Dental Hygienists' Use of Motivational Interviewing and Perceptions of Effectiveness in Changing Patient Behaviors.

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DEDICATION

This thesis is dedicated to my husband. Thank you for always believing in me and my abilities. Thank you for encouraging me to pursue my dreams and supporting me as I achieve my goal of becoming a dental hygiene educator.

ABSTRACT

Background: Motivational interviewing (MI) emerged in the area of substance abuse and addiction therapy and has been shown to be effective in changing health behaviors. The University of Minnesota (UMN) Dental Hygiene (DH) program devotes considerable time developing students' competency using MI. The purpose of this study was to determine to what extent UMN DH graduates are using MI in clinical practice, their perceptions of MI's effectiveness with regard to behavior change, and the association between MI use and the Theory of Planned Behavior (TPB) constructs: attitudes, social norms, and behavioral control.

Methods: A cross-sectional survey design was used. The study sample comprised DH program graduates from years 2010-2019. The study was conducted at the UMN School of Dentistry (SoD) during June-December 2020.

Results: Out of 208 surveys, there were 73 responses (35% response rate) and 58 surveys included in data analysis. The majority of participants (95%) reported using MI in clinical practice. The majority of participants (98%) perceive MI to be an effective behavioral approach. In the context of TPB, participants using MI have positive attitudes, support in their clinical environment, and higher self-efficacy with regards to MI compared to those not using MI. The most reported barrier affecting MI use was time constraints.

Conclusion: Study participants are using MI in clinical practice and perceive MI to be effective in changing patients' behaviors. The findings of this study support the TPB theory. However, some participants were unsure if MI has resulted in a positive behavior change for their patients and reported their patients' lack of

motivation being a significant work frustration, which may present as threats to their long-term use of MI in clinical practice.

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SECTION 1

INTRODUCTION

Motivational interviewing (MI) is defined as, "a collaborative, person-centered form of guiding to elicit and strengthen motivation to change" (1). MI initially emerged in the area of substance abuse and addiction therapy (1). However, over time the utilization of MI has expanded and the effectiveness of MI in changing behaviors has been studied within various health disciplines, including dentistry (2,3). Research has shown that MI can be effective in changing oral health behaviors and thus, MI has been integrated into dental hygiene (DH) curricula (3-5). The profession of dental hygiene is rooted in disease prevention. As a result of their preventive role, dental hygienists are uniquely educated in behavior change theory and counseling strategies aimed at preventing oral disease. The behavior change models or preventive counseling strategies used by dental hygienists affect patients' oral health and contribute to disease prevention (3,6). Currently, only a single qualitative study by Curry-Chiu et al. has aimed to explore the experiences MI-trained dental hygienists have using MI in clinical practice (7). Therefore, additional research is indicated to determine the utilization of MI by dental hygienists in clinical practice and their perceptions of MI's effectiveness with regard to behavior change.

Purpose of the Study

The purpose of this study is to determine to what extent the University of Minnesota (UMN) DH graduates are using MI in clinical practice and their perceptions of MI's effectiveness with regard to behavior change.

Statement of the Problem

MI is an evidence-based person-centered counseling approach for eliciting behavior change (1). MI has been proven effective in changing patients' health behaviors, including oral health, and consequently has been incorporated into dental and DH curricula. (2-5). The UMN DH program devotes considerable time in their curriculum developing students' competency using MI. However, it is currently unknown if UMN DH graduates use MI in clinical practice and if they perceive MI to be effective in changing behaviors. Knowledge of MI use among DH graduates will inform educators on the extent MI is being used and how MI interacts within clinical environments, allowing the DH curriculum to be modified accordingly.

Significance of the Study

MI is currently taught and integrated into United States DH curricula (4,5). Studies done in educational settings have shown MI can be effective in improving patients' oral health (5,8). Yet, there have been no quantitative studies found in the current literature that have investigated the utilization of MI by dental hygienists or their perceptions of MI's effectiveness in the clinical environment. The ultimate goal of any behavior change model is to improve health. However, to achieve this goal, the behavior change model must be perceived as effective by its users and must be conducive to the practice setting. This study will add to the body of knowledge in the area of behavior change models and inform DH curricula. If dental hygienists are not using MI in clinical practice and identified barriers are not able to be adequately addressed, other evidence-based behavior change models may need to be explored in order to achieve the goals of preventing disease and improving oral health (9,10).

Research Questions

1) To what extent are the University of Minnesota's DH graduates using MI in clinical practice?

2) What are the University of Minnesota's DH graduates' perceptions of MI's effectiveness with regard to behavior change?

3) What association is there between UMN DH graduates' use of MI and the Theory of Planned Behavior (TPB) constructs: attitudes, social norms, and perceived behavior control?

SECTION 2

REVIEW OF THE RELATED LITERATURE

Oral diseases affect an estimated 90% of the world's population (11,12). Although many oral diseases are preventable, oral diseases remain a persistent global public health problem, inflicting around 3.58 billion people (13). Two primary preventable oral diseases are dental caries and periodontal disease (11-13). Dental caries is the most prevalent oral disease worldwide and periodontal disease is the most common cause of tooth loss among adults (13,14). The manifestations of oral diseases are substantial and include: pain and discomfort, sepsis, a reduced quality of life, altered appearance, loss of nutrition, and increased cost (12,13). The negative effects of oral disease are significant and go beyond affecting solely the oral cavity.

Oral health is defined by the FDI Dental World Federation as, "multifaceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow, and convey a range of emotions through facial expressions with confidence and without pain, discomfort, and disease of the craniofacial complex" (15). Oral health is inextricably linked with general health and the oral cavity may reflect the state of an individual's general health (16,17). Research has shown systemic conditions like diabetes, leukemia, cardiovascular diseases, inflammatory bowel disease (IBD), human immunodeficiency virus (HIV), and acquired immune deficiency syndrome (AIDS) can be manifested in the oral cavity (16,17,18-20). Research also points to a bi-directional relationship between periodontal disease and diabetes (19). Individuals with diabetes are predisposed to periodontal disease and evidence suggests periodontal therapy provided by a dental hygienist or dentist may contribute to the control of diabetes (19).

The profession of dental hygiene is rooted in disease prevention. One of the top priorities of the American Dental Hygienists' Association (ADHA) National Research Agenda is health promotion and disease prevention. Dental hygienists are uniquely educated in behavior change theory and counseling strategies aimed at preventing oral diseases. U.S. Healthy People 2020 recognized the importance of oral health and for the first time included oral health as a quality of life indicator (21). Improving oral hygiene self-care practices and lifestyle behaviors was identified as critical for health promotion and oral disease prevention. This predication undergirds the need for oral health providers to be skilled in using evidence-based behavior change strategies aimed at motivating their patients to adopt healthy behaviors and improve their oral and general health (3,6,21).

Changing behaviors is a dynamic, non-linear, and complex process. Theories on behavior change models have evolved over time and influenced patient counseling strategies. One model, motivational interviewing (MI), has shown to be effective in changing health behaviors, and a large body of evidence has shown MI to be effective for treating addictive behaviors such as alcohol consumption, tobacco and substance abuse (2-3,22,23). A systematic review by Frost et al. found eight out of thirteen studies reviewed provided consistent evidence that MI has a beneficial effect on outcomes relating to the frequency and/or volume of alcohol consumption for short term outcomes (23). However, further research on the effectiveness of MI in the healthcare setting was recommended by Frost et al., including MI's effectiveness in promoting health behaviors (23).

