) | | |
| Nationality | | | 1 | .815 |
| Canadian | 48 (75.0) | 16 (25.0) | | |
| American | 136 (73.5) | 49 (26.5) | | |
| Patient population | | | 4 | .43 |
| <1000 | 65 (78.3) | 18 (21.7) | | |
| 1000–2000 | 56 (73.7) | 20 (26.3) | | |
| 2000–3000 | 33 (76.7) | 10 (23.3) | | |
| 3000–4000 | 13 (68.4) | 6 (31.6) | | |
| >4,000 | 15 (60.0) | 10 (40.0) | | |

^a Chi-square *P* value statistically significant if $\leq .05$.

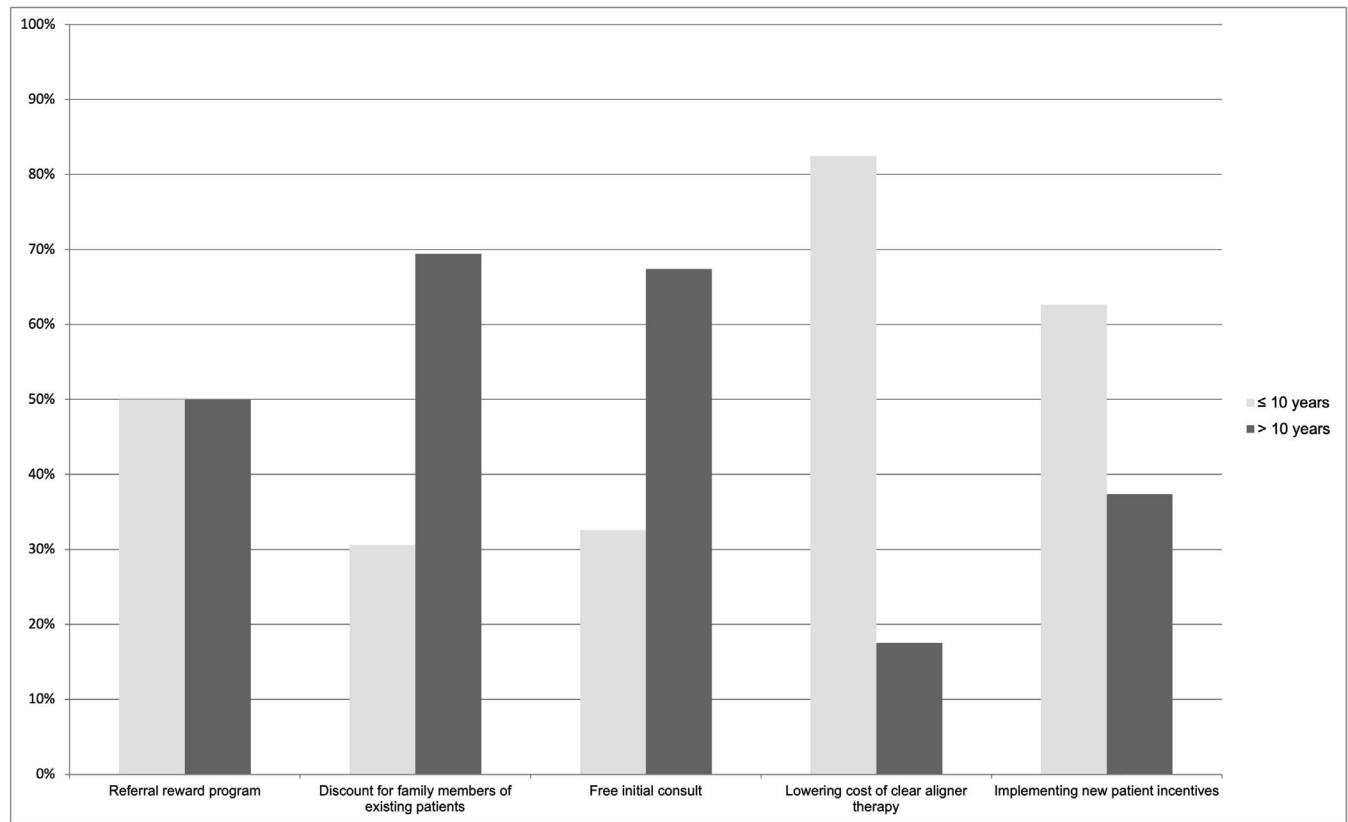


Figure 1. Patient-centered policy changes in orthodontic practices.

Table 5. Patient-Centered Policy Changes in Orthodontic Practices

| Demographic Characteristics | Referral Reward Program | | | | Patient Family Discount | | | |
|---------------------------------|-------------------------|------------------|----|--------------------|-------------------------|------------------|----|--------------------|
| | <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value |
| Years in practice | | | 4 | .0001 ^a | | | 4 | .0001 ^a |
| <10 | 32 (88.9) | 4 (11.1) | | | 39 (78.0) | 11 (22.0) | | |
| 10–20 | 18 (50.0) | 18 (50.0) | | | 8 (12.7) | 55 (87.3) | | |
| 20–30 | 5 (20.0) | 20 (80.0) | | | 7 (17.5) | 33 (82.5) | | |
| 30–40 | 5 (27.8) | 13 (72.2) | | | 3 (10.3) | 26 (89.7) | | |
| >40 | 0 (0.0) | 5 (100.0) | | | 2 (18.2) | 9 (81.8) | | |
| Gender | | | 1 | .001 ^a | | | 1 | .0001 ^a |
| Male | 34 (40.0) | 51 (60.0) | | | 32 (23.2) | 106 (76.8) | | |
| Female | 26 (74.3) | 9 (25.7) | | | 27 (49.1) | 28 (50.9) | | |
| Community size | | | 2 | .493 | | | 2 | .694 |
| Metropolitan area | 21 (50.0) | 21 (50.0) | | | 17 (28.3) | 43 (71.7) | | |
| Suburban/outside principal city | 28 (54.9) | 23 (45.1) | | | 29 (33.7) | 57 (66.3) | | |
| Small city/town | 11 (40.7) | 16 (59.3) | | | 13 (27.7) | 34 (72.3) | | |
| Nationality | | | 1 | .522 | | | 1 | .149 |
| Canadian | 16 (55.2) | 13 (44.8) | | | 19 (38.8) | 30 (61.2) | | |
| American | 44 (48.4) | 47 (51.6) | | | 40 (27.8) | 104 (72.2) | | |
| Patient population | | | 4 | .861 | | | 4 | .319 |
| <1000 | 16 (57.1) | 12 (42.9) | | | 22 (38.6) | 35 (61.4) | | |
| 1000–2000 | 21 (52.5) | 19 (47.5) | | | 20 (33.9) | 39 (66.1) | | |
| 2000–3000 | 12 (42.9) | 16 (57.1) | | | 10 (26.3) | 28 (73.7) | | |
| 3000–4000 | 4 (50.0) | 4 (50.0) | | | 3 (20.0) | 12 (80.0) | | |
| >4000 | 7 (46.7) | 8 (53.3) | | | 4 (18.2) | 18 (81.8) | | |

^a Chi-square *P* value statistically significant if $\leq .05$.

and free initial consults ($P = .0001$) for more than 10 years.

The participants' community outreach was significantly associated with two variables (Figure 2, Table 6). There was a positive association between years of experience and submitting educational press releases to local media ($P = .005$) and seeking referrals from other dental specialists ($P = .0001$) for more than 10 years. In addition, female orthodontists were more likely to have begun sponsoring local community events ($P = .001$) and seeking referrals from other dental specialists ($P = .006$) in the previous 10 years.

The participants' online presence was significantly associated with one variable (Figure 3, Table 7). Female orthodontists were significantly more likely to have redesigned their practice website ($P = .0001$), employed search engine optimization ($P = .048$), used pay-per-click advertising ($P = .029$), increased their practice social media presence ($P = .002$), used advertisement retargeting ($P = .044$), and encouraged patient online reviews ($P = .001$) in the previous 10 years.

Participants' staffing policies were significantly associated with three variables (Figure 4, Table 8). There was a positive association between years in practice and having performance goals ($P = .0001$) and a bonus system ($P = .0001$), cross-training staff ($P = .0001$), delegating increased responsibility ($P = .0001$), and hiring additional assistants ($P = .0001$) more than

10 years ago. Female orthodontists were more likely to have begun setting performance goals ($P = .013$), having a bonus system ($P = .016$), hiring a treatment coordinator ($P = .023$), cross-training staff ($P = .023$), delegating more responsibility ($P = .004$), and hiring additional assistants ($P = .005$) in the past 10 years. Orthodontists with larger practice patient populations were more likely to have set performance goals ($P = .006$) and a bonus system ($P = .020$), hired a treatment coordinator ($P = .014$), implemented team-building activities ($P = .023$), cross-trained staff ($P = .011$), delegated increased responsibility ($P = .043$), and hired additional assistants ($P = .048$) more than 10 years ago.

The participants' changes to office technology were significantly associated with one variable (Figure 5, Table 9). Female orthodontists were more likely to have purchased new technology ($P = .018$) and added automation to patient correspondence ($P = .026$) in the past 10 years.

