



## Provider and Patient Satisfaction With the Dental Therapy Workforce at Apple Tree Dental

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Center for Health Workforce Studies  
School of Public Health  
University at Albany, State University of New York



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**May 2022**



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# PREFACE

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The Oral Health Workforce Research Center (OHWRC) at the Center for Health Workforce Studies (CHWS) at the University at Albany's School of Public Health completed a study to describe the satisfaction of clinical providers, organizational administrators, and patients with the dental therapy workforce at Apple Tree Dental Centers in Minnesota.

This report was prepared for OHWRC by Margaret Langelier, Simona Surdu, and Ellen O'Malley, with layout design by Leanne Keough.

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The mission of OHWRC is to provide accurate and policy-relevant research on the impact of the oral health workforce on oral health outcomes. The research conducted by OHWRC informs strategies designed to increase access to oral health services for vulnerable populations. OHWRC is based at CHWS at the School of Public Health, University at Albany, State University of New York (SUNY), and is the only HRSA-sponsored research center with a unique focus on the oral health workforce.

The views expressed in this report are those of OHWRC and do not necessarily represent positions or policies of the School of Public Health, University at Albany, SUNY.

*May 2022*

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## Institutional Review Board

The plan for this study was reviewed and approved by the Institutional Review Board of the New York State Department of Health (Study No. 1692114-3).

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# EXECUTIVE SUMMARY

## BACKGROUND

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The Oral Health Workforce Research Center (OHWRC) completed a study to describe the satisfaction of clinical providers, organizational administrators, and patients with the dental therapy workforce at Apple Tree Dental in Minnesota, the first US state to authorize dental therapy practice statewide. Apple Tree Dental was among the first employers of this workforce, continuously employing dental therapists since they were initially licensed in 2012. Their dental centers and mobile programs serve patients across their lifespans and include many individuals with special health care needs.

This report describes the results from two surveys. The first assessed clinician and administration satisfaction with the dental therapy workforce within Apple Tree Dental's centers and programs. The second describes the satisfaction of patients with their clinical providers at Apple Tree Dental making comparisons across provider type.

## THE CLINICIAN & ADMINISTRATION SURVEY

### METHODS

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Researchers conducted a literature review to identify research related to other provider satisfaction with the dental therapy workforce model that might be relevant to the current study. Project staff selected individual question items from each of several previously published studies for inclusion within the surveys developed for this project. All questions included response options and many used a Likert rating scale of 1 to 5 with 1 being strongly disagree and 5 being strongly agree.

Four online surveys targeted different workforce within Apple Tree Dental: dentists, dental hygienists

and dental assistants, advanced dental therapists and dental therapists, and lastly, administrators. The surveys were open from February through April 2021. All clinical and administrative staff were invited to participate; 89 responded to the survey (overall response rate=49.4%).

## KEY FINDINGS

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### Characteristics of Staff at Apple Tree Dental

- The Apple Tree dental staff is mainly female (87.2%), 44 years of age or younger (74.5%), and White (79.4%), slightly less than the state as a whole (83.8%).
- On average, dental therapists who responded to the survey had approximately 4 years of clinical experience in their profession, while the other clinicians had, on average, 11 years. Administrators indicated an average of approximately 8 years working at Apple Tree Dental.

### Attitudes and Opinions of Survey Respondents About Their Experience Working With Advanced Dental Therapists and Dental Therapists

- When asked to indicate on a scale of 1 to 5 how well dental therapists fit within the team structure at the dental center where the survey respondent mainly worked, on average, dentists indicated a mean fit score of 4.47 and dental hygienists and dental assistants scored team fit at 4.77; both scores fell between very well and extremely well.
- On average, dentists (4.10), dental hygienists and dental assistants (4.43), and administrators (4.40) indicated high levels of agreement with the statements within the quality and efficiency topical area including that dental therapists perform high-quality work and that dentists can work more effectively and efficiently when teamed with a dental therapist.

- On average, administrators indicated very high levels of agreement with statements including that the dental therapy model is cost effective (4.46), permits timelier (4.61) and more flexible patient scheduling (4.74) and service delivery, and that the versatility (4.75) and productivity (4.56) of dental therapists were contributing to improvements in workflow.
- Overall and on average per item, dentists (4.04), dental hygienists and assistants (4.68) and administrators (4.55) agreed that other states might benefit from permitting the practice of dental therapy and that the workforce model was one means of addressing difficulty with access to dental services among certain populations.
- Mean overall ratings of attitudes towards dental therapy were calculated for dentists (3.46), dental hygienists and dental assistants (3.81), and administrators (4.25). Altogether, the mean overall rating across all responding staff was 3.92, indicating positive attitudes towards dental therapy.

### Opinions of Survey Respondents About Improvements to Patient Care

- An overwhelming majority of survey respondents from all professions noted reduced wait times for patients to receive needed care (ranging by professional type from 72.2% to 90.6%).
- Many respondents also acknowledged that having dental therapists on staff allowed patients to have more needs met in one visit (44.4% to 84.4%) and improved patients' sense of having a regular dental provider (33.3% to 78.1%).

### Attitudes of the Dental Therapy Workforce Towards Their Work

- Advanced dental therapists and dental therapists agreed that they spend a majority of their time providing restorative services (as opposed to pre-

ventive care) for patients (4.00) and that they are routinely required to use a variety (4.86) of complex or high-level clinical skills (4.57) in their work.

- Advanced dental therapists and dental therapists also agreed that they experienced professional autonomy in their practice allowing them to complete a patient service from start to finish (4.23) and to direct how they accomplish their clinical tasks (4.86).
- Dental therapists reported strong agreement that they were valued as members of their clinical teams (5.00), that they were satisfied with their work (4.86), and that they would choose to become a dental therapist if they had to choose again (4.71).

## CONCLUSIONS

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The overall survey findings attest to high levels of satisfaction with the dental therapy workforce model among the staff throughout Apple Tree Dental's mobile programs and dental centers. The flexibility of a well-trained workforce and the preventive and restorative elements within dental therapists' scope of practice are beneficial to an organization that must continually respond to changing needs and demands within their population of patients. The study findings also suggest that other dental professionals view the dental therapist as a complementary rather than a competitive workforce. There was overall agreement that dentists can work more effectively and efficiently using dental therapists on dental teams.

# THE PATIENT SURVEY

## METHODS

OHWRRC research staff conducted a literature review to examine survey research describing patient satisfaction with dental clinicians' services. Staff compiled a survey using validated questions and some original items to measure respondents' satisfaction with dental services.

We used a convenience sample of 1,000 patients with an email address on file with the organization. Parents of children or adults accompanying patients were asked to complete the survey on behalf of their dependents. Responses were reported on a Likert scale of 1 to 5 with 1 being strongly disagree and 5 being strongly agree. The survey was open to accrual from February to August 2021.

## KEY FINDINGS

### Characteristics of Survey Respondents

- The total number of respondents with valid survey entries in our analytic sample was 898. Compared to all active patients, the study sample had similar demographic characteristics.
- Most adult patients who responded to the survey were 35 years and older (57.6%), female (73.1%) and White, non-Hispanic (85.0%) compared to 83.8% in the state as a whole. The majority of accompanied patients were children (81.1%).
- Many respondents were treated by a dentist (43.6% adult patients; 32.8% child patients) or a dental hygienist (40.4% adult patients; 35.2% child patients). Among survey participants, dental therapists treated proportionately more child patients (31.9%) than adult patients (16.9%).

### Patients' Attitudes About Their Dental Experience

- Patients expressed agreement trending to strong agreement with the 11 positive statements in the information and communication, understanding and acceptance, and technical competence topical areas and alternatively, disagreement with the 2 negative statements in the technical competence category. These findings suggest that patients are quite satisfied with the care they received from dental teams at Apple Tree Dental.
- Information and communication items referred to the providers' ability to explain necessary information clearly and the patient's understanding of diagnoses, etiology, prognoses, and effects of treatment. Average scores of agreement with the statements within the information and communication topic ranged from 4.16 to 4.47. Dental hygienists had higher ratings than both dentists ( $P=.005$ ) and dental therapists ( $P=.047$ ).
- Understanding and acceptance items referred to patients' perception of the patient-provider relationship, including feelings of trust and acceptance by the provider and perceptions of the providers' positive regard for the patient. On average, patients' composite scores of agreement within the understanding and acceptance dimension ranged between 3.97 and 4.37. The scores were higher for dentists than for dental hygienists ( $P=.010$ ) and dental therapists ( $P=.047$ ).
- Technical competence and satisfaction with treatment items measured patients' evaluation of the providers' professional behaviors and technical skills, such as diagnostic procedures and the application of treatments. Average patient ratings of agreement to statements about technical competence and satisfaction with treatment ranged from 4.11 to 4.31. There were no statistically significant differences across provider type.



- On average, scores for general satisfaction (“I will come back to Apple Tree Dental”) ranged between 4.54 and 4.71. There were no statistically significant differences by provider type.
- Overall, patients’ ranking of their satisfaction levels with dental care across all dimensions ranged from 4.11 to 4.37. Patients were more satisfied with services from dental hygienists and dentists than from dental therapists, but the differences were very small and not statistically significant.
- Patients who received preventive care were more satisfied with services from dental therapists, while patients who received restorative care were more satisfied with dentists’ services than were others. These differences were small and not statistically significant.

## CONCLUSIONS

Our findings relative to patient satisfaction suggest that the clinical teams at Apple Tree Dental, which include dental therapists and advanced dental therapists, are providing services that meet the needs of their patient population. The increase in organizational capacity as a result of deployment of the dental therapy workforce corresponds with an increase in access to care in numerous locations throughout Minnesota. Furthermore, patient satisfaction, as a component of quality measurement, indicates that this workforce has not, as opponents feared, diminished quality of patient care.







# TECHNICAL REPORT

## BACKGROUND

Access to oral health services is a pronounced concern for residents of rural areas, individuals and families without dental insurance, populations with minority racial and ethnic backgrounds, people who depend on others for participation in their health care including children, elders, and those with disabilities, and for low-income groups in various communities. Over recent years, research describing facilitators and barriers to oral health services for all or some of these groups has been a focus of the public oral health community. Programmatic interventions including mobile and portable dentistry, inclusion of oral health services in federally qualified health centers (FQHCs), teledentistry programs, and other public health solutions have sought to remediate structural access to care issues. Many of these initiatives have moved care provision for communities of interest from the traditional private dental office into alternate settings including federally qualified health centers (FQHCs), schools, skilled nursing and congregate care settings, Head Start and day care programs, PACE (Program for All-Inclusive Care for the Elderly) and adult day care programs, among others.

A flexible and competent workforce with the skills to provide high-quality care in alternative circumstances is an essential component of implementing effective clinical service delivery programs that improve the availability of oral health services. Over the last 20 years, state legislatures and dental boards, patient advocacy and professional groups, and oral health professionals have promoted and enabled expanded scopes of practice for the existing oral health clinical workforce. Expansions in scope allow adaptation of traditional practice patterns to new practice locations using innovative modalities and technologies to meet the needs of the patient population. A separate but related movement gaining momentum in the US is to enable new oral health workforce which includes community dental health coordinators, modeled on community health workers in health care, and dental

therapists, building on dental health aide therapists in the Indian Health Service (IHS) and on the international workforce model that originated in New Zealand. Each of these models is strategically designed to address access and availability of oral health care for underserved groups.

This report discusses the role of the dental therapy workforce and the outcomes from dental therapy practice in a not-for-profit community dental organization located in Minnesota, the first US state to authorize dental therapy practice statewide. The Alaska Native Health Consortium (ANHC) and the IHS authorized dental health aide therapists in 2006 to work in indigenous communities in Alaska, but therapy practice in that state is limited to tribal areas and is unavailable to the general population.

This report, which focuses on patient and provider satisfaction with the dental therapy workforce model in a community dental organization, follows a report published in 2020 extensively describing the production values for services delivered by dentists before and after the introduction of dental therapists to the oral health care teams at Apple Tree Dental.<sup>1</sup>

The study protocol was reviewed and determined exempt by the New York State Department of Health Institutional Review Board (IRB# 1692114-3).

### *Dental Therapy in Minnesota*

Dental therapy practice was enabled in Minnesota after protracted negotiation and compromise among sponsoring groups with disparate objectives related to the design of a “mid-level” practitioner workforce model. Although Minnesota statutes uses the term dental therapy, the development of the model was rooted in Nurse Practitioner education and practice; the original proposal was for an “oral health practitioner” (OHP) to mirror their medical counterparts. Compromises included a name change from OHP to dental therapy despite the higher level of education and broader scope in Minnesota than that for den-



tal health aide therapists in Alaska. Descriptions of the planning and legislative processes to create this workforce are available from several stakeholder groups.<sup>2,3</sup>

The final harmonizing legislation, passed in 2009, enabled dental therapy practice at 2 complementary levels. Under the original act, a dental therapist was educated at the bachelor's degree level at the University of Minnesota School of Dentistry. Upon graduation and state licensure, the dental therapist was allowed to practice primary preventive and basic restorative dentistry under the direct or indirect supervision of a dentist. An already licensed dental hygienist with a bachelor's degree could earn a master's degree in advanced dental therapy at Normandale Community College and Metropolitan State University. After completion of the master's degree curriculum, 2,000 hours of direct supervision by a dentist, and passage of a credentialing examination, the advanced dental therapist was permitted to practice under general supervision in the community with permission to provide more expanded services than a dental therapist.

A list of allowable tasks and services was compiled for each category of licensure. In addition, the dental therapist and advanced dental therapist were required to provide services to patients considered underserved due to medical or disability status, geography of residence, income, or other sociodemographic characteristics. At least 50% of all dental therapist or advanced dental therapist patients were required to be eligible for Medicaid or be a member of an underserved community. In 2016, the University of Minnesota School of Dentistry changed their educational model to include dental hygiene education and a master's degree in response to clearly evident employer preferences and associated demand for advanced dental therapists.

The first dental therapists graduated from the education programs in Minnesota and began practice in late 2011 and early 2012. The first advanced dental therapists were certified in 2013, qualifying for practice

under general supervision after completing the necessary precepted hours and passing the credentialing examination. Initially, dental therapists and advanced dental therapists in Minnesota were only employed in the dental safety net at non-profit community dental organizations and FQHCs, which typically serve high volumes of low-income and underserved patients. In recent years, private practices with sufficient numbers of patients in targeted groups and those in Health Professional Shortage Areas have begun to hire dental therapists and advanced dental therapists to meet demand for oral health services.

Minnesota was the first state in the US to enact legislation governing a dental therapy workforce. The ANHC and the IHS initiated dental therapy practice in native communities in 2006, but practice by dental health aide therapists is still limited to indigenous populations in that state. Since passage of the legislation in Minnesota, 13 more states have legislatively enabled but not yet experienced dental therapy practice with the exception of Maine, which now has one dental therapist, and tribal communities in Oregon and Washington where dental therapists are providing services.

## Apple Tree Dental

Apple Tree Dental is a non-profit community dental organization founded in 1985 in Minnesota as a mobile dental provider serving elderly patients, particularly those residing in skilled nursing facilities and other communal residential settings in and around the Minneapolis area. In the 35 years since its founding, Apple Tree Dental progressively opened full-service, state-of-the-art fixed dental centers in 8 locations throughout Minnesota, including within a rural critical access hospital and another collocated within the Mayo Clinic Health System. The organization currently also operates mobile dentistry programs in 145 locations including schools, Head Start programs, long term care and assisted living facilities, and day programs and residences for the developmentally disabled. Apple Tree Dental was among the

first employers of dental therapists in Minnesota and has continuously employed a growing number of dental therapists since 2012. Apple Tree Dental's centers and mobile programs serve patients across their lifespans and include many individuals with special health care needs.

This report is divided into 2 sections:

1. The first section describes data from satisfaction surveys of all staff at Apple Tree Dental. This section discusses the attitudes of clinical and admin-

istrative personnel working at Apple Tree Dental centers and in their mobile programs about the use of dental therapists to provide services to patients.

2. The second section describes data collected from patients treated by dentists, dental hygienists, dental therapists, and advanced dental therapists. More than 1,000 patients responded to an online survey to provide their opinions on and satisfaction with the clinical services they received at the organization.





## THE SURVEYS OF ADMINISTRATIVE & CLINICAL STAFF AT APPLE TREE DENTAL

The introduction of dental therapists to the dental teams at Apple Tree Dental began almost 10 years ago when the first dental therapists were certified for practice in the state. The various clinicians and administrators in the dental centers and mobile programs now have substantial experience working with dental therapists in their clinical teams and with the administrative tasks of scheduling patients and managing workflows. The research plan for this study included a survey of all clinicians and administrators in the Apple Tree organization to ascertain their opinions and attitudes about the dental therapy workforce model to better describe the contributions of dental therapists to patient care, organizational capacity, and workflow efficiencies.

### METHODS

#### Survey Design

To accurately assess levels of dental clinician satisfaction with the dental therapy model, researchers conducted a literature review to identify research related to satisfaction with the dental therapy workforce model that might be relevant to the current study. The literature yielded multiple surveys of clinician knowledge and satisfaction with dental therapists, several

of which included questions that had been validated through survey administration and data analyses and were pertinent to our research agenda. Project staff selected individual question items from each of several studies for inclusion in the 4 surveys developed for this project. The instruments from which questions were drawn included those authored by Gallagher and Wright,<sup>4</sup> Blue and colleagues,<sup>5</sup> Ayers et al,<sup>6</sup> Hamson,<sup>7</sup> Ly et al,<sup>8</sup> Blue and co-authors,<sup>9</sup> Csikar et al,<sup>10</sup> and Rogers.<sup>11</sup>

Separate surveys targeted different workforces within Apple Tree Dental. One survey was directed to dentists, another to dental hygienists and dental assistants, another to the dental therapy workforce (advanced dental therapists and dental therapists), and lastly, one to administrative staff. The majority of questions contained within the 4 distinct surveys were common to all instruments, but each questionnaire contained at least 1 question specific to the profession completing it. The analyses that follow compare the opinions and attitudes of each workforce group with those of other professions based on the universe of responses to the common survey questions and also to the profession specific questions.