The utilization and effectiveness of MI has been studied in dentistry and incorporated into dental education. To date, the evidence on the effectiveness of MI in improving oral care behaviors is mixed. Additionally, very little is known about the extent oral health providers use MI in clinical practice and their perceptions of MI's effectiveness in changing behaviors. To ascertain the current utilization of MI among oral health providers, a literature search was performed using PubMed, Scopus, and Google Scholar databases between September 2019 to December 2020. Search terms used to find the primary articles included "motivational interviewing AND oral health" and "motivational interviewing AND dental hygienists". Additional search terms used included "utilization", "perceptions", "behavior change", "MI", "effectiveness", "curriculum", "dental", "dental education", "health care", "health disciplines", and "dental hygiene". Articles were excluded if they had been published over ten years ago with the exception of articles that provided foundational knowledge for this body of knowledge. A total of 51 articles were reviewed and included in this literature review.

Motivational Interviewing Foundational Concepts

Developed by clinical psychologists, William R. Miller and Stephen Rollnick, MI emerged in the 1980s in the area of substance abuse and addiction therapy (1). Motivational interviewing is defined as, "a collaborative, person-centered form of guiding to elicit and strengthen motivation to change." (1). MI is goal-driven, directional, and has a clear positive behavioral outcome (24). In 1991, Miller and Rollnick introduced the four guiding principles of MI, which are developing discrepancy, expressing empathy, rolling with resistance, and supporting self-efficacy (1). Health professionals use open-ended questions, affirmations, reflective listening, change talk, and summaries

to demonstrate these guiding principles (1,3). However, MI is not formulaic, as there are key relational elements that must be present: collaboration between the practitioner and client, evocation, and emphasizing the autonomy of the patient (1,3). Collectively, these elements are known as the "spirit of MI", and they serve as the foundation for the conversation (1,3).

Motivational Interviewing Within Health Disciplines

Various health disciplines have studied the effectiveness of MI in healthcare settings. Research has shown MI to improve a wide range of conditions in healthcare settings when delivered by healthcare professionals including physicians, psychiatrists, psychologists, pharmacists, nurses, dieticians, social workers, and oral health providers (25-34). The effectiveness of MI has been studied in the areas of tobacco cessation, addiction therapy, eating disorders, anxiety disorders, HIV, obesity, traumatic brain injuries, multiple sclerosis, cardiovascular health, sexual health, oral health behavior, improving medication adherence, and hearing aid use (22,23,25-34). A clinical systematic review by Christie et al. found MI has the potential to facilitate change and improve the efficacy of interventions in regards to diabetes and obesity (27). Similarly, a systematic review by Thompson et al. found MI to be effective in changing health behaviors relating to cardiovascular health (28). Ten randomized controlled trials (RCT), collectively totaling 1,000 adult participants with multiple sclerosis, found the addition of MI to existing rehabilitation therapies promoted better health outcomes and behaviors in individuals with multiple sclerosis (34).

Methodologies used to investigate the utilization and effectiveness of MI within health disciplines differ greatly, ranging from pilot studies to RCTs. The majority of

studies have included smaller sample sizes indicating larger trials are needed to achieve generalizable findings regarding MI use in the healthcare environment. However, a meta-analysis by Lundahl et al. reviewed 48 trials with a total of 9,618 participants in various healthcare settings and found significant advantages for using MI to change patients' behaviors. Findings showed MI to have a significant effect on blood pressure, cholesterol, HIV viral load, dental outcomes, death rate, body weight, physical strength, quality of life, substance use, sedentary behavior, self-monitoring, and approach to treatment (29).

Motivational Interviewing and Oral Health Behaviors

The current literature is mixed regarding the efficacy of MI to change patients' oral health behaviors. Within current literature, study design and characteristics of the study population do not appear to influence MI's interaction with the dental environment, as results are mixed. Multiple studies have shown MI to be effective in the dental environment to improve patients' oral health (3,5,8,31-33,35-40). Studies have aimed to determine the effectiveness of MI changing not only oral health behaviors, but also dental clinical outcomes (8,31-32,36-40). López-Jornet et al. studied compliance with self-care recommendations among patients with hyposalivation (31). The experimental group received oral health education using MI techniques and demonstrated significantly greater adherence to interproximal brushing. (31). While both groups showed an improvement in their oral health, López-Jornet et al. concluded MI offered benefits to patients' periodontal health, because MI motivated patients to increase the frequency of their oral self-care habits, thus reducing plaque and bleeding (31). A recently published randomized control trial by Saffari et. al studied the effectiveness of MI to enhance self-

efficacy and the oral health of pregnant women (32). When the participants returned for the follow-up, the women in the intervention group showed a decrease in gingival inflammation indexes, decayed teeth, and an increase in filled teeth and oral health self-efficacy (32). Thus, the investigators concluded MI not only improved clinical outcomes, but also improved oral health-related self-efficacy (32).

A systematic review by Kay et al. found MI to have potential for helping patients with poor oral health (33). The review found MI to be a learnable technique oral health professionals can use to increase their understanding of their patients' oral health behaviors (33). As a result of these findings, the authors recommended dental personnel receive training in MI in order to increase dental providers' skill in using this behavior model (33). A systematic review by Carra et al. provided further support for MI to promote behavioral changes and improve oral hygiene in patients with periodontal diseases (35). Examples of the improvements in the participants' behavior and measures of periodontal disease include: decreased plaque levels, decreased bleeding upon probing, increased toothbrushing, and increased interdental cleaning (35).

Conversely, Kopp et al. concluded there is a low body of evidence for MI positively affecting clinical periodontal parameters and psychological factors relating to oral hygiene (41). This conclusion was based on five studies, two studies showed MI had no effect on the periodontal parameters, plaque and gingival inflammation (41). The other three studies showed MI to have a positive effect on plaque levels, which were measured by a plaque index (41). Brand et al. found a single MI session to be insufficient for improving patients' oral hygiene and recommended additional trials (42). Both authors

agreed on the need for additional high-quality studies to affirm the use of MI in changing oral health behaviors (41,42).

Furthermore, the effect of MI on tobacco cessation has also been studied with mixed results (43,44). When comparing two systematic reviews, one group of authors found MI to be effective in smoking cessation, while the other set of authors disagreed despite an overlap in the studies included (43,44). Heckman et al. concluded MI to be an effective intervention for smoking cessation when used with adolescents and adults (43). Conversely, a more recently published review by Lindson et al. concluded there to be low-quality evidence in regards to MI helping individuals quit smoking (44). Lindson et al. also cited problems with study designs and small sample sizes (44).

Studies have also investigated the effectiveness of MI on decreasing the incidence of dental caries, and the relationship between the two variables remains inconclusive (36-40,45). Six RCTs with similar research designs, studied children and their caregivers from high-risk caries populations (36-40,45). Collectively, results showed MI to be effective in changing oral health behaviors related to nutritional choices, oral hygiene habits, and restorative treatment decisions resulting in a decrease in dental caries (36-40,45). The type of MI intervention used did slightly vary between the five studies and there were differences in the amount of time and frequency MI was used to positively change participants' oral health behaviors. Yet, the conclusions made by the authors were alike and support the use of MI to decrease dental caries. Conversely, one randomized control trial by Henshaw et. al found MI to increase caregiver oral health knowledge, but not decrease caries in the children (45). Three systematic reviews found the evidence to be inconclusive with regard to MI's effect on reducing dental caries (46-48). However,

one of the systematic reviews did find MI to outperform conventional health education in preventing early childhood caries (46).