The participants' changes to clinic-centric practices were significantly associated with one variable (Figure 6, Table 10). Orthodontists practicing in metropolitan areas were significantly less likely than those in suburban and rural areas to have changed a supply provider for major purchases in the past 10 years ($P = .002$). Orthodontists practicing in suburban areas were more likely than those in metropolitan and rural areas

Table 5. Extended

| Free Initial Consult | | | | Lower Cost of CAT | | | | New Patient Incentives | | | |
|----------------------|---------------------|----|--------------------|---------------------|---------------------|----|-------------------|------------------------|---------------------|----|--------------------|
| <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value |
| | | 4 | .0001 ^a | | | 4 | .127 | | | 4 | .0001 ^a |
| 36 (76.6) | 11 (23.4) | | | 31 (93.9) | 2 (6.1) | | | 28 (90.3) | 3 (9.7) | | |
| 10 (16.9) | 49 (83.1) | | | 33 (84.6) | 6 (15.4) | | | 16 (53.3) | 14 (46.7) | | |
| 5 (14.3) | 30 (85.7) | | | 17 (68.0) | 8 (32.0) | | | 9 (50.0) | 9 (50.0) | | |
| 3 (12.5) | 21 (87.5) | | | 10 (76.9) | 3 (23.1) | | | 1 (12.5) | 7 (87.5) | | |
| 3 (30.0) | 7 (70.0) | | | 3 (75.0) | 1 (25.0) | | | 3 (75.0) | 1 (25.0) | | |
| | | 1 | .0001 ^a | | | 1 | .253 | | | 1 | .001 ^a |
| 30 (24.4) | 93 (75.6) | | | 63 (79.9) | 16 (20.3) | | | 29 (50.0) | 29 (50.0) | | |
| 27 (51.9) | 25 (48.1) | | | 31 (88.6) | 4 (11.4) | | | 28 (84.8) | 5 (15.2) | | |
| | | 2 | .769 | | | 2 | .012 ^a | | | 2 | .335 |
| 16 (31.4) | 35 (68.6) | | | 33 (91.7) | 3 (8.3) | | | 20 (74.1) | 7 (25.9) | | |
| 29 (35.4) | 53 (64.6) | | | 45 (86.5) | 7 (13.5) | | | 28 (57.1) | 21 (42.9) | | |
| 12 (29.3) | 29 (70.7) | | | 16 (64.0) | 9 (36.0) | | | 9 (60.0) | 6 (40.0) | | |
| | | 1 | .010 ^a | | | 1 | .525 | | | 1 | .029 ^a |
| 17 (51.5) | 16 (48.5) | | | 20 (87.0) | 3 (13.0) | | | 16 (84.2) | 3 (15.8) | | |
| 40 (28.2) | 102 (71.8) | | | 74 (81.3) | 17 (18.7) | | | 41 (56.9) | 31 (43.1) | | |
| | | 4 | .046 ^a | | | 4 | .709 | | | 4 | .46 |
| 22 (46.8) | 25 (53.2) | | | 21 (80.8) | 5 (19.2) | | | 21 (75.0) | 7 (25.0) | | |
| 20 (35.7) | 36 (64.3) | | | 32 (86.5) | 5 (13.5) | | | 18 (62.1) | 11 (37.9) | | |
| 10 (28.6) | 25 (71.4) | | | 23 (88.5) | 3 (11.5) | | | 10 (55.6) | 8 (44.4) | | |
| 2 (15.4) | 11 (84.6) | | | 7 (77.8) | 2 (22.2) | | | 2 (40.0) | 3 (60.0) | | |
| 3 (14.3) | 18 (85.7) | | | 11 (73.3) | 4 (26.7) | | | 6 (54.5) | 5 (45.5) | | |

Table 6. Community Outreach Customs of Orthodontic Practices

| Demographic Characteristics | Sponsor Local Events | | | | Press Releases | | | | Seek Referrals From Other Specialists | | | |
|---------------------------------|----------------------|------------------|----|--------------------|------------------|------------------|----|-------------------|---------------------------------------|------------------|----|--------------------|
| | <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value |
| Years in practice | | | 4 | .0001 ^a | | | 4 | .005 ^a | | | 4 | .0001 ^a |
| <10 | 30 (71.4) | 12 (28.6) | | | 14 (77.8) | 4 (22.2) | | | 27 (75.0) | 9 (25.0) | | |
| 10–20 | 11 (19.3) | 46 (80.7) | | | 14 (66.7) | 7 (33.3) | | | 6 (16.2) | 31 (83.8) | | |
| 20–30 | 7 (19.4) | 20 (80.6) | | | 2 (18.2) | 9 (81.8) | | | 5 (21.7) | 18 (78.3) | | |
| 30–40 | 4 (16.7) | 20 (83.3) | | | 3 (33.3) | 6 (66.7) | | | 1 (5.3) | 18 (94.7) | | |
| >40 | 2 (16.7) | 10 (83.3) | | | 0 (0.0) | 2 (100.0) | | | 2 (28.6) | 5 (71.4) | | |
| Gender | | | 1 | .001 ^a | | | 1 | .261 | | | 1 | .006 ^a |
| Male | 30 (24.4) | 93 (75.6) | | | 23 (50.0) | 23 (50.0) | | | 22 (25.9) | 63 (74.1) | | |
| Female | 24 (50.0) | 24 (50.0) | | | 10 (66.7) | 5 (33.3) | | | 19 (51.4) | 18 (48.6) | | |
| Community size | | | 2 | .333 | | | 2 | .001 ^a | | | 2 | .316 |
| Metropolitan area | 17 (33.3) | 34 (66.7) | | | 14 (87.5) | 2 (12.5) | | | 15 (34.9) | 28 (65.1) | | |
| Suburban/outside principal city | 26 (36.1) | 46 (63.9) | | | 16 (53.3) | 14 (46.7) | | | 20 (39.2) | 31 (60.8) | | |
| Small city/town | 11 (23.4) | 36 (76.6) | | | 3 (21.4) | 11 (78.6) | | | 6 (22.2) | 21 (77.8) | | |
| Nationality | | | 1 | .507 | | | 1 | .023 ^a | | | 1 | .266 |
| Canadian | 15 (35.7) | 27 (64.3) | | | 10 (83.3) | 2 (16.7) | | | 10 (43.5) | 13 (56.5) | | |
| American | 39 (30.2) | 90 (69.8) | | | 23 (46.9) | 26 (53.1) | | | 31 (31.3) | 68 (68.7) | | |
| Patient population | | | 4 | .182 | | | 4 | .936 | | | 4 | .168 |
| <1000 | 16 (33.3) | 32 (66.7) | | | 8 (53.3) | 7 (46.7) | | | 16 (42.1) | 22 (57.9) | | |
| 1000–2000 | 23 (42.6) | 31 (57.4) | | | 9 (52.9) | 8 (47.1) | | | 15 (42.9) | 20 (57.1) | | |
| 2000–3000 | 7 (19.4) | 29 (80.6) | | | 8 (57.1) | 6 (42.9) | | | 4 (16.0) | 21 (84.0) | | |
| 3000–4000 | 4 (30.8) | 9 (62.9) | | | 3 (75.0) | 1 (25.0) | | | 2 (22.2) | 7 (77.8) | | |
| >4000 | 4 (22.2) | 14 (77.8) | | | 5 (50.0) | 5 (50.0) | | | 4 (33.3) | 8 (66.7) | | |

^a Chi-square *P* value statistically significant if $\leq .05$.

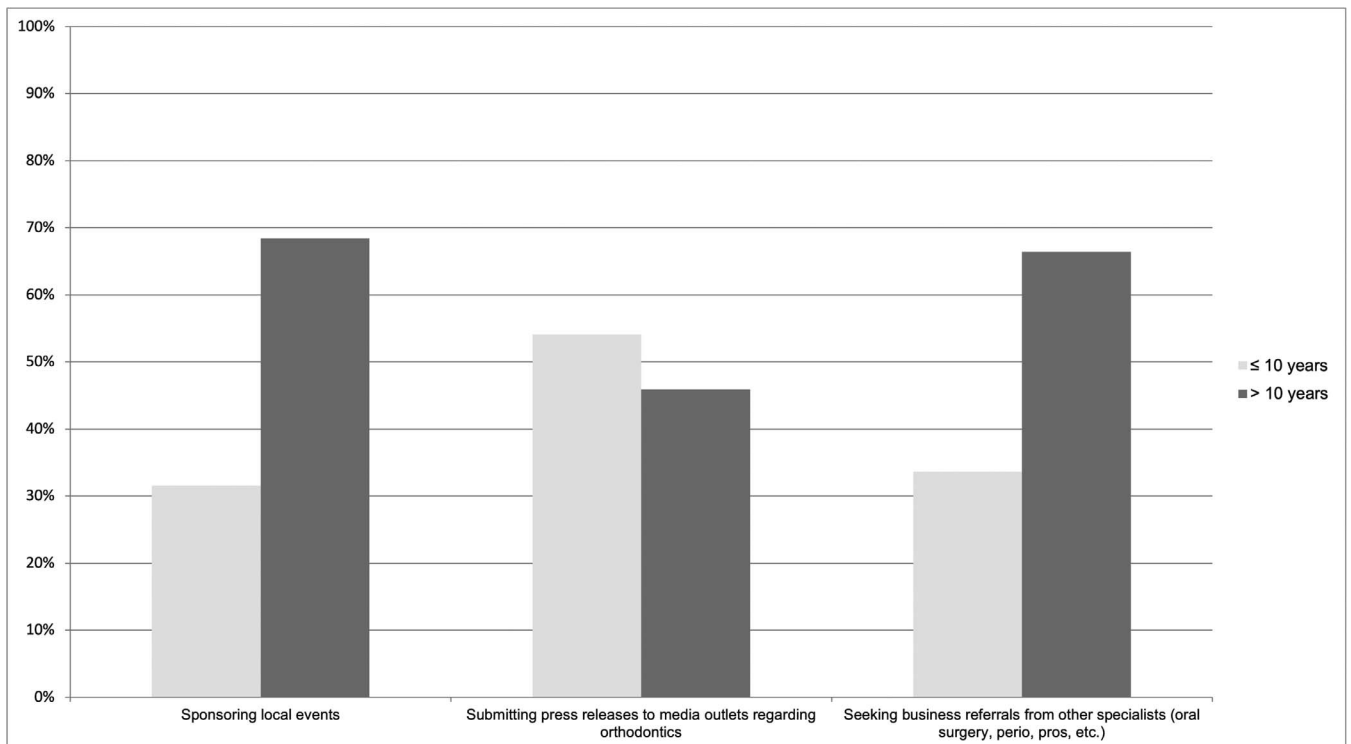


Figure 2. Community outreach customs of orthodontic practices.