The surveys were web-based using the Survey Monkey platform. Apple Tree Dental provided the

OHWRC with the business emails of staff. Each received a solicitation to participate in the research and all were informed that the survey was voluntary and confidential. The protocol for this research project was reviewed and approved by the New York State Department of Health Institutional Review (IRB No. 1692114-3). A copy of each of the survey instruments is available in the Appendix to this report.

## Data Collection

Surveys were pilot tested by 9 respondents composed of dentists (n=2), dental hygienists (n=3), dental therapists (n=2), and administrative staff (n=2). In addition to the modules included in the final surveys, pilot participants were asked to complete a narrative regarding the survey's ease of comprehension, interest, and relevance to clinical participants, and to identify any issues regarding survey completion. Edits were made to grammar and question order on the surveys following the pilot tests. No modules were added or removed.

When finalized, surveys were deployed to potential respondents. Survey participants responded via the individual email link included with the request for engagement with the research. Once respondents initiated the survey link, they were able to access the questionnaire at any time and to complete it at desired intervals. To maximize responses, reminder emails were sent to non-respondents every 10-12 days. After 4 reminders, the survey was closed to further accruals. The survey was available from February through April 2021.

A total of 180 clinical and administrative staff were invited to participate in the research. Surveys were sent to active Apple Tree Dental clinicians categorized by profession including 30 dentists, 25 licensed dental hygienists, 36 licensed dental assistants, 28 clinical assistants, 7 advanced dental therapists, and 4 dental therapists. Fifty administrative staff were included in the survey sample including 6 dental center direc-

tors, 7 individuals in other management positions, 2 billing specialists, 30 clinic care coordinators, and 5 community care coordinators. Non-clinical staff such as maintenance staff and corporate leaders were not included in the survey solicitations.

## Response Rate

The final sample consisted of 89 respondents, for an overall response rate of 49.4%. Response rates ranged from 33% to 82% across staff type. The response rate was higher among administrators (64%, n=32) than among clinicians (44.6 %; n=58) and was highest within the latter group among advanced dental therapists and dental therapists (82%, n=9). The process yielded 80 respondents who were not advanced dental therapists or dental therapists including dentists (60%; n=18), dental hygienists and dental assistants (33.7%; n=30), and administrators (64.0%: n=32).

## Measures of Clinician and Administrative Staff Attitudes towards Dental Therapy

The attitudes of clinical and administrative staff toward the dental therapy workforce model, our primary outcome of interest, were measured across a variety of domains. Most of the survey questions addressed the 2 dental therapy credentials (dental therapy and advanced dental therapy) as a unified model using the umbrella term "dental therapists." The only exceptions within the survey were the questions about education and training, scope of restorative services, and level of required supervision. These variables differ by type of dental therapist so questions about these aspects of practice were asked separately using "dental therapist" and "advanced dental therapist" in the appropriate context. In much of this report the dental therapy workforce is discussed using the consolidated term "dental therapist" except where the variation in the model in Minnesota is relevant. In that situation, we discuss advanced dental therapists and dental therapists separately.



Measured outcomes included the perceived effectiveness of the dental therapy workforce, the improvements in workflow experienced by other clinical staff since the introduction of dental therapy to the clinical teams, benefits to administrators and clinicians, attitudes about the dental therapy model as a whole, the limitations of the dental therapy workforce, and changes in personal perceptions about the dental therapy model. The clinicians and administrators were also asked about their opinions regarding the education, scope of practice, and supervision required for the workforce. Dental therapists were asked about their attitudes towards dental therapy practice and their perceptions about integration with clinical teams and effectiveness of the workforce model. Each item on the surveys, with the exception of one narrative question, contained pre-defined response options which included “don’t know/ unsure”. No items were compulsory so that a respondent could proceed with the survey after skipping any question.

## Data Analysis

Descriptive statistics were used to describe the demographics of clinical and administrative staff and their attitudes towards dental therapy; chi-square tests were used to test for differences in demographic characteristics across respondents. Differences in composite scores of attitudes about dental therapy (quality and efficiency, administrative and workflow items, benefits to clinicians, the dental therapy model as a whole, and the limitations of dental therapy) between respondent groups were tested using univariate analysis of variance (ANOVA) tests. Differences based on clinician practice characteristics (years practiced, years worked with the dental therapy workforce, and full-time/part-time schedule) were tested in the same way. Non-parametric equivalent tests (Kruskal-Wallis tests) were used in cases where the distribution of scores was not normal (eg, scores tended to be high and negatively skewed). Chi-square tests were used to test for differences in the proportion of agreement with statements about

improvements to patient care as a result of the dental therapy workforce. ANOVA tests were also used to test for differences in agreement about education, scope of practice, and required supervision for the dental therapy workforce. Paired-samples t-tests were used to compare respondents’ past and present opinions about dental therapy. P-values of .05 were used as significance cutoffs for all analyses. IBM SPSS Statistics Version 27.0 and R were used for analyses.

## FINDINGS

### Demographic Characteristics of Staff at Apple Tree Dental Invited to Participate in the Study

Three sets of respondent characteristics were gathered for dentists, dental hygienists and dental assistants, the dental therapy workforce, and administrators.

**Table 1** describes the demographic characteristics of staff at Apple Tree Dental who were invited to participate in the study. Staff was mainly female (87.2%), 44 years of age or younger (74.5%), and White (79.4%), slightly less than the state as a whole (83.8%). There were proportionally more females working in dental therapy, dental hygiene/ dental assisting, and administration than in dentistry. Proportionally more dentists and administrative staff were 45 years of age or older than were other staff. Proportionally more dentists were Asian than were other staff.

**TABLE 1. Demographic Characteristics of Staff at Apple Tree Dental Invited to Participate in the Study**

Demographic Characteristics	All Staff	Dentists	Dental Hygienists and Dental Assistants	Dental Therapy Workforce	Administrators	Difference Between Groups ( $\chi^2$ )
	(n=180)	(n=30)	(n=89)	(n=11)	(n=50)	
	n (%)	n (%)	n (%)	n (%)	n (%)	P
<b>Gender<sup>a</sup></b>						<b>&lt;.001</b>
Female	137 (87.2)	17 (60.7)	67 (91.8)	10 (90.9)	43 (95.6)	
Male	20 (12.7)	11 (39.3)	6 (8.2)	1 (9.1)	2 (4.4)	
<b>Age group</b>						<b>.010</b>
18-24	19 (10.6)	-	18 (20.2)	-	1 (2.0)	
25-34	67 (37.2)	15 (50.0)	33 (37.1)	7 (63.6)	12 (24.0)	
35-44	48 (26.7)	7 (23.3)	20 (22.5)	2 (18.2)	19 (38.0)	
45-54	17 (9.4)	2 (6.7)	8 (9.0)	1 (9.1)	6 (12.0)	
55-64	22 (12.2)	4 (13.3)	7 (7.9)	1 (9.1)	10 (20.0)	
65 and over	7 (3.9)	2 (6.7)	3 (3.4)	-	2 (4.0)	
<b>Race</b>						<b>.001</b>
White	143 (79.4)	15 (50.0)	72 (80.9)	10 (90.9)	46 (92.0)	
Asian	18 (10.0)	11 (36.7)	6 (6.7)	1 (9.1)	-	
Hispanic or Latino	7 (3.9)	1 (3.3)	2 (2.2)	-	4 (8.0)	
Black or African American	6 (3.4)	1 (3.3)	5 (5.6)	-	-	
Two or more races	5 (2.8)	2 (6.7)	3 (3.4)	-	-	
Native Hawaiian/ Pacific Islander	1 (0.6)	-	1 (1.1)	-	-	

<sup>a</sup>Gender statistics were not available for new hires within time of data collection (n=23).

Source: Surveys of clinical and administrative staff at Apple Tree Dental, 2021.

## Practice Characteristics of Survey Respondents

Dentists, dental hygienists, and dental assistants were asked about their years in clinical practice, as well as the number of hours per week and weeks per year that they practiced (Table 2). Clinicians also were asked to indicate the year in which they began working with the dental therapy workforce. The dental therapy workforce was asked to describe their certifications for practice and to indicate the number of dental centers at which they provided services on a regular basis in the last year. Administrative staff were asked about their current positions and number of years employed with Apple Tree Dental.

On average, the dentists, dental hygienists, and dental assistants who responded to the survey had approximately 11 years of clinical experience in their profession; the dental therapists had, on average, 4 years (Table 2). Administrators indicated an average of approximately 8 years working at Apple Tree Dental. The majority of survey respondents worked full time in the dental centers at Apple Tree Dental. Staff, who responded to the survey, indicated multiple years of experience working with advanced dental therapists/dental therapists on their clinical teams. On average, dental hygienists and dental assistants indicated more years of practice with the dental therapy workforce than did dentists. Most of the dental therapists who responded to the survey were certified as advanced dental therapists in Minnesota.

**TABLE 2. Practice Characteristics of Survey Respondents at Apple Tree Dental**

Practice Characteristics	Dentists	Dental Hygienists and Dental Assistants	Dental Therapy Workforce	Administrators
	(n=18)	(n=30)	(n=9)	(n=32)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Years in clinical practice	11.53 (12.65)	10.93 (9.63)	4.00 (2.69)	8.38 (7.29) <sup>a</sup>
Weeks worked per year	33.75 (11.33)	36.62 (9.83)	38.14 (11.63)	
Hours worked per week	37.44 (4.76)	38.24 (9.81)	38.29 (2.14)	
Full time (≥40), n (%)	11 (68.8%)	9 (25.0%)	4 (57.1%)	
Part time (<40), n (%)	5 (31.2%)	16 (75.0%)	3 (42.9%)	
Years worked with dental therapy workforce	3.21 (2.64)	4.69 (2.86)		
Number of sites worked by dental therapy workforce			1.14 (0.38)	
Dental therapy certifications, n (%)				
Dental therapist with dental hygiene license			1 (11.1)	
Advanced dental therapist			4 (44.4)	
Advanced dental therapist with dental hygiene license			3 (33.3)	
Advanced dental therapist in progress			1 (11.1)	

<sup>a</sup> Years worked at Apple Tree Dental were recorded for non-clinical team members.

Source: Surveys of clinical and administrative staff at Apple Tree Dental, 2021.

## Attitudes and Opinions of Survey Respondents About Their Experience Working With Advanced Dental Therapists and Dental Therapists

The surveys asked dentists, dental hygienists, and dental assistants to indicate how well dental therapists fit within the team structure at the Center where they worked on a scale of 1 to 5, with 1 being not at all well and 5 being extremely well. On average, dentists indicated a mean score of 4.47, while dental hygienists and dental assistants scored team fit at 4.77; both scores fell between very well and extremely well (data not shown).

Staff members were also asked to express a level of agreement with 16 statements describing their experience working with dental therapists (Table 3). Respondents were offered a 5-point rating scale with 1 being strongly disagree and 5 being strongly agree. Each of the 16 scored items were sorted into 1 of 5 topical categories: (1) quality and efficiency, (2) administration and workflow, (3) benefits to clinicians, (4) opinions about the utility of the dental therapy workforce model, and (5) the limitations of the workforce.

On average, dentists (4.10), dental hygienists and dental assistants (4.43), and administrators (4.40) indicated high levels of agreement with the statements within the quality and efficiency topical area (Table 3). These statements included that dental therapists perform high-quality work and that dentists can work more effectively and efficiently when teamed with a dental therapist. There was less strong but still overwhelmingly positive agreement that dually licensed dental therapists were more productive than therapists without a dental hygiene license. Dentists consistently scored each of the items within this topical area lower than did other clinicians and administrators; although the differences were small, they were statistically significant. Post-hoc results showed significantly higher ratings on composite scores of quality and efficiency by dental hygienists

and dental assistants compared to dentists (data not shown).

The separate questionnaire for administrators contained specific items related to workflow, scheduling flexibility, productivity, and timeliness of patient services (Table 3). On average, respondents indicated very high levels of agreement with the 5 statements related to this topical area including that the model is cost effective (4.46), permits timelier (4.61) and more flexible patient scheduling (4.74) and service delivery, and that the versatility (4.75) and productivity (4.56) of dental therapists were contributing to improvements in workflow.

The topical area that received the most muted ranking was related to the benefits of the workforce model for other clinicians (Table 3). This category included statements about the impact of dental therapists on the personal enjoyment and job satisfaction of dentists, dental hygienists and dental assistants with their jobs. The mean level of agreement among clinicians trended positively between neutral and agree. Dental hygienists and dental assistants were asked if working with dental therapists had increased their interest in becoming a dental therapist; the mean response (3.24) was between neutral and agree.

Overall and on average per item, dental clinicians agreed that other states might benefit from permit-

ting the practice of dental therapy and that the workforce model was one means of addressing difficulty with access to dental services among certain populations (Table 3). Once again, dentists, while still agreeing (4.04), offered slightly lower levels of agreement with these statements than dental hygienists and dental assistants (4.68) and administrators (4.55). The difference by provider type was statistically significant ( $P=0.004$ ). Post-hoc results showed significantly higher ratings on composite scores related to the dental therapy model by dental hygienists and dental assistants as well as for administrators compared to dentists (data not shown).

The surveys contained 2 negative statements and one positive statement in the limitations topical area (Table 3). Responses to the 2 statements trended in a negative direction toward strongly disagree. These items included that “patients don’t want to be treated by a dental therapist” and “if more use was made of dental therapists there wouldn’t be anything left for dentists to do.” The third statement that “dental therapists should work under direct supervision of a dentist” was ranked differently by dental hygienists and dental assistants, who scored the item between disagree and neutral (2.44), and dentists, who on average expressed neutrality about the statement (3.14).





**TABLE 3. Attitudes of Survey Respondents at Apple Tree Dental Towards Dental Therapy**

Attitudes Towards Dental Therapy <sup>a</sup>	Dentists	Dental Hygienists and Dental Assistants	Administrators	Difference Between Groups (F)
	(n=18)	(n=30)	(n=32)	
	Mean (SD)	Mean (SD)	Mean (SD)	P
<b>Quality and Efficiency Items (min=1.00, max=5.00)</b>				
Category overall agreement	4.10 (0.55)	4.43 (0.58)	4.40 (0.48)	.016
1. There is evidence that dental therapists can perform high quality work	4.21 (0.58)	4.56 (0.96)	4.75 (0.52)	
2. Dentists can work more effectively/efficiently using dental therapists in a team approach	4.21 (0.70)	4.68 (0.48)	4.54 (0.64)	
3. Dually licensed dental therapists are more productive than those without a dental hygiene license	3.86 (0.87)	3.96 (1.22)	3.96 (1.06)	
<b>Administrative and Workflow Items (min=3.00, max=5.00)</b>				
Category overall agreement			4.57 (0.55)	
4. Including dental therapists on the clinical teams is cost effective	-	-	4.46 (0.71)	
5. Including dental therapists on the clinical team permitted more patients to receive services in a timely manner	-	-	4.61 (0.63)	
6. Employing dental therapists has improved flexibility in scheduling patients	-	-	4.74 (0.53)	
7. It is helpful to have a clinical professional who can provide both preventive and basic restorative services to supplement dental services	-	-	4.75 (0.44)	
8. Dental therapists have increased dental team productivity	-	-	4.56 (0.71)	
<b>Benefits to Clinicians Items (min=2.00, max=5.00)</b>				
Category overall agreement		3.73 (0.84)		
9. Using a dental therapist will increase dentists' enjoyment of dental practice	3.64 (0.75)	4.13 (0.87)	3.88 (0.80)	
10. Working with dental therapists has increased my level of job satisfaction	3.50 (1.16)	3.88 (0.93)	-	
11. Working with dental therapists has increased my interest in becoming a dental therapist	-	3.24 (1.40)	-	
<b>Dental Therapy Model Items (min=3.00, max=5.00)</b>				
Category overall agreement	4.04 (0.77)	4.68 (0.47)	4.55 (0.50)	.004
12. Other states should adopt the dental therapist model to help address access and cost of care issues	3.86 (0.95)	4.72 (0.54)	4.65 (0.49)	
13. Dental therapists/advanced dental therapists help to alleviate the disparity in access to dental care	4.21 (0.80)	4.63 (0.58)	4.46 (0.64)	
<b>Limitations Items (min=1.00, max=4.00)</b>				
Category overall agreement	1.96 (0.66)			
14. In general, patients don't want to be treated by dental therapists	2.15 (0.69)	1.65 (0.78)	1.89 (0.85)	
15. If more use is made of dental therapists, there won't be anything left for dentists to do	1.79 (0.89)	-	-	
16. Dental therapists should work under the direct supervision of a dentist	3.14 (1.10)	2.44 (0.82)	-	

<sup>a</sup> All items were rated on a scale from 1 (strongly disagree) to 5 (strongly agree).

Composite scores were entered into ANOVA tests with provider type as the group factor. Non-parametric tests equivalent to analysis of variance (Kruskal-Wallis tests) revealed a significant difference on negatively skewed efficiency ratings (shown above) compared to a non-significant difference in the original model ( $P=.129$ ), but did not differ similarly for ratings of other composite measures with normal distributions.

