

# **Integrating Ultrasonic scaling at ABC Pediatric Dental Group in Winnipeg, Manitoba**

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## **ABSTRACT**

**Introduction:** ABC Pediatric dental group opened its door 15 years ago serving children under the age of 18 in Winnipeg and surrounding areas. Handscaling has been the primary form of scaling employed by dental providers to clean patients' teeth at ABC dental. In order to keep up with technological advancements, solve existing time management issues, resolve dental provider concerns and fulfil the comprehensive needs of patients, the introduction of power scaling (ultrasonic) had become necessary.

**Data Collection:** Thirteen dental providers including dentists and dental hygienists responded to a short survey designed to analyze their preference for including ultrasonic scaling in conjunction with handscaling to provide comprehensive patient care. Survey results revealed that 84.6% of respondents agree that a power scaler makes the dental hygiene visit time efficient and causes less fatigue to dental providers thus decreasing the risk of musculoskeletal injuries. Additionally, Informational interviews of ABC dental clinical staff disclosed that 80% of clinicians have used power scaler at some point in their career and will use it if it is implemented in the practice. A literature review of secondary research sources confirmed that clinical outcomes of dental hygiene treatment are not dependent on the type of instrument (hand vs ultrasonic scaling) but rather on the provider and patient discretion.

**Results:** The primary and secondary research concludes that ultrasonic is a valuable tool to use as an adjunct to handscaling while providing dental hygiene care. The addition of ultrasonic will reduce the risk of musculoskeletal injuries to dental providers and decrease the treatment time without compromising the quality of care.

**Recommendations:** My recommendation is to install the ultrasonic scaler in every dental hygiene operatory. A one-month trial run can be completed at the current time allocated for appointments. An evaluation can be done after one month to add an additional patient to start recouping the cost of

adding an ultrasonic scaler. Any future repairs and cost of changing tips for ultrasonic scalers can be adjusted from the profit of seeing additional patients.

## **I. INTRODUCTION**

### **A. Background and description**

Registered Dental Hygienists (RDH) are licensed, oral health professionals who focus on preventing and treating oral disease. RDHs use a variety of tools to remove plaque, calculus, and stains from teeth to improve oral health and prevent disease. Primarily, RDH employs two types of scaling: hand and ultrasonic scaling. Handscaling refers to manual scaling performed by hand to scrape teeth to remove plaque and calculus from teeth. Ultrasonic scaling (power scaling) is a water scaler that blasts plaque and calculus mechanically with high vibrational energy. Handscaling is the traditional method that requires physical strength to scrape the teeth with a metal instrument. Alternately, ultrasonic scaling is a power-driven scaling device that requires gently holding the scaler against the tooth and the vibration produced by the scaler cleans the teeth.

ABC pediatric dental group opened its door 15 years ago welcoming birth to 18 years of age children from Winnipeg and surrounding areas. Currently, the dental group has 4 dental hygienists and 6 dentists that strive to provide the highest standard of care to patients. ABC dental group only uses handscaling for cleaning teeth. As the practice grew over the years, a significant majority of patients over 14 years of age required alternative method to clean teeth to provide comprehensive care.

### **B. Purpose of the Report**

Dental cleanings are done manually by hand resulting in several inefficiencies at the ABC dental group. These inefficiencies include time management issues as hand scaling takes a long time, painful experience for an older patient who needs enhanced therapy, special needs patients who allow limited working time, and musculoskeletal problems for the dental hygiene care provider. This report aims to evaluate the feasibility of implementing ultrasonic scaling in conjunction with hand scaling at a Pediatric Dental Group in Winnipeg, Manitoba to reduce the above-described inefficiencies.

**C. Intended Audience**

The report is prepared for Johan Schalkwyk, Faith Faye, Dr. Amir, Dr. Mangat, Dr. Yve, Dr. Abdugar, Dr. Shah and Dr. Sandhu respectively.

**D. Method of Inquiry:**

Thirteen dental providers including dentists and dental hygienists responded to a short survey designed to analyze their preference for including ultrasonic scaling in conjunction with handscaling to provide comprehensive patient care. An analysis of potential costs and revenue is performed to determine the feasibility of implementing ultrasonic scaling. In addition, interviews are conducted with the management to assess their preference to implement ultrasonic scaling. Lastly, a detailed literature review is conducted regarding handscaling Vs ultrasonic scaling.