Table 7. Online Presence Changes in Orthodontic Practices

| Demographic Characteristics | Redesigned Practice Website Professionally | | | Optimized Search Engine | | | Advertised Pay-per-Click | | |
|---------------------------------|--|------------------|----------------------|-------------------------|------------------|----------------------|--------------------------|------------------|---------------------|
| | <10 Years, n (%) | >10 Years, n (%) | P Value | <10 Years, n (%) | >10 Years, n (%) | P Value | <10 Years, n (%) | >10 Years, n (%) | P Value |
| Years in practice | | | 4 .008 ^a | | | 4 .0001 ^a | | | 4 .043 ^a |
| <10 | 46 (95.8) | 2 (4.2) | | 43 (97.7) | 1 (2.3) | | 26 (100.0) | 0 (0.0) | |
| 10–20 | 41 (74.5) | 14 (25.5) | | 31 (68.9) | 14 (31.1) | | 28 (87.5) | 4 (12.5) | |
| 20–30 | 24 (64.9) | 13 (35.1) | | 22 (68.8) | 10 (31.3) | | 11 (68.8) | 5 (31.3) | |
| 30–40 | 22 (81.5) | 5 (18.5) | | 20 (95.2) | 1 (4.8) | | 6 (75.0) | 2 (25.0) | |
| >40 | 8 (72.7) | 3 (27.3) | | 5 (100.0) | 0 (0.0) | | 2 (100.0) | 0 (0.0) | |
| Gender | | | 1 .0001 ^a | | | 1 .048 ^a | | | 1 .029 ^a |
| Male | 94 (72.3) | 36 (27.7) | | 84 (78.5) | 23 (21.5) | | 50 (82.0) | 11 (18.0) | |
| Female | 47 (97.9) | 1 (2.1) | | 37 (92.5) | 3 (7.5) | | 23 (100.0) | 0 (0.0) | |
| Community size | | | 2 .093 | | | 2 .266 | | | 2 .219 |
| Metropolitan area | 48 (98.3) | 7 (12.7) | | 40 (87.0) | 6 (13.0) | | 21 (95.5) | 1 (4.5) | |
| Suburban/outside principal city | 60 (78.9) | 16 (21.1) | | 59 (83.1) | 12 (16.9) | | 39 (86.7) | 6 (13.3) | |
| Small city/town | 32 (69.6) | 14 (30.4) | | 21 (72.4) | 8 (27.6) | | 13 (76.5) | 4 (23.5) | |
| Nationality | | | 1 .047 ^a | | | 1 .73 | | | 1 .219 |
| Canadian | 37 (90.2) | 4 (9.8) | | 27 (84.4) | 5 (15.6) | | 19 (95.0) | 1 (5.0) | |
| American | 104 (75.9) | 33 (24.1) | | 94 (81.7) | 21 (18.3) | | 54 (84.4) | 10 (15.6) | |
| Patient population | | | 4 .961 | | | 4 .034 ^a | | | 4 .033 ^a |
| <1000 | 40 (76.9) | 12 (23.1) | | 34 (94.4) | 2 (5.6) | | 18 (100.0) | 0 (0.0) | |
| 1000–2000 | 44 (83.0) | 9 (17.0) | | 38 (80.9) | 9 (19.1) | | 26 (92.9) | 2 (7.1) | |
| 2000–3000 | 28 (80.0) | 7 (20.0) | | 27 (84.4) | 5 (15.6) | | 18 (81.8) | 4 (18.2) | |
| 3000–4000 | 12 (80.0) | 3 (20.0) | | 10 (76.9) | 3 (23.1) | | 5 (83.3) | 1 (16.7) | |
| >4000 | 15 (78.9) | 4 (21.1) | | 10 (58.8) | 7 (41.2) | | 6 (60.0) | 4 (40.0) | |

^a Chi-square P value statistically significant if ≤.05.

Table 8. Staffing Policy Changes in Orthodontic Practices

| Demographic Characteristics | Hired Treatment Coordinator | | | Created Performance Goals | | | Created Bonus System | | |
|---------------------------------|-----------------------------|------------------|---------|---------------------------|------------------|----------------------|----------------------|------------------|----------------------|
| | <10 Years, n (%) | >10 Years, n (%) | P Value | <10 Years, n (%) | >10 Years, n (%) | P Value | <10 Years, n (%) | >10 Years, n (%) | P Value |
| Years in practice | | | 4 .482 | | | 4 .0001 ^a | | | 4 .0001 ^a |
| <10 | 20 (87.0) | 3 (13.0) | | 32 (86.5) | 5 (13.5) | | 33 (84.6) | 6 (15.4) | |
| 10–20 | 22 (68.8) | 10 (31.3) | | 20 (48.8) | 21 (51.2) | | 23 (53.5) | 20 (46.5) | |
| 20–30 | 10 (71.4) | 4 (28.6) | | 7 (36.8) | 12 (63.2) | | 8 (30.8) | 18 (69.2) | |
| 30–40 | 5 (62.5) | 3 (37.5) | | 4 (23.5) | 13 (76.5) | | 5 (29.4) | 12 (70.6) | |
| >40 | 3 (60.0) | 2 (40.0) | | 1 (16.7) | 5 (83.3) | | 2 (33.3) | 4 (66.7) | |
| Gender | | | 1 .351 | | | 1 .013 ^a | | | 1 .016 ^a |
| Male | 43 (70.5) | 18 (29.5) | | 38 (45.8) | 45 (54.2) | | 43 (47.3) | 48 (52.7) | |
| Female | 17 (81.0) | 4 (19.0) | | 26 (70.3) | 11 (29.7) | | 28 (70.0) | 12 (30.0) | |
| Community size | | | 2 .212 | | | 2 .254 | | | 2 .163 |
| Metropolitan area | 18 (66.7) | 9 (33.3) | | 24 (64.9) | 13 (35.1) | | 24 (63.2) | 14 (36.8) | |
| Suburban/outside principal city | 29 (70.7) | 12 (29.3) | | 26 (50.0) | 26 (50.0) | | 33 (55.9) | 26 (44.1) | |
| Small city/town | 12 (92.3) | 1 (7.7) | | 14 (46.7) | 16 (53.3) | | 14 (41.2) | 20 (58.8) | |
| Nationality | | | 1 .987 | | | 1 .028 ^a | | | 1 .058 |
| Canadian | 11 (73.3) | 4 (26.7) | | 20 (71.8) | 8 (28.6) | | 19 (70.4) | 8 (29.6) | |
| American | 49 (73.1) | 18 (26.9) | | 44 (47.8) | 48 (52.2) | | 52 (50.0) | 52 (50.0) | |
| Patient population | | | 4 .244 | | | 4 .006 ^a | | | 4 .020 ^a |
| <1000 | 12 (85.7) | 2 (14.3) | | 19 (63.3) | 11 (36.7) | | 24 (64.9) | 13 (35.1) | |
| 1000–2000 | 16 (66.7) | 8 (33.3) | | 23 (60.5) | 15 (39.5) | | 26 (60.5) | 17 (39.5) | |
| 2000–3000 | 16 (80.0) | 4 (20.0) | | 17 (60.7) | 11 (39.3) | | 14 (56.0) | 11 (44.0) | |
| 3000–4000 | 7 (87.5) | 1 (12.5) | | 3 (30.0) | 7 (70.0) | | 3 (27.3) | 8 (72.7) | |
| >4000 | 7 (53.8) | 6 (46.2) | | 1 (8.3) | 11 (91.7) | | 3 (21.4) | 11 (78.6) | |

^a Chi-square P value statistically significant if ≤.05.

Table 7. Extended

| Increased Online Directory Listings | | | | Ensured Online Listings Consistency | | | | Increased Social Media Presence | | | |
|-------------------------------------|------------------|----|-------------------|-------------------------------------|------------------|----|-------------------|---------------------------------|------------------|----|-------------------|
| <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value |
| | | 4 | .050 ^a | | | 4 | .007 ^a | | | 4 | .028 ^a |
| 27 (100.0) | 0 (0.0) | | | 31 (100.0) | 0 (0.0) | | | 50 (98.0) | 1 (2.0) | | |
| 23 (74.2) | 8 (25.8) | | | 35 (83.3) | 7 (16.7) | | | 49 (83.1) | 10 (16.9) | | |
| 13 (72.2) | 5 (27.8) | | | 13 (61.9) | 8 (38.1) | | | 29 (82.9) | 6 (17.1) | | |
| 7 (77.8) | 2 (22.2) | | | 15 (71.4) | 6 (28.6) | | | 18 (72.0) | 7 (28.0) | | |
| 3 (100.0) | 0 (0.0) | | | 5 (83.3) | 1 (16.7) | | | 7 (87.5) | 1 (12.5) | | |
| | | 1 | .072 | | | 1 | .047 ^a | | | 1 | .002 ^a |
| 52 (78.8) | 14 (21.2) | | | 64 (77.1) | 19 (22.9) | | | 101 (80.8) | 24 (19.2) | | |
| 21 (95.5) | 1 (4.5) | | | 35 (92.1) | 3 (7.9) | | | 52 (98.1) | 1 (1.9) | | |
| | | 2 | .22 | | | 2 | .091 | | | 2 | .241 |
| 24 (88.9) | 3 (11.1) | | | 34 (82.9) | 7 (17.1) | | | 49 (92.5) | 4 (7.5) | | |
| 38 (84.4) | 7 (15.6) | | | 52 (86.7) | 8 (13.3) | | | 68 (84.0) | 13 (16.0) | | |
| | | 1 | .252 | | | 1 | .397 | | | 1 | .698 |
| 11 (68.8) | 5 (31.3) | | | 13 (65.0) | 7 (35.0) | | | 35 (81.4) | 8 (18.6) | | |
| 20 (90.9) | 2 (9.1) | | | 19 (76.0) | 6 (24.0) | | | 36 (87.8) | 5 (12.2) | | |
| 53 (80.3) | 13 (19.7) | | | 80 (83.3) | 16 (16.7) | | | 117 (85.4) | 20 (14.6) | | |
| | | 4 | .266 | | | 4 | .836 | | | 4 | .559 |
| 21 (87.5) | 3 (12.5) | | | 22 (88.0) | 3 (12.0) | | | 45 (90.0) | 5 (10.0) | | |
| 22 (84.6) | 4 (15.4) | | | 34 (81.0) | 8 (19.0) | | | 45 (86.5) | 7 (13.5) | | |
| 18 (90.0) | 2 (10.0) | | | 24 (77.4) | 7 (22.6) | | | 32 (86.5) | 5 (13.5) | | |
| 4 (57.1) | 3 (42.9) | | | 6 (75.0) | 2 (25.0) | | | 12 (75.0) | 4 (25.0) | | |
| 8 (72.7) | 3 (27.3) | | | 12 (85.7) | 2 (14.3) | | | 15 (78.9) | 4 (21.1) | | |