Post-hoc tests with adjusted p values showed significantly higher ratings by dental hygienists ( $P=.015$ ) and a borderline effect for administrators ( $P=.053$ ) compared to dentists. The same relationships were shown for ratings of the dental therapy model ( $P=.004$ ) in which there were significantly higher ratings by dental hygienists ( $P=.003$ ) and administrators ( $P=.018$ ) compared to dentists.

Source: Surveys of clinical and administrative staff at Apple Tree Dental, 2021.

Mean overall ratings of attitudes towards dental therapy were calculated for dentists (3.46), dental hygienists and dental assistants (3.81), and administrators (4.25) (Table 4). Although respondents generally gave very high ratings to the dental therapy workforce model, administrators had statistically higher overall ratings than dentists and dental hygienists and dental assistants. Dentists' overall ratings progressed with the number of years of experience working with dental therapists. However, an analysis of the practice characteristics of responding staff with their mean overall ratings of the dental therapy workforce found no statistically significant associations among dentists, dental hygienists and dental assistants, or administrators. Altogether, the mean overall rating across all responding staff was 3.92 ( $SD=.48$ ), indicating strong positive attitudes towards dental therapy (data not shown).

**TABLE 4. Overall Attitudes of Survey Respondents at Apple Tree Dental Towards Dental Therapy by Practice Characteristics**

Practice Characteristics <sup>a</sup>	Dentists	Dental Hygienists and Dental Assistants	Administrators	Difference Between Groups (F)
	(n=18)	(n=30)	(n=32)	(F)
	Mean (SD)	Mean (SD)	Mean (SD)	P
<b>Overall rating</b>				<b>&lt;.001</b>
All respondents	3.46 (0.28)	3.81 (0.39)	4.25 (0.39)	
<b>Years practiced</b>				<b>.23</b>
1-3	3.37 (0.29)	3.88 (0.69)		
4-10	3.70 (0.14)	3.82 (0.27)		
11+	3.46 (0.32)	3.77 (0.34)		
<b>Years worked at Apple Tree Dental</b>				
1-3			4.33 (0.60)	
4-10			4.22 (0.44)	
11+			4.67 (0.20)	
<b>Years worked with dental therapy workforce</b>				<b>.20</b>
1-2	3.48 (0.29)	4.03 (0.54)		
3-4	3.47 (0.15)	3.66 (0.36)		
5+	3.65 (0.35)	3.77 (0.26)		
<b>Schedule</b>				<b>.96</b>
Full time (≥40 hours per week)	3.42 (0.33)	3.81 (0.52)		
Part time (<40 hours per week)	3.54 (0.18)	3.79 (0.32)		

<sup>a</sup> Overall scores were compared across responder types. Practice characteristics were used to group respondents into tertiles with the exception of schedule for all other variables. Ratings across each group were tested using ANOVA. Scores were transformed before being entered in order to adjust for negative skew, as scores were generally high. There were no appreciable differences based on these changes compared to original scores.

There were statistically significant differences in the overall ratings: administrators had higher overall ratings than dentists ( $P<.001$ ) and dental hygienists and dental assistants ( $P<.001$ ); dental hygienists and dental assistants had higher ratings than dentists ( $P=.021$ ). There were no statistically significant associations between practice characteristics and overall ratings among dentists, dental hygienists and

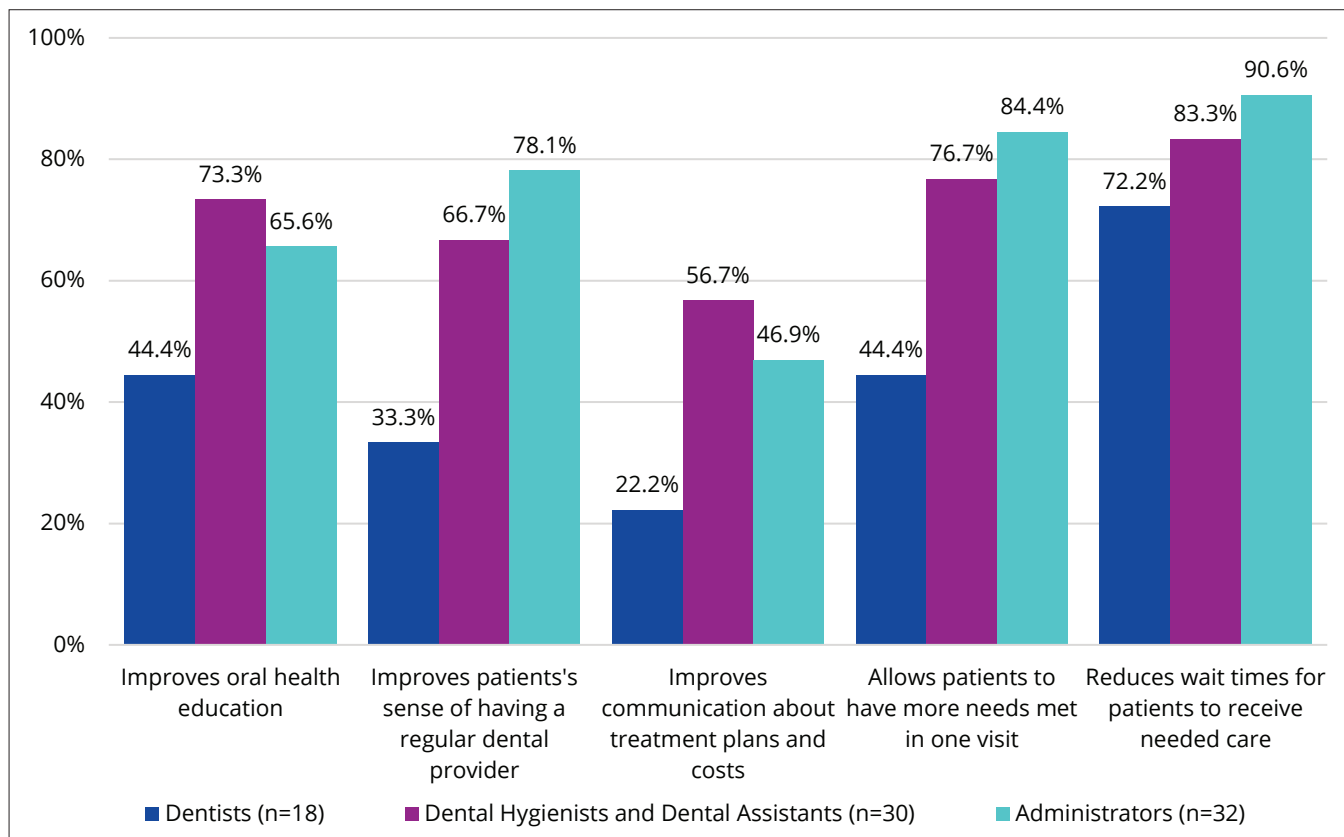
Source: Surveys of clinical and administrative staff at Apple Tree Dental, 2021.

## Opinions of Survey Respondents About Improvements to Patient Care

Five items were used to assess perceived improvements in quality of patient care after the introduction of dental therapists to the clinical teams at Apple Tree Dental (Figure 1). Respondents were asked, “How does having dental therapists on your clinical team improve patient care?” with the option to select applicable answers. Survey respondents were provided with a list of 5 areas where improvements to patient care might have occurred as a result of having dental therapists on clinical teams: (1) oral health education, (2) patients’ sense of having a regular dental provider, (3) communication about treatment plans and costs of care, (4) greater facility with meeting patient needs in a single visit, and (5) reduced wait times for patients to receive needed care. Respondents were given the option to mark any and all that applied.

An overwhelming majority of survey respondents from all professions noted reduced wait times for patients to receive needed care (72.2% to 90.6%). Many also acknowledged that having dental therapists on staff allowed patients to have more needs met in one visit (44.4% to 84.4%) and improved patients’ sense of having a regular dental provider (33.3% to 78.1%) (Figure 1). The least selected improvement by respondents, regardless of profession type, was that the presence of dental therapists improved communication about treatment plans and costs (22.2% to 56.7%). Dental hygienists and dental assistants and administrators more often selected multiple or all improvements than did dentists. Proportional differences in agreement across staff were significant for the items “improves patients’ sense of having a regular dental provider” and “allows patients to have more needs met in one visit.”

**FIGURE 1. Opinions of Survey Respondents at Apple Tree Dental About Improvements to Patient Care As a Result of Having the Dental Therapy Workforce on the Clinical Teams<sup>a</sup>**



<sup>a</sup> Proportional differences in agreement (chi-square) across staff types were significant for items “improves patients’ sense of having a regular dental provider” ( $P=.006$ ) and “allows patients to have more needs met in one visit” ( $P=.008$ ).

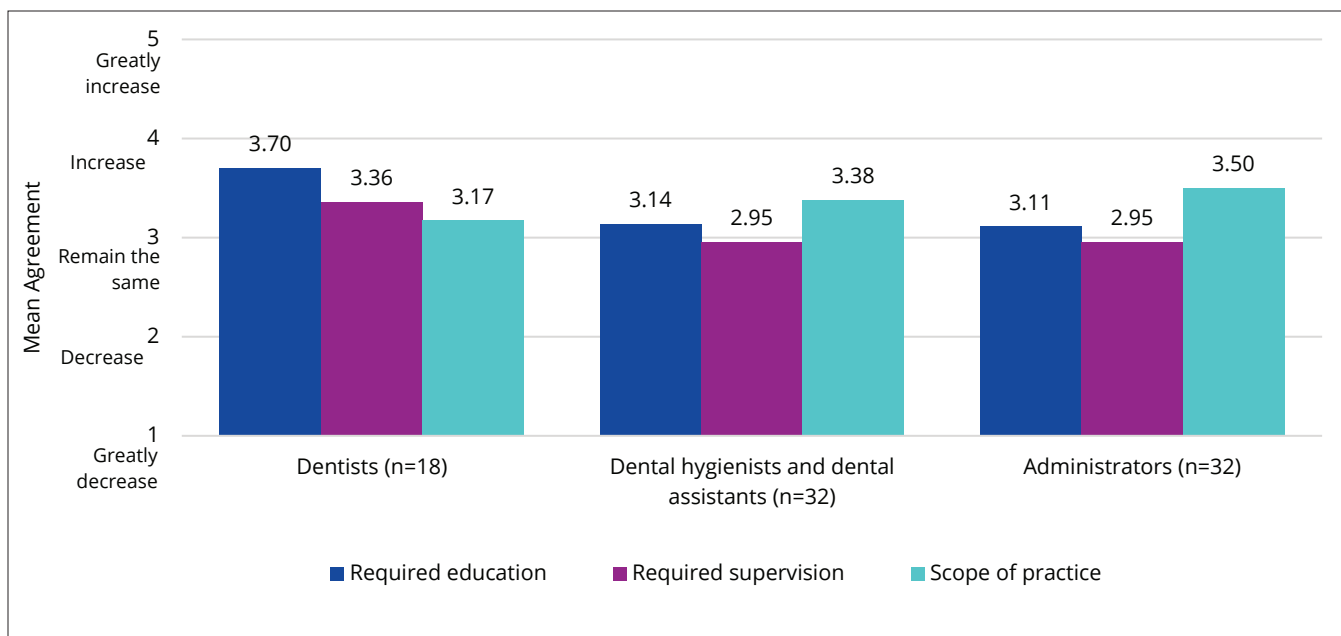
Source: Surveys of clinical and administrative staff at Apple Tree Dental, 2021.

## Opinions of Survey Respondents About the Levels of Education and Training, Scope of Practice, and Required Supervision of Advanced Dental Therapists and Dental Therapists

Each of the surveys contained an item asking survey participants about whether the current scope of practice for dental therapists (Figure 2) and advanced dental therapists (Figure 3) including the required levels of education and training, scope of restorative services, and required supervision in Minnesota should (1) greatly decrease, (2) decrease, (3) remain the same, (4) increase, or (5) greatly increase. The responses of survey participants generally clustered closest to “remain the same”, keeping the current education, scope of restorative service, and level of required supervision as is currently in regulation in Minnesota. Once again, the attitudes of dentists differed somewhat from those of dental hygienists and dental assistants and administrators.

On average, dentists indicated that the current level of education and training for dental therapists (3.70) should stay the same (a score of 3) or should increase (a score of 4) (Figure 2). Differences in agreement on the scope of dental therapy education requirements across staff types were significant; dentists more often indicated a desire for an increase in education requirements for dental therapists (3.70) compared to dental hygienists and dental assistants (3.14) and administrators (3.11).

**FIGURE 2. Opinions of Survey Respondents at Apple Tree Dental About Education, Scope of Practice, and Required Supervision for Dental Therapists<sup>a</sup>**



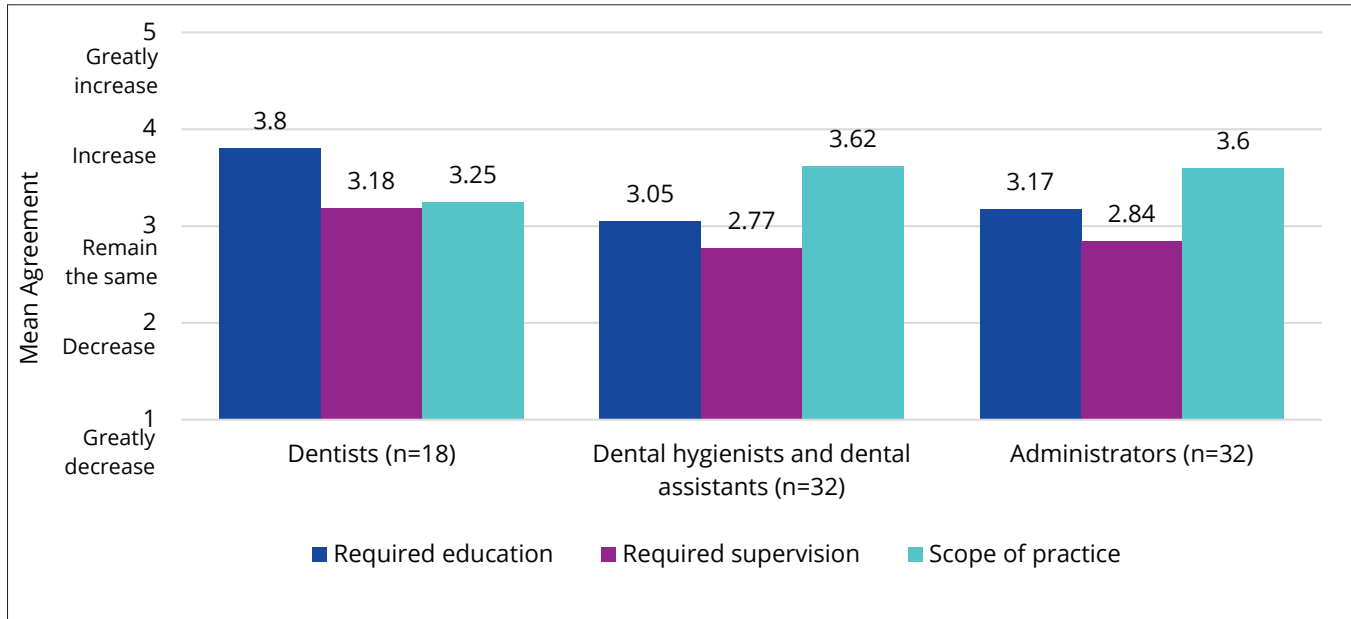
<sup>a</sup> Differences in agreement on the scope of dental therapist education requirements across staff types based on one-way analysis of variance (ANOVA) were significant ( $P=.020$ ), in which dentists indicated desiring greater education requirements for dental therapists relative to dental hygienists and dental assistants ( $P=.049$ ) and administrators ( $P=.039$ ). Non-parametric tests did not reveal differences from the original models. Agreement with each statement was scored from 1 (greatly decrease) to 5 (greatly increase).

Source: Surveys of clinical and administrative staff at Apple Tree Dental, 2021.

Dentists also indicated that the current level of education and training for advanced dental therapists (3.80) should stay the same (a score of 3) or should increase (a score of 4) (Figure 3). These ratings were significantly different compared to dental hygienists and dental assistants (3.05), who indicated mainly that the current level of education and training for advanced dental therapists should stay the same (a score of 3). On aver-

age, dental hygienists and dental assistants (3.62) and administrators (3.60) agreed that the current scope of restorative services permitted to advanced dental therapists should stay the same (a score of 3), but their responses trended closely to increasing the scope of restorative tasks (a score of 4).

**FIGURE 3. Opinions of Survey Respondents at Apple Tree Dental About Education, Scope of Practice, and Required Supervision for Advanced Dental Therapists<sup>a</sup>**



<sup>a</sup> Differences in agreement on the scope of education requirements for advanced dental therapists were significant for dentists compared to dental hygienists and dental assistants ( $P=.019$ ). Non-parametric tests did not reveal differences from the original models. Agreement with each statement was scored from 1 (greatly decrease) to 5 (greatly increase).

Source: Surveys of clinical and administrative staff at Apple Tree Dental, 2021.

## Current and Past Attitudes of Clinicians Towards Dental Therapy

Dentists, dental hygienists, and dental assistants were asked to provide both their past and current opinions about dental therapy, including their opinions about (1) the range of allowable services, (2) the quality of care, (3) the scope of care, and (4) the overall contributions of dental therapists to the clinical team (Table 5). Each of the 4 items were scored for prior and present opinions using a Likert response scale from 1 (strongly disagree) to 5 (strongly agree). The intent of these questions was to measure any change in opinion about the workforce from the time before clinicians worked with dental therapists to the present time when each was working directly with dental therapists in clinical practice.

