

**Waiting Room Time: An Opportunity for Caregiver Oral Health Education**

by

Randa Soussou

B.D.S., Jordan University of Science and Technology, 2001

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF  
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE

in

THE FACULTY OF GRADUATE AND POSTDOCTORAL STUDIES  
(Craniofacial Science)

THE UNIVERSITY OF BRITISH COLUMBIA

(Vancouver)

December 2017

© Randa Soussou, 2017

## **Abstract**

The UBC Children's Dental Program (CDP) has provided free basic dental treatment for high caries risk children, from marginalized populations, since the mid-1970s. Children are referred to the program by Health Authority Staff in metro Vancouver. Treatment is provided by senior dental students under the supervision of UBC Pediatric Dentistry instructors. However, the students have limited time to provide health education to the accompanying caregivers. Therefore, this project developed a "waiting-room based" dental health education program (DHEP) to engage the caregivers of participating children. Our main objectives were to assess the feasibility and acceptability of the DHEP and its short term effectiveness in changing parental dental health related behaviours.

A situational analysis using structured interviews was performed with the caregivers and other stakeholders of the CDP: Health Authority Staff, UBC Pediatric Dentistry instructors and participating dental students. After the assessment of caregivers' dental knowledge, dental behaviours, attitudes as well as preferences about a dental educational program, the DHEP was developed and implemented in the waiting rooms at UBC's two children's dental clinics. Follow-up phone calls with the caregivers assessed their short term self-reports of changes in dental health related behaviours. Comparisons before and after being exposed to our DHEP were made using Chi-square tests; significance was set at  $P < 0.05$ .

Of the 80 caregivers who received the DHEP, the follow-up rate was 81% (67/80). Significant increases in proportions (from 12% to 79%) of caregivers brushing their children's teeth and brushing before bed (54% to 85%) were self-reported. An improvement in caregiver-reported child's snacking habits was also observed. Decreases (from 93% to 69%) in giving children sugar-

containing beverages and in consuming sugar-containing foods as snacks (from 94% to 31%) were also noted.

A caregiver-centred DHEP implemented in the waiting rooms of UBC's dental clinics proved to be a feasible strategy for oral health education. The program was well-accepted by the caregivers, who reported significant short-term improvements in their children's dental health behaviours. Therefore, appropriate oral health education provided to caregivers in the waiting room is a recommendation for the CDP.

## **Lay Summary**

For several decades, the UBC Children's Dental Program has provided free treatment to low income children who need extensive dental work. Dental students, who provide the treatment, have limited time to provide health education to the accompanying caregivers. The present work aimed to assess the feasibility, acceptability and short term effectiveness of a dental health education program (DHEP) that engaged caregivers in the waiting room.

To help assess the caregivers' dental knowledge and home care behaviours for their children, interviews were performed with the caregivers, Health Authority staff, UBC Pediatric Dentistry instructors and dental students. The DHEP, developed and delivered in the waiting rooms, featured face-to-face dental counselling sessions. Each caregiver set personalized goals for changing their child's dental health related behaviours; their success was then assessed through follow-up phone calls. Our DHEP was feasible and well-accepted by the caregivers, who reported improvements in their children's toothbrushing and snacking habits.

## **Preface**

This dissertation is an original intellectual product of the author, R. Soussou. The project and methods were approved by the University of British Columbia Research Ethics Board (H13-03440).

A version of the material in this dissertation is published in Canadian Journal of Public Health Vol.108, No.3, 2017.

## Table of Contents

<b>Abstract.....</b>	<b>ii</b>
<b>Lay Summary .....</b>	<b>iv</b>
<b>Preface.....</b>	<b>v</b>
<b>Table of Contents .....</b>	<b>vi</b>
<b>List of Tables .....</b>	<b>ix</b>
<b>List of Figures.....</b>	<b>x</b>
<b>List of Abbreviations .....</b>	<b>xi</b>
<b>Acknowledgements .....</b>	<b>xiii</b>
<b>Chapter 1: Literature Review .....</b>	<b>1</b>
1.1    The Problem of Dental Caries in Children .....	1
1.2    Caries as a Process .....	2
1.3    Epidemiology of Caries in Canadian Children .....	3
1.4    Caries Risk Assessment .....	4
1.5    Interventions to Control Caries .....	6
1.5.1    Fluorides in Caries Control.....	7
1.5.1.1    Self-Applied Fluoride: Toothpastes and Rinses .....	7
1.5.1.2    Professionally-Applied Topical Fluorides: Varnishes and Gels .....	8
1.5.2    Dietary Modification and Feeding Practices.....	9
1.5.3    Other Strategies for Caries Prevention .....	10
<b>Chapter 2: UBC Children’s Dental Program: Need for a Preventive Program.....</b>	<b>12</b>
<b>Chapter 3: Waiting Room as a Venue for Health Promotion.....</b>	<b>14</b>
<b>Chapter 4: Theories for Behavioural Interventions.....</b>	<b>16</b>

4.1	Social Cognitive Theory .....	16
4.2	Self-Efficacy Theory .....	16
4.3	Adult Learning Theory .....	17
4.4	Transtheoretical Model (Stages of Change Theory) .....	18
4.4.1	Motivational Interviewing (MI) .....	19
4.5	PRECEDE-PROCEED Model (Planning Model) .....	20
<b>Chapter 5: Research Question and Objectives .....</b>		<b>22</b>
5.1	Research Problem .....	22
5.2	Research Question .....	22
5.3	Study Objectives .....	22
<b>Chapter 6: Material and Methods.....</b>		<b>24</b>
6.1	Preparation Phase (PRECEDE Component of the PRECEDE PROCEED Model) .....	25
6.1.1	Situational Analysis .....	26
6.1.2	Designing the Program .....	27
6.2	Implementation Phase 2: Dental Health Education Program (DHEP) .....	28
6.3	Program Evaluation Phase 3: Evaluation of Caregiver DHEP .....	29
<b>Chapter 7: Results .....</b>		<b>31</b>
7.1	Preparation Phase 1:.....	31
7.1.1.	Situational Analysis: Summary of Counts UBC CDP Treatment Procedures.....	31
7.1.2.	Situational Analysis: Interviews with Caregivers.....	32
7.1.3.	Situational Analysis: Interviews with Stakeholders of the UBC CDP .....	33
7.2	Implementation Phase 2: Caregiver Dental Education Program .....	37
7.3	Evaluation Phase 3: Evaluating Caregiver Dental Education Program .....	39

<b>Chapter 8: Discussion .....</b>	<b>43</b>
8.1    Limitations .....	48
8.2    Recommendations for Future Studies .....	51
<b>Chapter 9: Conclusions .....</b>	<b>52</b>
<b>References .....</b>	<b>53</b>
<b>Appendix A: Brief Introduction- Part1 .....</b>	<b>62</b>
<b>Appendix B: Caregiver Consent .....</b>	<b>63</b>
<b>Appendix C: Caregiver Questionnaire .....</b>	<b>69</b>
<b>Appendix D: Health Authority Staff Questionnaire .....</b>	<b>78</b>
<b>Appendix E: Instructors' Questionnaire .....</b>	<b>79</b>
<b>Appendix F: DMD's Questionnaire .....</b>	<b>81</b>
<b>Appendix G: Caregiver-Centred Power Point Presentation .....</b>	<b>83</b>
<b>Appendix H: Brief Introduction- Part2.....</b>	<b>93</b>
<b>Appendix I: Pre-education Questionnaire .....</b>	<b>94</b>
<b>Appendix J: Post-education Questionnaire .....</b>	<b>97</b>



## List of Tables

Table 7.1 Aggregate Summary of Health Authority Staff Collaborative Suggestions .....	34
Table 7.2 Dental Students' Selected Comments about Challenges to Providing Oral Health Counselling to Caregivers .....	35
Table 7.3 Dental Students' Selected Ideas about How to Enhance the Prevention Component of UBC CDP.....	36
Table 7.4 Supervising Dental Instructors' Selected Comments .....	37

## List of Figures

Figure 6.1 Phases of the Study Guided by PRECEDE-PROCEED Model .....	25
Figure 6.2 The “Setting Goals” card given to caregivers for setting dental health-related goals for their child .....	29
Figure 7.1 An example of Individualized “Setting Goals” card a caregiver set for her child .....	39
Figure 7.2 Pre and Post intervention comparisons done only on complete data .....	42

## **List of Abbreviations**

AAP: American Academy of Pediatrics

AAPD: American Academy of Pediatric Dentistry

ADA: American Dental Association

APF: Acidulated Phosphate Fluoride

B.C.: British Columbia

CDA: Canadian Dental Association

CDA: Certified Dental Assistant

CDP: Children's Dental Program

CHMS: Canadian Health Measures Survey

CPP: Casein Phosphopeptide

DC: Douglas College

DHEP: Dental Health Education Program

ECC: Early Childhood Caries

MI: Motivational Interviewing

MS: Mutans streptococci

NaF: Sodium Fluoride

NSF: Nano Silver Fluoride

OHC: Oral Health Centre

PPM: Parts Per Million

RDH: Registered Dental Hygienist

SCT: Social Cognitive Theory

SDF: Silver Diamine Fluoride

SDH: Social Determinants of Health

SES: Socioeconomic Status

TTM: Transtheoretical Model

UBC: University of British Columbia

WHO: World Health Organization

## Acknowledgements

This research project would not have been possible without the support of many people.

I would like to express my sincere gratitude to all the people who contributed to the work described in this thesis.