Table 8. Extended

| Made Staff Responsible for Patient Education | | | Created Team-Building Activities | | | Cross-Trained Staff | | | Increased Delegation | | | | | | |
|--|------------------|---------|----------------------------------|------------------|-----------|---------------------|-------------------|-----------|----------------------|------------------|-------------------|--------------------|-----------|---|-------------------|
| <10 Years, n (%) | >10 Years, n (%) | P Value | <10 Years, n (%) | >10 Years, n (%) | P Value | <10 Years, n (%) | >10 Years, n (%) | P Value | <10 Years, n (%) | >10 Years, n (%) | P Value | | | | |
| | | 4 | .001 ^a | | 4 | .0001 ^a | | 4 | .0001 ^a | | 4 | .0001 ^a | | | |
| 31 (86.1) | 5 (13.9) | | | 35 (85.4) | 6 (14.6) | | | 40 (83.3) | 8 (16.7) | | | 37 (94.9) | 2 (5.1) | | |
| 18 (43.9) | 23 (56.1) | | | 21 (40.4) | 31 (59.6) | | | 17 (30.4) | 39 (69.6) | | | 26 (51.0) | 25 (49.0) | | |
| 7 (36.8) | 12 (63.2) | | | 8 (26.7) | 22 (73.3) | | | 9 (22.5) | 31 (77.5) | | | 11 (32.4) | 23 (67.6) | | |
| 7 (46.7) | 8 (53.3) | | | 6 (26.1) | 17 (73.9) | | | 2 (8.3) | 22 (91.7) | | | 5 (20.8) | 19 (79.2) | | |
| 2 (40.0) | 3 (60.0) | | | 2 (33.3) | 4 (66.7) | | | 5 (41.7) | 7 (58.3) | | | 4 (40.0) | 6 (60.0) | | |
| | | 1 | .023 ^a | | | 1 | .137 | | | 1 | .023 ^a | | | 1 | .004 ^a |
| 38 (48.7) | 40 (51.3) | | | 46 (43.4) | 60 (56.6) | | | 46 (35.4) | 84 (64.6) | | | 50 (45.0) | 61 (55.0) | | |
| 27 (71.1) | 11 (28.9) | | | 26 (5.65) | 20 (43.5) | | | 27 (54.0) | 23 (46.0) | | | 33 (70.2) | 14 (29.8) | | |
| | | 2 | .543 | | | 2 | .611 | | | 2 | .324 | | | 2 | .732 |
| 22 (59.5) | 15 (40.5) | | | 21 (42.0) | 29 (58.0) | | | 19 (34.5) | 36 (65.5) | | | 25 (54.3) | 21 (45.7) | | |
| 31 (57.4) | 23 (42.6) | | | 33 (50.0) | 33 (50.0) | | | 37 (46.8) | 42 (53.2) | | | 39 (54.9) | 32 (45.1) | | |
| | | 1 | .365 | | | 1 | .708 | | | 1 | .619 | | | 1 | .257 |
| 11 (45.8) | 13 (54.2) | | | 18 (51.4) | 17 (48.6) | | | 17 (37.8) | 28 (62.2) | | | 19 (47.5) | 21 (52.5) | | |
| 16 (64.0) | 9 (36.0) | | | 19 (50.0) | 19 (50.0) | | | 18 (43.9) | 23 (56.1) | | | 23 (60.5) | 15 (39.5) | | |
| 49 (53.8) | 42 (46.2) | | | 53 (46.5) | 61 (53.5) | | | 55 (39.6) | 84 (60.4) | | | 60 (50.0) | 60 (50.0) | | |
| | | 4 | .014 ^a | | | 4 | .023 ^a | | | 4 | .011 ^a | | | 4 | .043 ^a |
| 19 (70.4) | 8 (29.6) | | | 19 (51.4) | 18 (48.6) | | | 26 (54.2) | 22 (45.8) | | | 24 (63.2) | 14 (36.8) | | |
| 22 (61.1) | 14 (38.9) | | | 27 (57.4) | 20 (42.6) | | | 26 (48.1) | 28 (51.9) | | | 28 (59.6) | 19 (40.4) | | |
| 15 (57.7) | 11 (42.3) | | | 15 (50.0) | 15 (50.0) | | | 10 (27.0) | 27 (73.0) | | | 19 (51.4) | 18 (48.6) | | |
| 6 (54.5) | 5 (45.5) | | | 5 (35.7) | 9 (64.3) | | | 5 (31.3) | 11 (68.8) | | | 6 (42.9) | 8 (57.1) | | |
| 2 (14.3) | 12 (85.7) | | | 3 (15.0) | 17 (85.0) | | | 4 (18.2) | 18 (81.8) | | | 4 (22.2) | 14 (77.8) | | |

Table 7. Extended

| Retargeted Advertisements | | | | Encouraged Online Reviews | | | | Addressed Bad Reviews | | | |
|---------------------------|------------------|----|-------------------|---------------------------|------------------|----|-------------------|-----------------------|------------------|----|-------------------|
| <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value |
| | | 4 | .277 | | | 4 | .030 ^a | | | 4 | .049 ^a |
| 16 (100.0) | 0 (0.0) | | | 40 (98.0) | 1 (2.0) | | | 23 (100.0) | 0 (0.0) | | |
| 19 (82.6) | 4 (17.4) | | | 38 (76.0) | 12 (24.0) | | | 21 (84.0) | 4 (16.0) | | |
| 6 (75.0) | 2 (25.0) | | | 28 (87.5) | 4 (12.5) | | | 10 (76.9) | 3 (23.1) | | |
| 5 (71.4) | 2 (28.6) | | | 22 (81.5) | 5 (18.5) | | | 4 (57.1) | 3 (42.9) | | |
| 2 (100.0) | 0 (0.0) | | | 7 (77.8) | 2 (22.2) | | | 2 (66.7) | 1 (33.3) | | |
| | | 1 | .044 ^a | | | 1 | .001 ^a | | | 1 | .15 |
| 31 (79.5) | 8 (20.5) | | | 94 (79.7) | 24 (20.3) | | | 42 (80.8) | 10 (19.2) | | |
| 17 (100.0) | 0 (0.0) | | | 49 (100.0) | 0 (0.0) | | | 18 (94.7) | 1 (5.3) | | |
| | | 2 | .15 | | | 2 | .789 | | | 2 | .995 |
| 17 (94.4) | 1 (5.6) | | | 45 (83.3) | 9 (16.7) | | | 22 (84.6) | 4 (15.4) | | |
| 25 (86.2) | 4 (13.8) | | | 66 (85.7) | 11 (14.3) | | | 27 (84.4) | 5 (15.6) | | |
| | | 1 | .68 | | | 1 | .37 | | | 1 | .104 |
| 6 (66.7) | 31 (88.6) | | | 31 (88.6) | 4 (11.4) | | | 10 (83.3) | 2 (16.7) | | |
| 9 (81.8) | 2 (18.2) | | | 29 (90.6) | 3 (9.4) | | | 12 (100.0) | 0 (0.0) | | |
| 39 (86.7) | 6 (13.3) | | | 114 (84.4) | 21 (15.6) | | | 48 (81.4) | 11 (18.6) | | |
| | | 4 | .202 | | | 4 | .037 ^a | | | 4 | .159 |
| 11 (100.0) | 0 (0.0) | | | 41 (89.1) | 5 (10.9) | | | 13 (92.9) | 1 (7.1) | | |
| 11 (73.3) | 4 (26.7) | | | 46 (88.5) | 6 (11.5) | | | 19 (82.6) | 4 (17.4) | | |
| 17 (94.4) | 1 (5.6) | | | 34 (89.5) | 4 (10.5) | | | 17 (89.5) | 2 (10.5) | | |
| 3 (75.0) | 1 (25.0) | | | 6 (54.5) | 5 (45.5) | | | 3 (50.0) | 3 (50.0) | | |
| 6 (75.0) | 2 (25.0) | | | 14 (82.4) | 3 (17.6) | | | 7 (87.5) | 1 (12.5) | | |