Across the 4 items, there were no significant changes between past and present opinions about dental therapy among dentists (Table 5). However, there was a positive trend in dentists' change of opinion across each item with respondents indicating more positive feelings about the range of services, the quality of care provided, and the contributions of the dental therapy workforce, as well as in attitudes about dental therapists' scope of practice. The same was mostly true for dental hygienists and dental assistants; the exception was in their attitudes about scope of practice. Dental hygienists and dental assistants disagreed that the scope of dental therapists' practice was too broad, but this disagreement waned in intensity between past (1.83) and current (2.08) assessments of breadth of scope. Dentists' opinions exhibited a reverse trend scoring this item,

on average, with more intense disagreement, but the change was not significant. Changes in opinion across all other items scored by dental hygienists and dental assistants were positive but not statistically significant.

**TABLE 5. Current and Past Opinions of Apple Tree Clinicians on the Range of Services, Quality, Contribution and Scope of Dental Therapists’ Work**

Provider Type	Attitude Items	Past Assessment		Current Assessment		Difference <sup>a</sup>
		Mean	SD	Mean	SD	P
Dentists (n=18)	I was impressed with the range of services they were trained to provide	4.07	0.70	4.20	0.68	.33
	I had no concerns about the quality of care provided by dental therapists	3.33	0.90	3.53	1.13	.42
	I thought that dental therapists would make a noticeable contribution to the dental team	4.33	0.49	4.40	0.74	.75
	I felt the scope of dental therapists’ practice was too broad	2.33	0.98	2.20	1.08	.16
Dental Hygienists and Dental Assistants (n=32)	I was impressed with the range of services they were trained to provide	4.32	0.99	4.40	0.91	.49
	I had no concerns about the quality of care provided by dental therapists	4.16	0.99	4.44	1.00	.18
	I thought that dental therapists would make a noticeable contribution to the dental team	4.38	1.01	4.64	0.91	.06
	I felt the scope of dental therapists’ practice was too broad	1.83	0.816	2.08	1.10	.031

<sup>a</sup> Paired t-tests were used to test for differences between past and current attitudes within subjects. Non-parametric alternatives (Wilcoxon signed-rank test) did not produce appreciably different results from above.

Source: Surveys of clinical and administrative staff at Apple Tree Dental, 2021.

## Attitudes of the Dental Therapy Workforce Towards Their Work

The dental therapy workforce at Apple Tree Dental were surveyed about their attitudes towards their work using 12 items clustered within 4 topical areas: (1) skill mix, (2) work facilitators, (3) work barriers, (4) satisfaction with dental therapy (Table 6). Respondents were asked to provide an opinion on a 5-point rating scale from 1 (strongly disagree) to 5 (strongly agree).

The results from the survey of advanced dental therapists and dental therapists are reported separately from those of other clinicians since it would be expected that the dental therapy workforce would be generally positive about their roles and engagement with their work (Table 6). The number of responses was small, although they represent more than 90% of the dental therapy workforce at Apple Tree Dental. The results should be evaluated with caution since the small cohort of respondents is a limitation.

It was apparent that both advanced dental therapists and dental therapists were overwhelmingly supportive of the roles they play in provision of patient care (Table 6). The mean response to many of the statements trended towards strongly agree. Advanced dental therapists and dental therapists reported that they spend a majority of their time providing restorative services (as opposed to preventive care) for patients (4.00) and that they are routinely required to use a variety (4.86) of complex or high-level clinical skills (4.57) in their work.

Advanced dental therapists and dental therapists also agreed that they experienced professional autonomy in their practice allowing them to complete a patient service from start to finish (4.23) and to direct how they

accomplish their clinical tasks (4.86) (Table 6). They also reported strong agreement that they were valued as members of their clinical teams (5.00), that they were satisfied with their work (4.86), and that they would choose to become a dental therapist if they had to choose again (4.71).

**TABLE 6. Attitudes and Opinions of Dental Therapists at Apple Tree Dental About Their Work**

Attitudes of Dental Therapists About Their Work	Dental Therapy Workforce
	(n=9)
	Mean (SD)
<b>Skill mix (min=3.60, max=4.40)</b>	<b>4.09 (0.30)</b>
1. I spend the majority of my clinical time each day providing preventive services for patients	2.57 (0.53)
2. I spend the majority of my clinical time each day providing restorative services for patients	4.00 (0.00)
3. My job as a dental therapist requires me to use a number of complex or high-level clinical skills	4.57 (0.53)
4. My work as a dental therapist requires me to use a variety of my clinical skills	4.86 (0.38)
5. Dental therapy work requires a lot of cooperative work with other people	4.43 (0.79)
<b>Work facilitators (min=4.25, max=5.00)</b>	<b>4.61 (0.28)</b>
6. My work is arranged so that I can complete an entire clinical service from beginning to end	4.23 (0.76)
7. I receive regular feedback on how well I am doing at work	4.23 (0.49)
8. I am a valued member of the dental team	5.00 (0.00)
9. My work as a dental therapist permits me to decide how to go about doing my work	4.86 (0.38)
<b>Work barriers (min=1.00, max=4.00)</b>	
10. I could do more extensive work if patients were referred to me	2.86 (1.21)
<b>Satisfaction with dental therapy (min=4.00, max=5.00)</b>	<b>4.79 (0.39)</b>
11. Overall, I am satisfied with my career as a dental therapist	4.86 (0.38)
12. I would choose to pursue dental therapy again	4.71 (0.49)

Source: Surveys, Apple Tree Dental, 2021.

## DISCUSSION

The literature discussing satisfaction with the dental therapy workforce model is limited in the US because it is an emerging workforce and few dental clinicians have direct experience with the workforce model. Much of the current literature using survey research queried dentists and others on their theoretical attitudes about dental therapy rather than their judgments of practical experience with the workforce. The following discussion relies heavily on literature describing the experiences of dental clinicians with dental therapists in other countries, where the workforce is long established.

This study, while limited by small sample sizes, is useful because it surveyed all members of the clinical and administrative teams at a large non-profit community dental organization that has experience with employment of advanced dental therapists and dental therapists in both fixed dental centers and in mobile dentistry programs. The organization serves a large number of low-income, Medicaid-insured patients, a population that includes many elderly people and patients with a broad range of intellectual and development disabilities and medical comorbidities. The experience of working with dental therapists is also long-standing in the organization. Dental therapists have been employed in one or many of the service sites for a decade and are now institutionalized members of the clinical teams.



## The Dental Therapy Model

A survey of licensed dentists in Minnesota, conducted in early 2012, coincided with the entry of the first dental therapists to practice in the state.<sup>12</sup> The survey data suggested that dentists had varying attitudes toward the new workforce; many were reluctant about the impact of dental therapy on the patient relationship including questioning whether patients would be accepting of the model. At that time, about one-third of survey respondents indicated an interest in the workforce as one possible answer to limited access to dental services for some populations in the state. In 2012, fewer than half of responding dentists viewed dental therapy as a solution for addressing oral health disparities in the state's population.<sup>12</sup>

At that time, dentists who responded to the survey did not feel that the required level of education and training for dental therapists was sufficient to allow diagnostic decision-making by the workforce. Many also expressed reluctance to delegate restorative services to another workforce. Dentists also preferred the dual-trained dental therapist, that is, a dental hygienist who trains as a dental therapist.<sup>12</sup> In 2012, there were 2 training options as pathways to the profession including a bachelor's degree in dental therapy with no prior dental hygiene education. In response to employer preferences, that has since changed with both educational programs in the state now offering education in dental hygiene and dental therapy.

Our study found that a slight preference for the dental hygiene model among dentists, dental hygienists and dental assistants, and administrators prevailed in 2021. The mean level of agreement with the statement "dually licensed dental therapists are more productive than those without a dental hygiene license" ranged between 3.86 and 3.96, between neutral (3) and agree (4), on a 5-point scale. There is abundant discussion in states currently about the utility of a dually trained clinician versus a professional who

has been singly trained in dental therapy. The recent change in the educational model in Minnesota at the University's dental school suggests preference in the statewide environment for competence in both dental hygiene and dental therapy, perhaps because of the added flexibility inherent in a workforce equipped with both qualifications.

The United Kingdom (UK) has required dual qualification as both a dental hygienist and dental therapist since 1983.<sup>13</sup> A survey in 2009 of dually qualified therapists in the countries composing the UK found that 75% of these clinicians were satisfied with their work. Satisfaction within the various domains which constituted the composite score varied, however, with higher satisfaction scores related to satisfaction with colleagues and their teams compared to compensation for their work, general working conditions, use of their abilities, and variety of their work. Researchers found that in some cases, dually qualified therapists were being delegated more hygiene than therapy work and that the inability to use their therapy skills was a source of dissatisfaction. Researchers found that the therapists who valued dental hygiene work highly were less concerned about not having therapy work and were more satisfied overall.<sup>13</sup>

## Impact on Dental Teams

Our survey found that overall other oral health clinicians at Apple Tree Dental were very satisfied with the inclusion of dental therapists on their clinical teams. While attitudes on particular items within the survey content varied, in general, variation was small. The survey data described the positive contributions of the workforce relative to staff satisfaction, organizational and workflow efficiencies, and patient care.

Gallagher and Wright<sup>4</sup> conducted research in Sussex, England soliciting general dentists to complete a survey to describe their knowledge of and attitudes toward employment of dental therapists. Several of the questions included in the Gallagher survey were replicated in the survey of clinicians and administrators



at Apple Tree Dental. When evaluating the knowledge of general dentists about dental therapists, Gallagher asked dentists to respond yes, no, or don't know to the statement "there is evidence that dental therapists can perform high quality work"; 52.5% of respondents answered yes and 45.5% did not know.

Our study asked respondents to respond to the same statement by indicating an opinion on the 5-point scale ranging from strongly disagree to strongly agree. The mean for all survey respondents was 4.57, a metric showing agreement with the statement that there is evidence that dental therapists perform high-quality work. Dental hygienists and dental assistants (4.56) and administrators (4.75), once again, expressed higher levels of agreement than dentists (4.21), but the differences were small.

The Gallagher survey<sup>4</sup> asked dentists about their agreement with the statement "using a dental therapist will increase dentists' enjoyment of clinical practice." That survey found that 43% of respondents agreed with the statement and 21% had no opinion. Our survey found the highest level of agreement with the same statement among dental hygienists and dental assistants (4.13 on a 5-point scale). Dentists were more reserved in their agreement, scoring the item at 3.64 on average, trending between neutral (3) and towards agreement (4). Our interpretation of this response is that there are many factors that influence enjoyment of work. From a dentist's perspective, the assumption of routine restorative services by dental therapists may result in an increase in complexity of workload for the team dentist. The intensity or severity of the resulting caseload may increase feelings of overwork, affecting a dentist's overall sense of job enjoyment. Still, these findings regarding dental therapists suggest a positive contribution to the complex of factors within the construct of enjoyment of practice.

Gallagher and Wright's survey<sup>4</sup> also included the statement "dentists can work more effectively/ efficiently using therapists in a team approach" with 58.8% of

respondents expressing a favorable attitude towards working with dental therapists and 31.5% indicating no opinion. Our survey found high levels of agreement with this statement among all respondents including dentists (4.21), dental hygienists and dental assistants (4.68), and administrators (4.54). Once again, dentists' responses trended more towards agree (4), while other survey participants tended towards strongly agree (5). Nevertheless, in sum, staff members agreed that dental therapists contribute to the efficiencies of clinical teams.

One very interesting response within the Gallagher survey<sup>4</sup> was to the statement "if more use is made of therapists there won't be anything left for dentists to do." Discussions regarding the dental therapy model sometimes suggest that there will be "creep" within the scope of the mid-level workforce that would affect the tasks left exclusively to dentists. Dentists in England soundly disagreed (80%) with this statement. Our survey revealed similar findings with dentists on average reporting that they greatly disagree (1) or disagree (2) with the statement (1.79 on a 5-point scale).

Another statement common to both the Gallagher survey<sup>4</sup> and our survey of Apple Tree Dental staff was, "In general, patients don't want to be treated by dental therapists". Half of the respondents to the Gallagher survey in England (51%) expressed no opinion/ neutrality to the statement with one-quarter agreeing and another quarter disagreeing. The same statement was offered to all respondents on this current study's surveys. On average, clinical providers and administrators expressed disagreement with the statement. Dentists showed lower levels of mean disagreement (2.15) compared to administrators (1.89) and dental hygienists (1.65) when a score of 1 is equal to strongly disagree and 2 is equal to disagree.

Our survey results also indicated that the majority of clinician and administrative respondents reported that having dental therapists on staff reduced wait times for patients to receive needed care (scores by professional type ranged from 72.2% to 90.6%), al-

lowed patients to have more needs met in one visit (range 44.4% to 84.4%), and improved patients' sense of having a regular dental provider (range 33.3% to 78.1%).

## Attitudes of Administration Towards Dental Therapy

Respondents with administrative roles were asked to indicate their opinions about several statements related to process and workflow. Administrators agreed (4) or strongly agreed (5) about the cost effectiveness of dental therapists (4.46), increases in the timeliness of patient services (4.61), and increases in dental team productivity (4.56) since dental therapists began practicing at Apple Tree Dental centers. Administrators agreed or strongly agreed, on average, that dental therapists improved flexibility in patient scheduling (4.74) and that having a professional who can provide both preventive and basic restorative services was helpful (4.75).

## Education, Scope of Work, and Supervision

In 2017, Ly and colleagues conducted a survey of dentists and dental hygienists working in a regional dental group in the Pacific Northwest to ascertain their attitudes about the utility of instituting a dental therapy workforce and the levels of agreement with proposed education and training, scope of services, and levels of required supervision.<sup>8</sup> Ly and colleagues<sup>8</sup> reported that dentists showed lower levels of agreement with the proposed scope of practice for dental therapists (45% either agreed or strongly agreed) than dental hygienists (70% either agreed or strongly agreed). Our survey asked respondents to indicate their opinions about these aspects (education and training, scope of work, supervision) of dental therapy practice in Minnesota on a 5-point scale with 1 being greatly decrease, 3 being remain as is, and 5 being greatly increase.

In Ly's survey,<sup>8</sup> respondents were asked what level of education a dental hygienist would need to become a dental therapist; 31% of dentists indicated a pref-

erence for a bachelor's degree and 35% indicated a master's degree. Dental hygienists provided similar responses with 36% indicating a bachelor's degree and 21% selecting a master's degree. Forty percent of dental hygienists considered a certificate or associate degree sufficient training while just 27% of dentists selected either of these options as appropriate.

Our survey found that dentists felt that, on average (3.70), the level of required education for dental therapists and the required education for advanced dental therapists (3.80) should remain as is (3), but their response trended closely to should increase (4). On average, dental hygienists and dental assistants (3.14) and administrators (3.11) indicated that the current level of required education for dental therapists in Minnesota, which requires a bachelor's degree and now encourages a master's degree, should remain as is. Dental hygienists and dental assistants (3.05) and administrators (3.17) expressed similar opinions about the level of required education for advanced dental therapists indicating that the currently required master's level education should remain as is (3).

On average, our survey respondents indicated that the current scope of restorative services for dental therapists should remain as is (3) in Minnesota regulation, but dental hygienists and dental assistants (3.30) and administrators (3.50) trended towards an increase (4) in scope. The mean for dentists clustered closer to remain as is (3.17). The mean scores related to the scope of restorative services allowed to advanced dental therapists exhibited similar trends with dental hygienists and dental assistants (3.62) and administrators (3.60) trending towards increasing the scope (4) while dentists (3.25) preferred scope to remain as is (3).

Ly<sup>8</sup> found that 48% of dentists but only 11% of dental hygienists felt that dental therapists should practice under direct supervision. Thirty-one percent of dentists supported general supervision and another 16% supported general supervision using teledentistry.

Twenty-nine percent of dental hygienists supported indirect supervision and 28% felt general supervision was appropriate. Ten percent of dental hygienists but no dentists indicated an opinion that dental therapists did not need supervision.<sup>8</sup> Our survey found that, on average, dentists agreed that supervision should remain as is (3) (direct and indirect supervision) (3.36). Dental hygienists and dental assistants (2.95) and administrators (2.95) also held the opinion that dental therapy supervision should remain as is. When asked about current supervision requirements for advanced dental therapists (general supervision), dentists (3.18), dental hygienists and dental assistants (2.77), and administrators (2.84) agreed, on average, that it should also remain as is.

### Attitudes of Advanced Dental Therapists and Dental Therapists Towards Their Work

A study by Csikar et al. in 2006 of dental therapists in the UK, where dental therapists had been working for many years, examined whether dental therapists felt they were part of the clinical teams where they worked and whether their clinical work was as expected.<sup>10</sup> The survey sample included both dental therapists and dually qualified dental hygienist/dental therapists. When asked if they could do more extensive work if patients were referred to them, 55% agreed or strongly agreed (on a 5-point scale).<sup>10</sup> The dental therapists agreeing to this statement were predominately those who had qualified to practice within the prior 3 to 10 years and had practiced mainly in private practice settings in general dentistry practice.<sup>10</sup> The advanced dental therapists and dental therapists responding to our survey were asked to agree or disagree with the same statement presented to UK dental therapists. However, our findings were quite different. On average, advanced dental therapists and dental therapists scored this item at 2.86 between disagree and neutral, suggesting that many were feeling that their skills and competencies were being effectively used in their workplaces.