**D. Limitations of the study**

The small and convenient sample size of survey respondents is a major limitation of the study. Further, an informational interview is subject to the respondent's bias. Secondary research sources also have various limitations that may affect the result of this report.

**E. Scope of the Inquiry**

This report covers 8 topics: what are the benefits of ultrasonic water scaling to the patient and dental hygienist, what are the benefits and constraints to office management, what is the cost of an ultrasonic water scaler, will there be an added cost to maintain an ultrasonic scaler, what are the different types of ultrasonic scalers available in the market, does the staff need additional training to use ultrasonic water scaler, can ultrasonic scaler makes dental hygiene visits more efficient and profitable, when will the ultrasonic scaler pay for itself.

**F. Conclusion of the Inquiry**



The report concluded that the addition of an ultrasonic scaler is a feasible option and will benefit the staff of ABC dental practice and the management.

## **II. PLAN**

### **A. COMPARE AND CONTRAST ULTRASONIC AND HANDSCALING**

#### **1. Pros and cons of ultrasonic scaling and handscaling to provider, patient and management.**

Ultrasonic scalers were initially introduced in 1950 (Ontario Dental Hygiene Association, 2020). Increased research on the effectiveness of ultrasonic scaling and its improved technology led to a paradigm shift to ultrasonic scaling becoming a predominant treatment modality for nonsurgical periodontal therapy (Ontario Dental Hygiene Association, 2020).

For dental providers, the advantages of ultrasonic scaling are less provider hand/wrist fatigue and risk of musculoskeletal injury, shorter treatment time as compared to handscaling with similar clinical outcomes, water lavage washes away debris from under the gums, less need for rinsing the teeth, and less chance of provider injury because there are no cutting edges on the tips used by ultrasonic scaler (Ontario Dental Hygiene Association, 2020).

Disadvantages of ultrasonic scaler include root roughness caused by ultrasonic scaler if the dental provider is not using the correct angle and the production of contaminated aerosols (Ontario Dental Hygiene Association, 2020).

The advantages of handscaling are no aerosol contamination as it became a staple of dental hygiene practice during covid 19 pandemic (Ontario Dental Hygiene Association, 2020).

The disadvantages of handscaling are that it takes longer to clean teeth and the risk of hand/wrist injury to the dental provider due to repetitive motion(Ontario Dental Hygiene Association, 2020).

The patient can also benefit from ultrasonic scaling as it is comfortable and less time-consuming. Disadvantages may include teeth sensitivity by ultrasonic scaler depending on the patient's oral condition.

The advantage to the management to add ultrasonic scaling is efficient time management that can result in reduced appointment times and the ability to see the additional patient. Disadvantages include the cost of purchasing the ultrasonic units for operatories.

**Types of ultrasonic scalers (Magnetostrictive and piezoelectric).**



Figure 1: Ultrasonic Unit (Magnetostrictive)

Source: Magnetostrictive scaler units (ultrasonic units) (n.d.). Retrieved July 19, 2022, from Wise Dental Repair website: <https://www.wisedentalrepair.com/product/magnetostrictive-scaler-units-ultrasonic-units-repair/>



Figure 2: Piezoelectric unit

Source: Woodpecker dental piezoelectric ultrasonic scaler handpiece UDS-P LED HW-5L EMS (110V). (n.d.). Retrieved July 19, 2022, from Canadawidedental.com website: <https://canadawidedental.com/product/woodpecker-dental-piezo-electric-ultrasonic-scaler-hand-piece-uds-p-led-hw-5l-ems-110v/>

Magnetostrictive and piezoelectric are two types of power scalers used while delivering dental hygiene care. Both have been clearly proven to be effective for plaque, calculus and stain removal. The differences lie in how the two devices function. Magnetostrictive power scalers (Figure 1) operate at an optimal frequency of 20 kHz to 40 kHz, whereas piezoelectric power scalers (Figure 2) operate at a slightly higher optimal frequency of 29 kHz to 50 kHz (Sebero & Kelly, 2016). In magnetostrictive scalers, energy is converted to vibrations from the elliptical stroke patterns of the unit's metal rod or stack of metal sheets (Sebero & Kelly, 2016). All surfaces of the tip are active in the removal of debris (Sebero & Kelly, 2016). For the piezoelectric scaler, strokes occur in a linear pattern via crystals activated by the ceramic handpiece. Only the lateral sides are effective in the removal of debris (Sebero & Kelly, 2016).