Table 8. Extended

| Paid for Conference Attendance | | | | Hired Dental Assistants | | | | Hired Dental Hygienists | | | |
|--------------------------------|------------------|----|--------------------|-------------------------|------------------|----|--------------------|-------------------------|------------------|----|-------------------|
| <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value |
| | | 4 | .0001 ^a | | | 4 | .0001 ^a | | | 4 | .069 |
| 26 (83.9) | 5 (16.1) | | | 33 (94.3) | 2 (5.7) | | | 11 (100.0) | 0 (0.0) | | |
| 21 (42.9) | 28 (57.1) | | | 28 (62.2) | 17 (37.8) | | | 8 (66.7) | 4 (33.3) | | |
| 6 (19.4) | 25 (80.6) | | | 13 (50.0) | 13 (50.0) | | | 4 (50.0) | 4 (50.0) | | |
| 4 (16.0) | 21 (84.0) | | | 6 (35.3) | 11 (64.7) | | | 2 (40.0) | 3 (60.0) | | |
| 1 (10.0) | 9 (90.0) | | | 2 (28.6) | 5 (71.4) | | | 2 (50.0) | 2 (50.0) | | |
| | | 1 | .005 ^a | | | 1 | .005 ^a | | | 1 | .377 |
| 36 (33.0) | 73 (67.0) | | | 53 (55.8) | 42 (44.2) | | | 17 (63.0) | 10 (37.0) | | |
| 22 (59.5) | 15 (40.5) | | | 29 (82.9) | 6 (17.1) | | | 10 (76.9) | 3 (23.1) | | |
| | | 2 | .067 | | | 2 | .209 | | | 2 | .027 ^a |
| 15 (34.9) | 28 (65.1) | | | 26 (66.7) | 13 (33.3) | | | 8 (66.7) | 4 (33.3) | | |
| 31 (50.8) | 30 (49.2) | | | 41 (68.3) | 19 (31.7) | | | 16 (84.2) | 3 (15.8) | | |
| | | 1 | .846 | | | 1 | .081 | | | 1 | .72 |
| 12 (29.3) | 29 (70.7) | | | 15 (50.0) | 15 (50.0) | | | 3 (33.3) | 6 (66.7) | | |
| 16 (41.0) | 23 (59.0) | | | 25 (75.8) | 8 (24.2) | | | 12 (70.6) | 5 (29.4) | | |
| 42 (39.3) | 65 (60.7) | | | 57 (58.8) | 40 (41.2) | | | 15 (65.2) | 8 (34.8) | | |
| | | 4 | .568 | | | 4 | .048 ^a | | | 4 | .409 |
| 16 (42.1) | 22 (57.9) | | | 21 (77.8) | 6 (22.2) | | | 6 (54.5) | 5 (45.5) | | |
| 20 (47.6) | 22 (52.4) | | | 26 (65.0) | 14 (35.0) | | | 8 (80.0) | 2 (20.0) | | |
| 10 (34.5) | 19 (65.5) | | | 20 (71.4) | 8 (28.6) | | | 7 (87.5) | 1 (12.5) | | |
| 6 (40.0) | 9 (60.0) | | | 6 (46.2) | 7 (53.8) | | | 3 (60.0) | 2 (40.0) | | |
| 5 (26.3) | 14 (73.7) | | | 8 (40.0) | 12 (60.0) | | | 3 (50.0) | 3 (50.0) | | |

Table 9. Office Technology Changes in Orthodontic Practices

| Demographic Characteristics | Bought New Technology | | | | Updated Current Technology | | | | Added Automation to Patient Correspondence | | | |
|---------------------------------|-----------------------|------------------|----|-------------------|----------------------------|------------------|----|---------|--|------------------|----|-------------------|
| | <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value |
| Years in practice | | | 4 | .035 ^a | | | 4 | .696 | | | 4 | .002 ^a |
| <10 | 49 (96.1) | 2 (3.9) | | | 41 (95.3) | 2 (4.7) | | | 48 (94.1) | 3 (5.9) | | |
| 10–20 | 50 (86.2) | 8 (13.8) | | | 43 (87.8) | 6 (12.2) | | | 43 (75.4) | 14 (24.6) | | |
| 20–30 | 36 (90.0) | 4 (10.0) | | | 32 (86.5) | 5 (13.5) | | | 23 (63.9) | 13 (36.1) | | |
| 30–40 | 23 (76.7) | 7 (23.3) | | | 21 (91.3) | 2 (8.7) | | | 17 (60.7) | 11 (39.3) | | |
| >40 | 6 (66.7) | 3 (33.3) | | | 8 (88.9) | 1 (11.1) | | | 6 (60.0) | 4 (40.0) | | |
| Gender | | | 1 | .018 ^a | | | 1 | .063 | | | 1 | .026 ^a |
| Male | 112 (83.6) | 22 (16.4) | | | 105 (87.5) | 15 (12.5) | | | 92 (70.8) | 38 (29.2) | | |
| Female | 52 (96.3) | 2 (3.7) | | | 40 (97.6) | 1 (2.4) | | | 45 (86.5) | 7 (13.5) | | |
| Community size | | | 2 | .712 | | | 2 | .569 | | | 2 | .503 |
| Metropolitan area | 54 (90.0) | 6 (10.0) | | | 45 (93.8) | 3 (6.3) | | | 40 (71.4) | 16 (28.6) | | |
| Suburban/outside principal city | 70 (86.4) | 12 (14.6) | | | 64 (88.9) | 8 (11.1) | | | 65 (79.3) | 17 (20.7) | | |
| Small city/town | 39 (86.7) | 6 (13.3) | | | 35 (87.5) | 5 (12.5) | | | 31 (72.1) | 12 (29.7) | | |
| Nationality | | | 1 | .341 | | | 1 | .319 | | | 1 | .728 |
| Canadian | 42 (91.3) | 4 (8.7) | | | 34 (94.4) | 2 (5.6) | | | 33 (73.3) | 12 (26.7) | | |
| American | 122 (85.9) | 20 (14.1) | | | 111 (88.8) | 14 (11.2) | | | 104 (75.9) | 33 (24.1) | | |
| Patient population | | | 4 | .814 | | | 4 | .994 | | | 4 | .834 |
| <1000 | 47 (88.7) | 6 (11.3) | | | 36 (90.0) | 4 (10.0) | | | 39 (78.0) | 11 (22.0) | | |
| 1000–2000 | 50 (87.7) | 7 (12.3) | | | 46 (90.2) | 5 (9.8) | | | 41 (75.9) | 13 (24.1) | | |
| 2000–3000 | 34 (87.2) | 5 (12.8) | | | 31 (88.6) | 4 (11.4) | | | 27 (73.0) | 10 (27.0) | | |
| 3000–4000 | 14 (93.3) | 1 (6.7) | | | 13 (92.9) | 1 (7.1) | | | 13 (81.3) | 3 (18.8) | | |
| >4000 | 16 (80.0) | 4 (20.0) | | | 16 (88.9) | 2 (11.1) | | | 14 (66.7) | 7 (33.3) | | |

^a Chi-square P value statistically significant if ≤.05.

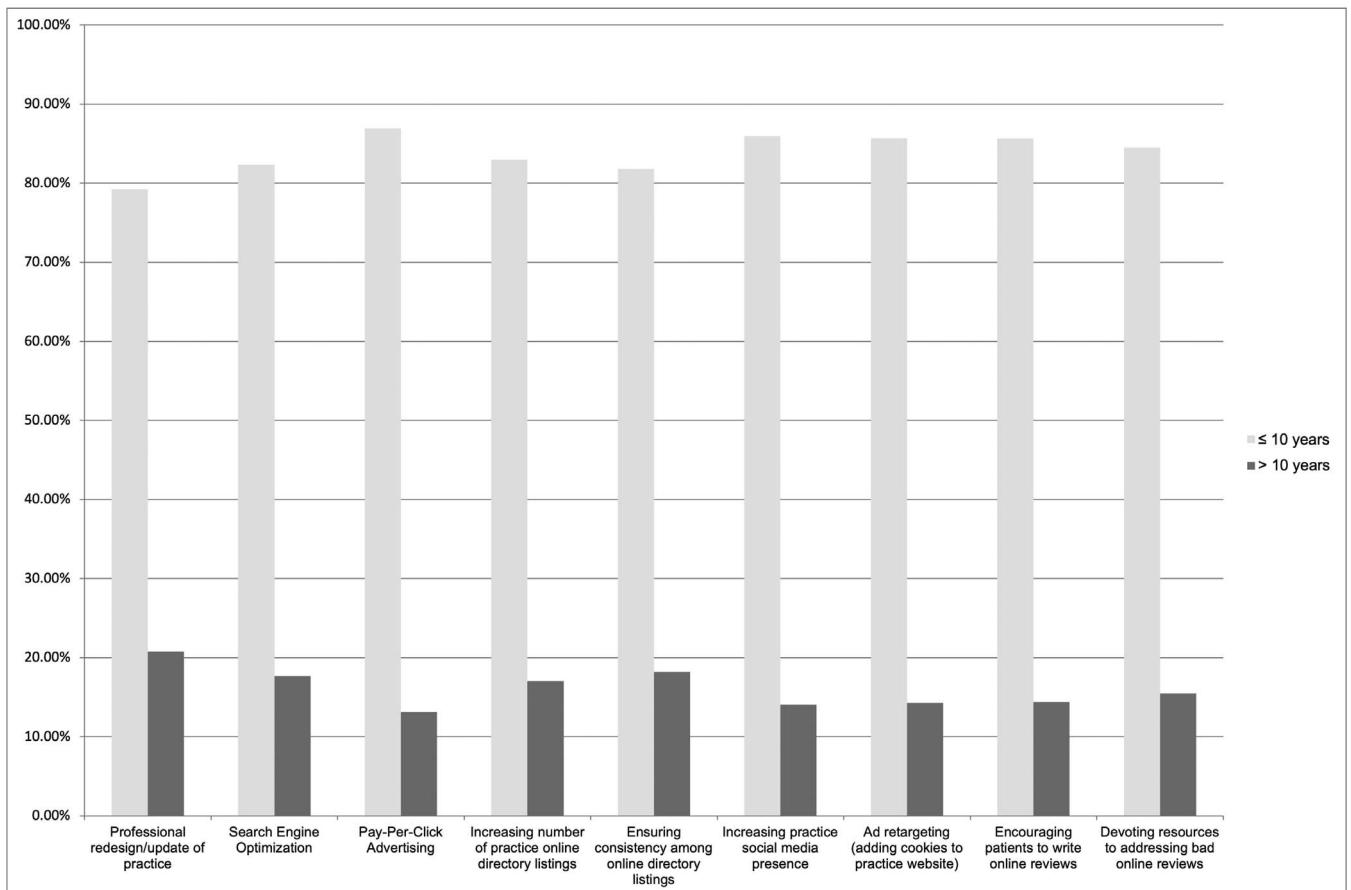


Figure 3. Online presence changes in orthodontic practices.