Studies specific to the Native American population have also shown mixed results regarding the effectiveness of MI in the dental environment. A recently published study by Blue et al. aimed to study the use of MI to reduce parental risk related behaviors for ECC (49). The pilot study concluded MI to have no significant effect on oral self-care behaviors and the use of MI did not reduce parental risk related behavior for early childhood caries (49). Additionally, Blue et al. discussed the impact social determinants of health have on oral health behaviors, and how an increase in knowledge does not necessarily result in sustained behavior change, especially in high-risk populations (49). Furthermore, a cluster-randomized pragmatic trial by Harrison et. al had conflicting results (50). The study aimed to determine if MI could be used as an approach to control caries in indigenous children and found a MI-style intervention had a positive impact on the severity of caries (50). Despite mixed findings, the level of positive evidence in the current literature supports the incorporation of MI in health professions curricula.

Incorporation of MI in Health Professions Curricula

MI has been incorporated into health professions curricula for over two decades (3,4,8,21,51-54). Teaching MI to students has shown to be feasible, effective, and students are able to achieve beginning proficiency in MI (51). Studies from different healthcare programs conclude MI training to be beneficial for students to use as a behavior change model (4,8,21,51,52). Haeseler et al. had positive results for incorporating MI training and MI skill assessments into medical school curricula (52). Medical students who participated in a 2-hour MI curriculum improved their ability to

counsel patients for behavior change (52). Similarly, Woelber et al. and Hinz et al. had positive findings regarding training dental students in MI and supported the incorporation of MI in dental school curricula in order to help change patients' oral health behaviors and improve their oral health (53). There were differences in study design between these two studies with one study having an experimental group and the other did not, yet the authors made similar conclusions and supported MI being taught to dental students (8,53). In addition, White et al. found incorporating MI into the curriculum improved medical students' confidence in discussing behavior change with patients (54). White et al. evaluated medical students using MI with a standardized patient who portrayed a smoker (54). Results showed 83% of the students felt the MI curriculum helped them be more comfortable discussing behavior change with a patient, and 98% felt MI to be an important skill for physicians to possess (54). Lastly, White et al. uniquely suggested that MI training provided students with specific feedback on their strengths and weaknesses via MI assessment tools and facilitated self or peer-evaluation of practice performance in MI (54).

Perceptions of Motivational Interviewing in Oral Health

Collectively, studies to date suggest a positive perception of MI (4,7,21). Mills et al. concluded that DH students' confidence in applying MI strategies increased over time, and the MI curriculum raised students' awareness of the importance of using MI strategies (21). Likewise, Curry-Chiu et al. concluded a positive perception of MI from dental hygienists who graduated from a DH program that provided them with MI training (7). The dental hygienists valued MI and supported MI as a part of all DH curricula (7). However, this was a single qualitative study that had only nine participants.

Barriers to using Motivational Interviewing

The most commonly perceived barrier to using MI was lack of time (3,7,55,56). Healthcare professionals in the clinical environment reported feeling the weight of time constraints and thus, opted out of using MI (7,55,56). Curry-Chiu et al. found that all nine participants reported having insufficient time to fully use MI in clinical practice (7). As a result of the pressure to stay on time, participants cut steps or truncated the use of open-ended questions (7). To address the barrier of limited time, there is a derivative of MI known as "brief motivational interviewing" (BMI). Brief MI has shown to be effective in dental settings where oral health providers are often encountering time constraints (3,51). Koerber et al. explored the outcomes of BMI when used by dental students and had results that supported the utilization of BMI to change patients' behaviors (57). BMI has been found to be more effective compared to traditional methods of health behavior change when delivered in a decreased amount of time (57). It is currently unknown how much BMI is taught in DH curricula compared to traditional MI and teaching BMI may need to be considered by educators if health professionals are frequently encountering time constraints that impede on their ability to use MI.

Another identified barrier was anticipated negative patient reaction and the difficulty to sustain MI when encountering less motivated patients (7,55). However, it was not clear in the literature why the participants perceived a negative patient reaction, what was considered a negative patient reaction to MI, and how patients were considered to be less motivated. Rosseel et al. suggested that healthcare professionals may not be confident in using MI when they anticipate the patient to react negatively to MI (55).

Additionally, lack of training or the need for ongoing MI training was a perceived barrier (4,23,58,59). Outside the educational setting, MI training is often provided through a workshop that on average lasts 1 or 2 days (58). MI requires initial training, but research suggests proficiency in MI skills are developed over time (55,59,60). A review by Weisner et. al screened more than 400 studies and found only fifteen studies assessed MI training proficiency at follow-ups (59). Of those fifteen studies, only two studies had participants with 75% MI proficiency following initial MI training (59). Health providers may need ongoing training in order to continue to feel confident and proficient in MI, yet it is not clear in the literature what type of MI training participants were exposed to (4, 21,23,55,58,59). Lastly, Faustino- Silva et al. and Wiley et. al promoted annual one-day refresher courses on MI for oral health providers in order to effectively use MI daily in the clinical environment (61, 62).

Ajzen's Theory of Planned Behavior (TPB) asserts behavior change depends on an individual's beliefs/attitudes toward the behavior, social norms, and perceived behavioral control (63). TPB posits that solely increasing an individual's knowledge will not help change a behavior (63). TPB serves as a theoretical framework for this study as dental hygienists' knowledge of MI will not necessarily translate to use in the clinical environment. Social norms or others' beliefs that they should or should not perform MI may influence their decision to use it in practice. If colleagues do not support the use of MI, dental hygienists may forgo using this model. Personal attitudes toward how adaptable MI is in the clinical environment will also affect MI use. TPB would suggest that even though dental hygienists believe MI is a superior counseling method, their level

of self-efficacy must be high (63). Dental hygienists who lack confidence in their MI skills may choose to use another preventive counseling strategy.

Currently, it is unknown if UMN DH graduates use MI in clinical practice and if they perceive MI to be effective in changing behaviors. No quantitative studies have been found in the literature pertaining to the use of MI by dental hygienists in the clinical environment. Therefore, the purpose of this study is to determine to what extent the University of Minnesota's DH graduates are using MI in clinical practice, their perceptions of MI's effectiveness with regard to behavior change, and the association between MI use and the TPB constructs: attitudes, social norms, and behavioral control.

SECTION 3

MANUSCRIPT

This manuscript will be submitted to The Journal of Dental Hygiene.

Introduction and Literature Review

Oral diseases affect an estimated 90% of the world's population and the majority are preventable (11,12). The profession of dental hygiene (DH) is rooted in disease prevention. As a result of their preventive role, dental hygienists are uniquely educated in behavior change theory and counseling strategies aimed at preventing oral disease. One model, motivational interviewing (MI) has been effective in changing health behaviors (3-15). MI is defined as, "a collaborative, person-centered form of guiding to elicit and strengthen motivation to change" (1). MI initially emerged in the area of substance abuse and addiction therapy (1). However, over time the utilization of MI has expanded and the effectiveness of MI in changing behaviors has been studied within various health disciplines, including dentistry (2,3).

The current literature is mixed regarding the use of MI to change patients' oral health behaviors. Multiple studies have shown MI to be effective in the dental environment to improve patients' self-care behaviors and oral health (3,5,8,31-33,35-40). Several studies have shown the use of MI resulted in decreased plaque levels, gingival inflammation, decayed teeth, and increased toothbrushing and interdental cleaning (31-33,35-40,45). Yet, there are conflicting findings among studies that have aimed to determine the effect of MI on clinical periodontal parameters, tobacco cessation, and reducing dental caries (31-33,35-50). Consequently, multiple studies have concluded MI to have no significant effect on oral self-care behaviors or dental clinical outcomes (41,42,44,49). Regarding other health disciplines, the use of MI has shown to improve the

efficacy of medical interventions for diabetes and obesity, positively change health behaviors related to cardiovascular health, and promote better health outcomes and behaviors in individuals with multiple sclerosis (27,28,34). Thus, the level of positive evidence in the medical literature supports the continued incorporation of MI in health professions curricula.