First and foremost, I thank my supervisory committee for their continued support for my endeavors. It was a privilege and blessing to have you as my supervisors.

To **Dr. Jolanta Aleksejuniene**, my graduate supervisor, who was abundantly helpful and generous in her knowledge, support, energy and guidance throughout my graduate program.

To my supervisory committee members; **Dr. Rosamund Harrison**, thank you for your mentoring, expertise, insight, patience, endless enthusiasm and care. You helped me put complex ideas into simple terms. To **Dr. Komkham Pattanaporn**, for your support and encouragement.

To **Dr. Jim Frankish**, thank you for the eye-opening opportunity to community based research. I was fortunate to have the chance to learn from you.

I would like to thank all members of the UBC Division of Pediatric Dentistry, Health Authority dental staff, coordinator and manager of UBC Children's Dental Program, UBC 4<sup>th</sup> year dental students and participating caregivers. They provided friendly and cooperative atmosphere as well as useful feedback and insightful comments to my research. My project would not have been as successful without your support, participation and cooperation.

To my **family** and **friends**, for your encouragement, unyielding support and prayers. To my **parents** and my **parents-in-law**, you have supported me on every level. 'Thank You' just seems so inadequate. When I needed you, you were there, no questions asked. Thank you for believing in me.

To my husband **Hani**, you are my soul mate, my rock. Thank you for supporting every endeavor I have chosen to take on, and for encouraging and supporting me to pursue great things. There are no words that could bring justice to the depth of my gratitude for everything you have ever done. Thank you for having faith in me and for being my shoulder, my inspiration and the source of my strength. To my children, **Maya and Carla**, you are the most precious gifts God could have given me. Thank you for being such a great source of joy in my life, and thank you for your extraordinary understanding, thoughtfulness and countless sacrifices.

I am thankful to **God and Savior Jesus Christ** for all **He** has done for me and for **all** the blessings.....

## **Chapter 1: Literature Review**

A child's dental health means, to many of us, white straight teeth, a bright smile and no cavities. Indeed, a beautiful smile and shiny white teeth are compatible with a "cavity-free" mouth. Unfortunately, dental decay (dental caries) continues to be a problem for many children in our community especially those from marginalized populations. Access to dental care for children from these vulnerable populations is challenging and the cost of dental services are a burden for their families. In response, the UBC Children's Dental Program (UBC CDP) was established to provide free basic dental treatment to underserved low income children. In addition to definitive treatment, a preventive component is essential to sustain the overall long term oral health of those children. This project developed a "waiting-room based" dental education program for caregivers of those children. The thesis will begin with a literature review that examines the issue of caries in children, describes the UBC CDP program and details the model that we used to develop and evaluate the impact of the dental education program. This section will be followed by methods, results, discussion, recommendations and conclusions.

### **1.1 The Problem of Dental Caries in Children**

Dental caries may occur during or just after eruption of both primary and permanent teeth and, if not managed, may advance and progress (1). It can progress rapidly or slowly depending on a variety of factors. According to the 2007-2009 Canadian Health Measures Survey (CHMS), the mean number of decayed, missing or filled primary (dmft) and permanent (DMFT) teeth for 6–11 year old Canadian children was 2.5 (2). Thus, even though caries prevalence has declined over the past years, it is still a problem for child health. Once caries reaches cavitation in multiple teeth, oral function may be impaired. Furthermore, if appropriate and timely professional care is not

provided, a child may experience pain and discomfort interfering with the child's play, sleep, eating, mood, emotions and attention span, thus influencing quality of life (3). The consequences of caries affect children, their families, the community and the health care system. Caregivers may seek care for their children for pain management; such a quest may lead to hospital emergency departments and eventually the operating room, a stressful experience for both the family and the child. In addition, there will be indirect burden and cost, such as time-lost from normal activities whether it be days of school missed because of dental pain or time-taken away from work, by caregivers, to seek professional care, as well as cost associated with travel to dental care (3). Other clinical concerns may include food impaction and space loss in the molar region that may lead to crowding in the permanent dentition (3,4).

## 1.2 Caries as a Process

Dental caries is a dynamic and, in the right conditions, reversible process. Dental hard tissues (enamel, dentin) undergo destruction by acidic by-products from bacterial fermentation of dietary carbohydrates, particularly from in between-meal snacks and drinks or beverages containing sugars (1,5–7). The etiology of caries is multifactorial, and the presence of acidogenic bacterial dental plaque biofilm and carbohydrate-containing diet are conducive to caries initiation (5). Several bacterial species mainly mutans streptococci (MS) [*Streptococcus mutans* and *Streptococcus sobrinus*] and Lactobacilli species in a dynamic oral environment cause pH fluctuations in both saliva and dental plaque biofilms (5,8,9). As the pH is lowered, minerals (calcium and phosphate) diffuse out of the hard tooth tissues; this is known as demineralization (10–13). The pH fluctuations within dental plaque lead to a constant interchange of demineralization (loss of mineral) and remineralization (repair of mineral loss) cycles.



Remineralization can be facilitated by protective factors which include fluoride from extrinsic sources, saliva buffering, antibacterial agents and a healthy low sugar diet (10,11). Dental caries occurs when the dynamic balance between pathological factors that lead to demineralization and protective factors that lead to remineralization is disrupted.

Caries starts as noncavitated (macroscopically intact) lesions, but over time, and once the destruction process has progressed, early caries will eventually progress to cavitation (1,8). Caries may be influenced by several factors such as quality of saliva, ultrastructure of hard tissues, or possibly by genetics factors (5,14). Developmental deficiencies such as enamel anomalies or developmental enamel defects, such as hypoplasia also increase caries risk because teeth with defects have a higher risk to acid solubility and may also retain higher cariogenic bacterial load (15).

### 1.3 Epidemiology of Caries in Canadian Children

The prevalence of dental caries in children has declined over the last years in Western countries, including Canada, but it is still a child health concern (16,17). The 2007-2009 Canadian Health Measures Survey (CHMS), a province by province-wide dental survey, provides national estimates of the oral health status of Canadians, aged 6–79 years. The survey is representative of 97.0% of the general Canadian population. According to the CHMS, 56.8% of Canadian children, aged 6–11 years old, have had a history of dental caries in either the primary or permanent dentitions. Most importantly, the burden of dental caries is disproportionately distributed among children of lower socioeconomic status, Aboriginal children and new immigrants (2). Moreover, oral health

inequalities are commonly related to social determinants of health (SDH)<sup>1</sup>. Parental education and family income may play a role in child-related health outcomes. Other factors such as family structure, health behaviours, social environment, culture and ethnicity, all may also be caries determinants (19,20). Epidemiological caries studies reported that children from low-income families experience the most extensive oral disease and tend to seek dental services primarily for pain relief or acute dental problems (2,21,22). Caries prevalence is reported to be 89.0% among Aboriginal children<sup>2</sup> aged 6–11 years (2). Moreover, compared to the general Canadian population, new immigrant families likely have language barriers, less dental awareness, and a variety of cultural differences, all of which may act as barriers for seeking timely professional care (23). Indeed, a recent investigation of school-aged children in Vancouver revealed that a substantial proportion of these children had unmet dental treatment need (23). The study included six of Vancouver's inner-city elementary schools; every third child or 32.0 % needed restorative treatment on either their primary or permanent teeth (23). Higher treatment needs were found in the children who had recently immigrated to Canada (23).

#### 1.4 Caries Risk Assessment

The first step in designing a caries-prevention program for either an individual or a population is assessing caries risk. Evaluation of risk of a child is essential to understand those behaviours that increase the child's risk for caries and its progression in order to develop an appropriate plan for

---

<sup>1</sup> WHO defines Social Determinants of Health (SDH) as the circumstances in which people grow, live, work and age, as well as the systems implicated to attend to those circumstances and deal with illness (18).

<sup>2</sup> Indigenous Canadians are referred to as "Aboriginal" a "definition" that includes First Nation, Metis and Inuit peoples

caries management. It is well known that the main predictor of caries is socioeconomic status. Indeed, evidence suggests an inverse relationship between socioeconomic status (SES) and dental caries (24,25). More dental decay is seen among children from socioeconomically deprived communities than those from more affluent areas (26,27). According to the CHMS, lower income families have 3–4 times more unmet dental need than more affluent families (2). Socioeconomic disparities in caries rates may be due to many variables such as caregivers' education, sharing of utensils, consumption of foods and drinks containing sugars and other carbohydrates, bacterial transmission from caregivers to children, and limited home or professional caries preventive activities (19,27). According to the Canadian Dental Association (CDA) recommendation, “*A child may be at risk of early childhood tooth decay if one or more of the following conditions exist*” (28,29):

- A child resides in a non-fluoridated area where natural fluoride levels are < 0.3 ppm.
- A child has visible dental defects such as notches, cavities or white spot lesions in the primary dentition.
- A child frequently consumes sugar-containing foods or drinks including natural sugars between meals. This high caries risk associated behaviour includes use of a bottle or sippy cup filled with any liquid other than water or the consumption of sweetened medications.
- A special health care needs' child with limited cooperative abilities that may be challenging for a caregiver to provide proper oral care.
- Caregivers brush the child's teeth less than once a day.
- A prematurely born child with a very low birth weight < 1500 grams.
- Caregivers have dental caries.
- A child has visible dental plaque biofilm manifested as white/yellow deposits on teeth.