## B. BUDGET

### 1. Cost

Magnetostrictive unit range from \$1500- \$2000 Canadian dollars depending on the features and Piezoelectric unit range from \$800- \$1500 (“Sinclair dental, “n.d.). The cost of purchasing tips is similar for both units (“Sinclair dental, “n.d.).

## **2. Training**

Complimentary lunch and learn can be arranged with the supplier to train the staff on the use of the units (“Sinclair dental, “n.d.). Dental Hygienists and dentists are often familiar with the units' operation as they have used them during their education or other training.

## **3. Additional maintenance of ultrasonic scalers**

These units do not require additional maintenance as long the manufacturer recommendations are followed and the units are flushed with water before use first thing in the morning and in between patients. New units also have a warranty for future issues (“Sinclair dental, “n.d.). Tips need to be purchased for units depending on the wear and tear of the existing tips. Typically, tips are ordered every 6-12 months for a high-volume office

## **C. REVISED RECARE SYSTEM**

### **1. Plan to redesign the dental hygiene recare system.**

ABC Dental bills one unit of scaling (15 minutes of time) at the rate of \$ 60. Generally, each appointment is booked for 30-60 minutes. 30-minute appointments often have ½ to 1 unit of scaling billed, the 45-minute appointment has 1-2 units of scaling and the 60-minute appointment has 2.5 or 3 units of scaling. Dental hygiene appointments often run behind when back-to-back 30-minute appointments are scheduled especially when the patient tends to need more scaling than anticipated since their last cleaning. This can be quickly resolved by adding a power scaler as it will decrease the treatment time. 60-minute appointments can also be shortened to 45 minutes with the addition of a

power scaler. This decrease in appointment time can open up additional time slots to see an extra patient to counteract the cost of adding a power scaler unit. This will not decrease the quality of service provided and will also be comfortable for dental providers. It can be foreseen that the ultrasonic scaler can pay for itself in 4 months.

## D. DATA SECTION

### 1. Eligibility Criteria

Surveys are completed by practicing dentists and dental hygienists anonymously. Secondary research included is level 1 and level 2 evidence which consists of systematic reviews and randomized controlled trials.

### 2. Analyze survey results and informational questions

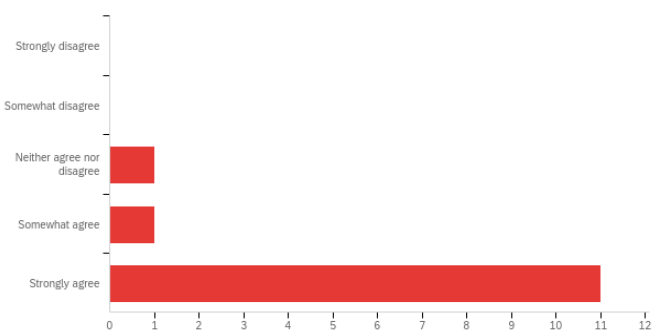


Figure 3: Power scaler makes the dental hygiene visit time efficient

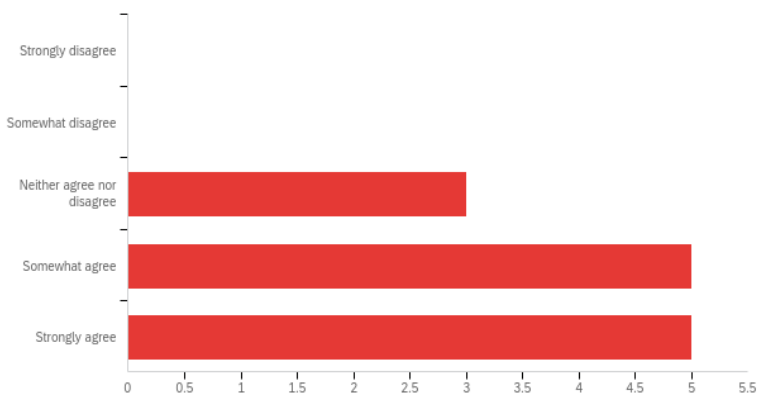


Figure 4: Power Scaler enhance patient comfort as compared to handscaling during dental hygiene care.