MI is currently taught and integrated into United States DH curricula (4,5). Studies from different healthcare programs conclude MI training enhances students' abilities and confidence when communicating with patients about behavior change (4,5,8,21,51,52). Teaching MI to students has shown to be feasible, effective, and students are able to achieve beginner proficiency in MI (51). However, there have been no quantitative studies found in the current literature that have determined the utilization of MI by dental hygienists or their perceptions of the effectiveness of MI in the clinical environment. The limited evidence requires further investigation to determine the utilization of MI in clinical practice and identify potential barriers to adequately address this behavior change approach (9,10). This study may provide insight on the application of MI and raise questions if other evidence-based behavior change models need to be explored to achieve the goals of preventing disease and improving oral health.

The University of Minnesota (UMN) DH program began incorporating MI into its curriculum in 2010 and devotes considerable time in their curriculum developing students' competency using MI. However, it is currently unknown if UMN DH graduates use MI in clinical practice and if they perceive MI to be effective in changing behaviors. Knowledge of MI use among DH graduates will inform educators if MI is being used and how MI interacts with clinical environments, allowing the DH curriculum to be modified

accordingly. Therefore, the purpose of this study was to determine to what extent UMN DH graduates are using MI in clinical practice and their perceptions of MI's effectiveness with regard to behavior change. The study also aimed to determine the association between UMN DH graduates' use of MI and the Theory of Planned Behavior (TPB) constructs: attitudes, social norms, and perceived behavior control.

Methods and Materials

The study was deemed exempt from review by the UMN Institutional Review Board (STUDY00009559). A cross-sectional, survey design was used to study DH graduates' use of MI, their perceptions of MI's effectiveness in changing patients' behavior, and the association between MI use and the TPB constructs: attitudes, social norms, and perceived behavior control. The study took place at the UMN School of Dentistry (SoD) during June-December 2020. UMN DH alumni who graduated between the years 2010-2019 comprised the sample for the study (n=58). A power analysis based on 58 survey respondents concluded there is a 95% probability that a confidence interval of 10.95 would include the true value of the population parameter. Participants were identified using a list of program alumni obtained from the UMN SoD Alumni Office.

An electronic survey was emailed to 208 UMN DH graduates via Qualtrics using an anonymous link. The survey was initially sent in June 2020. Via a survey cover letter, DH alumni were informed of the study purpose, risks, benefits, and voluntary nature of the study. If an alumnus consented to participate, he or she checked "Yes" and began the survey. Participants were each randomly assigned a unique identification number, so identity remained anonymous. After one week, the first follow-up email was sent to all possible respondents. Two additional follow-ups were sent at 14 days and 20 days after

the initial survey was sent. Due to an initial low response rate, a modification to the original protocol was made, and IRB approval was obtained to allow the student investigator (SI) to individually email possible participants in order to increase the response rate. The SI did not have knowledge if a participant did in fact take the survey as a result of the email.

At the conclusion of the survey, participants had the option to provide their name and address to be entered into a random drawing to win a pair of Apple Airpods. Participants were made aware that they would only be contacted in the event they won the drawing. If any participant chose to withdraw from the study and/or discontinued to take the survey, the participant was asked to contact the student investigator via email or phone and their responses were not included in data analysis. All survey data was stored and shared in the UMN's secured software, Box. The SI was solely responsible for entering and obtaining the data from study participants.

Instrument

The MI survey was originally developed by researchers at the University of New Mexico to study the effectiveness of a MI training protocol (64). The survey was chosen due to its focus on application of MI in practice. Permission to use and modify the original survey was obtained from one of the survey developers. The survey was piloted among seven UMN DH faculty and three UMN DH alumni during February 2020 to determine face validity. After the survey was piloted, it was modified to better answer the study research questions. Five questions were added to gain more robust information regarding participants' demographics, MI use, and perceptions of MI and one demographic question was removed that inquired about participants' marital status.

The survey was comprised of 28 questions including demographics. Questions specific to application of MI in the clinical environment and perceptions of MI's effectiveness with regard to changing patients' behavior used a 5-point Likert-scale (1=Strongly Agree, 2=Agree, 3=Disagree, 4=Strongly Disagree, 5=Unsure). Skip logic was used, so participants who were not currently practicing clinically skipped to the end of the survey and their data was not included in data analysis. At the end of the survey, two open-ended questions queried other patient counseling strategies participants use and what barriers they encounter that affect their application of MI in clinical practice. The survey was estimated to take 5 minutes to complete.

Analysis

The data analysis plan included descriptive statistics (means and standard deviations) for continuous variables, and frequencies and percentages for categorical variables. Data was analyzed in Qualtrics. Descriptive statistics were utilized to summarize the survey data through counts and proportions for each survey item. Cross-tabulation was used to determine association between attribute variables and survey items. Associations between the survey questions and the TPB constructs: attitudes, social norms, and perceived behavior control were tested using a one-way ANOVA. The response, "Unsure" was coded as 2.5 for Tables II and III. All analyses were performed using SAS 9.4 from the SAS Institute based in Cary, North Carolina. P-values less than 0.05 were considered statistically significant.

Operational Definitions

Motivational interviewing is defined as a direct, patient-centered counseling style for eliciting a positive behavior change by helping patients explore and resolve ambivalence (1).

Behavior change is defined as the transformation or modification of any human behavior that affects the overall function of an individual (65).

Results

Out of 208 surveys distributed via Qualtrics, 73 surveys were returned, resulting in a 35% response rate. A total of 58 participants met the inclusion criteria and were included in the statistical analysis (n = 58). Three surveys were excluded due to incomplete responses. Eleven individuals were excluded due to currently not working in the clinical environment and one individual did not consent to participate in the study.

The majority of participants were dental hygienists (86%) compared to dual degree providers (dental hygienist/dental therapist) (14%). The vast majority of participants were women (95%) and Caucasian (81%). The median age of participants was 27. The majority of participants practice in a single or group private practice (72%) and reported working between 25-40 hours per week (66%). See Table I for participant demographics.

Ninety-five percent of participants use MI in clinical practice and believe they are proficient with using this technique. Participants who use MI reported they use the behavior change model with more than half of the patients they see daily (62%). Ninety-eight percent of participants perceive MI to be an effective behavioral change strategy. Participants believed MI is effective because it draws on internal motivations for change (90%), and all participants believed that a patient's own level of motivation for change is important (100%). Table II shows the association between demographics and

participants' MI use and their perceptions of MI's effectiveness. A significant association was found between participants' age and perceptions of MI resulting in positive behavior change for their patients ($p = 0.04$). The youngest study participants, ages 20-24, were the most unsure about MI resulting in a positive behavior change for their patients (mean=3.7, SD=1.66). The slightly older participants, 25-28, reported MI has resulted in positive behavior change for their patients (μ2.1+1.33). In addition, there was a significant association found between practice setting and participants' perceptions of MI effectiveness ($p = 0.01$). Participants working in corporate settings held the most favorable view of MI's effectiveness compared to those working in other types of practice settings (μ1.1+1.35).