Therefore, it is essential to understand the child's caries risk and account for SDH-related factors when implementing risk-related management to improve oral health behaviours (19,30). Hence, a preventive approach must be tailored to each family's needs with the goal of establishing a preventive lifestyle to reduce the children's caries rates.

### 1.5 Interventions to Control Caries

Dental caries can often be managed before irreversible damage to dental hard tissue occurs. However, because of caries' multifactorial nature, prevention is a challenge, especially in at-risk vulnerable children (5,12). Dental caries in enamel is often first seen as small areas of subsurface demineralization that can be reversed at this early stage through meticulous oral home care and diet modification (11). Sustainable approaches should also be focused on primary prevention i.e. preventing new caries (31). Evaluation and monitoring of caries risk is essential for determining which behaviours increase a child's risk for disease and its progression (5,26). It should be possible to design a prevention to arrest dental caries by reducing demineralization, or reversing the disease process via facilitation of remineralization, and hence reducing the progression of caries to cavitation.

Current evidence recommends a "healthy" diet, use of fluoride and tooth brushing with fluoride toothpaste as protective factors against caries (26). Obviously, a child's health is dependent upon the practices and beliefs of their primary caregivers, i.e. parents who play an important role whether or not favourable habits related to oral hygiene and dietary practices are established and maintained in their children (32,33). Children imitate and are guided by their parents, so parental attitudes will facilitate the establishment of favourable habits in their children (34). A "parental guided" child oral health lifestyle should include regular oral hygiene routines such as tooth

brushing with fluoride toothpaste, regular dental visits, and maintenance of a healthy balanced diet that includes limited sugar-containing food and drink items in-between meals. This lifestyle should be considered one of the social determinants of oral health that if geared towards health may contribute to improvement of child oral health (19,30).

### 1.5.1 Fluorides in Caries Control

Fluoride has three main topical mechanisms for preventing the development and progression of caries and arresting its early stages. One mechanism is inhibition of bacterial metabolism by interference with enzyme activity in the bacteria. A second mechanism is reducing demineralization; fluoride renders the tooth less susceptible to mineral loss. The final mechanism is enhancing remineralization; fluoride adsorbs to the tooth surface and attracts calcium and phosphate ions for new mineral formation (33,35).

Fluoride has primarily a topical post-eruptive effect and less a systemic pre-eruptive effect in caries prevention (35,36). Topical fluoride delivery to a tooth surface is achieved through use of fluoride toothpaste, fluoride rinses, and professional application of fluoride varnish or gel, as well as water fluoridation.

#### 1.5.1.1 Self-Applied Fluoride: Toothpastes and Rinses

Fluoride containing toothpaste may delay or arrest progression of caries and is the most widely used method of delivering topical fluoride to tooth surfaces (28,37,38). Significant caries reduction at surface, tooth and individual levels has been observed from toothbrushing with fluoride ion concentration from 1,000 to 1,500 parts per million (ppm) (38,39). Caregivers brushing their children's teeth or close parental supervision of children when they brush their teeth

themselves is necessary to ensure an appropriate amount of fluoride toothpaste and to minimize the risk of swallowing too much fluoride. The goal is to achieve a balance between the benefits of fluoride and the risk of developing fluorosis (28,38). Dental professionals should educate caregivers by using visual aids and actual demonstrations to help ensure that children's teeth are brushed twice daily with an appropriate amount of fluoride toothpaste. The Canadian Dental Association (CDA) has provided guidelines how to optimize the benefits of fluoride while minimizing the risk of developing dental fluorosis (28,40).

Another effective homecare preventive measure for at-risk individuals is the use of low concentration fluoride mouth rinses; these solutions contain calcium, phosphate, fluoride (as monofluorophosphate and ionic fluoride) (36). Daily rinsing with over-the-counter 0.05% sodium fluoride NaF (226 ppm F) or once a week/once every two weeks rinsing with prescription-filled 0.2% NaF (900 ppm F) are effective especially when combined with fluoride containing toothpaste (37,41). However, mouth rinse use is not recommended for children younger than 6 years (28,40).

#### 1.5.1.2 Professionally-Applied Topical Fluorides: Varnishes and Gels

In addition to homecare and home applied fluoride, professionally applied fluorides are helpful for children. High fluoride concentration agents such as fluoride varnishes and fluoride gels are available. Clinical trials have demonstrated that either regimen, in conjunction with toothbrushing and nutritional counselling, to be effective in reducing caries incidence especially in high-risk population (42). Fluoride varnish is a resin or synthetic base product with high fluoride concentration; the most commonly used in practice is 5.0% sodium fluoride (NaF). It is applied to the teeth, ensuring enhanced contact between fluoride and enamel as well as slow release of fluoride. Fluoride varnish is well tolerated by children, even very young children.

A 2-year randomized controlled trial tested the efficacy of fluoride varnish in reducing caries incidence and promoting the remineralization of non-cavitated lesions in a population of Aboriginal children in northern Ontario. Results supported the use of fluoride varnish at least twice a year supplemented with caregiver counselling (43). Indeed, a current systematic review of evidence-based clinical recommendations for caries management supports the application of twice yearly fluoride varnish for children in the high- and medium-caries-risk populations (42).

Fluoride gel is a high fluoride concentration gel that should be differentiated from fluoride toothpastes that are also in gel forms. Fluoride gel contains 12,300 ppm of fluoride in the form of acidulated phosphate fluoride: APF. It is recommended that it be professionally applied twice a year. The gel is placed in trays for four minutes in the mouth and requires good cooperation from the child. (42,44,45).

Other fluoride compounds, such as silver diamine fluoride (SDF) (46) and nano silver fluoride (NSF), a new experimental formulation containing silver nanoparticles, chitosan and fluoride (47) are relatively new, but promising anticaries agents. Both regimens are non-invasive procedures (a drop for each quadrant delivered with a brush, and rinsed off afterward), applied once a year and have been successful in arresting caries in children. However, SDF can blacken caries lesions, whereas NSF has the advantages of not staining teeth or leaving a metallic aftertaste (46,47).

### 1.5.2 Dietary Modification and Feeding Practices

Dietary habits and choices affect the overall well-being of children including their oral health (48). Although fluoride use has lowered caries risk, a strong relation still exists between caries rate and sugar consumption (49–52). Therefore, caregiver diet counselling should emphasize the amount, consistency and particularly frequency of intake of refined, industrialized sugary foods and sugar-

sweetened beverages, particularly pop, and juice. Intake should be limited to meal times. The American Academy of Pediatrics (AAP) Committee on Nutrition's recommends avoiding the use of juice in infants before one year of age, encouraging whole fruit instead of juice. For children older than one year of age, no more than four ounces of fruit juice once a day, from a cup (not a bottle) and only as part of main meals is recommended (53). However, at the Canadian Obesity Summit in Toronto in 2015 new recommendations emerged to disregard juice as a source of fruit and vegetables because a single glass of orange juice exceeds the daily sugar limit recommended by the World Health Organization (54).

An oral health promotion program with Vietnamese children in Vancouver featuring one-to-one counselling of mothers by a Vietnamese lay health worker was effective in assisting mothers with the adoption of healthy behaviours, including dietary practices (55). Consequently, a significant reduction in caries prevalence in participating children was noted in comparison to control children (55). This study was observational, not a randomized controlled trial (55). However, a 2-year randomized controlled trial in Quebec reported substantial reduction in extent and severity of caries in Aboriginal children (43). Fluoride varnish application was supplemented with caregiver counselling about dietary habits that promote good oral health and help prevent caries (43). Thus, limiting the frequency of sugar-containing foods and making other dietary changes contributes to decreased dental caries rates (56).

### 1.5.3 Other Strategies for Caries Prevention

Other protective approaches include stimulating the salivary flow with sugar-free chewing gum; other approaches include the use of re-mineralizing products or antibacterial agents. Remineralizing products containing calcium and phosphate or casein phosphopeptide-stabilized



amorphous calcium phosphate nanocomplexes (CPP) have been suggested for use in primary caries prevention (26,57). CPP is a milk derived protein that may be expected to increase mineral deposition by binding to calcium and phosphate ions to stabilize them as a capsule of casein phosphopeptides until they are delivered to a tooth surface, thus acting as a reservoir. As promising as this mechanism sounds, there is a lack of evidence to support the use of these products for the prevention of caries. Consequently, further randomized controlled trials are required (58).

Other non-fluoride agents such as xylitol, a sugar substitute, have also demonstrated a significant reduction of *Streptococcus Mutans* levels in plaque (59). Xylitol may contribute to reduction of dental caries in young children because it decreases *Streptococcus Mutans* levels in plaque and saliva. *Streptococcus Mutans* cannot metabolize xylitol into energy sources, consequently acid production by these bacteria on tooth surfaces is reduced (26,60). Commercially produced sugar substitutes have been added to products such as chewing gums and candies. They may have an important role in the prevention of caries among children, but there is not sufficient clinical evidence for using xylitol as anticaries agent in children. Future well-designed randomized controlled trials are required before making recommendations (60).

Despite the availability of fluoride and other preventive measures in dentistry, the burden of dental caries remains high, among children from economically deprived populations. Therefore, the need to improve caries prevention strategies remains a priority in pediatric dentistry. Dental practitioners should provide a prevention-oriented approach in addition to a rehabilitative approach. Caries risk assessment is a key factor to help practitioners understand the child's oral health profile and facilitate designing appropriately individualized interventions that work for a child and their caregivers.