Table 9. Extended

| Purchased Practice Management Software | | | | Added Application(App)-Related Strategies | | | | Added Biometric Scanner | | | |
|--|------------------|----|---------|---|------------------|----|---------|-------------------------|------------------|----|---------|
| <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value |
| | | 4 | .184 | | | 4 | .801 | | | 4 | .231 |
| 38 (84.4) | 7 (15.6) | | | 19 (90.5) | 2 (9.5) | | | 7 (70.0) | 3 (30.0) | | |
| 33 (64.7) | 18 (35.3) | | | 26 (83.9) | 5 (16.1) | | | 13 (65.0) | 7 (35.0) | | |
| 25 (67.6) | 12 (24.2) | | | 16 (84.2) | 3 (15.8) | | | 2 (28.6) | 5 (71.4) | | |
| 16 (61.5) | 10 (38.5) | | | 14 (93.3) | 1 (6.7) | | | 4 (66.7) | 2 (33.3) | | |
| 6 (66.7) | 3 (33.3) | | | 3 (100.0) | 0 (0.0) | | | 3 (100.0) | 0 (0.0) | | |
| | | 1 | .631 | | | 1 | .199 | | | 1 | .334 |
| 83 (69.2) | 37 (30.8) | | | 57 (85.1) | 10 (14.9) | | | 24 (66.7) | 12 (33.3) | | |
| 35 (72.9) | 13 (27.1) | | | 21 (95.5) | 1 (4.5) | | | 5 (50.0) | 5 (50.0) | | |
| | | 2 | .258 | | | 2 | .98 | | | 2 | .514 |
| 36 (72.0) | 14 (28.0) | | | 26 (86.7) | 4 (13.3) | | | 10 (71.4) | 4 (28.6) | | |
| 48 (64.8) | 26 (35.1) | | | 28 (87.5) | 4 (12.5) | | | 13 (65.0) | 7 (35.0) | | |
| | | 1 | .224 | | | 1 | .199 | | | 1 | .417 |
| 34 (79.1) | 9 (20.9) | | | 23 (88.5) | 3 (11.5) | | | 6 (50.0) | 6 (50.0) | | |
| 23 (62.2) | 14 (37.8) | | | 21 (95.5) | 1 (4.5) | | | 12 (70.6) | 5 (29.4) | | |
| 95 (72.5) | 36 (27.5) | | | 57 (85.1) | 10 (14.9) | | | 17 (58.6) | 12 (41.4) | | |
| | | 4 | .213 | | | 4 | .431 | | | 4 | .741 |
| 38 (79.2) | 10 (20.8) | | | 16 (94.1) | 1 (5.9) | | | 4 (57.1) | 3 (42.9) | | |
| 38 (76.0) | 12 (24.0) | | | 23 (85.2) | 4 (14.8) | | | 12 (75.0) | 4 (25.0) | | |
| 22 (62.9) | 13 (37.1) | | | 20 (90.9) | 2 (9.1) | | | 6 (60.0) | 4 (40.0) | | |
| 9 (60.0) | 6 (40.0) | | | 9 (90.0) | 1 (10.0) | | | 3 (50.0) | 3 (50.0) | | |
| 9 (56.3) | 7 (43.8) | | | 7 (70.0) | 3 (30.0) | | | 3 (50.0) | 3 (50.0) | | |

Table 10. Clinic-Centric Policy Changes in Orthodontic Practices

| Demographic Characteristics | Expanded Clinic Hours | | | Added New Open Days | | | Redesigned Reception Area | | |
|---------------------------------|-----------------------|------------------|---------|---------------------|------------------|---------|---------------------------|------------------|---------|
| | <10 Years, n (%) | >10 Years, n (%) | P Value | <10 Years, n (%) | >10 Years, n (%) | P Value | <10 Years, n (%) | >10 Years, n (%) | P Value |
| Years in practice | | | .092 | | | .105 | | | .185 |
| <10 | 22 (78.6) | 6 (21.4) | | 18 (94.7) | 1 (5.3) | | 29 (93.5) | 2 (6.5) | |
| 10–20 | 19 (67.9) | 9 (32.1) | | 12 (70.6) | 5 (29.4) | | 29 (72.5) | 11 (27.5) | |
| 20–30 | 9 (60.0) | 6 (40.0) | | 8 (66.7) | 4 (33.3) | | 18 (72.0) | 7 (28.0) | |
| 30–40 | 4 (33.3) | 8 (66.7) | | 4 (66.7) | 2 (33.3) | | 16 (80.0) | 4 (20.0) | |
| >40 | 1 (50.0) | 1 (50.0) | | 1 (33.3) | 3 (66.7) | | 4 (66.7) | 2 (33.3) | |
| Gender | | | .812 | | | .382 | | | .156 |
| Male | 39 (63.9) | 22 (36.1) | | 32 (72.7) | 12 (27.3) | | 68 (75.6) | 22 (24.4) | |
| Female | 16 (66.7) | 8 (33.3) | | 11 (84.6) | 2 (15.4) | | 28 (87.5) | 4 (12.5) | |
| Community size | | | .511 | | | .083 | | | .852 |
| Metropolitan area | 15 (57.7) | 11 (42.3) | | 10 (62.5) | 6 (37.5) | | 32 (80.0) | 8 (20.0) | |
| Suburban/outside principal city | 31 (70.5) | 13 (29.5) | | 25 (89.3) | 3 (10.7) | | 39 (79.6) | 10 (20.4) | |
| Small city/town | 9 (60.0) | 6 (40.0) | | 8 (66.7) | 4 (33.3) | | 24 (75.0) | 8 (25.0) | |
| Nationality | | | .279 | | | .712 | | | .431 |
| Canadian | 17 (73.9) | 6 (26.1) | | 8 (80.0) | 2 (20.0) | | 19 (73.1) | 7 (26.9) | |
| American | 38 (61.3) | 24 (38.7) | | 35 (74.5) | 12 (25.5) | | 77 (80.2) | 19 (19.8) | |
| Patient population | | | .324 | | | .416 | | | .473 |
| <1000 | 14 (63.6) | 8 (36.4) | | 11 (73.3) | 4 (26.7) | | 22 (81.5) | 5 (18.5) | |
| 1000–2000 | 19 (79.2) | 5 (20.8) | | 10 (71.4) | 4 (28.6) | | 32 (80.0) | 8 (20.0) | |
| 2000–3000 | 13 (61.9) | 8 (38.1) | | 12 (85.7) | 2 (14.3) | | 18 (81.8) | 4 (18.2) | |
| 3000–4000 | 3 (42.9) | 4 (57.1) | | 5 (100.0) | 0 (0.0) | | 11 (91.7) | 1 (8.3) | |
| >4000 | 5 (50.0) | 5 (50.0) | | 4 (57.1) | 3 (42.9) | | 11 (64.7) | 6 (35.3) | |

^a Chi-square P value statistically significant if ≤.05.

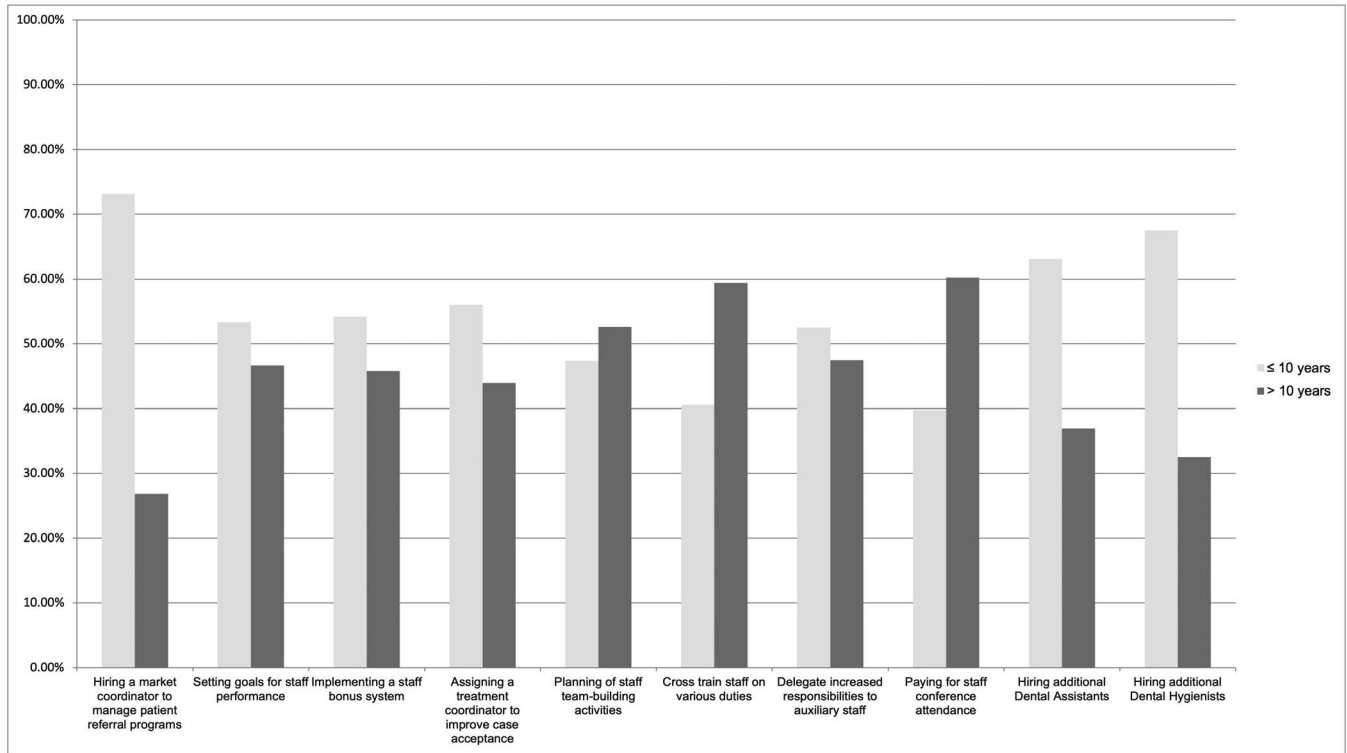


Figure 4. Changes in staffing policies of orthodontic practices.