Practice setting and participants' frequency of MI use was found to have a significant association ($p = 0.02$). Participants working at either a nonprofit, Federally Qualified Health Center (FQHC), specialty, or other type of practice used MI the most frequently, and reported they use MI when communicating with every patient. (μ1.4+ 0.52). No significant association was found between MI use, perceptions of proficiency and participants' graduation year, age, hours per week working, and type of practice setting. Participants working in a corporate practice setting use MI the least, and reported they use MI at least once per day, but with fewer than half of their daily patients (μ2.8+ 1.49).

Table III shows the association between participants' MI use and the TPB constructs: attitudes, social norms, and behavioral control. The average mean scores for participants using MI for each TPB construct were 2.5 (beliefs/attitudes), 1.9 (social norms), and 1.9 (behavioral control), compared to 2.6 (beliefs/attitudes), 3.2 (social

norms), and 3.1 (behavioral control) for participants not using MI. The comparison of average mean scores for each of the TPB constructs suggests participants not using MI have decreased support in their clinical environment (social norms), and lower self-efficacy with regard to MI (behavioral control). However, with regard to the construct beliefs, participants not using MI held positive attitudes towards MI. All of the participants reported understanding the basic ideas and principles of MI (100%). Participants' responses reflected adherence to the principles of MI, as they reported assessing patients' readiness for change, intentionally asking open-ended questions, and intentionally recognizing patients' efforts in changing oral health habits. However, over half of participants (57%) reported their patients' lack of motivation for change was a significant frustration in their work.

Social norms appear to support MI use, as participants reported support from their employer to integrate MI into their work (77%). A little over a third of the participants (36%) reported they use the same approaches to patient education that their co-workers use. Fourteen percent of participants were unsure if they use the same approach as their co-workers.

Although 55 (95%) participants reported using MI, only 43 (75%) participants reported MI has resulted in a positive behavior change for their patients, indicating they are unsure about MI's effectiveness in positively changing their patients' behaviors. In addition, 38 (65%) participants reported that some patients will never change regardless of how they interact with them. This finding revealed a lower degree of self-efficacy or behavioral control. A significant association was found between age and the TPB construct: behavioral control ($p = 0.02$), Participants ages 20-24 appear to have lower

level of perceived behavioral control when using MI by how they answered the five questions related to the construct, which resulted in a significant higher mean (μ3.0+ 0.44).

Qualitative data revealed the main barriers participants encounter that negatively affect their MI use in clinical practice were time constraints and patients' lack of willingness, interest, or cooperation to discuss their oral health behaviors. Time constraints was the most frequently reported barrier. Other barriers reported were language barriers, lack of patient rapport, pressure from the dentist, personal attitude, new personal protective equipment due to COVID-19, and needing a refresher on how to use MI.

Discussion

During the last two decades, there has been widespread adoption of MI in the health disciplines, including dental hygiene (25-34). Research studies support the use of MI to change oral health behaviors in the areas of early childhood caries and periodontal diseases, and therefore, MI is considered to be an evidence-based behavior change model (35,36-40,45,50). However, the ultimate goal of achieving optimal oral health via improved self-care behaviors is dependent on the extent to which dental providers use MI in clinical practice. According to the TPB, people intend to perform a behavior when they evaluate it positively (attitudes), when they believe others think they should perform an action (social norms) and whether they feel they have the abilities to perform the action (perceived behavior control). This study aimed to determine to what extent UMN DH graduates are using MI in clinical practice, their perceptions of MI's effectiveness with

regard to behavior change, and the association between UMN DH graduates' use of MI and the TPB constructs: attitudes, social norms, and perceived behavior control.

The finding that study participants are using MI (95%) and perceive MI to be an effective behavior change strategy suggests extremely positive attitudes toward MI as a behavior change model. It was evident from survey responses that participants believe and value MI principles. Study participants believe at the core of behavior change is internal motivation. The vast majority of participants valued and practiced MI principles by intentionally asking open-ended questions, assessing a patient's readiness for change, and recognizing patients' efforts in changing their oral health habits. These actions support the "spirit of MI" and serve as a foundation for conversations between dental hygienists and their patients (1). Dental hygienists must be mindful MI is not formulaic and embrace the MI principles in order to change their patients' behaviors. Moreover, participants' positive attitudes closely align with the study findings of Curry-Chui et al. and White et al., which found their participants embracing MI principles and having positive attitudes towards using MI (7,54).

Peer influence and work environment appear to impact graduates' use of MI in practice. Study participants reported having support from their employer regarding integrating MI into their clinical practice. However, about half of participants reported using the same approach to educating their patients as their co-workers, revealing that peer pressure exists in the clinical environment. Dental hygiene graduates in the study by Curry-Chui et al. reported having their dentist's support to use MI as an important facilitator and reported they feel self-conscious when they used a communication style that was different from the office norm (7).

Findings suggest participants are confident in their MI skills, suggesting the UMN SoD DH curriculum prepared them well. However, 57% of participants reported patients' lack of motivation for change is a significant frustration in their work, and 65% of participants reported that some patients will never change regardless of how they interact with them. The feeling of frustration and belief that patients may not change suggests a lower level of behavioral control. Similarly, DH graduates in the study conducted by Churry-Chui et al. also reported patients' resistance as a significant work frustration and barrier to using MI (7). Frustration over the lack of change in patients' oral self-care is a common theme in the literature. Nowak et al. had similar findings, as dentists reported "there was only so much they could do if patients don't follow their recommendations" (66). These "more resistant" patients may be exhibiting behaviors Miller and Rollnick would describe as sustain talk and discord (1). A possible solution to reduce clinician frustration is to practice "resist the righting reflex" or "roll with resistance" (1). When both of these strategies are embraced by the clinician, they enhance the patient's perceptions of change or perceptions of their challenges for change.

The DH graduates in the Curry-Chui et. al study saw these behaviors as barriers and the participants in this study may have had similar perceptions towards resistant patients (7). However, MI experts may argue the graduates may have lacked readiness and MI training to manage sustain talk and discord (roll with resistance) or lacked the time to manage these patient behaviors (7). Although the vast majority of participants reported using MI, only 75% participants reported MI has resulted in a positive behavior change. This finding is consistent with the current literature, as the body of evidence with regard to MI and clinical outcomes is mixed (8,31-32,36-40). Additionally, this may be

attributed to nearly 10% of the respondents practicing in a non-profit or a FQHC setting where social determinants of health and oral health disparities impact behavior change (49,67). Blue et al. had similar findings and discussed how it is difficult to change behaviors when there are complex socioeconomic status (SES) factors, and an increase in patient knowledge does not necessarily result in sustained behavior change, especially in high-risk populations (49). Thus, behavior change remains complex, and currently, there is still limited understanding regarding how factors like a patients' beliefs, attitudes, social norms, and perceived control interact to achieve optimal behavior change (68). If dental hygienists continue to have the belief that some patients may never change and also continue to not see behavior change in their patients, they may forgo using MI in clinical practice.

Not surprisingly, the youngest participants, ages 20-24, were the most unsure about MI resulting in a positive behavior change for their patients (μ3.7+1.66). This study finding may be due to less time using MI in clinical practice compared to the older age groups. Similarly, previous studies have shown MI proficiency and skills are developed over time (55,59,60). Mills et al. concluded confidence in applying MI strategies increases over time as well (21). Dental hygienists may increase their self-efficacy with regard to using MI the more years they practice as clinical dental hygienists. Additionally, dental hygienists may need refresher courses on MI in order to maintain MI fidelity and confidence to use MI, which is also supported by the current literature (4, 21,23,55,58-62). Annual one-day refresher courses may help increase or maintain dental hygienists' self-efficacy and renew inspiration with regard to using MI

and should be explored by dental offices, yet the cost of MI training to maintain MI fidelity may be a barrier (59,61).