## **Chapter 2: UBC Children's Dental Program: Need for a Preventive Program**

In British Columbia (B.C.) dental care is not a universal, provincially-funded health service. Indeed, the proportion of public funding dedicated to dental services has decreased over time (61,62). This decrease in public funds for dental services will disproportionately affect low income families who are unlikely to have private dental insurance. The publicly-funded provincial or territorial dental plans that do exist for low income Canadian children are limited and these plans have substantial variability in their coverage (17). According to the CHMS report, about 32.0% of the Canadian population do not have any dental coverage (private or public) to cover their child's dental services. About 6.0% of Canadian families have dental benefits through publicly funded programs such as British Columbia's Healthy Kids Dental Program (2).

In response to the problem of lack of funds to support necessary children's dental care for working-poor families in metro Vancouver, the Children's Dental Program (CDP) was developed at the UBC Faculty of Dentistry in the mid-1970s. It started as a six-week summer clinic involving dental students who had completed their third year of studies. Currently, the UBC CDP offers free basic dental services during the academic year to low-income school-aged children, primarily immigrant families. The program provides treatment for patients 5 to 11 years of age. Referrals from the Health Authorities to the UBC CDP are mainly from Vancouver Coastal Health and Fraser Health. Children from various metro Vancouver locations (North Shore, Maple Ridge, North Delta, Abbotsford, North Surrey, Burnaby, Langley, Chilliwack and Mission) are enrolled in the program. "Recruitment" consists of screenings to identify children with high need for dental treatment. Screenings are performed in community health units or in a variety of community settings such as Community Centre Hubs, Parent Support Groups, New Immigrant programs, and School Strong Start programs. This dental screening is provided by nine Registered Dental

Hygienists (RDH), five Certified Dental Assistants (CDA) and seven dental administration assistants. After screening, children in need of treatment are referred to the UBC CDP.

Basic dental treatment is provided free of charge by fourth-year students under the supervision of pediatric or general dentists and graduate pediatric dentistry students. Children who require more complex dental work are referred for treatment to the UBC Pediatric Dentistry Graduate Specialty program. However, dental treatment in the graduate program is not free, although the fees are about 20% less than the fees customarily charged in general dentist or specialist pediatric dentistry practices.

Currently, the UBC CDP operates at the UBC dental clinic on campus from September to December, and at a satellite dental clinic at Douglas College in New Westminster from January to March of each academic year. To overcome the cost of transportation from the more distant communities, many of the children and caregivers are bussed to the UBC clinics. The children are of diverse demographic backgrounds and cultures; for many caregivers and children, language is a barrier. Fortunately, at UBC, students and instructors are culturally diverse and can be recruited for interpretation, as needed.

In addition to providing preventive (prophylaxis, fluoride varnish, and fissure sealants), restorative and surgical services, a desirable goal of the CDP is to sustain the long term oral health of participating children. Therefore, appropriate oral health education and preventive counselling should be part of the CDP. Since the dental students have scant opportunity during treatment appointments to offer such education to the caregivers, novel approaches to preventive education of caregivers need to be explored.

### **Chapter 3: Waiting Room as a Venue for Health Promotion**

In the UBC CDP, each caregivers' time in the waiting room is an "untapped opportunity" for health promotion. One common waiting room-based approach to caregivers' education is providing health information materials such as leaflets and posters for health promotion. However, this approach has proven effective in improving the health-related knowledge only to those individuals who take time to read the material while waiting (63). Furthermore, such resources are often not used by individuals in waiting rooms, especially if language barriers exist.

Other novel approaches have been used to actively engage individuals to use their "waiting time" effectively. Audio-visual health promotion messages have been demonstrated to be an effective way of health education for improving exercise and dietary behaviours in pregnant women when integrated in the prenatal care prior to their medical appointment (64). This randomized control trial took place in the waiting room of a prenatal clinic. The intervention group received a counselling session in addition to computerized, interactive audio-visual education material about nutrition, exercise, and weight gain during pregnancy; the control group received the usual clinic care and no audio-visual education material (64). At the 4 week follow-up assessment the intervention group reported improved dietary and exercise behaviours in comparison to the control group (64). Other investigators successfully improved knowledge of female patients about long-acting reversible contraceptive methods after they participated in an electronic device-based educational "app" that included patient-centred informative visuals and videos in the waiting room (65). Another intervention performed in the waiting room of an inner-city university hospital emergency department used a computer-based assessment for screening and counselling that targeted some health risk behaviours. These activities were combined with interactive patient-centred education (66). Those who participated in the screening were offered advice about how

modifications to some lifestyle changes can be achieved, and were followed-up a week later for assessment of knowledge retention. The intervention group retained the health knowledge (66).

Dental team members engaging with caregivers in a waiting room may be an effective approach for oral health education. However, to our knowledge no oral health promotion activities targeting caregivers in the waiting room have yet been undertaken and evaluated. The present work aimed to develop and assess the feasibility, acceptability and short term effectiveness of a dental health education program (DHEP) that engages caregivers in the waiting room with the goal of changing dental health behaviours for their children.

## **Chapter 4: Theories for Behavioural Interventions**

Theoretical frameworks are useful for building a conceptual structure for understanding behaviours and for explaining which key variables impact certain behaviours and which variables need to be changed to resolve the underlying problems (67,68). An understanding of different behavioural theories will enable understanding of the variables contributing to poor child oral health and how they may be modified. Behavioural theory should guide the preventive health education approach most appropriate for behaviour modification in our families of interest.

### **4.1 Social Cognitive Theory**

The Social Cognitive Theory (SCT) of Bandura considers the role of social modelling in human motivations and includes three main constructs: a person, his/ her behaviour and an environment that contributes to his/her behaviour (69,70). SCT acknowledges the importance of social environment and its role in human motivation and action (71). This theory considers the interaction among personal, social and environmental factors. Because of the intervention, individuals can learn skills through education, direct experience, observation and or social modeling. According to the SCT, once the skill is learned, personal efficacy and expectations will facilitate the adoption/modification of the health behaviour.

### **4.2 Self-Efficacy Theory**

Self-efficacy is one of the most frequently applied constructs in social theories. Self-efficacy is associated with a personal belief that one is able to perform the behaviour despite challenges or aggravating circumstances and that one's outcome expectations will lead to establishment and maintenance of one's health behaviour (70). Bandura defines self-efficacy as self-control of one's

actions that in turn influences one's beliefs, knowledge, and skills (70,71). Self-efficacy theory is based upon individuals' beliefs and their capabilities to interact with their environment to produce desired health outcomes by their actions. As an individual learns more, his/ her behaviour and environment may change; this change may in turn enhance both self-efficacy and self-esteem. This theory is well accepted in health promotion and is based on a person's cognitive state of being in control over his/her health-related issues (72). Empowered individuals can be motivated to reach the desired health outcomes.

#### 4.3 Adult Learning Theory

In order to motivate adult caregivers to learn and, subsequently, to facilitate the change in their child's behaviours, it is important to understand how adults learn. Learning by adults is mostly problem-based; consequently adults tend to seek new knowledge and learn better when they are faced with real-life tasks or problems (73,74). When they encounter real life tasks, they become self-directed and motivated to learn in order to cope with their own situation. Subsequently, they may apply the new knowledge into their everyday life (74). Adults tend to engage more when collaborative and interactive approaches are used that promote active participation and provide immediate feedback. Therefore, it is essential to develop rapport with an adult learner, have their respect and encourage a positive learning environment, by creating opportunities to ask questions and providing reasoning for the choices offered as well as giving constructive feedback (74). In order to build confidence in adults and promote the development of the desired skill or behaviours, it is important to assess their new knowledge and behaviours (74).

#### 4.4 Transtheoretical Model (Stages of Change Theory)

This model of Prochaska, Norcross and DiClemente evaluates an individual's readiness to accept a new health behaviour in order to tailor interventions appropriate to a person's stage of readiness for change (75,76). The Stages of Change Model is a model where a subsequent stage of change is dependent on the previous stage (70). This theory suggests that individuals engaging in new behaviours move along a predictable process of change through the stages of precontemplation, contemplation, preparation, action, and maintenance. Individuals unaware of the problem, unable to admit that there is a problem or with no intention of changing it or interest in adopting new behaviours will presumably be in the precontemplation stage. Once they become aware of the problem and are interested in changing and adopting new behaviours they move to the contemplation stage. Enhancing knowledge and awareness is the key change process to advance to the next stages. As individuals move through the stages of change, they assess the benefits and costs, or pros and cons, of such change. When an individual values the pros more than cons of changing or alternatively not changing one's behaviour, he/she may decide or not to move to the next stage. Self-efficacy can be enhanced when an individual believes that a behaviour change may improve health outcomes and that the pros outweigh the cons (75,77). After the action stage, the individual moves to the maintenance stage where a person is engaged about maintaining the new behaviours and avoiding relapse (71,75,78). However, a relapse can occur even in action or maintenance stage.



#### 4.4.1 Motivational Interviewing (MI)

MI is a behaviour modification strategy grounded in the Transtheoretical Model (TTM). Thus, MI considers a patient's stage of behaviour change.