Ayers and colleagues<sup>6</sup> surveyed more than 500 dental therapists in New Zealand where the dental therapy model originated in the form of dental nurses in schools. The authors reported that overall career satisfaction of dental therapists who responded to the survey was high at a mean of 7.1 on a 10-point scale. In contrast, just 40.6% of dental therapists indicated that they felt they were a valued part of a dental community; 51.3% indicated high satisfaction with their careers, but only 44.9% indicated that they would choose to pursue a dental therapy career again.

Naidu, Newton, and Ayers<sup>14</sup> surveyed dental therapists in New Zealand, the UK, and Trinidad & Tobago about their career satisfaction and found that dental therapists in Trinidad & Tobago expressed lower rates of job satisfaction than did dental therapists in New Zealand or the UK. However, when all dental therapists were asked if they felt a valued member of the staff, respondents from Trinidad & Tobago had the highest percentage of dental therapists who indicated they were a valued member of the team. Authors concluded that a number of variables contribute to job satisfaction including colleagues, patients, and structural and environmental factors that would vary by country and professional culture.

Our study asked the dental therapy workforce at Apple Tree Dental to agree or disagree with the same statement presented to therapists in the UK, New Zealand, and Trinidad & Tobago: "I am a valued member of the dental team". The mean response on the Likert Scale was 5.0 corresponding to strongly agree. Additionally, our study found overall general satisfaction within the dental therapy workforce at Apple Tree Dental. Advanced dental therapists and dental therapists rated their overall satisfaction at 4.86 on a 5-point scale and also strongly agreed (4.71) that they would choose to pursue a dental therapy career again. Differences in employment situations would affect satisfaction and job enjoyment scores. The dental therapists at Apple Tree Dental all work on strong clinical teams in established dental centers and outpatient programs. Dental therapists in New

Zealand worked in a variety of settings but mainly in school dental services where the presence of established teams may be less prominent. This difference might affect the dental therapists' sense of value to the general dental community.

Turner and colleagues<sup>15</sup> surveyed dental hygienists, dental therapists, and dental hygiene therapists in the UK in 2009 to ascertain their perceptions about the amount of professional autonomy they experienced in providing assessment, treatment planning, preventive care, and restorative services. Researchers found that dental hygienists and dental hygienist therapists experienced autonomy in assessments, diagnosing periodontal disease, and providing local analgesia, among other skills. Dental therapists and dental hygienist therapists experienced autonomy in choosing restorative materials. However, many fewer dental therapists and dental hygienist therapists indicated autonomy in dental charting, fissure sealing, performing resin restorations, and taking radiographs. Dental therapists with heavy workloads indicated the greatest autonomy in their work and dental hygienist therapists working in countries other than the UK were the most autonomous, likely due to variation in scope of practice in different regulatory jurisdictions.

Our study found that the dental therapy workforce at Apple Tree Dental expressed feelings of overall autonomy. The mean ranking in response to the statement "my work as a dental therapist permits me to decide how to go about doing my work" was 4.86 and the mean response to a related statement "my work is arranged so that I can complete an entire clinical service from beginning to end" was 4.23 on the 5-point agreement scale. Hamson<sup>7</sup> asked dental therapists in Minnesota to respond to this same statement and found that 82% of survey respondents indicated that they could initiate and complete clinical services using their skill set.

## LIMITATIONS

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One limitation of our study was potential for self-selection bias of the respondents, with respondents being more favorable towards dental therapy than non-respondents. For example, although dental therapists' scores were not included in inferential analyses, it is clear that their response rates and scores on attitudinal measures were notably high. Additionally, an organizational history of promoting innovative dental practices at Apple Tree Dental (eg, early adoption of dental therapy) may represent a similar basis for positive bias. We also asked respondents to rate their past and present attitudes towards dental therapy on 4 dimensions based on their recall of their experiences at the time of survey administration. It is possible that participants may have experienced recall bias and/or underestimated the impact of factors in determining past attitudes compared to present attitudes. However, changes in attitudes within our sample did not differ based on when dentists and dental hygienists had reported first working with dental therapists.

## CONCLUSIONS

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There was variation in levels of agreement with the common statements on the various Apple Tree Dental survey instruments based on clinical and administrative roles within the organization. However, the overall survey findings attest to high levels of satisfaction with the dental therapy workforce model among the staff throughout the Apple Tree Dental programs and dental centers. Advanced dental therapists and dental therapists are now integral members of the clinical teams and their presence has contributed to improved capacity within the organization to meet the needs of patients. During the years since dental therapists were initially employed at Apple Tree Dental, the patient population has increased in size and variety to now include more children than in the past. The flexibility of a well-trained workforce and the pre-



ventive and restorative elements within dental therapists' scope of practice are beneficial to an organization that must continually respond to changing needs and demands within their population of patients. The findings from the Apple Tree Dental surveys also suggest that other dental professionals view the dental therapist as a complementary rather than a competitive workforce. Dentists in our study disagreed that if more use was made of dental therapists there wouldn't be anything left for dentists to do and there was overall agreement that dentists can work more effectively and efficiently using dental therapists on dental teams.





## PATIENT SATISFACTION SURVEY

This research was part of a 2-pronged study related to the introduction of dental therapy to clinical teams at Apple Tree Dental Centers in Minnesota beginning in 2012. This study follows an extensive project completed in 2020 that examined encounter data for the years 2012-2019 for more than 75,000 patients at Apple Tree Dental to describe how service delivery was impacted as dental therapists were introduced and integrated to the dental teams.<sup>1</sup> Our current study focuses on clinician and patient satisfaction with the new workforce model.

Patients at Apple Tree Dental span the age continuum. While the organization originally served mostly adults, the patient cohorts now include a large number of children. The majority of patients are low income and Medicaid eligible (82%).<sup>1</sup> Apple Tree Dental has operated as a flagship for dental therapy since the inception of this workforce in Minnesota. Apple Tree Dental's organizational mission, its patient profile, and its successful integration of dental therapists and advanced dental therapists has made it a unique source for data about the contributions of this provider type.

## METHODS

### Survey Design

OHWRRC research staff conducted a literature review to examine previous survey research describing patient satisfaction with dental clinicians' services. Staff then compiled a survey using previously validated

questions to measure respondents' satisfaction with dental services using content from 3 sources: the Dental Satisfaction Survey from the Australian Institute of Health and Welfare (AIHW),<sup>17</sup> the 10-Item Dental Visit Satisfaction Scale,<sup>18</sup> and the suggested surveys in the Safety Net Dental Clinic Manual.<sup>19</sup> The survey also included some original items. The Web-based survey was developed using the SurveyMonkey platform. The survey took approximately 5 minutes to complete.

### Survey Content

Patient satisfaction is an overarching concept that includes a patient's perception of many aspects of a dental visit. Selected attitudinal statements within our survey fell into 3 conceptual categories that are thought to contribute to the overall construct of patient satisfaction:<sup>18</sup> (1) information and communication, (2) understanding and acceptance, and (3) technical competence and satisfaction with treatment items. The analysis of the survey data grouped statements within these categories to measure satisfaction.

Information and communication items referred to the providers' ability to explain necessary information clearly and the patient's understanding of diagnoses, etiology, prognoses, and effects of treatment. Understanding and acceptance items referred to patients' perception of the patient-provider relationship, including feelings of trust and acceptance by the provider and perceptions of the providers' positive regard for the patient. Technical competence and

satisfaction with treatment items measured patients' evaluation of the providers' professional behaviors and technical skills, such as diagnostic procedures and the application of treatments. A final item was added to assess patients' overall general satisfaction with their visit. This statement asked about patients' intention to return to Apple Tree Dental, which was based on similar questioning found in the Australian Dental Satisfaction Survey.<sup>17</sup> A copy of the survey questionnaire is available in the Appendix of this report.

Patients were asked to rank their agreement with each of 13 statements on a Likert scale from 1 to 5 with 1 being strongly disagree and 5 being strongly agree. Two of the statements were phrased negatively and 11 were stated positively. Composite scores containing negatively phrased items were adjusted by reversing the scale (5=strongly disagree, 1=strongly agree) for those items.

The patient questionnaire also asked patients to describe the main purpose of the dental visit, whether the visit was for themselves or for a minor child or dependent adult and the type of provider that *primarily* treated them during their most recent visit.

In the cases where patients were not responding about their own encounter, surveys collected demographic information about both the accompanied patient and the respondent. Respondent characteristics of interest included age, sex, race/ethnicity, area of residence, and appointment purpose.

## Sample Size

Due to a number of privacy constraints and to assure patient anonymity, OHWRC researchers relied on a quota sampling of patients. The study protocol described a desired response from a total of 1,000 patients (from approximately 35,000 total patients annually) who received any dental services between February and August 2021 at one of the 7 Apple Tree

Dental centers where surveys were fielded. The centers are located in Coon Rapids, Fergus Falls, Hawley, Little Falls, Madelia, Mounds View, and Rochester, Minnesota. Patients at Apple Tree Dental's Fairmont location were excluded from the research since there were no advanced dental therapists or dental therapists at that location.

Researchers designed the quotas based on proportional representation of patients by type of clinical providers employed at Apple Tree Dental in January 2021. Approximately two-fifths of providers were dentists, two-fifths were dental hygienists, and one-fifth were advanced dental therapists or dental therapists. The sampling plan was to accrue approximately 400 patients who received a service from a dentist, 400 patients who received a service from a dental hygienist, and 200 patients who received a service from an advanced dental therapist or dental therapist.

## Fielding of the Survey

Apple Tree Dental was unable to share any identifying patient information due to its commitment to patient privacy and HIPAA constraints. Administrative personnel at Apple Tree Dental emailed the survey invitation to any patient or parent/guardian of a patient with an email on file (about 44% of active patients). The invitation was sent within a week of the patient receiving a dental service.

Each invitation contained a link to the electronic survey that was coded to identify the clinic in which the patient received their care and the type of provider who primarily completed the services on the day of their visit. The patient was also asked to identify the type of provider that primarily cared for them. This allowed research staff to compare provider type as identified by Apple Tree Dental and also by the patient. To assure accuracy, the following analyses use the provider type assigned by Apple Tree Dental to the patient.

The survey process began in February 2021 and ended in August 2021. As noted above, data were collected in quotas proportionate to existing shares of patients treated by dentists, dental hygienists, and dental therapists (inclusive of advanced dental therapists and dental therapists). Surveys were deployed to all patients until appropriate quotas were acquired for each provider type.

Patients were advised that the survey was voluntary and that results would only be reported in summary so that individual responses were not discernible. Patients who completed the survey were given the opportunity to receive an incentive, a \$5.00 electronic gift card from Amazon. In order to receive the gift card, the patient was required to supply an email address with their completed survey. Respondents were advised that the email would only be used to transmit the gift card number.

Patients requiring more than 1 visit during the period received multiple survey invitations if encounters occurred over separate weeks or months. Once deployed, respondents were able to access surveys at any time and to complete sections at desired intervals. A total of 11,258 surveys links were sent to patients during the study period. Patients who responded multiple times to a single survey invitation were excluded from the expected quota of responses. Repeated responses about a single visit event were identified based on Internet Protocol address or the email supplied by the respondent to obtain the email gift card incentive.

The total number of responses at the end of data collection was 1,021. Responses with survey completion times less than 2 minutes were excluded from analyses (n=123). The remaining 898 responses represent our analytic sample. OHWRC researchers determined that a 2-minute survey completion threshold represented a reasonable time in which to read survey questions and provide a considered response.

## Data Analysis

Descriptive statistics were calculated for respondent demographic information and their ratings across satisfaction categories. Chi-square tests were used to detect differences between patient groups (adult patients, accompanying respondents, accompanied patients) across demographic groups (ie, age, sex, race/ethnicity, self-reported urban/suburban/rural area of residence) and dental visits characteristics (ie, main reason for dental visit, clinician type who primarily provided services).

Univariate and multivariate analysis of variance procedures were used to test differences across patients' ratings of satisfaction by provider type (ie, dentists, dental hygienists, and dental therapists) and patient age (ie, adults, children), as well as race, gender, location, and service type. As a result, there were 6 subgroups across which scores were compared (adult and child patients who were treated primarily by a dentist, dental hygienist or dental therapist). Composite mean scores for information and communication, understanding and acceptance, and technical competence and satisfaction with treatment items were averaged from all items from respective conceptual categories, excluding respondents within each patient/provider subgroup who did not answer all items.

Multivariate analysis of variance was used to test the effects of provider type and patient type upon the composite ratings of information and communication, understanding and acceptance, and technical competence and satisfaction with treatment items. A full factorial model including main effects (ie, the effects of each independent variable when others are held constant) and interactions (the combined effects of each independent variable) were tested in the multivariate analysis of variance. Univariate analyses of variance were used to test the effects of patient type by race, gender, location, and service type respectively on overall ratings. Non-parametric tests (Kruskal-Wallis) were run for ANOVA tests where data



were not distributed normally, as ratings tended to be highly positive. Scores included in the multivariate analysis were exponentially transformed before being entered into the model for the same reason. P-values of .05 were used as significance cutoffs for all analyses. IBM SPSS Statistics Version 27.0 and R were used for analyses.

## FINDINGS

### Characteristics of Survey Respondents

The total number of respondents with valid survey entries was 898. Compared to patient data from Apple Tree Dental in 2018-2019, our sample was similar in terms of age, sex, race, residence, and distribution of patients across clinics (Table 7). Apple Tree Dental's urban dental centers served similar proportions of patients in 2018-19 (75.8%) and 2021 (74.0%).

**TABLE 7. Demographic Characteristics of Apple Tree Dental Patients Who Received Services in 2018-19 and Patients Surveyed in 2021<sup>a</sup>**

Demographic Characteristics	Patients Who Received Services in 2018-19 (n=33,270)		Patients Surveyed in 2021 (n=898)	
	n	%	n	%
<b>Age (years)</b>				
<21	15,642	47.0	296	34.1
21 and older	17,628	53.0	571	65.9
<b>Sex</b>				
Male	14,331	43.3	311	34.6
Female	18,729	56.7	575	65.3
<b>Race</b>				
White	14,651	83.0	715	80.7
Non-White	3,005	17.0	172	19.3
<b>Residence<sup>b</sup></b>				
Urban	25,279	76.3	531	60.0
Rural	7,833	23.7	354	40.0
<b>Clinic<sup>b</sup></b>				
Urban				
Mounds View	7,494	22.5	267	29.7
Coon Rapids	6,594	19.8	138	15.4
Hawley <sup>c</sup>	6,388	19.2	122	13.6
Rochester	4,765	14.3	137	15.3
Rural				
Fergus Falls	3,529	10.6	139	15.5
Little Falls	1,359	4.1	35	3.9
Madelia	3,141	9.4	60	6.7

<sup>a</sup> Total number of subjects across variables varies due to missing responses. For example, race information was not available for 63.5% of patients in 2018-19.

<sup>b</sup> Urban and rural designations for the 2018-2019 sample as well as clinic designations were based on rural-urban commuting area (RUCA) codes defined by the US Department of Agriculture's Economic Research Service, where codes 1-6 included urban areas (metropolitan, large city) and codes 7-10 included rural areas (rural area, town/small city). Urban and rural residence designations for the 2021 sample were self-reported.

<sup>c</sup> The Hawley center is located on the edge of an urban center. Patients who receive services at this center may be more likely to self-re-report as rural residents.

Sources: Rural-Urban Commuting Area (RUCA) Codes, Economic Research Service, 2020. Surveys, Apple Tree Dental, 2021.

**Table 8** describes characteristics of adult patients, minor children, and dependent adults, and those who accompanied these patients. Patients (adults and children) and guardians of accompanied patients all provided age, gender, and sex information in surveys. Frequencies for these variables were compared across these three groups, whereas frequencies for residence, appointment type and provider type were compared across patients only (adults and children). Most adult patients who responded to the survey were 35 years and older (57.6%), female (73.1%) and White, non-Hispanic (85.0%) compared to 83.8% in the state as a whole. Similarly, parents or caretakers who accompanied patients were mostly 35 years and older (80.8%), female (92.7%) and White, non-Hispanic (81.3%). The majority of accompanied patients were children (81.1%), female (50.3%), and White, non-Hispanic (73.3%).

Differences across groups were statistically significant, with the exception of area of residence (**Table 8**). The US Census Bureau indicates that, in 2019,

83.8% of the population in Minnesota was White, alone<sup>20</sup> suggesting that survey respondents were representative of the larger population. Importantly, 37.2% of adult patient respondents and 44.8% of child patients lived in rural Minnesota. Rural populations are potentially underserved so their presence in the respondent cohort suggests that Apple Tree Dental is meeting the needs of some who are at risk for reduced access to dental services.

More than 40% of the adult and children patients visited a dental center for preventive services and more than 20% received a restorative service (**Table 8**). Many of the respondents were treated by a dentist (43.6% adult patients; 32.8% child patients) or a dental hygienist (40.4% adult patients; 35.2% child patients). Among survey participants, dental therapists treated proportionately more child (31.9%) than adult patients (16.0%). We compared the provider type indicated by the survey respondent with the code embedded in the survey that identified the type of clinician seen by the patient. There was high concordance (68.0%-85.2% for adult patients; 68.7%-71.7% for children/other accompanied patients) between the survey identifier and the patient selection, suggesting that patients were mostly aware of the different provider types (data not shown).