Table 10. Extended

| Redesigned Operatories | | | | Changed Supply Provider | | | | Purchased Competing Practice | | | |
|------------------------|------------------|----|---------|-------------------------|------------------|----|---------|------------------------------|------------------|----|---------|
| <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value |
| | | 4 | .433 | | | 4 | .019* | | | 4 | .357 |
| 25 (89.3) | 3 (10.7) | | | 34 (91.9) | 3 (8.1) | | | 14 (93.3) | 1 (6.7) | | |
| 29 (70.7) | 12 (29.3) | | | 35 (79.5) | 9 (20.5) | | | 15 (83.3) | 3 (16.7) | | |
| 19 (73.1) | 7 (26.9) | | | 18 (78.3) | 5 (21.7) | | | 6 (66.7) | 3 (33.3) | | |
| 16 (80.0) | 4 (20.0) | | | 9 (75.0) | 3 (25.0) | | | 5 (71.4) | 2 (28.6) | | |
| 5 (83.3) | 1 (16.7) | | | 2 (33.3) | 4 (66.7) | | | 4 (66.7) | 2 (33.3) | | |
| | | 1 | .12 | | | 1 | .124 | | | 1 | .986 |
| 66 (74.2) | 23 (25.8) | | | 66 (76.7) | 20 (23.3) | | | 31 (81.6) | 7 (18.4) | | |
| 28 (87.5) | 4 (12.5) | | | 32 (88.9) | 4 (11.1) | | | 9 (81.8) | 2 (18.2) | | |
| | | 2 | .6 | | | 2 | .002* | | | 2 | .842 |
| 30 (75.0) | 10 (25.0) | | | 22 (61.1) | 14 (38.9) | | | 13 (81.3) | 3 (18.8) | | |
| 41 (82.0) | 9 (18.0) | | | 48 (85.7) | 8 (14.3) | | | 17 (85.0) | 3 (15.0) | | |
| | | 1 | .609 | | | 1 | .959 | | | 1 | .861 |
| 22 (73.3) | 8 (26.7) | | | 27 (93.1) | 2 (6.9) | | | 10 (76.9) | 3 (23.1) | | |
| 20 (74.1) | 7 (25.9) | | | 24 (80.0) | 6 (20.0) | | | 10 (83.3) | 2 (16.7) | | |
| 74 (78.7) | 20 (21.3) | | | 74 (80.4) | 18 (19.6) | | | 30 (81.1) | 7 (18.9) | | |
| | | 4 | .509 | | | 4 | .044* | | | 4 | .555 |
| 24 (82.8) | 5 (17.2) | | | 24 (80.0) | 6 (20.0) | | | 4 (80.0) | 1 (20.0) | | |
| 26 (72.2) | 10 (27.8) | | | 34 (85.0) | 6 (15.0) | | | 13 (81.3) | 3 (18.8) | | |
| 19 (90.5) | 2 (9.5) | | | 21 (80.8) | 5 (19.2) | | | 10 (71.4) | 4 (28.6) | | |
| 9 (75.0) | 3 (25.0) | | | 11 (91.7) | 1 (8.3) | | | 4 (80.0) | 1 (20.0) | | |
| 14 (73.7) | 5 (26.3) | | | 5 (45.5) | 6 (54.5) | | | 9 (100.0) | 0 (0.0) | | |

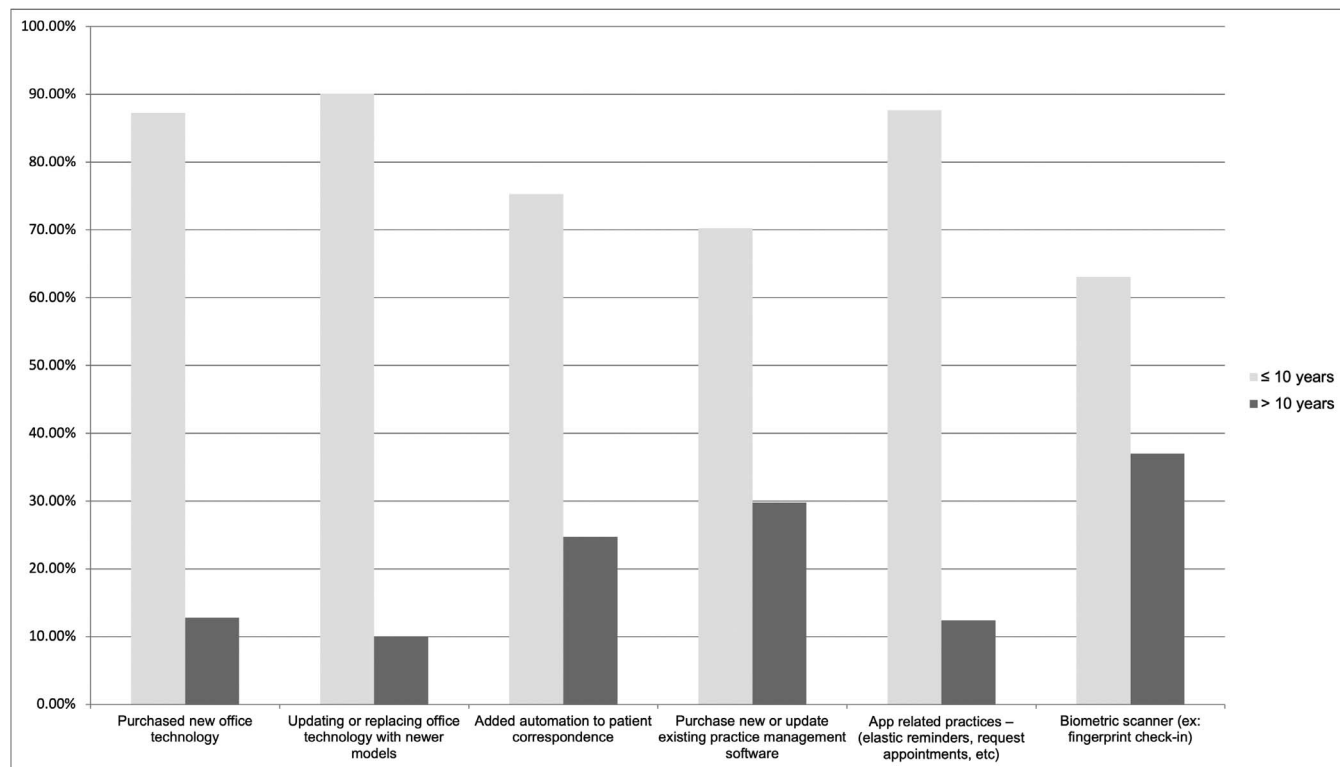


Figure 5. Changes in office technology of orthodontic practices.

Table 10. Extended

| Opened Satellite Clinic | | | | Had Laboratory Technician On Site | | | | Worked in a Multidisciplinary Clinic | | | |
|-------------------------|------------------|----|--------------------|-----------------------------------|------------------|----|--------------------|--------------------------------------|------------------|----|-------------------|
| <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value | <10 Years, n (%) | >10 Years, n (%) | df | P Value |
| 18 (100.0) | 0 (0.0) | 4 | .0001 ^a | 13 (76.5) | 4 (23.5) | 4 | .0001 ^a | 15 (88.2) | 2 (11.8) | 4 | .025 ^a |
| 16 (55.2) | 13 (44.8) | | | 9 (36.0) | 16 (64.0) | | | 11 (55.0) | 9 (45.0) | | |
| 6 (28.6) | 15 (71.4) | | | 0 (0.0) | 23 (100.0) | | | 3 (30.0) | 7 (70.0) | | |
| 7 (50.0) | 7 (50.0) | | | 2 (15.4) | 11 (84.6) | | | 3 (42.9) | 4 (57.1) | | |
| 2 (66.7) | 1 (33.3) | 1 | .052 | 1 (20.0) | 4 (80.0) | 1 | .038 ^a | 1 (100.0) | 0 (0.0) | 1 | .634 |
| 35 (52.2) | 32 (47.8) | | | 16 (24.6) | 49 (75.4) | | | 22 (57.9) | 16 (42.1) | | |
| 14 (77.8) | 4 (22.2) | 2 | .109 | 9 (50.0) | 9 (50.0) | 2 | .763 | 11 (64.7) | 6 (35.3) | 2 | .003 ^a |
| 17 (65.4) | 9 (34.6) | | | 7 (25.0) | 21 (75.0) | | | 8 (36.4) | 14 (63.6) | | |
| 23 (63.9) | 13 (36.1) | 1 | .509 | 11 (33.3) | 22 (66.7) | 1 | .155 | 21 (84.0) | 4 (16.0) | 1 | .335 |
| 9 (39.1) | 14 (60.9) | | | 7 (31.8) | 15 (68.2) | | | 4 (50.0) | 4 (50.0) | | |
| 14 (63.6) | 8 (36.4) | 4 | .341 | 4 (18.2) | 18 (81.8) | 4 | .678 | 8 (72.7) | 3 (27.3) | 4 | .956 |
| 35 (55.6) | 28 (44.4) | | | 21 (34.4) | 40 (65.6) | | | 25 (56.8) | 19 (43.2) | | |
| 12 (63.2) | 7 (36.8) | | | 8 (38.1) | 13 (61.9) | | | 9 (56.3) | 7 (43.8) | | |
| 12 (54.5) | 10 (45.5) | | | 8 (29.6) | 19 (70.4) | | | 10 (62.5) | 6 (37.5) | | |
| 10 (55.6) | 8 (44.4) | | | 4 (20.0) | 16 (80.0) | | | 9 (56.3) | 7 (43.8) | | |
| 3 (33.3) | 6 (66.7) | | | 1 (20.0) | 4 (80.0) | | | 3 (75.0) | 1 (25.0) | | |
| 12 (75.0) | 4 (25.0) | | | 4 (40.0) | 6 (60.0) | | | 2 (66.7) | 1 (33.3) | | |