Dentist-centred education i.e. "direct advice-giving" has been demonstrated to be ineffective in changing individual's health behaviour. In addition, "advice-giving" may pose discomfort to personal freedom i.e. "being told what to do" (78). As an alternative, motivational interviewing (MI) has been demonstrated to be an effective patient-centred behaviour modification strategy. This approach provides brief counselling and is based upon building intrinsic motivation to move individuals into an action state (79). When individuals are intrinsically motivated they will take actions which will inherently fulfill their basic psychological needs (80,81). MI is based on engaging a participant with open-ended questions, encouraging them to be actively involved in a discussion and then setting their personalized goals. This one-on-one counselling with most of the talking done by a participant not a health professional, enhances patient autonomy to make his/her own decisions about change, and increases individual's commitment to change by personalizing goals leading to a desirable change. MI was first described by Miller and Rollnick (80); both medical and dental investigations have reported it to be effective for modifying health behaviours (79,81–83). In addition, MI enhances active participation and face-to-face engagement. Consequently, it may lead to improved patient satisfaction and to his/her empowerment, better cooperation with health professionals and enhanced patient–professional relationships (84).

MI provides guidelines to move patients along the continuum of behavioural stages by tailoring the MI to the person's stage of change, subsequently encouraging individuals to engage in improving their behaviours (82,85). A randomized controlled trial featuring MI involved 240 Indo-Canadian mothers in Surrey, B.C. (78). The control group received health education material only:

informative video and pamphlets on preventing dental caries. The MI group received a 45 minute MI counselling session, as well as six brief follow-up phone calls over 20 weeks in addition to the same educational material provided to the control group. After one year, children in the MI group developed fewer carious lesions than those in the control group. These early positive results were confirmed two years later (86,87). MI appears to be a relevant strategy for working with caregivers of young children at high risk for dental decay. A recent systematic review also provides support for the MI strategy (79). MI has been associated with improvements in a number of other health behaviours (79,85).

#### 4.5 PRECEDE-PROCEED Model (Planning Model)

While other health promotion planning models are available, the PRECEDE-PROCEED Model was employed in the present study. We needed a theoretical framework to assist in planning, designing and evaluating our dental health education strategy for caregivers of children at high risk for caries. This model of Green and Kreuter has been successfully applied in both medical and dental research, and proven feasible for health or dental education targeting high risk individuals in a community setting (72,88–91). The PRECEDE (Predisposing, Reinforcing and Enabling Constructs, Educational/Ecological Diagnosis, Evaluation) section for designing the health promotion model guides the assessment of a target population, its environment, needs and preferences (92). The PROCEED section (Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development) guides the implementation as well as evaluation of the educational program (92). The application of the PRECEDE-PROCEED Model was a useful framework to guide all three phases of this present project, namely 1) planning and preparation, 2) implementation, including the development of

the educational strategy and 3) evaluation of the strategy targeting the improvement of behaviours of children that are enrolled in the UBC CDP. Given our objectives and the fact that our intervention was not based in community, our approach drew mainly from the PRECEDE component of this model. However, our findings from the PRECEDE component informed the design of the implementation and the evaluation. Our evaluation and recommendations illustrated the PROCEED phase of the caregiver program; indeed some UBC Dentistry Clinic policies and regulations (guidelines) may need to be modified to fulfill the intervention outcome.

## **Chapter 5: Research Question and Objectives**

### **5.1 Research Problem**

School-aged, low income children attend the UBC Children's Dental Program for one course of dental treatment. These children have no dental benefits and are unlikely to be treated elsewhere. Senior dental students have limited appointment time to provide the necessary extensive dental treatment. Consequently, finding time to provide preventive counselling to caregivers of those children is a challenge. Parents and caregivers routinely wait two to three hours in the Oral Health Centre (OHC) waiting room while their child's treatment is completed. Therefore, we considered the waiting room to be a practical setting to engage caregivers in a preventive education program promoting dental health for their children. In this thesis, we have consistently used the term "caregiver" rather than parent to give a more inclusive approach.

### **5.2 Research Question**

Is a dental health education program that engages caregivers "in the waiting room" of the UBC Children's Dental Program a feasible, acceptable and effective strategy to modify caregivers' dental health behaviours for their high risk school-aged children?

### **5.3 Study Objectives**

The main study objective was to develop and evaluate a waiting room-based dental health education program for caregivers whose children were enrolled in UBC CDP.

There were six more specific aims:

1. Perform a situational analysis (SA) in preparation for the development of a dental health program (PRECEDE component). A component of the SA was to analyse treatment performed to better understand the children's dental needs.
2. Develop a dental health education program (PRECEDE component).
3. Assess the program's feasibility (PROCEED component). Will clinic administration support the program and will the program be "doable" in the environment of the UBC Dentistry Clinic?
4. Evaluate the program's acceptability by caregivers (PROCEED component). Will caregivers commit to the program and be willing to participate?
5. Assess the short-term effectiveness of this program (PROCEED component). Will caregivers respond to follow-up?
6. Make recommendations for further sustainability of this program.

## Chapter 6: Material and Methods

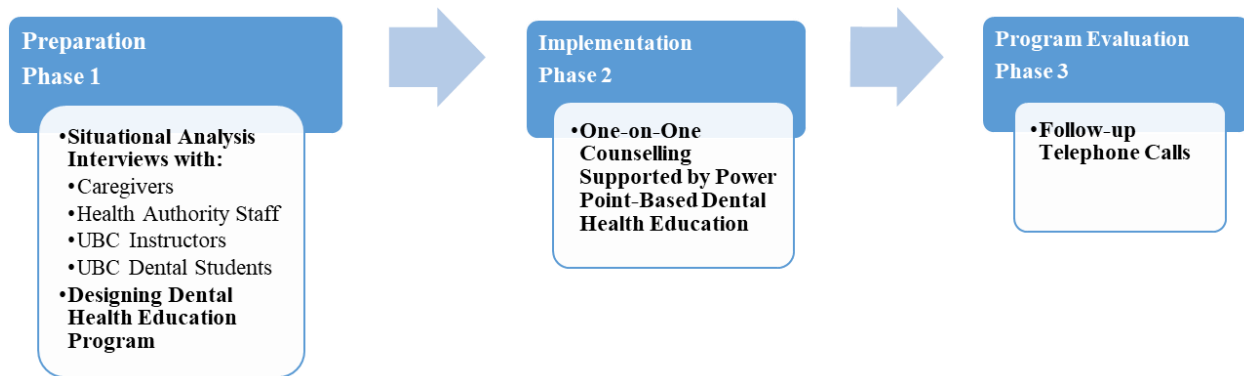
The present study, approved by the UBC Behavioural/Research Ethics Board (H13-03440), was conducted from 2013-2015.

As recommended by the PRECEDE-PROCEED Model, a health education program should have three distinct phases: preparation, intervention and evaluation. In the preparation (Phase 1), a situational analysis (SA)<sup>3</sup> was performed with caregivers and the various stakeholders who were involved in different capacities in the UBC CDP. All interviews were done during Term 2 once ethics approval had been received. The UBC dental clinics' administration was contacted and informed about the project and the intention of using the clinics waiting rooms as a venue for interviews. The Phase 1 (preparation) set the groundwork for the intervention (Phase 2); i.e. a dental health education program to engage caregivers while their children were receiving dental treatment. For the program's evaluation, i.e. measurement of short term effectiveness (Phase 3), caregivers were followed-up by telephone to determine how they succeeded in achieving their personalized goals to improve dental health-related behaviours of their children. Further, the feasibility of our waiting room-based caregiver education was explored, i.e., was the intervention "doable" in the circumstances of the UBC Dentistry Clinic? Acceptability of the program to caregivers was based simply on the caregivers' responses to the program and their willingness to participate.

---

<sup>3</sup> Situational Analysis (SA): defines the internal and external factors in the situation of concern of the research and explores the lay out as well as the most important human and nonhuman elements involved in the study (93).

**Figure 6.1** Phases of the Study Guided by PRECEDE-PROCEED Model



### 6.1 Preparation Phase (PRECEDE Component of the PRECEDE PROCEED Model)

Oral health promotion programs should target the needs of the specific population group. By collecting information about dental health knowledge and oral health status as well as socio-cultural, behavioural and environmental factors, the needs of a specific population will be better understood. Next, appropriate approaches for caries prevention can be selected (49). To that end, our situational analysis or “diagnostic phase” in the PRECEDE component was used to understand the knowledge and behaviours of caregivers and their children and determine the viewpoints of different stakeholders of the CDP. The findings from the SA formed the basis for the subsequent development of the dental education program.

The key stakeholders of the CDP were:

- Health authority staff who recruited and enrolled the children for the UBC CDP.
- UBC instructors who supervised students providing treatments at the UBC CDP. These dental instructors were practicing pediatric dental specialists, graduate students of the UBC pediatric dentistry specialty program or general dentists who committed a half-day a week to teach

in the UBC CDP. The majority of instructors have been involved in the UBC CDP for several years, consequently they understood the backgrounds of children served by this program.

- UBC dental students who provided treatment.

#### 6.1.1 Situational Analysis

Caregivers were approached in the waiting room during their child's dental appointment. A verbal and written introduction and explanation of the project (Appendix A: Brief info- part1) was provided by the primary researcher (RS). All questions by the caregiver were answered prior to the 'interview' and signing of the Informed Consent (Appendix B: Caregiver consent). The interview guide, including closed and open ended questions, was developed, pilot tested and, subsequently revised based on input from volunteer caregivers not involved in the present study (Appendix C: Caregiver Questionnaire). The interviews with caregivers took place in the clinics' waiting rooms and covered basic demographics, dental knowledge and oral homecare behaviours for children. For a caregiver with limited English fluency, a dental student who spoke the same language helped in interpretation. Many of the caregivers were new immigrants and shy to participate, but the researcher, being a new immigrant herself, helped "break the ice" and encouraged participation. At the end of this interview, caregivers were asked about their preference regarding the delivery of preventive education (Appendix C: Caregiver Questionnaire). Prior to dismissal, each caregiver was given a \$10 CAD grocery gift card. To explore opinions of Health Authority staff, dental health representatives of Vancouver Coastal Health and Fraser Health were invited to the end of term meeting to provide input. At the beginning of the meeting an open-ended questionnaire was provided (Appendix D: Health



Authority Staff Questionnaire) to explore their viewpoints and ideas about how to enhance the prevention component of the UBC CDP. The attendees from the Health Authority staff went back to their respective health authorities, conferred with their staff, and emailed the researcher an aggregate summary of their collaborative suggestions. This approach worked best logistically for their work demands.