**TABLE 8. Demographic and Clinical Characteristics of Survey Respondent Patients/Caretakers of Patients Who Received Dental Care at Apple Tree Dental in February-August 2021**

Demographic and Clinical Characteristics <sup>a</sup>	Adult Patients (n=567) n (%)	Parents/ Caretakers of Children (n=331) n (%)	Children/Other Accompanied Patients (n=331) n (%)	Difference Between Groups ( $\chi^2$ )  P
<b>Age (years)</b>				<b>&lt;.001</b>
17 or younger	3 (0.6)	2 (0.6)	262 (81.1)	
18-24	26 (4.8)	6 (1.9)	27 (8.4)	
25-34	75 (13.8)	88 (27.2)	16 (5.0)	
35-44	120 (22.1)	110 (34.0)	9 (2.8)	
45-54	102 (18.8)	65 (20.1)	4 (1.2)	
55-64	112 (20.7)	35 (10.8)	-	
65 and older	104 (19.2)	18 (5.6)	5 (1.5)	
<b>Sex</b>				<b>&lt;.001</b>
Female	411 (73.3)	303 (92.7)	164 (50.3)	
Male	149 (26.6)	24 (7.3)	162 (49.7)	
Other	1 (0.2)	-	-	
<b>Race/ethnicity</b>				<b>&lt;.001</b>
White, non-Hispanic	476 (85.0)	266 (81.3)	239 (73.3)	
Hispanic (alone or in combination)	17 (3.0)	21 (6.4)	16 (5.2)	
Black or African American, non-Hispanic	21 (3.8)	8 (2.4)	12 (3.7)	
American Indian/Alaska Native	3 (0.5)	3 (0.9)	4 (1.2)	
Asian	17 (3.0)	10 (3.1)	10 (3.1)	
Native Hawaiian/Pacific Islander	-	2 (0.6)	-	
Multiracial/Other <sup>b</sup>	26 (4.6)	17 (5.2)	44 (13.5)	
<b>Self-reported area of residence</b>				<b>.06</b>
Urban	116 (20.8)		53 (16.3)	
Suburban	235 (42.0)		127 (39.0)	
Rural	208 (37.2)		146 (44.8)	
<b>Appointment type</b>				<b>&lt;.001</b>
First visit	36 (6.5)		26 (8.0)	
Regular checkup/cleaning	225 (40.4)		158 (48.6)	
Filling	118 (21.2)		83 (25.5)	
Dental emergency	68 (12.2)		26 (8.0)	
Crown/bridge/denture	64 (11.5)		9 (2.8)	
Extraction	6 (1.1)		1 (0.3)	
Root canal	40 (7.2)		22 (6.8)	
<b>Provider type seen<sup>c</sup></b>				<b>&lt;.001</b>
Dentist	247 (43.6)		109 (32.8)	
Dental hygienist	229 (40.4)		116 (35.2)	
Dental therapist	91 (16.0)		106 (31.9)	

<sup>a</sup> Total number of subjects across variables varies due to missing responses.

<sup>b</sup> Multiracial/Other group included participants who selected more than one option for race as well as those who selected "Other race."

<sup>c</sup> Provider type was not self-reported. This information was attached to completed surveys as supplemental information from Apple Tree Dental.

Source: Surveys, Apple Tree Dental, 2021.

## Patients' Attitudes About Their Dental Experience

The findings from the survey suggest that patients are quite satisfied with the care they received from dental teams at the Apple Tree Dental centers (Table 9). Patients were asked to rank their agreement with the following statements on a scale of 1 to 5 with 1 being strongly disagree and 5 being strongly agree. While there were small variations among the responses from adults and those for children and by provider type, patients expressed agreement trending to strong agreement with the 11 positive statements within the survey questionnaire and alternatively, disagreement with the 2 negative statements in the technical competence category. The most subdued response was to the statement that the dental provider really knew how upset the patient was about the possibility of pain. Responses to this item ranged, on average, from 3.17 to 3.98, neutral (3) to agree (4). The reasons for lesser enthusiasm about this statement are not known. It is possible that patients are reluctant to overtly express trepidation to their dental provider which would contribute to the provider being unaware of the patient's concern. However, it is also possible that patients were not concerned about pain from, for example, preventive services so they responded neutrally.

**TABLE 9. Patients' Satisfaction with Dental Care at Apple Tree Dental by Provider Type and Patient Age**

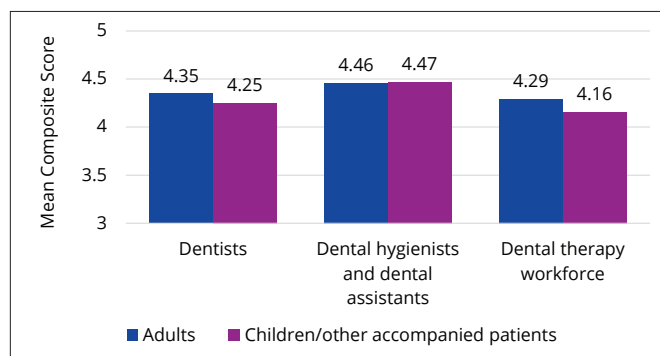
Patients' Satisfaction With Dental Care <sup>a</sup>	Dentists		Dental Hygienists		Dental Therapists	
	Adults	Children/Other Accompanied Patients	Adults	Children/Other Accompanied Patients	Adults	Children/Other Accompanied Patients
<b>Information and Communication</b>	<b>n=244</b>	<b>n=105</b>	<b>n=226</b>	<b>n=114</b>	<b>n=90</b>	<b>n=105</b>
The dental professional I saw explained well what treatment was needed	4.52 (0.98)	4.25 (1.28)	4.52 (0.93)	4.52 (1.00)	4.36 (1.09)	4.22 (1.25)
My dental provider gave me good advice about how to look after my teeth and gums	4.13 (1.29)	4.15 (1.34)	4.43 (0.93)	4.45 (0.99)	4.13 (1.36)	4.06 (1.38)
<b>Understanding and Acceptance</b>	<b>n=244</b>	<b>n=105</b>	<b>n=225</b>	<b>n=114</b>	<b>n=90</b>	<b>n=105</b>
The dental provider was considerate and sensitive to my needs	4.44 (1.09)	4.30 (1.23)	4.51 (1.00)	4.54 (0.88)	4.40 (1.16)	4.15 (1.33)
I felt that this dental provider really knew how upset I was about the possibility of pain	3.84 (1.53)	3.98 (1.51)	3.22 (1.85)	3.79 (1.67)	3.39 (1.86)	3.17 (1.93)
I felt this dental provider accepted me as a person	4.52 (0.98)	4.30 (1.29)	4.49 (1.00)	4.59 (0.92)	4.42 (1.14)	4.19 (1.39)
The dental provider was professional and courteous	4.60 (0.90)	4.35 (1.21)	4.59 (0.98)	4.60 (0.94)	4.46 (1.09)	4.26 (1.24)
<b>Technical Competence and Satisfaction with Treatment Items</b>	<b>n=244</b>	<b>n=105</b>	<b>n=226</b>	<b>n=114</b>	<b>n=90</b>	<b>n=114</b>
The dental provider seemed to know what he/she was doing during my visit	4.59 (0.90)	4.32 (1.27)	4.57 (0.98)	4.69 (0.71)	4.51 (1.04)	4.19 (1.38)
The dental provider was thorough in doing the procedure	4.47 (1.04)	4.30 (1.19)	4.60 (0.85)	4.54 (0.95)	4.38 (1.12)	4.40 (0.98)
My dental treatment was completed efficiently and in a timely manner	4.47 (1.05)	4.34 (1.11)	4.54 (0.94)	4.62 (0.67)	4.38 (1.14)	4.48 (0.98)
There are things about the dental care I received that could have been better	2.21 (1.39)	2.10 (1.34)	2.04 (1.23)	2.18 (1.23)	2.29 (1.30)	2.12 (1.31)
There were other dental problems I had that were not treated	2.08 (1.37)	1.92 (1.27)	1.90 (1.24)	1.96 (1.15)	2.02 (1.24)	2.10 (1.31)
I am confident that I received good dental care at my last visit	4.46 (1.03)	4.48 (0.90)	4.57 (0.86)	4.64 (0.63)	4.52 (0.98)	4.37 (0.89)
<b>General Satisfaction</b>	<b>n=220</b>	<b>n=104</b>	<b>n=206</b>	<b>n=114</b>	<b>n=82</b>	<b>n=105</b>
I will come back to Apple Tree Dental	4.55 (1.06)	4.70 (0.74)	4.68 (0.79)	4.71 (0.77)	4.62 (0.86)	4.54 (0.88)

<sup>a</sup>Total number of subjects across variables varies due to missing responses.  
Source: Surveys, Apple Tree Dental, 2021.

The scores for patients' responses to each of the statements in each separate domain were summed and separate mean scores by type of provider who treated the patient were calculated. The following graphical comparison presents average categorical ratings of the attributes of patients' most recent dental visits (Figures 4-8).

Significant differences were shown for the information and communication dimension based on provider type, but not based on patient type (Figure 4). Dental hygienists had higher average ratings than both dentists ( $P=.005$ ) and dental therapists ( $P=.047$ ) when holding patient type constant. There were also no significant interactions, meaning that categorical ratings did not differ based on the combined effect of patient type and provider type.

**FIGURE 4. Information and Communication Ratings Across Provider and Patient Type<sup>a</sup>**



<sup>a</sup> Due to non-normality of distribution, scores were transformed before being entered into ANOVA models with patient type and provider as independent variables. Original non-transformed scores are shown above.

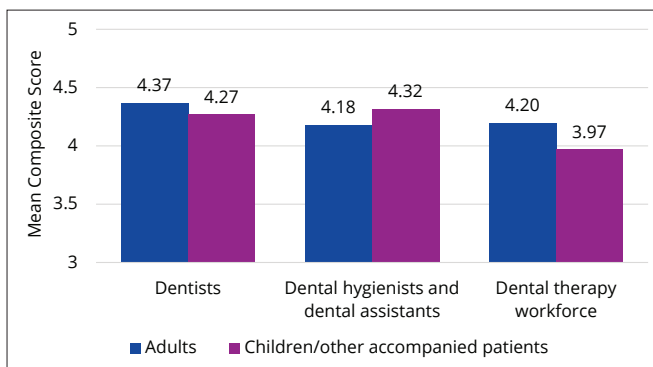
Significant differences were seen between dental hygienists and dental assistants and dentists ( $P=.047$ ) and dental therapists ( $P=.005$ ) for information and communication. There were no significant differences in any ratings based on patient type. There were no significant combined effects of patient type and provider type.

Source: Surveys, Apple Tree Dental, 2021.

Significant differences were also shown for the understanding and acceptance dimension based on provider type, but not based on patient type (Figure 5). Understanding and acceptance scores were higher for dentists than for dental hygienists ( $P=.010$ ) and dental therapists ( $P=.047$ ) when holding patient type

constant. The ratings did not differ based on the combined effect of patient type and provider type.

**FIGURE 5. Understanding and Acceptance Ratings Across Provider and Patient Type<sup>a</sup>**



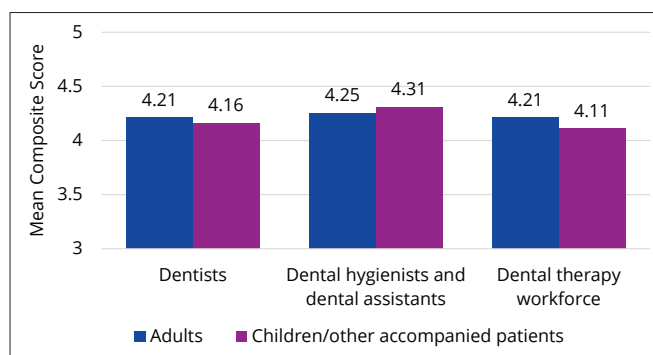
<sup>a</sup> Due to non-normality of distribution, scores were transformed before being entered into ANOVA models with patient type and provider as independent variables. Original non-transformed scores are shown above.

Significant differences were seen between dentists and dental therapists ( $P=.004$ ) and dentists and dental hygienists and dental assistants ( $P=.010$ ) on understanding and acceptance. There were no significant differences in any ratings based on patient type. There were no significant combined effects of patient type and provider type.

Source: Surveys, Apple Tree Dental, 2021.

There were no significant differences across either provider or patient type for technical competence and satisfaction with treatment items (Figure 6). The combined effect of patient type and provider type was also not significant.

**FIGURE 6. Technical Competence and Satisfaction With Treatment Ratings Across Provider and Patient Type<sup>a</sup>**



<sup>a</sup> Items 10 ("There are things about the dental care I received that could have been better") and 11 ("There were other dental problems I had that were not treated") were worded such that higher scores indicated dissatisfaction with treatment, contrary to the other items included in the technical competence composite



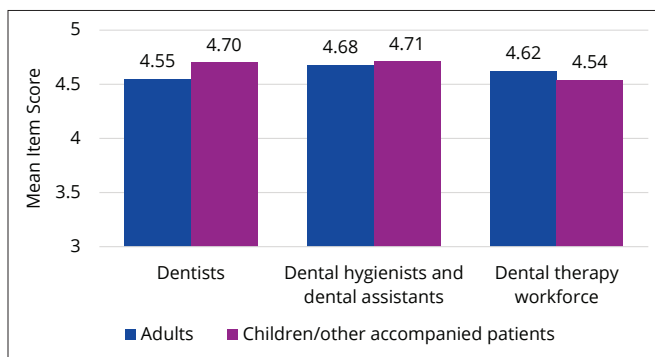
score. In order to calculate composite scores for technical competence, items 10 and 11 were reverse scored (1=5, 2=4, etc.) so that higher scores indicated better ratings across all items. Due to non-normality of distribution, scores were transformed before being entered into ANOVA models with patient type and provider as independent variables. Original non-transformed scores are shown above.

There were no significant differences in scores based on provider or patient type. There were no significant combined effects of patient type and provider type.

Source: Surveys, Apple Tree Dental, 2021.

There were no significant differences across either provider or patient type for general satisfaction scores, which were high (Figure 7). In particular, scores for general satisfaction ranged between 4.54 and 4.71. Also, the ratings did not differ based on the combined effect of patient type and provider type.

**FIGURE 7. General Satisfaction Across Provider and Patient Type<sup>a</sup>**



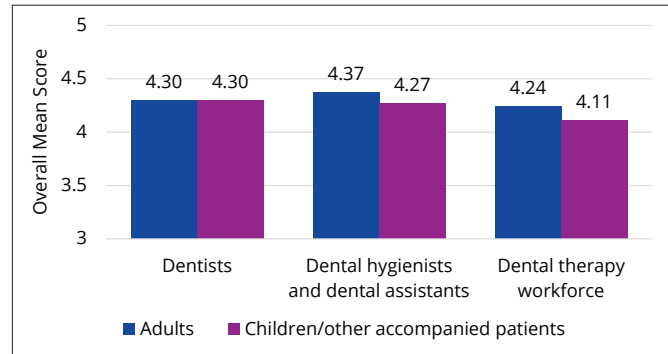
<sup>a</sup> The final item (“I will come back to Apple Tree Dental”) did not fit into existing composites and scores are therefore shown for this item by itself. Due to non-normality of distribution, scores were transformed before being entered into ANOVA models with patient type and provider as independent variables. Original non-transformed scores are shown above.

There were no significant differences in scores based on provider or patient type. There were no significant combined effects of patient type and provider type.

Source: Surveys, Apple Tree Dental, 2021.

Overall, patients were more satisfied with services from dental hygienists and dentists than from dental therapists, but the differences were very small (Figure 8). Parents of children who responded to the survey expressed robust satisfaction with the services of dental therapists, but they ranked those services less highly than did the adult patients served by dental therapists.

**FIGURE 8. Overall Ratings of Patient Satisfaction With Dental Care Across Provider and Patient Type<sup>a</sup>**



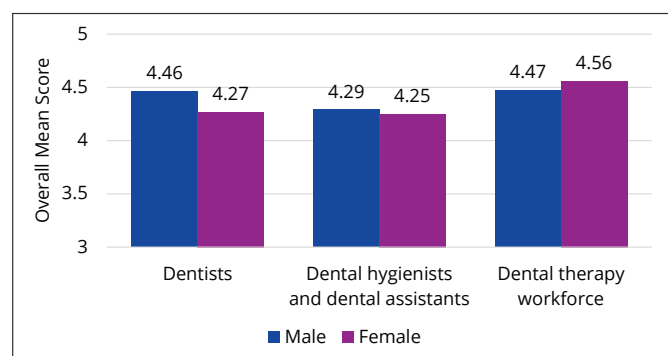
<sup>a</sup> Due to non-normality of distribution, scores were transformed before being entered into ANOVA models with patient type and provider as predictors. Original non-transformed scores are shown above.

There were no differences in any ratings based on patient type or provider type. There were no significant combined effects of patient type and provider type. Ratings for the final item (“I will come back to Apple Tree Dental”) were included in the overall satisfaction scores.

Source: Surveys, Apple Tree Dental, 2021.

On average, male patients ranked their satisfaction levels with dentists’ services higher than did female patients (Figure 9). In contrast, female patients ranked their satisfaction levels with dental therapists higher than did male patients. However, these differences were not significant.