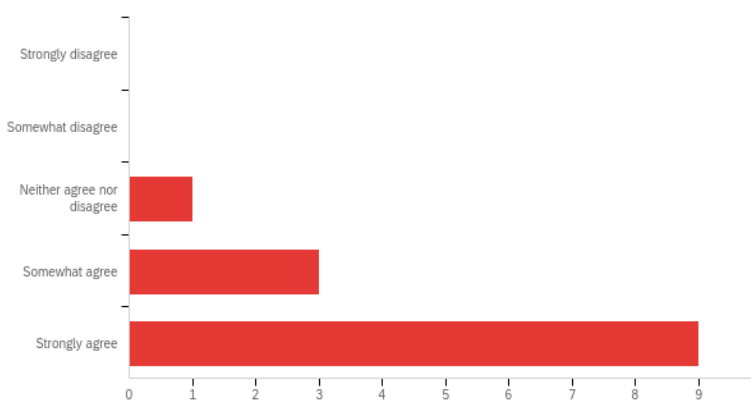


Figure 5: Power scaler cause less fatigue to dental providers as compared to handscaling.

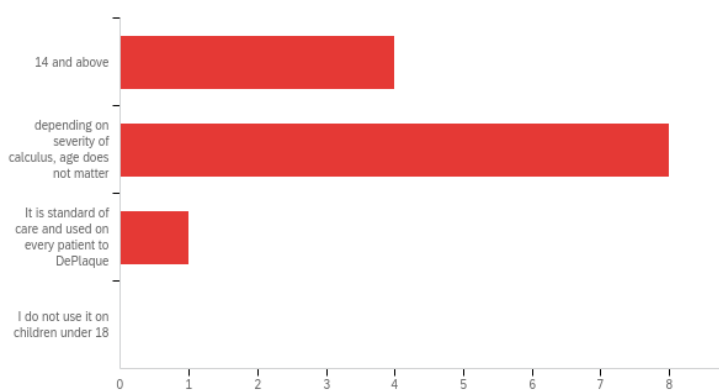


Figure 6: The use of a Power Scaler is directly related to the severity of calculus on teeth instead of the patient's age.

Survey results revealed that 84.6% of respondents agree that a power scaler makes the dental hygiene visit time efficient. 61.5 % cumulatively agree that power scalers enhance patient comfort during dental hygiene care. 84.6% agree that power scalers cause less fatigue to dental providers thus decreasing the risk of musculoskeletal injuries. Further, 61.5% agree that the use of a power scaler is directly related to the severity of calculus on teeth instead of age for most clinicians. Survey results also showed a preference for the ultrasonic unit over the piezoelectric unit by dental providers. These statistics confirm that dentists and dental hygienists prefer to use power scalers in conjunction with handscaling while providing dental hygiene care.

Additionally, Informational interviews of ABC dental clinical staff revealed that 80% of clinicians have used power scaler at some point in their career and will use it if it is implemented in the practice. The remaining 20% of staff will not use an ultrasonic scaler and will prefer to hand scale.

ABC management revealed that being a pediatric practice they did not think that the addition of ultrasonic is necessary but they are willing to see if this addition can resolve time management issues.

### **3. Analyze secondary sources**

Suvan et al. (2019) concluded that the removal of calculus is important while providing dental hygiene care irrespective of the type of instrument or mode of delivery.

When instrumenting on a patient with heavy calculus deposits, dental hygienists use additional strength and lateral pressure for controlled function during hand scaling. Åkesson, Balogh, & Hansson, (2012) suggest ultrasonic scalers as a prevention method to minimize the load from hand-scaling and can decrease the risk of musculoskeletal injuries.

Sanz et al. (2020) recommended that the choice of instrument should be based upon the experience, skills, and preference of the clinician together with client preference.

Johnston et al. (2020) concluded that ultrasonic instrumentation resulted in shorter treatment time compared to handscaling with similar clinical outcomes.

## **E. LIMITATIONS OF SURVEY AND STUDIES**

### **1. Limitations of primary research sources**

The limitation of the surveys is the small sample size of respondents and lack of time to administer surveys. The informational interview may also present respondent bias as the answers may be affected by the interviewer's position in the company. It can also be subjected to sampling bias as the only sample chosen was readily available and may not be representative.