All interviews of UBC instructors took place at the Douglas College clinic. The available Term 2 instructors were interviewed by RS using a structured questionnaire with open-ended questions (Appendix E: Instructors' Questionnaire). Instructor viewpoints about what might work for improving dental knowledge and behaviours in our caregivers were important.

To conclude the SA, all senior dental students were approached by RS at the end of the spring term and a questionnaire (Appendix F: DMD's Questionnaire) was administered in person to available students.

The principal investigator together with the supervisory committee reviewed the responses of the health authority staff, instructors and senior dental students for content. Responses of the dental students and instructors were categorised into the most common themes that emerged.

#### 6.1.2 Designing the Program

The dental education program was developed by the researcher in conjunction with the research supervisory committee, guided by the dental literature and findings from the situational analysis. The needs of caregivers and their preferences, as well as the suggestions from other stakeholders were analysed and included. Prior to program delivery, the resulting caregiver-centred dental education program was reviewed and revised many times with the supervisory committee, and finally pre-tested with a small sample of caregivers not part of the present

study. Caregivers' preference appeared to be for one-on-one counselling accompanied by helpful graphics and audio-visuals, thus a power point presentation with coloured images was developed. This power point presentation (Appendix G: Dental Education Power Point Presentation) explained the process, etiology and prevention of dental caries using simple images with limited text.


## 6.2 Implementation Phase 2: Dental Health Education Program (DHEP)

One-on-one caregiver counselling sessions supported by a power point-based dental education occurred from September 2014 to March 2015. Caregivers were approached in the waiting room during the child's dental appointment at either of the two UBC dental clinics: at the UBC OHC in term 1 and at the Douglas College satellite clinic in term 2. Prior to the 'interview', a brief explanation of the project (Appendix H: Brief info-part 2) was given to each caregiver and then interested caregivers signed the Informed Consent (Appendix B: Caregiver consent). If a caregiver had limited English, he/she was assisted by a dental student conversant in the caregiver's native language. During the sessions, each caregiver was encouraged to ask questions and make comments. To maintain consistency in the provision of face-to-face education, one individual (RS) led the counselling sessions. An important consideration, in the spirit of MI, was to facilitate each caregiver's intrinsic motivation; thus, after the presentation each caregiver was asked to make personalized goals about changing their behaviours. To assist caregivers in this process, each caregiver was given a template of a "settings goals" card (Figure 6.2) and each caregiver chose goals that were most appropriate for his/her child.


**Figure 6.2** The “Setting Goals” card given to caregivers for setting dental health-related goals for their child


**“Setting goals” card**

Child's Name \_\_\_\_\_ wants to keep his/her TEETH healthy by:




Brushing with fluoride toothpaste







I remembered to BRUSH my TEETH




Healthy Snacks




Drink water, not juice



NO to ALL Pop Drinks



Brushing for 2 minutes



No sugary SNACKS  
SWEETS only at special times

The personalized goals' card was taken home and a picture of the card was kept in their project record. Empowerment of each caregiver was facilitated by listening to their ideas and, if necessary, providing more workable options. New toothbrushes for caregiver and child as well as a sample tube of fluoride toothpaste were given to each participant at the end of counselling session. During the first few sessions some pamphlets, in different languages, were displayed on a table in the waiting room. Nonetheless, the pamphlets did not seem to interest any of the caregivers. Therefore, the intervener discontinued their display.

### 6.3 Program Evaluation Phase 3: Evaluation of Caregiver DHEP

For our families, the best means of follow-up was by telephone. Each participant was called once and if there was no answer, the intervener (RS) called back until at least three telephone calls had been made. The program's short-term effectiveness was evaluated by comparing caregivers' self-reports regarding their child's behaviours before and after the intervention. Comparisons were made using Chi-square tests; significance was set at  $P < 0.05$ .

To enable direct comparison between the baseline and the follow-up, the follow-up questions (post-education assessment) (Appendix J: Post-education interview) were the same as the “pre-education” questions regarding child dental health behaviours (Appendix I: Pre-education interview). Follow-up was done by the same individual who delivered the intervention (RS).

## **Chapter 7: Results**

The present study enrolled two cohorts of caregivers, the first cohort (n=97) was interviewed during the preparation phase (situational analysis) and the 2<sup>nd</sup> cohort received face-to-face dental education based on motivational interviewing. The 2<sup>nd</sup> cohort of caregivers was interviewed prior to the intervention (Baseline, n=80) and they were followed-up with telephone calls 2-3 months later (Follow-up, n=67). All interviews took place in UBC's dental clinics' waiting rooms, clinic's administration was very supportive to the program.

### **7.1 Preparation Phase 1:**

#### **7.1.1. Situational Analysis: Summary of Counts UBC CDP Treatment Procedures**

During the study period (2014/15), a total of 344 children received treatment from the UBC CDP. Of the 2758 procedures provided, 784 (28.4%) were diagnostic (x-rays, patient exams), 677 (24.5%) were preventive (fissure sealants, fluoride varnish), 708 (25.7%) were operative (restorations, stainless steel crowns) and 227 (8.2%) were extractions. Of the children 44% (151/344) needed more than three appointments to complete their treatment.

In the primary dentition, the following procedures were provided: stainless steel crowns (n=341), extractions (n=224), amalgam restorations (n=187), pulpotomies (n=131), sealants (n=103) and composite restorations (n=97). Treatment in permanent dentitions included sealants (n=397), composite restorations (n=96), amalgam restorations (n=80) and extractions (n=3). A total of 167 fluoride applications were performed.

### 7.1.2. Situational Analysis: Interviews with Caregivers

Only one out of the 97 caregivers who were invited to participate refused to participate; he chose to stay with his child during the dental treatment. Of all interviewed, 24% (24/97) of caregivers did not speak English at home. Other than English, the most frequently spoken languages at home were Punjabi (56%), Arabic (21%) and Mandarin (8%). Of the caregivers 65% (63/97) had been in Canada for six years or less. Because of the availability of interpreters in our dental student population, no caregivers were excluded because of language barriers. Of all participants, 66% (64/97) of children and 7% (7/97) of their caregivers were born in Canada. The majority of children, 82% (80/97), were between six to ten years old; 65% (63/97) of the children were in the UBC CDP program for the first time receiving their first dental experience.

The majority of caregivers, 97% (94/97) were mothers; 75% (73/97) reported that the main reason for their child's visit was to receive free dental care which otherwise they could not afford. Some also reported they were referred to the program by their physician or nurse in the community clinic or school, other reasons were; *"I heard this is a good program, and I trust UBC"*, other parents reported *"I had dental treatment done by dental student, it was very good and the students are really nice"*. *"I like how the dentists are giving back to the community, and I trust their opinion"*. *"Students provide good care, and through this program both benefit the students and the families as there is no cost"*. Some of those families had access to dental care in their home countries but after they immigrated to Canada, they simply could not afford dental treatment. Moreover, they were not yet eligible for the BC Healthy Kids Dental Program (94) coverage.

The caregivers had limited knowledge about dental caries, based on their responses to two open ended questions: 1) What do you think causes tooth decay? and 2) Tell us how dental caries can be prevented in your child? Only 24% (23/97) of caregivers knew that dental caries was caused by

both a frequent sugar-containing diet and lack of proper oral self-care with fluoride toothpaste. Of all caregivers, 37% (36/97) thought that the only cause for caries was sugar in the diet, 22% (21/97) did not know what caused caries, 8% (9/97) of caregivers believed that the only cause for caries was not brushing the teeth and 8% (8/97) of caregivers thought that caries was due to “bad genes”. Regarding prevention of future caries in their children, 69% (67/97) of caregivers believed that caries can be prevented, 19% (18/97) of them did not know whether caries can be prevented or not and 13% (13/97) of them thought that recurrence of caries in their child’s teeth is unavoidable. Three quarters (73/97) of caregivers selected one-on-one counselling together with a short video for their preferred option of dental education; all agreed to participate in dental health education in the waiting room.

### 7.1.3. Situational Analysis: Interviews with Stakeholders of the UBC CDP

#### 7.1.3.1 Health Authority Staff

As discussed in methods, the health authority staff chose to aggregate their responses in one document which is presented in Table 7.1.