**FIGURE 9. Overall Ratings Across Provider and Patient Gender<sup>a</sup>**



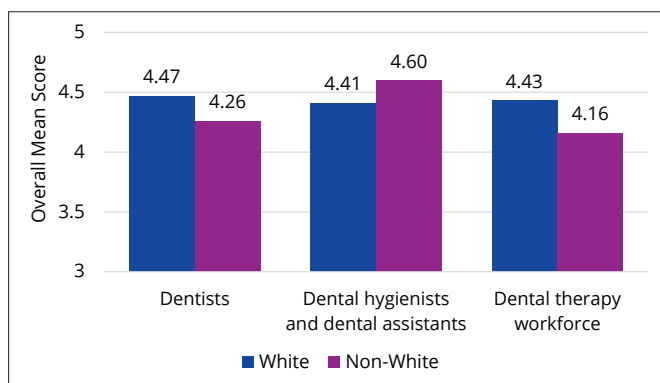
<sup>a</sup> Due to non-normality of distribution, scores were transformed before being entered into ANOVA models. Original non-transformed scores are shown above.

There were no differences in any ratings based on any of the predictors. There were no significant combined effects of patient type and provider type.

Source: Surveys, Apple Tree Dental, 2021.

Patients who did not indicate White as their race, on average, ranked their satisfaction levels with dental hygienists and dental assistants higher than did patients who reported White as their race (Figure 10). On average, patients who were White ranked their satisfaction levels with dentist and dental therapists higher than did non-White patients. However, there were no significant differences in ratings based on race/ethnicity.

**FIGURE 10. Overall Ratings Across Provider Type and Patient Race/Ethnicity Groups<sup>a</sup>**



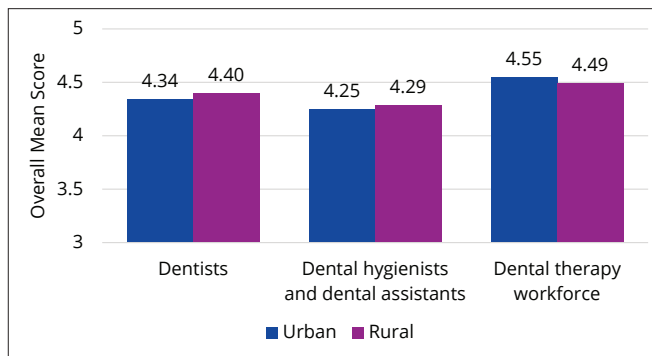
<sup>a</sup> Due to non-normality of distribution, scores were transformed before being entered into univariate analysis of variance (ANOVA) models. Original non-transformed scores are shown above.

There were no differences in any ratings based on any of the predictors. There were no significant combined effects of patient type and provider type.

Source: Surveys, Apple Tree Dental, 2021.

Patients who were urban residents, on average, ranked their satisfaction levels with dental therapists higher than did patients from rural areas (Figure 11). In contrast, rural patients ranked their satisfaction levels with dentists' and dental hygienists' services higher than did urban patients. However, there were no significant differences in ranking by area of residence.

**FIGURE 11. Overall Ratings Across Provider Type and Patient's Area of Residence<sup>a</sup>**



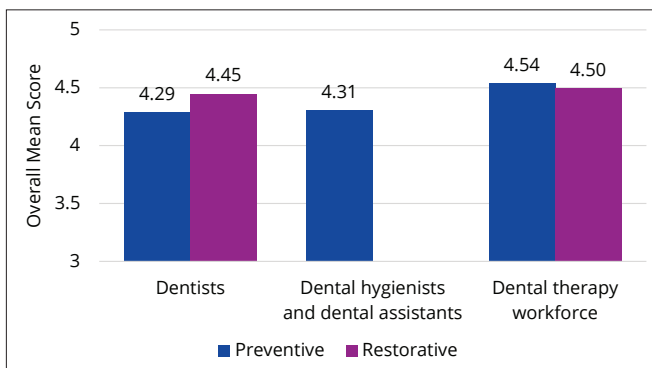
<sup>a</sup> Due to non-normality of distribution, scores were transformed before being entered into ANOVA models. Original non-transformed scores are shown above.

There were no differences in any ratings based on any of the predictors. There were no significant combined effects of patient type and provider type. Patient area of residence was self-reported.

Source: Surveys, Apple Tree Dental, 2021.

On average, patients who received preventive services ranked their satisfaction levels with dental therapists higher than did other patients. In contrast, patients who received restorative services ranked their satisfaction levels with dentists' services higher than did others (Figure 12). However, differences in ranking were not significant. Patients of dental therapists were similarly satisfied with preventive and restorative services from those providers.

**FIGURE 12. Overall Ratings Across Provider Type and Patient's Procedure Type<sup>a</sup>**



<sup>a</sup> Due to non-normality of distribution, scores were transformed before being entered into ANOVA models. Original non-transformed scores are shown above.

There were no differences in any ratings based on any of the predictors. There were no significant interactions. Restorative scores are not shown for dental hygienists because they do not perform restorative services.

Source: Surveys, Apple Tree Dental, 2021.

## DISCUSSION

Efforts to address a less than optimal level of utilization of oral health services among the general population, which is often attributed to barriers to services, have included innovative models for care delivery and workforce modernization. Scopes of practice for existing clinicians have been expanded so that dental assistants' and dental hygienists' duties are more closely aligned to their education, training, and skills. In addition, the dental therapy workforce model has been integrated into practice in tribal communities in several states and statewide in Minnesota. The model is new and controversial with both proponents and critics discussing the merits or disadvantages of adding a "mid-level practitioner" to well established dental teams. In the US, those teams have historically consisted of dentists, dental hygienists, and dental assistants. Dental therapy is a bridging profession in that dental therapists are trained in both preventive and restorative dentistry, skills that overlap those of existing provider types.

Instituting a new workforce model is a complex undertaking that requires legislative action, regulatory guidance, establishment of high-quality educational pathways, creation of a standardized curriculum, mechanisms for program accreditation and professional credentialing, integration of the workforce into traditional dental practices that include clinicians with established competencies and bounded skill sets, and lastly, and most importantly, acceptance from patients who will benefit from the services of dental therapists. Patient-centered care, which includes elements such as safety, is one proxy for measuring quality. Sun and colleagues discuss this relationship describing consensus among experts that care cannot be described as high quality unless a patient is satisfied with that care.<sup>21</sup>

We examined the satisfaction of patients with services received in the several Apple Tree Dental centers and compared satisfaction by type of provider

completing the care. Our study identified past research using surveys to measure different aspects of patient satisfaction. Using items from standardized instruments has the benefit of providing reliability and validity to research assessing patient satisfaction.<sup>22</sup> In a qualitative study<sup>23</sup> undertaken to develop a scale for appraising patients' satisfaction with dental services, researchers noted that during their interviews with patients about their experiences with their dental providers, one of the first themes related to satisfaction that emerged was "attitude." Study authors described this facet of satisfaction as including the attitude of dentists and all staff toward the patient throughout the encounter, but especially during the treatment process including the dentists' attention and concern for their comfort. Authors described this as providing information about what the dentist was going to do and the reasons why, as well as post-treatment care and follow-up.

In our survey, this aspect of satisfaction was investigated using statements that fell within the categories of information and communication as well as understanding and acceptance. Adults and those responding for dependent patients, on average, responded that they agreed or strongly agreed with 5 statements that would describe the "attitude" of the clinician including that the patient had been given adequate information about the services to be provided, that they were provided with good advice about their oral health, and that the provider was professional and considerate of the patient's needs. Patients at Apple Tree Dental expressed satisfaction with all provider types in their appraisal of these particular aspects of their care. While there was some variation in levels of satisfaction by provider type, those differences (when holding patient type constant) were all between scores above 4 on a 5-point scale, indicating that all providers were viewed positively and as integral parts of clinical oral health care.

In a study seeking to assess post-service evaluation of dental providers in New Zealand,<sup>24</sup> patients identified the importance of clinicians discussing treatment

options prior to initiating treatment and also that a clinician not cause pain during treatment. The only item on our survey for which scores fell, on average, in the range between neutral and agree was patients' opinions about the provider being aware of how anxious they were about pain. This item was the lowest scored among the positive statement items on the patient questionnaire.

One possible explanation is that patients are generally reluctant to express fear which would contribute to a lack of overt awareness on the part of the clinician providing services. That said, some clinicians are likely aware of the non-verbal signs of anxiety about pain from a procedure. Another is that many patients, especially those receiving routine preventive services, may not have been concerned about pain so they responded with neutrality to the statement. A further explanation is that some individuals only seek episodic care; when they do access services, disease burden may be high and required treatment may be more extensive and less comfortable. Any or all of these situations may explain patients' responses to this statement. Although the New Zealand study cited cost as the primary barrier to dental services, the next most prominent barrier was dental anxiety followed by a lack of perception of need for oral health services.<sup>24</sup> This survey suggests that mitigating patients' fears about dental procedures should be a priority in health literacy activities and among clinicians providing services.

Luo et al<sup>23</sup> identified another dimension of satisfaction called quality. When researchers probed their study participants on the dimensions of quality, respondents offered that it included the currency of the technology, equipment, and facilities where they received treatment, the technical skills of the provider, and improvements after treatment in the condition for which they sought care. In the technical competence and satisfaction with treatment items domain on our survey, patients were enthusiastic with their praise for the expertise of the clinical providers at

Apple Tree Dental, scoring each provider type in a range from agree (4) to strongly agree (5) with the statements that the provider was thorough, that their treatment was efficiently completed in a timely manner, and that the patient was confident that they had received good care. Again, scores varied slightly by provider type but those differences were small. Patients, on average, disagreed with the 2 negative statements in this category that the services they received could have been better or that they had other dental problems that were not treated.

When the mean scores for each of the 3 domains, general satisfaction with care received at Apple Tree Dental, and overall satisfaction (all items combined) were analyzed by provider type, on average, the differences were small and generally not statistically significant. Dental hygienists were given the highest mean scores within the information and communication domain, likely attributable to their expertise in patient education. While the differences between provider scores were small in the understanding and acceptance domain, these differences were significant between patients of dental hygienists and dentists, and dental therapists and dentists, with dentists scoring somewhat higher levels of approval than did other provider types. There were also significant differences among providers in the information and communication domain. Dentists received the highest mean scores for understanding and acceptance, and dental hygienists were given the highest scores for technical competence and satisfaction with treatment items and information and communication. Dentists and dental therapists received similar mean scores for general satisfaction with dental hygienists closely approaching those means.

Sun and co-authors<sup>21</sup> conducted a study in the UK to examine whether there were differences in patient satisfaction after a visit with a dentist or a dental therapist. These researchers used the 10-item Dental Visit Satisfaction Scale, which focuses on the perceptions of patients about a specific dental encounter. Our

survey used several items from the same scale. Sun found a “robust measure of satisfaction” with services provided by dental therapists overall, but also in the separate areas of information and communication, understanding and acceptance, and technical competence and satisfaction with treatment items. Sun’s study found a greater degree of satisfaction with services provided by dental therapists versus those provided by dentists. The authors suggested that the difference may be due to the length of the appointment, commenting that dental therapists may take longer than dentists to accomplish a similar procedure and that interpersonal skills and time spent providing education to the patient may all contribute to higher patient satisfaction. Sun’s study also discussed the impact of expectations on outcomes, such that patients may have a higher level of expectation when services are provided by a dentist and lower expectations when the dental therapist is the clinician. A patient might, therefore, find that the services from a therapist exceed expectations creating a greater sense of satisfaction. We did not find this variation between dentists and dental therapists in our study.

Barnes and colleagues<sup>25</sup> completed a study in Wales that included 1,224 patients in general dental practices, some of which employed a dental therapist and some that did not. The data showed high levels of patient satisfaction and confidence in providers’ abilities across provider type showing “uniformly high” satisfaction with both dentists and dental therapists. In practices with a dental therapist, the team’s dentist was providing fewer preventive services than in practices with no dental therapist. The authors conclude that patients are accepting a team-based preventive model of care delivery. We suggest that this is likely the reason for the congruity in scores across provider type in our survey results. Dental therapists are integrated members of the dental teams in the Apple Tree Dental Centers and patients have accepted these providers as competent and efficient clinicians.

Dyer and colleagues (2013)<sup>26</sup> conducted a small study using semi-structured in-depth interviews to evaluate experiences of adult patients (n=15) and parents of children patients (n=3) who received oral health care from dental therapists in the UK. Overall, the study participants reported positive perceptions regarding the treatment provided by dental therapists; the dental teams’ communication skills, attitude (affective behavior), and continuity of care were important determinants of positive experiences of dental therapist care.

When our data were analyzed by the demographics of patient respondents, the results were once again quite similar across provider type. However, female patients, those identifying as non-White, people who lived in urban areas, and those receiving either preventive or restorative services ranked dental therapists slightly above dental hygienists and dentists. These differences were not significant. Ultimately, little difference in satisfaction was noted by provider type suggesting that dental therapists were providing acceptable, high-quality services to the patients they serve. Self and colleagues (2018)<sup>27</sup> conducted a study using a convenience sample of 405 adults in Minnesota and an electronic survey to assess associations between acceptability of dental therapists and respondents’ characteristics including socioeconomic factors and perceived oral health status. Similar to our study, Self and colleagues found no differences in acceptability of care provided by a dental therapist across age, gender, race, ethnicity, education, insurance, or oral health of survey respondents.

## LIMITATIONS

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One limitation of our study is that only respondents who had shared an email address with Apple Tree Dental were included in the study. Included in this limitation is the possibility that some patients who might have participated did not have access to computers, which may represent potential bias across age and income brackets. Willingness to share email



addresses with Apple Tree Dental (eg, to increase correspondence with a dental provider) may also be indicative of greater awareness or knowledge of oral health issues, a variable that was not assessed within our sample. As a result, it is possible that those who were selected and those who responded may differ from the general population.

Another limitation is that due to issues of patient privacy, it was not possible to differentiate long-term patients from new or episodic patients. As a result, respondents' evaluations may differ in their scope of experience with Apple Tree Dental. Finally, our study is based on the inclusion of self-reported data, which may be subject to recall bias. In cases where concordance rates could be calculated, however (eg, provider type seen by children and accompanied patients as reported by their caretakers), results indicated that recall accuracy was typically high. Additionally, as surveys corresponded only to visits experienced within 1 calendar week of survey deployment, the risk of recall bias is generally low and is not expected to have affected results significantly.

## CONCLUSIONS

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Birch and co-authors<sup>28</sup> discuss sluggish workforce planning efforts in oral health that emphasize effective demand for services and fail to accommodate gaping needs for care among certain population groups. The authors considered that an "innovation culture" has affected oral health service delivery and transformed methods to address oral health problems through use of new materials and technologies and novel models of care delivery. However, they commented that rigid approaches to planning persist for the clinical workforce that delivers these services.

Our planners and policymakers expect the traditional workforce to provide services within a dynamic environment that demands creativity in deployment of clinicians. The failure to address the impact of an

"innovation culture" on the workforce leaves planners and policymakers poorly equipped to allocate resources to address gaps in oral health access and outcomes among various populations. Dental therapy is an innovation in the US health care system that is showing promising impacts on oral health access for many. Minnesota's experience as an early adopter of this new workforce provides concrete evidence that a profession with hybrid skills (both preventive and restorative competencies) can be successfully integrated into established oral health teams with beneficial impacts for patients, other providers on the clinical teams, and the employer organization.

Our findings relative to patient satisfaction suggest that the clinical teams at Apple Tree Dental, which include dental therapists and advanced dental therapists, are providing services that meet the needs of their patient populations. The integration of dental therapists permits the organization to be nimble in efforts to accommodate patient need. It is important to remember that Apple Tree Dental serves a majority of low-income patients, more than 80% of whom are insured by Medicaid. Therefore, the increase in organizational capacity as a result of deployment of the dental therapy workforce corresponds with an increase in access to care in numerous locations throughout Minnesota. Furthermore, patient satisfaction, as a component of quality measurement, indicates that this workforce has not, as opponents feared, diminished quality of patient care.





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# APPENDIX

# DENTIST SURVEY

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1. How many years have you practiced dentistry?  
Total number of **years** \_\_\_\_\_
  
2. Please answer the following about the time you spent treating patients at Apple Tree Dental during **2020**:
  - a. Total number of **weeks** worked (do not include vacation, furlough, or other time off) \_\_\_\_\_
  - b. Total number of **hours per week** \_\_\_\_\_
  
3. In what year did you start working with dental therapists?  
\_\_\_\_\_(year)
  
4. How well do dental therapists fit with the overall team structure at Apple Tree Dental center where you work?
  - Extremely well
  - Very well
  - Somewhat well
  - Not very well
  - Not at all well
  - Don't Know/Unsure
  
5. Before dental therapists were introduced to the dental teams at Apple Tree Dental, had you any experience working with expanded function dental assistants or expanded function dental hygienists?
  - Yes
  - No
  - Don't Know/Unsure
  
6. Each of the following items concerns your attitudes about working with dental therapists. Please indicate your level of agreement with the statements when you **first started working** with dental therapists (question 6a). Then indicate your **current level of agreement** with each of these statements (question 6b).  
  