Similar to previous studies, dental hygienists consider time constraints to be a significant barrier affecting MI use (3,7,55,56). Given the time constraints of a dental hygienist's schedule, it was not surprising that time constraints are frequently cited as a barrier in the current literature. Using MI can be time consuming and thus challenging for a dental hygienist to use when communicating with their patients (3,7,55,56). Brief motivational interviewing (BMI) aims to address this concern about MI (3,51). This technique is delivered in a decreased amount of time compared to traditional MI and shown to be effective in the dental environment (3,51,57). The incorporation of BMI training in DH curricula may reduce the stress of time constraints to collaborate with patients to support a positive behavior change during patient care.

Participants who work in the corporate setting reported using MI the least frequently per patient. Dental hygienists who work in a corporate setting may be required to treat more patients in a day and may have a decreased amount of time with each patient compared to dental hygienists working in other practice settings (69). Time constraints has been shown to negatively impact MI use (3,7,55,56). However, a noteworthy finding was although study participants working in the corporate setting use MI less frequently, they had the strongest perception that MI is an effective behavior approach ($\mu 1.5 +0.76$). This study finding may be due to the lack of experience participant who work in the corporate setting have encountering "more resistant" patients because they are using MI the least frequently, resulting in them still having very positive attitudes towards MI as a behavior change model.

Limitations of this study include the small sample size and DH graduates from only one DH program. Social desirability bias was also a limitation, as participants may have chosen answers they believed were more socially desirable or acceptable rather than choosing responses that are reflective of their true thoughts or feelings. Future studies should include larger samples of DH graduates from multiple DH programs that have incorporated MI into their curriculum in order to increase the generalizability of study findings. Additionally, future investigations should explore BMI content in DH curricula compared to traditional MI.

Conclusion

This study found participants are using MI in clinical practice and perceive MI to be effective in changing patient behaviors. Participants who are using MI have more positive attitudes, support in their clinical environment, and higher self-efficacy with regards to MI compared to those not using MI. In the context of the TPB, participants' attitudes suggest a strong intent to continue using MI. However, frustration over the lack of positive patient behavior change and time constraints within the work environment may present as threats to dental hygienists' long-term use of MI in clinical practice.

SECTION 4

Table I**:** Demographics

	Frequency	**Percent (%)**
Graduation Year		
2010	2	3.45
2011	9	15.52
2012	11	18.97
2013	2	3.45
2015	5	8,62
2016	9	15.52
2017	5	8.62
2018	8	13.79
2019	7	12.07
Dual-degree Provider		
Yes	8	13.79
No	50	86.21
Age (in years)		
Reported	53 Median = 27	91.38
Prefer not to answer	5	8.62
Sex		
Male	1	1.72
Female	55	94.83
Prefer not to answer	2	3.45
Racial/Ethnic Background		
Caucasian	47	81.03
African American or Black	1	1.72
Asian	4	6.90
Other	1	1.72

Prefer not to answer	5	8.62
Hour per week working in clinic practice		
1-8	3	5.17
9-16	3	5.17
17-24	5	8.62
25-32	15	25.86
33-40	23	39.66
40+	4	6.90
Other	5	8.62
Dental practice setting		
Privately-owned single practice	29	50.00
Privately-owned group practice	13	22.41
Corporate practice	8	13.79
Nonprofit community practice	3	5.17
FQHC	3	5.17
Specialty practice	1	1.72
Other	1	1.72

Table II**:** Associations between demographics and dental provider MI use and perceptions of MI's effectiveness.

	N	MI use (Q9)	MI Frequency (Q26)	MI proficiency (Q13)	Effectiveness of MI approach (Q12)	Effectiveness of MI changing patient behaviors (Q14)
Graduation Year		p=0.65	p=0.83	p=0.28	p=0.37	p=0.38
2010 & 2011	11	1.8 (0.40)	2.3 (0.65)	1.8 (0.40)	1.7 (0.47)	2.0 (1.10)
2012 - 2014	13	1.9 (1.04)	2.4 (1.19)	1.8 (0.60)	1.7 (0.48)	2.4 (1.56)
2015 & 2016	14	1.8 (0.58)	2.4 (1.22)	1.4 (0.51)	1.4 (0.50)	2.3 (1.54)
2017 & 2018	13	1.7 (0.48)	2.1 (0.76)	2.0 (1.00)	1.6 (0.51)	2.6 (1.71)
2019	7	2.1 (0.38)	2.6 (0.79)	1.9 (0.69)	1.7 (0.76)	3.4 (1.51)
Age (in years)		p=0.20	p=0.20	p=0.43	p=0.18	**p=0.0413**
20-24	9	2.1 (0.33)	2.4 (0.88)	2.4 (0.88)	1.8 (0.67)	3.7* (1.66)
25-28	20	1.7 (0.49)	2.1 (0.69)	2.1 (0.69)	1.4 (0.50)	2.1* (1.33)
29-32	16	2.0 (0.89)	2.7 (1.14)	2.7 (1.14)	1.7 (0.48)	2.6 (1.50)
33 years or older	8	1.8 (0.46)	2.3 (0.71)	2.3 (0.71)	1.8 (0.46)	1.9 (1.36)
Hours Per Week Working		p=0.49	p=0.66	p=0.35	p=0.79	p=0.61
1-24	11	1.7 (0.47)	2.0 (0.77)	2.0 (1.10)	1.6 (0.50)	2.2 (1.47)
25-32	15	1.8 (0.41)	2.4 (0.74)	1.8 (0.56)	1.7 (0.49)	2.7 (1.50)
33-40	23	2.0 (0.80)	2.4 (1.08)	1.7 (0.54)	1.6 (0.58)	2.7 (1.67)
40+, Other	9	1.7 (0.71)	2.3 (1.22)	1.4 (0.53)	1.4 (0.53)	2.0 (1.22)
Practice Setting		p=0.33	**p=0.0156**	p=0.37	**p=0.0092**	p=0.26
Privately-owned single	29	2.0 (0.73)	2.4* (0.87)	1.9 (0.79)	1.7* (0.53)	2.8 (1.67)
Privately-owned group	13	1.8 (0.38)	2.4 (0.65)	1.8 (0.38)	1.8^{+} (0.44)	1.8 (0.38)
Corporate	8	1.8 (0.71)	2.8^{+} (1.49)	1.5 (0.76)	1.1^{*+} (0.35)	2.3 (1.75)
Nonprofit, FQHC, Specialty, or Other	8	1.5 (0.53)	1.4^{*+} (0.52)	1.5 (0.53)	1.4 (0.52)	2.4 (1.69)

Summaries are mean (standard deviation) with p-values calculated from a one-way Analysis of Variance (ANOVA). * or $^{+}$ indicates significant differences.

Table III. Associations between demographics and dental provider attitudes, social norms, and behavioral control.