**Table 7.1** Aggregate Summary of Health Authority Staff Collaborative Suggestions

<p><b>UBC Children’s Dental Program</b></p> <p><b>Q1. Tell me your ideas about how to enhance the prevention or oral health promotion component of our program?</b></p> <p><i>Parents can be offered an opportunity to meet with a dental student to discuss the oral health of their child, to watch a video and/or be given pamphlets to read. All of these suggestions would be optional.</i></p> <p><b>Q2. What do you think we could do as far as engaging caregivers in the waiting room in the prevention either here at DC or in the UBC Oral Health Centre?</b></p> <p><i>If there was a television available in the waiting room, we suggest creating a short digital message with key oral health messaging that could be played continuously in the waiting room. Ideally it would be best if it was offered in English as well as other languages such as Punjabi and Mandarin. Parents would be able to watch the digital message as much as they liked throughout the appointment time.</i></p> <p><i>Parents could be offered a chance to meet with a dental student to discuss prevention strategies. This could be done either individually or in a group session.</i></p> <p><i>Parents could be offered pamphlets relating to identified concerns with diet and oral hygiene.</i></p> <p><i>If a computer is available with internet access, parents could be shown by dental students how to navigate through the internet to access appropriate resources such as BCDA, Healthy Families BC, Fraser Health, and VCH websites. They could also be shown how to create “shortcuts” and “Favorites” to these resources and be encouraged to share the information with their family members.</i></p>
---

#### 7.1.3.2 Dental Students

Of the 60 senior year dental students, 42 were available to respond and participate in interviews. The first topic discussed with students was “*challenges to providing oral health*



*counseling to children's caregivers*” The table below describes the five main themes about challenges reported by the dental students. Selected quotes accompany each theme.

**Table 7.2** Dental Students’ Selected Comments about Challenges to Providing Oral Health Counselling to Caregivers

Challenges	Dental Students Comments
Language and Communication n=34	<i>“Sometimes language can be a challenge so you will not be able to relay the messages”.</i> <i>“Communication barrier. I can speak Punjabi but cannot speak Arabic or Mandarin”.</i>
Dental Knowledge n=17	<i>“Preconceived notions (amalgam fillings, fluoride)”.</i> <i>“Lots of parents don’t appreciate the value of primary teeth”</i> <i>“Parents’ attitude towards oral hygiene, primary teeth; they don’t understand the importance of keeping them healthy”</i>
Limited appointment time n=8	<i>“Lack of time to counsel parents”.</i> <i>“Lack of time, we are always in a rush to provide treatment”.</i>
Caregiver issues n=10	<i>“Some parents will not be available as the kids are sent with friends or grandparents”.</i> <i>“Different person accompanying the child each time”.</i> <i>“Some parents would prefer to be in the clinic with their kids”.</i>
No recall or follow-up appointment n=5	<i>“We don’t see the same child so it’s not easy to reinforce the information”.</i> <i>“We don’t see the child once the treatment is completed and they don’t come for maintenance”.</i>

Next topic discussed with students was their *“ideas about how to enhance the prevention or oral health promotion component of the UBC Children’s Dental Program?”* The table below describes the most common themes related to their thoughts about a preventive component. Few of the students had even considered the waiting room as a venue for oral health promotion. Their views on the waiting room were solicited; responses were many and varied.

**Table 7.3** Dental Students’ Selected Ideas about How to Enhance the Prevention Component of UBC CDP

<b>Ideas about how to enhance the prevention component of UBC CDP</b>	<b>Comments</b>
Counselling supported with visuals n=29	<p><i>“Giving counselling to the parents like giving training sessions for one or two parents then let them educate the rest or even as part of committing to the program and having their kids treated”.</i></p> <p><i>“Maybe if dental hygienist would do some counselling with the parent. I don’t think parents will be motivated to read any pamphlets so counselling is a better option”.</i></p> <p><i>“May be have an educational video and have a link to it on YouTube that the parents can refer back to it. I don’t think pamphlets will be as effective.”</i></p>
Pamphlets and brochures n=13	<p><i>“Giving brochures with pictures explaining how cavity starts and diet information; having those in different languages to take home”.</i></p>

#### 7.1.3.3 Instructors

Of the 8 interviewed instructors, four were pediatric dentists, three graduate pediatric dentistry students and one a general dentist. We asked the instructors slightly different questions than the students as we wanted to take full advantage of their clinical and teaching experience. We analyzed their responses in relation to the same themes used when analyzing students’ responses. The general themes that arose from the instructors’ comments fit well with what the students were telling us. The supervising dental instructors unanimously agreed that caregiver counselling needed to be added as a preventive component to the UBC CDP. However, they all recognized that dental students had limited appointment time to provide care, and consequently some instructors suggested that preventive counselling could be delivered by either junior dental or senior year dental hygiene students. The table below lists some of the challenges expressed by instructors as well as their ideas for oral health promotion. One interesting suggestion was to have

the parent sit through an information session in order to qualify for the free treatment for their child offered at UBC.

**Table 7.4** Supervising Dental Instructors' Selected Comments

<b>Topics</b>	<b>Comments</b>
<b>Challenges</b>	<p><i>"The students have limited sessions in pediatric dentistry"</i></p> <p><i>"Students are always rushing to do x-rays and trying to develop them and trying to get some work done and then present the case to the professor; counseling is one of things that always gets less".</i></p> <p><i>"Unfortunately, I think there is still a thought that those are baby teeth and they'll fall out so why do anything".</i></p> <p><i>"The patient is treated by a different student each visit".</i></p>
<b>Ideas about how to enhance the prevention or oral health promotion component of UBC CDP</b>	<p><i>"A hygiene, CDA or junior dental student providing learning information session while the parents are waiting for the child to get the treatment done".</i></p> <p><i>"Provide audiovisual of oral hygiene, caries process and prevention on the TV screen in the waiting room".</i></p> <p><i>"Trained staff like trained dental hygienists to talk about the role of oral hygiene and diet and do counseling to parents. Also giving them ready made packages that actually outline all the aspects of prevention like brushing with fluoride toothpaste and changes in diet; like frequency of snacking, etc. and go over it with them on one-on-one it might make a big difference".</i></p>

## 7.2 Implementation Phase 2: Caregiver Dental Education Program

The counselling sessions were offered over 18 different afternoon clinics (10 afternoon clinics at OHC in Term 1 and 8 at DC in Term 2). Each individual session lasted about 20 minutes, and included one-on-one caregiver counselling supported by our power point presentation (Appendix G), and a demonstration of tooth brushing by use of models. A total of 80 caregivers were approached and all agreed to participate. The majority of the interventions were actually done in the waiting room, and occasionally a separate room was used at DC if the caregiver had several children in her care. One caregiver was hesitant to participate at first, preferring to be in the clinic


with her child, but once she saw how other caregivers were interacting with the researcher and asking for some snack ideas, she decided to participate. Moreover, she brought her mother-in-law the following session so she could also participate in the education session as she was the one staying home with the children, and according to the mother, providing all the sweet snacks.

After the counselling session, each caregiver was offered a goals card (Figure 7.1) and asked to set personalized goals for modifying his/her child's dental behaviours. For example, a mother said that her children snacked on cookies and chocolate throughout the day, but following our session this mother decided to limit sugary snacks for her children by limiting their intake to one cookie daily consumed during meal time during the first week, and then reducing the frequency to one cookie every other day until reaching a goal of having sugar containing items only once weekly. Another example of a goal was to reduce the consumption of pop drinks, for instance if a child used to drink pop throughout the day, a mother decided to limit pop drinking to once at meal time. Another mother decided not to buy pop for her child, while the other chose to limit such drinks to weekends only.

**Figure 7.1** An example of Individualized “Setting Goals” card a caregiver set for her child


**“Setting goals” card**

Child's Name \_\_\_\_\_ wants to keep his/her TEETH healthy by: \_\_\_\_\_'s Goal for this week




Brushing with fluoride toothpaste

☒




+




I remembered to BRUSH my TEETH

☒




Healthy Snacks

☐




Drink water, not juice

☐




NO to ALL Pop Drinks

☒



No sugary SNACKS  
SWEETS only at special times

☒



Brushing for 2 minutes

☐

### 7.3 Evaluation Phase 3: Evaluating Caregiver Dental Education Program

All aspects of our dental health education program appeared to be both feasible and acceptable to caregivers. Our first cohort of mothers willingly participated in the SA and needs assessment, and, once designed, our second cohort enthusiastically engaged in the counselling intervention. The current research project has shown that waiting-room based dental education for caregivers, including the developmental phases, was feasible in a university-based dental clinic environment. Clinic administration supported use of the waiting rooms for both the situational analyses with caregivers and for one-on-one caregiver counselling. Moreover, the caregivers were willing to give up their time for interviews during all phases of the study. The acceptability of the program was also obvious as caregivers expressed their enthusiasm for the program and willingness to participate. In addition, no participant withdrew from our program.

The before and after frequency comparisons were done employing the IBM SPSS Version 21.0 software; the threshold for statistical significance was set at  $P < 0.05$ .

The follow-up rate for caregivers was 81.0% (67/80). A total of eight caregivers were lost to follow-up because of language barriers and five caregivers were lost because their telephone numbers were no longer in service. Hence, the statistical comparisons were performed only on complete data and did not include those lost to follow-up.

Most caregivers were enthusiastic about reporting their progress. Some were obviously proud of the healthy changes in their child's snack options. Other caregivers asked further questions regarding specific snack options or were looking for snacking alternatives. Findings related to the reported dental health behavioural changes after the counselling intervention are presented in Table 7.5 and illustrated graphically in Figure 7.2.