### **2. Limitation of secondary research studies**

Limitations of secondary research include that several of the relevant studies included in the systematic review of "Suvan et. al." was conducted before the development of instruments available today. The parameter to be included in the systematic review was not consistently followed as it did not represent the PICO question. Sanz et al (2020) declared a major conflict of interest which exposed them to researcher bias by receiving funding, researcher and consultant fees to conduct their research. The inclusion of non-randomized observational studies in the research also increased the risk of bias and confounding, and cannot be used to demonstrate causality. Åkesson, I., Balogh, I., & Hansson (2012) had a very small sample size of 12 dental hygienists to conduct their research. An observational and objective method to score pain and discomfort was used which may reflect researcher and respondent bias. Johnston et al., 2020 research was funded were Dentsply Sirona, a manufacturer of ultrasonic scalers in North America.



## CONCLUSION

### 1. Summary and interpretation of findings

Dental Hygienists are primary health care providers who mainly use manual (handscaling) and power instrumentation (ultrasonic scaling) to clean patients' teeth. Dental providers at ABC pediatric dental group employs handscaling only to clean patients' teeth. This has resulted in several inefficiencies such as time management issues as hand scaling take a long time, painful experience for an older patient who needs enhanced therapy, special needs patients who allow limited working time, and musculoskeletal problems for the dental hygiene care provider. The purpose of this report is to evaluate the feasibility of integrating ultrasonic scaling which is a form of power instrumentation at ABC pediatric dental group located in Winnipeg, Manitoba. In short, primary and secondary research concludes that ultrasonic is a valuable tool to use as an adjunct to handscaling while providing dental hygiene care. The addition of ultrasonic will reduce the risk of musculoskeletal injuries to dental providers and decrease the treatment time without compromising the quality of care. It further reiterates the fact that clinical outcomes of dental hygiene treatment are not dependent on the type of instrument (hand vs ultrasonic scaling) but rather on the provider and patient discretion. The clinical and non-clinical staff of ABC dental practice will also appreciate the implementation as it will resolve the ongoing time management issues and also will pay for the ultrasonic scaler by adding an additional patient to the dental provider schedule. Further, it will also help in decreasing the amount of overtime paid to the staff by running appointments on time. Patients will also appreciate this as they are provided with more than one option for their dental

hygiene therapy. Time off requests due to repetitive motion injuries by the dental staff will also be reduced.

### **1. Recommendations**

My recommendation is to install the ultrasonic scaler in every dental hygiene operatory. One portable unit should also be placed in the dental assistant treatment area so dentists can also benefit from it if the need arises. A one-month trial run can be completed at the current time allocated for appointments. An evaluation can be done after one month to add an additional patient to start recouping the cost of adding an ultrasonic scaler. Any future repairs and cost of changing tips for ultrasonic scalers can be adjusted from the profit of seeing additional patients.

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<https://doi.org/10.1111/jcpe.13342>

**GLOSSARY**

<b>Term</b>	<b>Definition</b>
Adjunct	In addition to
Calculus:	Hardened or calcified dental plaque.
Clinical Outcome	The measure that reflects the end result.
Comprehensive Care	Care is based on the patient's needs.
Contaminated Aerosols	Droplets produced by ultrasonic during dental cleaning.
Cutting Edges	Sharp sides of a manual dental instrument.
Debris	Plaque, calculus, or stain on the teeth.
Enhanced Therapy	Modern Care.
Instrumentation	Type of dental tool to clean teeth.
Musculoskeletal Injury	Injury caused by repetitive motion. For example, Carpel tunnel syndrome.
Non-surgical periodontal therapy	Cleaning under the gums to clean roots of the teeth.
PICO Question	Specific question asked and answered in research studies based on population, intervention, comparison and outcome of the research.
Plaque	Sticky colourless soft layer of bacteria on the teeth.

Scaling: Removal of plaque, calculus or stain from teeth by using metal or power instruments.

Scaling Unit 15 minutes of dental hygienist time while scaling.

Stain Pigmented residue on teeth, can be black, brown or yellow.

Subgingival Cleaning performed under the gums by the dental provider or root surface of the teeth.

Supragingival Cleaning performed above the gums by a dental provider or surface above the gums.

**APPENDIX 1****Information interview questions for clinicians:**

Q1: Have you used ultrasonic scaling?

Q2: Do you prefer ultrasonic scaling?

Q3: Do you prefer Handscaling?

Q4: If provided with an ultrasonic scaler, will you use it?

**Information interview with non-clinical staff**

Q1. Is there a need to add another form of scaling to handscaling?

Q2. Will there be interest if such an addition can resolve existing time management issues and generate profit while providing clinical dental hygiene care?