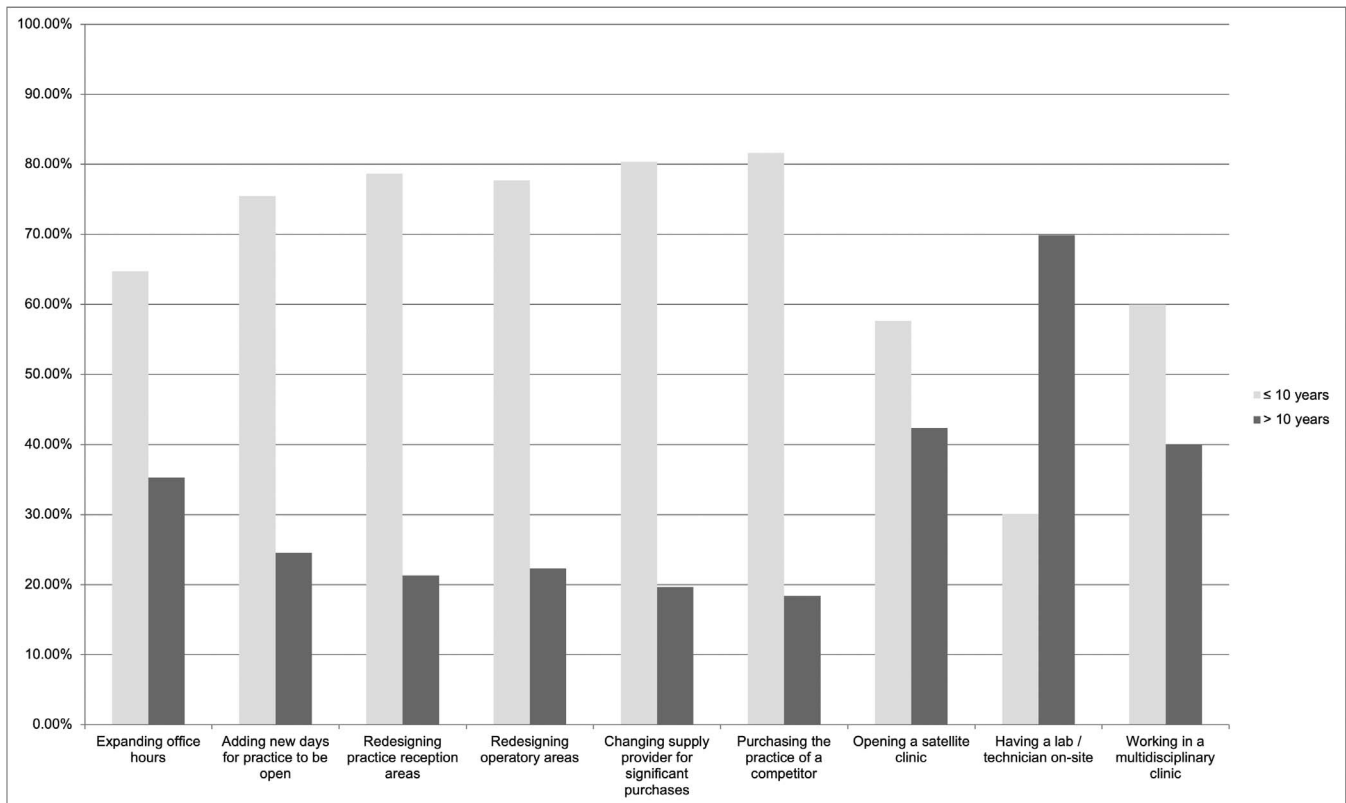


Figure 6. Changes in clinic-centric policies of orthodontic practices.

to have begun working in a multidisciplinary clinic in the past 10 years ($P = .003$).

DISCUSSION

Orthodontics was conventionally practiced by dental specialists. The rise of nonspecialists providing orthodontic treatment and the arrival of DTC aligner companies has increased competition. This study reported orthodontists' opinions on the external environment and recent modifications to practice administration and analyzed the demographic factors influencing their selections. These data suggested that orthodontists have perceived a negative impact on their practice and have made significant administrative changes in the past 10 years as experience, gender, nationality, practice patient population, and community size all affected these variables.

The results demonstrated that a greater number of orthodontists perceived that their practice had been impacted by GPs providing orthodontic treatment compared with DTC providers. More experienced male orthodontists were more likely to indicate that they have been impacted by GPs providing orthodontic care. More experienced orthodontists are more likely to be males and may have had more time in practice to recognize a decrease in referrals.^{11,12} The only demo-

graphic factor that affected perceived impact of DTC providers was nationality. American orthodontists were more likely than Canadian orthodontists to perceive an impact on their practice from DTC providers. This was likely attributed to the origin of most DTC providers being in the United States and delayed growth in Canada.¹³

Most orthodontists indicated that they perceived a reduction in GP referrals, an increase in referral case difficulty, and a need to improve practice competitiveness in the past 10 years. More experienced orthodontists were more likely to have noted a reduction in GP referrals and less likely to have felt a need to improve competitiveness. These clinicians have likely already grown a healthy practice and may be closer to retirement. In addition, experienced orthodontists are more likely to be practice owners, and ownership has been linked to a higher level of confidence in one's business acumen.¹⁴

The demographic factors that significantly affected patient-centered policies were years of experience and gender (Figure 1). More experienced orthodontists were more likely to have had their patient-centered policies in place for more than 10 years. Female orthodontists were most likely to transform their patient-centered policies in the past 10 years. These occurrences can be explained by the age and gender

distribution among the profession. Approximately 70% of all orthodontists in the United States are men, and the current demographics of most dental schools and residency programs are equally distributed between men and women.¹² Consequently, the average female orthodontist is younger than the average male orthodontist, and newer practitioners are still gaining experience and building their practices with the help of patient incentives and rewards.

The demographic factors that significantly affected participant community outreach customs were also years of experience and gender (Figure 2). More experienced orthodontists were more likely to have had their community outreach practices in place for more than 10 years. Female orthodontists were more likely to have modernized their community outreach efforts in the past 10 years. These data further support the experience and gender distribution of the profession.

The demographic factor that significantly affected participant online presence was gender (Figure 3). Female orthodontists were more likely to have increased their practice's online presence in the previous 10 years. The orthodontic workforce is modernizing, with the average female orthodontist being 4 to 6 years younger than their male counterparts.^{11,12} In addition, American orthodontists younger than age 35 years are equally distributed among males and females despite the overall demographics being 70% males.¹² The gender differences observed in this study indicated that female orthodontists were significantly more likely to attempt to innovate their online presence to reach and interact with patients. Although this does not confirm the effectiveness of such means, it signifies that male orthodontists could learn valuable skills from their female colleagues.

The demographic factors that significantly affected participant staffing policies were years of experience, gender, and practice population (Figure 4). Orthodontists' years in practice was positively associated with the length of time having a fixed set of staffing policies in place. It appears that experienced orthodontists are more likely to be early adopters of various staffing policies. Although no literature could be found examining these variables, it could be postulated that experienced orthodontists may have undergone a period of experimentation with staffing policies before achieving a successful workplace balance. Female orthodontists were more likely than male orthodontists to have updated their staffing policies in the past 10 years. These data indicated that female orthodontists were more likely to have taken ownership and begun managing an orthodontic practice in the past 10 years. Previously noted gender equality among graduating orthodontists supports this suggestion.¹² Practice patient population was positively associated with the

length of time having specific staffing policies in place, suggesting that larger practices have adopted multiple competitive staffing policies to achieve their previous growth and current patient population.

The demographic factor that significantly affected trends in office technology was gender (Figure 5). Female orthodontists were significantly more likely to have updated office technology in the past 10 years. This was in contrast to previous research almost a decade ago that noted that male orthodontists used nearly every available orthodontic technology and newer technology was almost completely absent from female-owned offices.¹⁵ This further supports the suggestion that the male–female balance in private practice orthodontics is becoming more equivalent.

The demographic factor that significantly affected participants' clinic-centered changes was community size (Figure 6). Orthodontists practicing in metropolitan areas were significantly less likely than those in smaller population centers to have changed a supply provider for major purchases in the past 10 years. Those practicing in suburban areas were most likely to have started working in a multidisciplinary specialty clinic in the past 10 years. This suggests that orthodontists in smaller population centers are more likely to be flexible in their supply providers and that multidisciplinary specialty clinics appear to be growing most rapidly in suburban areas. A recent survey of Canadian orthodontists demonstrated that 8.8% of male and 7.1% of female orthodontic practitioners work in a multidisciplinary practice.¹¹ In addition, approximately 9.0% of American orthodontists currently work in some form of group practice environment.¹² Although there are no historical data for these practice circumstances, changes in future data will be of interest in examining the state of the specialty. Additional research into clinic-centered practices would be valuable in elucidating the greater trends that affect orthodontists' work–life balance.

Although this survey was designed with the challenges of survey-based research in mind, it is not always possible to control all variables and limitations. The information provided in questions was neutral to reduce bias. Because the survey was distributed online, an estimation of response rate was not possible. Through a large sample size, an attempt was made to reduce bias. A disadvantage of this survey was that it only used three categories to discern the community size of participants. As the trend of urbanization continues, it may be beneficial to dissect the community size further for greater insight.¹⁶ Future research should be designed to provide insight on regional trends for improved utility.

This study provided insight regarding orthodontists' perceived negative impacts on their practice from GP

and DTC orthodontic providers and significant adaptational changes implemented in the past 10 years. These data can be used by orthodontists to provide direction in analyzing the external environment. In addition, it may serve as a foundation for more pointed research queries.

CONCLUSIONS

- The perceived impact of GPs providing orthodontic care was greater than that of DTC providers.
- American orthodontists were significantly more likely than Canadian orthodontists to perceive an impact on their practice from DTC providers.
- Orthodontists perceive a reduction in referrals from GPs and an increase in referred case difficulty.
- Less experienced and female orthodontists have made the most adaptive changes to the administration of their practices in the past 10 years.
- Practice patient population was positively correlated to the amount of time staff incentives were used.
- In conclusion, orthodontists have perceived an impact on their practice in recent years and have implemented a variety of adaptive changes to meet the evolving equilibrium.

SUPPLEMENTAL DATA

Appendix 1 available online.

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