	N	Beliefs/Attitudes	Social Norms	Behavioral Control
Graduation Year		p=0.51	p=0.19	p=0.19
2010 & 2011	11	2.1 (0.33)	3.0 (0.59)	2.4 (0.28)
2012 – 2014	13	2.0 (0.54)	2.9 (0.49)	2.5 (0.67)
2015 & 2016	14	1.8 (0.35)	2.8 (0.61)	2.3 (0.59)
2017 & 2018	13	2.0 (0.41)	2.7 (0.73)	2.7 (0.64)
2019	7	2.0 (0.26)	3.4 (0.73)	2.9 (0.57)
Age (in years)		p=0.31	p=0.96	**p=0.0246**
20-24	9	2.0 (0.26)	2.9 (1.05)	3.0* (0.44)
25-28	20	1.9 (0.38)	2.9 (0.58)	2.3* (0.59)
29-32	16	2.1 (0.43)	3.0 (0.59)	2.6 (0.56)
33 years or older	8	2.0 (0.49)	2.8 (0.53)	2.3 (0.51)
Hours Per Week Working		p=0.24	p=0.90	p=0.23
1-24	11	2.0 (0.48)	2.9 (0.60)	2.5 (0.80)
25-32	15	1.9 (0.29)	3 (0.74)	2.5 (0.46)
33-40	23	2.1 (0.42)	2.9 (0.67)	2.6 (0.58)
40+, Other	9	1.8 (0.39)	3.1 (0.46)	2.2 (0.40)
Practice Setting		p=0.43	p=0.27	p=0.20
Privately-owned single	29	2.1 (0.42)	2.8 (0.70)	2.7 (0.64)
Privately-owned group	13	2.0 (0.31)	3.2 (0.48)	2.4 (0.37)
Corporate	8	1.9 (0.37)	3.1 (0.78)	2.4 (0.65)
Nonprofit, FQHC, Specialty, or Other	8	1.8 (0.49)	2.9 (0.35)	2.3 (0.51)

Mean scores for those who did not use MI	N	Mean	SD
Beliefs/Intentions	3	2.6	0.67
Social Norms	3	3.2	0.29

Behavioral Control	3	3.1	0.76

Summaries are mean (standard deviation) with p-values calculated from a one-way Analysis of Variance (ANOVA). * indicates significant differences.

Statistical Methods:

Descriptive statistics were calculated and presented using mean (standard deviation) and n (%). Means were compared among groups using one-way Analysis of Variance (ANOVA). Statistical analyses were performed using SAS software, version 9.4 (SAS Institute Inc., Cary,

Table IV: Descriptive statistics for Theory of Planned Behavior Constructs: behavioral attitudes, social norms, and behavioral control.

Domain: Behavioral Attitudes	**1=Strongly Agree**	**2=Agree**	**3=Disagree**	**4=Strongly Disagree**	**5=Unsure**	**Mean (SD)**
I use motivational interviewing when communicating with patients. (Q9)	14 (24%)	41 (71%)	2 (3%)	0 (0%)	1 (2%)	1.8 (0.64)
I understand the basic ideas and principles of motivational interviewing. (Q10)	30 (52%)	28 (48%)	0 (0%)	0 (0%)	0 (0%)	1.5 (0.50)
Motivational interviewing is an effective behavioral counseling approach. (Q12)	24 (41%)	33 (57%)	1 (2%)	0 (0%)	0 (0%)	1.6 (0.53)
I think that the most effective way to motivate patients to change is by drawing on their own internal motivations. (Q15)	22 (38%)	30 (52%)	1 (2%)	0 (0%)	5 (9%)	1.9 (1.09)
I believe that a patient's own level of motivation for change is important. (Q16)	44 (76%)	14 (24%)	0 (0%)	0 (0%)	0 (0%)	1.2 (0.43)
I assess my patient's readiness for change. (Q17)	26 (45%)	28 (48%)	3 (5%)	0 (0%)	1 (2%)	1.7 (0.74)
I intentionally ask open-ended questions to my patients. (Q18)	15 (26%)	40 (69%)	0 (0%)	0 (0%)	3 (5%)	1.9 (0.85)
I intentionally recognize my patients' effort in changing their oral health habits. (Q19)	28 (48%)	29 (50%)	0 (0%)	0 (0%)	1 (2%)	1.6 (0.68)
My patients' lack of motivation for change is a significant frustration in my work. (Q20)	9 (16%)	24 (41%)	23 (40%)	0 (0%)	2 (3%)	2.3 (0.87)
Some patients need to be coerced or pressured to change. (Q23)	1 (2%)	16 (28%)	29 (50%)	9 (16%)	3 (5%)	2.9 (0.85)
Domain: Social Norms	**1=Strongly Agree**	**2=Agree**	**3=Disagree**	**4=Strongly Disagree**	**5=Unsure**	**Mean (SD)**
I tend to use the same approaches to patient education that my co-workers use. (Q24)	0 (0%)	21 (36%)	26 (45%)	3 (5%)	8 (14%)	3.0 (0.99)
There is limited support from my employer for integrating motivational interviewing into my work. (Q25)	3 (5%)	6 (10%)	31 (53%)	14 (24%)	4 (7%)	3.2 (0.90)
Domain: Behavioral Control	**1=Strongly Agree**	**2=Agree**	**3=Disagree**	**4=Strongly Disagree**	**5=Unsure**	**Mean (SD)**
I am a good reflective listener in working with patients. (Q11)	24 (41%)	32 (55%)	1 (2%)	0 (0%)	1 (2%)	1.7 (0.69)
I feel proficient and able to use motivational interviewing in my practice. (Q13)	19 (33%)	36 (62%)	2 (3%)	0 (0%)	1 (2%)	1.8 (0.68)
I feel the use of motivational interviewing has resulted in positive behavior change for my patients. (Q14)	16 (28%)	27 (47%)	1 (2%)	0 (0%)	14 (24%)	2.5 (1.51)
If a patient is not initially motivated, I do not think that I will be able to increase his or her motivation. (Q21)	2 (3%)	11 (19%)	36 (62%)	5 (9%)	4 (7%)	3.0 (0.84)
Some patients will never change regardless of how I interact with them. (Q22)	7 (12%)	31 (53%)	14 (24%)	4 (7%)	2 (3%)	2.4 (0.91)

Summaries are mean (standard deviation [SD]) or n (%). Means were calculated using 1=Strongly agree, 2=Agree, 3=Disagree, 4=Strongly disagree, 5=Unsure

SECTION 5

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SECTION 6

APPENDICES

Appendix A: Practical Applications

Motivational Interviewing (MI) is an evidence-based behavior change model useful to dental hygienists to change their patients' oral health behaviors. Dental diseases like periodontal disease and caries disease are largely preventable, and the profession of dental hygiene is rooted in disease prevention. The current literature on MI in dentistry is mixed and our study, to our knowledge, is currently the sole quantitative study that has investigated dental hygienists' MI use in clinical practice and their perceptions of MI's effectiveness. The vast majority of dental hygienists in our study use MI in clinical practice and strongly perceive MI to be effective in changing patient behaviors.

According to the Theory of Planned Behavior (TPB), dental hygienists' decision to act and use MI stems from their attitudes, social norms, and perceived behavior control. The results of our study support the TPB, as all three constructs were found to be associated with University of Minnesota (UMN) Dental Hygiene (DH) graduates' use of MI in the clinical environment. Overall, dental hygienists included in our study that used MI had positive attitudes, support in their clinical environment, high self-efficacy with regards to MI, which support the continued incorporation of MI into DH curricula. However, there were a few areas of disconnect, as dental hygienists' reported patients' lack of motivation for change as a significant work frustration and a decreased perception regarding whether or not MI has positively changed their patients' behaviors.

The qualitative data collected strengthened the study findings and provided insight on the barriers dental hygienists experience that negatively affect their ability to use MI in clinical practice. Time constraints was the most commonly reported barrier

dental hygienists experience in the clinical environment affecting dental hygienists' MI use in our study. Moving forward, future studies should explore "brief motivational interviewing" (BMI) content in DH curricula compared to traditional MI, because teaching BMI may help address time constraints that impede clinical dental hygienists' ability to use MI.