*(Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Don't Know/Unsure)*
  - 6a. When **I first started working** with dental therapists:
    - a. I was impressed with the range of services they were trained to provide
    - b. I had no concerns about the quality of care provided by dental therapists

- c. I thought that dental therapists would make a noticeable contribution to the dental team
- d. I felt the scope of dental therapists' practice was too broad

**6b. At the current time:**

- a. I am impressed with the range of services they are trained to provide
- b. I have no concerns about the quality of care provided by dental therapists
- c. I think that dental therapists make a noticeable contribution to the dental team
- d. I feel the scope of dental therapists' practice is too broad

**7. Please indicate your level of agreement with the following statements:**

*(Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Don't Know/Unsure)* Since I began working with dental therapists:

- a. I have experienced beneficial change in the content of my daily work
- b. I have been able to focus on more complex procedures for my patients
- c. I have noticed an increase in dental team productivity
- d. I have been able to spend more time with my patients
- e. I have noticed widespread patient acceptance of dental therapists
- f. I have noticed improved acceptance by the dental team of dental therapists

**8. Please indicate your level of agreement with the following statements.**

*(Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Don't Know/Unsure)*

- a. There is evidence that dental therapists can perform high quality work.
- b. Dental therapists should work under the direct supervision of a dentist
- c. Dentists can work more effectively/efficiently using dental therapists in a team approach
- d. In general, patients don't want to be treated by dental therapists
- e. If more use is made of dental therapists, there won't be anything left for dentists to do
- f. Working with dental therapists has increased my level of job satisfaction
- g. Using a dental therapist will increase dentists' enjoyment of dental practice
- h. Dually licensed dental therapists are more productive than those without a dental hygiene license
- i. Dental therapists can help to alleviate the disparity in access to dental care
- j. Other states should adopt the dental therapist model to help address access and cost of care issues

9. How does having dental therapist/s on your clinical team **improve patient care**?

*(Mark all that apply.)*

- a. Improves oral health education
- b. Improves patients' sense of having a regular dental provider
- c. Improves communication about treatment plan and costs
- d. Allows patients to have more needs met in one visit
- e. Reduces wait times for patients to receive needed care
- f. None of the above
- g. Other. Please describe \_\_\_\_\_

10. Please indicate your opinion about the following requirements for dental therapy practice in Minnesota.

*(Decrease Greatly, Decrease Slightly, Stay the Same, Increase Slightly, Increase Greatly, Don't Know/Unsure)*

- a. The level of required education and training for dental therapists should
- b. The level of required education and training for advanced dental therapists should
- c. The level of required supervision for dental therapists should
- d. The level of required supervision for advanced dental therapists should
- e. The scope of restorative services that dental therapists are allowed to perform should
- f. The scope of restorative services that advanced dental therapists are allowed to perform should

11. Please provide any comments about the practice of dental therapy that are not covered in this survey.

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# DENTAL HYGIENIST/DENTAL ASSISTANT SURVEY

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1. How many years have you practiced dental hygiene and/or dental assisting?

Total number of **years** \_\_\_\_\_

2. Please answer the following about the time you spent treating patients at Apple Tree Dental during **2020**:

a. Total number of **weeks** worked (do not include vacation, furlough or time off) \_\_\_\_\_

b. Total number of **hours per week** \_\_\_\_\_

3. In what year did you start working with dental therapists?

\_\_\_\_\_ (year)

4. How well do dental therapists fit with the overall team structure at the Apple Tree Dental center where you work?

Extremely well

Very well

Somewhat well

Not very well

Not at all well

Don't Know/Unsure

5. Each of the following items concerns your attitudes about working with dental therapists. Please indicate your level of agreement with the statements when you **first started working** with dental therapists (question 5a). Then indicate your **current level of agreement** with each of these statements (question 5b).

*(Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Don't Know/Unsure)*

5a. When **I first started working** with dental therapists:

a. I was impressed with the range of services they were trained to provide

b. I had no concerns about the quality of care provided by dental therapists

c. I thought that dental therapists would make a noticeable contribution to the dental team

d. I felt the scope of dental therapists' practice was too broad

5b. **At the current time:**

a. I am impressed with the range of services they were trained to provide

b. I have no concerns about the quality of care provided by dental therapists

c. I think that dental therapists make a noticeable contribution to the dental team

d. I feel the scope of dental therapists' practice is too broad

6. Please indicate your level of agreement with the following statements:  
(*Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Don't Know/Unsure*)

Since I began working with dental therapists:

- a. I have experienced beneficial change in the content of my daily work
- b. I have noticed an increase in dental team productivity
- c. I have been able to spend more time with my patients
- d. I have noticed widespread patient acceptance of dental therapists
- e. I have noticed improved acceptance by the dental team of dental therapists

7. Please indicate your level of agreement with the following statements.  
(*Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Don't Know/Unsure*)

- a. There is evidence that dental therapists can perform high quality work
- b. Dental therapists should work under the direct supervision of a dentist
- c. Dentists can work more effectively/efficiently using dental therapists in a team approach
- d. In general, patients don't want to be treated by dental therapists
- e. Working with dental therapists has increased my level of job satisfaction

8. Please indicate your level of agreement with the following statements.

- a. Using a dental therapist will increase dentists' enjoyment of dental practice
- b. Working with dental therapists has increased my interest in becoming a dental therapist
- c. Dually licensed dental therapists are more productive than those without a dental hygiene license
- d. Dental therapists can help to alleviate the disparity in access to dental care
- e. Other states should adopt the dental therapist model to help address access and cost of care issues

9. How does having a dental therapist/s on your clinical team **improve patient care**?

(*Mark all that apply*).

- a. Improves oral health education
- b. Improves patients' sense of having a regular dental provider
- c. Improves communication about treatment plan and costs
- d. Allows patients to have more needs met in one visit
- e. Reduces wait times for patients to receive needed care
- f. None of the above
- g. Other. Please describe \_\_\_\_\_

10. Please indicate your opinion about the following requirements for dental therapy practice in Minnesota.  
*(Decrease Greatly, Decrease Slightly, Stay the Same, Increase Slightly, Increase Greatly, Don't Know/Unsure)*
- a. The level of required education and training for dental therapists should
  - b. The level of required education and training for advanced dental therapists should
  - c. The level of required supervision for dental therapists should
  - d. The level of required supervision for advanced dental therapists should
  - e. The scope of restorative services that dental therapists are allowed to perform should
  - f. The scope of restorative services that advanced dental therapists are allowed to perform should

11. Please provide any comments about the practice of dental therapy that are not covered in this survey.

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# DENTAL THERAPIST SURVEY

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1. How many years have you practiced dental therapy?  
Total number of **years** \_\_\_\_\_
  
2. Please answer the following about the time you spent treating patients at Apple Tree Dental during **2020**:
  - a. Total number of **weeks** worked (do not include vacation, furlough, or time off) \_\_\_\_\_
  - b. Total number of **hours per week** \_\_\_\_\_
  
3. At how many dental center sites did you provide dental therapy services on a regularly scheduled basis (one day a week or more) in 2020?  
\_\_\_\_\_ Number of dental centers
  
4. What types of licensure/certification describes your practice in Minnesota? Check all that apply.
  - Dental Therapist (DT) - Dually licensed (Dental Hygiene (DH)/DT)
  - DT-Not dually licensed (DT)
  - Advanced Dental Therapist (ADT) - certification completed
  - ADT with DH License – certification completed
  - ADT certification in process
  - NOT interested in ADT certification
  
5. Please rank your agreement with the following statements:  
*(Strongly disagree, Disagree, Neutral, Agree, Strongly agree, Don't Know/Unsure)*
  - a. My work as a dental therapist permits me to decide how to go about doing my work
  - b. My work as a dental therapist requires me to use a variety of my clinical skills
  - c. My work as a dental therapist significantly affects the lives or well-being of others
  - d. I am a valued member of the dental team
  - e. I could do more extensive work if patients were referred to me
  - f. I receive regular feedback on how well I am doing at work
  - h. Overall, I am satisfied with my career as a dental therapist
  - i. I would choose to pursue dental therapy again

6. Please indicate the frequency of the following work conditions related to your practice of dental therapy.  
*(None of the time, Seldom, Sometimes, Most of the Time, All of the Time)*
- a. My job as a dental therapist requires me to use a number of complex or high-level clinical skills
  - b. Dental therapy work requires a lot of cooperative work with other people
  - c. My work is arranged so that I can complete an entire clinical service from beginning to end
  - d. I spend the majority of my clinical time each day providing preventive services for patients
  - e. I spend the majority of my clinical time each day providing restorative services for patients
7. Please indicate your level of agreement with the following statements.  
*(Strongly disagree, Disagree, Neutral, Agree, Strongly agree, Don't Know/Unsure)*
- a. There is evidence that dental therapists can perform high quality work
  - b. Dental therapists should work under the direct supervision of a dentist
  - c. Dentists can work more effectively/efficiently using dental therapists in a team approach
  - d. In general, patients don't want to be treated by dental therapists
  - e. If more use is made of dental therapists, there won't be anything left for dentists to do
  - f. Using a dental therapist will increase dentists' enjoyment of dental practice
  - g. Dually licensed dental therapists are more useful than those without a dental hygiene license
  - h. Dental therapists can help to alleviate the disparity in access to dental care
  - i. Other states should adopt the dental therapist model to help address access and cost of care issues
8. How does having dental therapist/s on the clinical team **improve patient care**? *Mark all that apply.*
- a. Improves oral health education
  - b. Improves patients' sense of having a regular dental provider
  - c. Improves communication about treatment plan and costs
  - d. Allows patients to have more needs met in one visit
  - e. Reduces wait times for patients to receive needed care
  - f. None of the above
  - g. Other. Please describe \_\_\_\_\_



9. Please indicate your opinion about the following requirements for dental therapy practice in Minnesota.  
*(Decrease Greatly, Decrease Slightly, Stay the Same, Increase Slightly, Increase Greatly, Don't Know/Unsure)*
- a. The level of required education and training for dental therapists should
  - b. The level of required education and training for advanced dental therapists should
  - c. The level of required supervision for dental therapists should
  - d. The level of required supervision for advanced dental therapists should
  - e. The scope of restorative services that dental therapists are allowed to perform should
  - f. The scope of restorative services that advanced dental therapists are allowed to perform should

10. Please provide any comments about the practice of dental therapy that are not covered in this survey.

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# ADMINISTRATIVE SURVEY

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1. Please describe your current position at Apple Tree Dental?

- Corporate Office
- Clinical Support
- Other. Please describe \_\_\_\_\_

2. How many years have you been employed at Apple Tree Dental?

Number of Years \_\_\_\_\_

3. Have you been directly involved in recruiting a dental therapist to work in one of the organization's dental centers in the last 2 years?

- Yes
- No

*(If yes to question 3 go to question 4. If no go to question 7)*

4. In your experience and thinking about the **most recent recruitment** efforts for a dental therapist, how difficult was it to recruit a dental therapist to join the Apple Tree Dental clinical team?

- Very Difficult
- Somewhat Difficult
- Neither Difficult Nor Easy
- Somewhat Easy
- Easy
- Don't Know/ Unsure

*(If very difficult or somewhat difficult, go to question 5. Otherwise go to question 6)*

5. Describe the work conditions that contributed to the difficulty with recruitment. Please select all reasons that apply to the most recent recruitment of dental therapists at the organization.

- Dental therapists are in high demand.
- There was a shortage of qualified dental therapists who applied for the position.
- There was not a sufficient supply of dental therapists willing to work in the geographic area where the position was located
- Other employers were able to offer a better pay scale
- The dental therapists who applied for the position had no previous work experience
- Other. Please describe \_\_\_\_\_

6. Please indicate the reason for this **most recent recruitment** of a dental therapist.

- To fill a new position
- To fill a position vacated by another dental therapist
- Other. Please describe \_\_\_\_\_

7. In your experience, how difficult is it to **retain** a dental therapist once the therapist is employed with the organization?

- Very Difficult
- Somewhat Difficult
- Neither Difficult Nor Easy
- Somewhat Easy
- Easy
- Don't Know/ Unsure

*(If very difficult or somewhat difficult, go to question 8. Otherwise go to question 9)*

8. Describe the work conditions that contributed to the difficulty with retention. Please select all reasons that apply to the most recent departures of dental therapists from the organization.

- Left for a better paying position
- Wanted more responsibility or autonomy in patient treatment
- Offered another position that fit better with the therapist's personal demands (ie, closer to home, fewer hours)
- Not a good fit with our clinical team
- Other. Please describe \_\_\_\_\_

*(Questions for All Respondents)*

9. How does having dental therapist/s on the clinical teams at Apple Tree Dental **improve patient care**?

*(Mark all that apply)*

- a. Improves oral health education
- b. Improves patients' sense of having a regular dental provider
- c. Improves communication about treatment plan and costs
- d. Allows patients to have more needs met in one visit
- e. Reduces wait times for patients to receive needed care
- f. None of the above

10. Please indicate your level of agreement with the following statements.

*(Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Don't Know/Unsure)*

- a. There is evidence that dental therapists can perform high quality work
- b. Including dental therapists on the clinical teams is cost effective
- c. Dental therapists have increased dental team productivity
- d. Including dental therapists on the clinical team permitted more patients to receive services in a timely manner
- e. Dentists can work more effectively/efficiently using dental therapists in a team approach
- f. Employing dental therapists has improved flexibility in scheduling patients

11. Please indicate your level of agreement with the following statements.

*(Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Don't Know/Unsure)*

- a. It is helpful to have a clinical professional who can provide both preventive and basic restorative services to supplement dental services
- b. In general, patients don't want to be treated by dental therapists
- c. Using a dental therapist will increase dentists' enjoyment of dental practice
- d. Dually licensed dental therapists are more productive than those without a dental hygiene license
- e. Other states should adopt the dental therapist model to help address access and cost of care issues
- f. Dental therapists/advanced dental therapists help to alleviate the disparity in access to dental care

12. Please indicate your opinion about the following requirements for dental therapy practice in Minnesota.

*(Decrease Greatly, Decrease Slightly, Stay the Same, Increase Slightly, Increase Greatly, Don't Know/Unsure)*

- a. The level of required education and training for dental therapists should
- b. The level of required education and training for advanced dental therapists should
- c. The level of required supervision for dental therapists should
- d. The level of required supervision for advanced dental therapists should
- e. The scope of restorative services that dental therapists are allowed to perform should
- f. The scope of restorative services that advanced dental therapists are allowed to perform should

13. Please provide any comments about the practice of dental therapy that are not covered in this survey.

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# PATIENT SURVEY

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1. The following responses are related to:

- My dental appointment
- My child's dental appointment

*(Skip logic here to a survey with my child as subject)*

2. What was the MAIN purpose of this dental visit?

- A first visit to Apple Tree Dental
- A regular checkup and cleaning
- A filling
- A dental emergency (for example an infected or broken tooth)
- A crown, bridge or denture
- A root canal
- A tooth extraction
- Other. Please describe \_\_\_\_\_

3. My age is: \_\_\_\_\_ (included on child and adult survey)

4. My gender is: (included on child and adult survey)

- Male
- Female
- Other

*(If answering for a child, ask question about gender of child)*

5. I/my child live in:

- An urban area
- A suburban area
- A rural area

6. The type of provider who **primarily** treated me/my child on the most recent visit to Apple Tree Dental was:

- A Dental Hygienist
- A Dental Therapist
- A Dentist
- Don't Know/Unsure

7. At the most recent visit to Apple Tree, I /my child saw the dental provider(s) I/we wanted to see:

- Yes
- No
- I have no preference

8. I/my child see the same dental provider(s) at each visit to the Apple Tree dental center:

- Yes
- No

9. Please provide us with your opinion about the following statements:

*(Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Don't Know/ Unsure)*

- The dental professional I/my child saw explained well what treatment was needed
- My/my child's dental provider gave me/my child good advice about how to look after my/my child's teeth and gums
- My child's dental appointment
- The dental provider was considerate and sensitive to my/my child's needs
- I felt that this dental provider really knew how upset I/my child was about the possibility of pain
- I felt this dental provider accepted me/ my child as a person
- The dental provider was professional and courteous
- The dental provider seemed to know what he/she was doing during my/my child's visit
- The dental provider was thorough in doing the procedure
- My/my child's dental treatment was completed efficiently and in a timely manner
- There are things about the dental care I/my child received that could have been better
- There were other dental problems I/my child had that were not treated
- I am confident that I/my child received good dental care at my last visit
- I/my child will come back to Apple Tree Dental

10. Please tell us anything else about your visit that is not covered in the survey questions.

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_









### **Margaret Langelier, MSHSA**

*Co-Deputy Director, Oral Health Workforce Research Center*

As deputy director of OHWRC, Ms. Langelier assists the Director in preparation of all research projects and reports and in the OHWRC's dissemination activities. Ms. Langelier has served as a project manager at CHWS for 2 decades, where she has been responsible for supervising staff and coordinating of all aspects of project workflow. During her tenure, Ms. Langelier has been lead staff or the principal investigator on numerous research projects about the allied health and oral health workforce.



### **Simona Surdu, MD, PhD**

*Co-Deputy Director, Oral Health Workforce Research Center*

With a background as a medical doctor and over 2 decades of experience in health sciences, Dr. Surdu has contributed to the development and implementation of epidemiologic studies supported by the US National Institute of Health (NIH), the European Union (EU), the World Health Organization (WHO), among others. Dr. Surdu has worked for the Center for Health Workforce Studies (CHWS) for over a decade and her current research involves comprehensive studies of oral health in various states, including the evaluation of oral health needs, delivery of oral health services, and access and utilization of oral health services, particularly for underserved populations.



### **Ellen O'Malley, PhD**

*Research Associate, Oral Health Workforce Research Center*

Ms. O'Malley works on data analysis, writes and reviews statistical literature, and provides research support to the oral health research team. She specializes in psychological research, statistics, and teaching. Prior to OHWRC, Ms. O'Malley worked in academia, teaching and conducting independent research at Skidmore College, Grinnell College, and the University at Albany while completing her PhD. She has a PhD in Social-Personality Psychology from the University at Albany. Ms. O'Malley has published articles in psychological journals on self-regulation and individual differences, and has led collaborative projects with both students and community partners.