This study offers practical applications in determining dental hygienists' use of MI in clinical practice and their perceptions of MI's effectiveness in changing patient behaviors. We now know dental hygienists use MI, but they do experience barriers and report work frustrations that negatively affect their MI use, which may affect their long-term use of MI. This study can serve as foundational knowledge regarding dental hygienists' use of MI in clinical practice and be used to further develop DH curricula.

Appendix B: IRB Approval Letter

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Human Research Protection Program
Office of the Vice President for Research

Room 350-2
McNamara Alumni Center
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NOT HUMAN RESEARCH

April 14, 2020

Christine Blue

612-625-5954
bluex005@umn.edu

Dear Christine Blue:

On 4/14/2020, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	University of Minnesota Dental Hygiene Graduates Use of Motivational Interviewing in Clinical Practice and Their Perceptions of Motivational Interviewing's Effectiveness in Changing Patient Behaviors.
Investigator:	Christine Blue
IRB ID:	STUDY00009559
Sponsored Funding:	None
Grant ID:	None
Internal UMN Funding:	None
Fund Management Outside University:	None
IND, IDE, or HDE:	None
Documents Reviewed with this Submission:	• Survey Questions for Kelly Roger's Thesis Study, Category: Other; • Kelly Rogers' IRB Protocol Form for Thesis Study, Category: IRB Protocol; • Consent form for Kelly Rogers' Thesis Study, Category: Consent Form;

Significant restrictions regarding the continued conduct of all research with human participants are now in place. Guidance, including what must be reported to the IRB as a result of these restrictions, is available at Frequently Asked Questions: COVID-19 and Human Research.

Guidance is updated frequently and you are encouraged to visit the FAQ website daily.

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The IRB determined that the proposed activity is not research involving human subjects as defined by DHHS and FDA regulations. To arrive at this determination, the IRB used "WORKSHEET: Human Research (HRP-310)." If you have any questions about this determination, please review that Worksheet in the HRPP Toolkit Library and contact the IRB office if needed. Please remove the IRB out of study contact information from the consent form as this research is not subject to IRB oversight.

Ongoing IRB review and approval for this activity is not required; however, this determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether IRB review is required, please submit a Modification to the IRB for a determination.

Sincerely,

Bri Warner
IRB Analyst

Appendix C: Invitation Email Letter

SCHOOL OF DENTISTRY
UNIVERSITY OF MINNESOTA
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DENTAL HYGIENE

Dear Colleague,

Hello and Greetings from the Division of Dental Hygiene!

I am reaching out to you because you are alumni of the University of Minnesota Dental Hygiene Program. I am conducting a study for my thesis and am asking you to take part in the study by completing a 5-minute electronic survey.

The survey does not require you to identify yourself. At the end of the survey, you can choose to be entered into a random drawing to win a pair of Apple Airpods.

Thank you for taking the time to complete this brief survey and I sincerely appreciate your support!

Link to Survey

***Please complete the survey by: July 3rd, 2020**

Thank you,

Kelly Rogers RDH, BSDH, RF
MSDH Clinical Teaching Assistant

Appendix D: Informed Consent

You are being asked to take part in a survey to determine your use of motivational interviewing (MI) in clinical practice and your perceptions of MI's effectiveness with regard to behavior change. You were selected because you graduated from the University of Minnesota (UMN) School of Dentistry (SoD) Bachelor of Science Dental Hygiene program between the years 2010-2019. The results of this survey will be used to enhance understanding of MI use in clinical practice by oral health providers and aim to improve Dental Hygiene curricula. This study is being conducted by a Master of Science Dental Hygiene student at the University of Minnesota School of Dentistry. Before you decide to participate in this study, it is important to understand why the research is being conducted and what it will involve. Please read the following information provided below carefully and contact the principal investigator with any questions. You can obtain the full consent document here: Consent form. Your participation in this study is completely voluntary. If you decide to participate, please select "Yes" below and begin the study survey. Thank you for your participation.

I agree to participate in this study:

Yes

No

→

Appendix E: Survey

Q1. What year did you graduate from the University of Minnesota School of Dentistry Bachelor of Science Dental Hygiene program?

- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019

Q2. Did you graduate from the University of Minnesota School of Dentistry as a dual-degree provider (Dental Hygienist/Dental Therapist)?

- Yes
- No

Q3. Please enter your age.

- Age (in years):
- Prefer not to answer

Q4. Please select your sex assigned at birth.

- Male
- Female
- Prefer not to answer

Q5. What racial or ethnic background do you **most** identify with?

- White or Caucasian
- Black or African American
- Asian
- Hispanic
- American Indian
- Pacific Islander
- Other
- Prefer not to answer

Q6.

Are you **currently** working in clinical practice as an oral health provider?

- Yes
- No
- Furloughed from clinical practice due to Covid-19

→

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Q7. How many hours per week do you **currently** work in clinical practice as an oral health provider?

- 1-8 hours
- 9-16 hours
- 17-24 hours
- 25-32 hours
- 33-40 hours
- 40+ hours
- Other:

Q8

Which **most** describes your current practice setting as an oral health provider?

- Privately-owned single practice
- Privately-owned group practice
- Corporate practice
- Nonprofit community practice
- FQHC
- Specialty practice
- Other:

→

The following questions are specific to motivational interviewing.

"**Motivational interviewing** is a directive, patient-centered counseling style for eliciting behavior change by helping clients to explore and resolve ambivalence. It is a practical, empathetic process that takes into consideration how difficult it is to make life changes."

Q9.

I use motivational interviewing when communicating with patients.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q10.

I understand the basic ideas and principles of motivational interviewing.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q11.

I am a good reflective listener in working with patients.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q12. Motivational interviewing is an effective behavioral counseling approach.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q13.
I feel proficient and able to use motivational interviewing in my practice.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q14. I feel the use of motivational interviewing has resulted in positive behavior change for my patients.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q15. I think that the most effective way to motivate patients to change is by allowing them to talk about on their own internal motivations.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q16.

I believe that a patient's own level of motivation for change is important.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q17. I assess my patient's readiness for change.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q18.

I intentionally ask open-ended questions to my patients.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q19.

I intentionally recognize my patients' effort in changing their oral health habits.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q20. My patients' lack of motivation for change is a significant frustration in my work.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q21. If a patient is **not** initially motivated, I do **not** think that I will be able to increase his or her motivation.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q22.

Some patients will never change regardless of how I interact with them.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q23. Some patients need to be coerced or pressured to change.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q24. I tend to use the same approaches to patient education that my co-workers use.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q25. There is limited support from my employer for integrating motivational interviewing into my work.

- Strongly Agree
- Agree
- Disagree
- Strongly disagree
- Unsure

Q26. If you are **currently** using motivational interviewing in clinical practice, to what extent are you using it?

- Every patient
- More than half of the patients I see daily
- At least once each day, but with fewer than half of the patients I see daily
- Less than daily, but once or more each month
- Other:

Q26. If you are **currently** using motivational interviewing in clinical practice, to what extent are you using it?

- Every patient
- More than half of the patients I see daily
- At least once each day, but with fewer than half of the patients I see daily
- Less than daily, but once or more each month
- Other:

Q27.

If you are **not** currently using motivational interviewing in clinical practice, what other patient counseling strategies do you use to change your patients' behaviors?

Q28. What barriers do you encounter that affect your use of motivational interviewing in clinical practice?

→