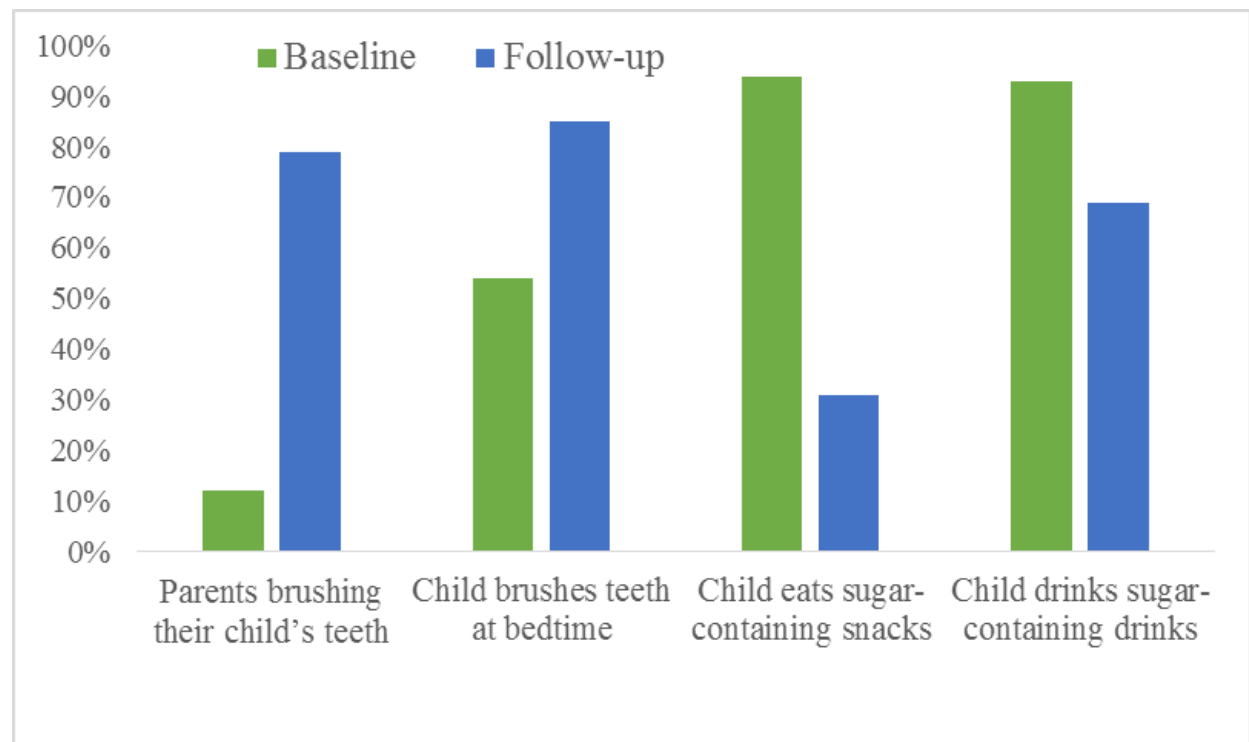
The ORs exceeding one indicate an increase in behaviours, while ORs approaching "0" indicate that behaviours decreased after the intervention. For example, the OR=4.9 (Table 7.5) for the 'Child brushes teeth at bedtime' means that there was a substantial increase in brushing, whereas OR=0.1 for 'child eats sugar-containing snacks' means that there was a substantial decrease in such behaviour. The most significant change related to the increase of numbers of caregivers who reported brushing their child's teeth (Chi square test, OR=23.5; 95%CI 9.3; 56.0). Before the intervention, 12% (8/67) of caregivers reported brushing their child's teeth while after the intervention, this proportion increased to 79% (53/67). Based on caregiver reports, at baseline 54% (36/67) of children brushed their teeth before bedtime; this proportion increased to 85% (57/67) after the education. An improvement in caregiver-reported child's snacking habits was also observed. At baseline, almost all children consumed sugar-containing snacks or drinks. At follow-up, the proportion decreased to 31% (21/67) for snacks and to 69% (46/67) for sugar-containing drinks. Despite the self-reported positive behavioural changes,

there was still a considerable variation in these changes as indicated by a rather wide range of 95% CI for the Odds Ratios.

**Table 7.5** Pre and Post intervention comparisons (complete data)

<b>Dental health related behaviours</b>	<b>Baseline n (%)</b>	<b>Follow-up n (%)</b>	<b>OR (95%CI)</b>
Caregivers brushing their child's teeth	8 (12 %)	51 (79%)	23.5 (9.3; 56.0)
Child brushes teeth at bedtime	36 (54%)	57 (85%)	4.9 (2.1; 11.2)
Child eats sugar-containing snacks	63 (94%)	20 (31%)	0.1 (0.1; 0.2)
Child drinks sugar-containing drinks	62 (93%)	45 (69%)	0.2 (0.1; 0.6)
Total assessed	67 (100%)	67 (100%)	

**Figure 7.3** Pre and Post intervention comparisons (complete data)





## Chapter 8: Discussion

*“Children have a right to the enjoyment of the highest standard of health, and to facilities for the treatment of illness and rehabilitation of health”* (95). Unfortunately and despite the fact that oral diseases are mostly preventable, caries still remains a global oral health problem (96). Moreover, dental diseases are unevenly distributed among population groups with the largest burden observed in underserved low income children (27,97). Similarly in Canada, children continue to experience caries, with the highest burden observed in children from families of low socioeconomic and/or or new immigrant status (98). Caries in young children can be further aggravated by barriers that prevent children from receiving timely dental care (99).

All children should have access to professional dental care, including preventive services (98). The ultimate goal of the present work was to explore the feasibility of providing a preventive component to the UBC Children’s Dental program, by developing “waiting-room based” dental education for caregivers whose children were receiving free dental treatment at the UBC CDP. We considered caregivers’ time in our waiting room during their child’s dental appointment to be a practical setting and opportunity for dental health education. Our dental counselling was developed and implemented integrating feedback from caregivers, Health Authority staff, the senior dental students providing the treatment, and the dental instructors supervising the students. The present caregiver-centred dental education was guided by the spirit of MI: a caregiver played an active role and the intervener operated as a facilitator of behavioural change. We used an abridged PRECEDE- PROCEED theoretical framework for the preparatory, implementation and evaluation phases and, finally evaluated our program for feasibility, acceptability and short term effectiveness.

The UBC CDP provides free dental treatment to qualifying children from low income families. Although our project was an integrated study, the overall project had two “parts”: the first part was situational analysis (SA) which informed the design of our oral health promotion intervention. The second part was the implementation of the intervention and, finally, the short-term evaluation. The first section of this Discussion will comment on the SA results, followed by comments on the intervention and the short-term evaluation. Finally, we will acknowledge the limitations of the study as well as make recommendations for future research.

In the preparation phase for this project, a situational analysis was performed in order to design an oral health promotion appropriate for our UBC CDP families. Based on the fact that children in the UBC CDP had been referred by HA staff to the program because of their dental need, we assumed all of our child patients were high caries risk, but to verify this assumption, we collected data on the dental procedures performed for those children. Indeed, most of these school-aged children had not previously visited a dental office and the majority, needed extensive dental treatment, often including extractions.

Our first cohort was primarily mothers; the majority of them were new immigrants to Canada. Most had limited dental knowledge and they knew little about the etiology of dental caries; for example, one mother’s reply to our question related to etiology of dental caries was “*When I was in Toronto my son had no cavities, but now here both my son and daughter have cavities, it could be the water here*”. They also lacked dental knowledge e.g. some thought that brushing the teeth in the morning is the most important for maintaining healthy teeth, thus they did not attempt to brush their children’s teeth before bedtime. They were offering lots of juice and pop drinks to their children, many had pop and candy ready to provide, as a treat, for their children as they finished their dental appointment. Moreover, many did not know that the first permanent molars erupt at

around the age of six years and thought that their seven-year-old child had only baby molars that will eventually fall out. Many of them had not seen a dentist for years. This finding supports that of other investigators who reported low oral health awareness and high unmet dental needs in new immigrant families (91,100). Not surprisingly, dental health is a low priority to new immigrant families who face many challenges adjusting to life in Canada, and are affected by the social determinants of health. Finding employment, often working more than one job, and providing their family with shelter, food and support are top priorities for new immigrants. In addition to these challenges of recent immigration to Canada, most of the caregivers in our SA had language barriers as well, hence, stated a preference for one-on-one counselling supported by visuals to make sure they could understand our key messages.

The input of the other stake holders in the SA provided further insight into the design of our intervention. The Health Authority staff, who provided an aggregate list of suggestions for the waiting room counselling, no longer travel with the families to UBC as they did in previous years. Thus, they may not have a current understanding of the time constraints faced by UBC senior dental students. Therefore, some of their suggestions were not practical. In addition, they recommended a more traditional strategy, for example, pamphlets. Interestingly, when the intervener (RS) offered pamphlets, available in a variety of languages, during the first few sessions, all of the caregivers declined. This lack of enthusiasm for printed material was similar to what other investigators have reported for health education for individuals with low health literacy (102). Our caregivers were more interested in personal interaction, preferring to have a facilitator to help clarify their understanding. Further, they also valued the fact that they were “being listened to.” For example, one mother cried when RS told her she was doing a great job simply because that was the first time anyone has appreciated this mother’s efforts, (in the words of this mother).

As for the thoughts of the dental students, we must keep in mind that they have multiple clinics in a variety of disciplines, other than pediatric dentistry, and are “running” both morning and afternoon. They care for their patients and want to perform good treatment, but are quite aware of the limited time that they are allocated during the UBC CDP for children’s treatment. Thus, providing in-depth counselling with families that they may only see once or twice is probably unrealistic. Students are focused on providing treatment, without the aid of a chairside dental assistant, on children who can be difficult to manage and therefore, not many of the students even thought of the waiting room as a venue for oral health promotion. They are also not used to involving the skills and knowledge of a dental hygienist or dental assistant in the delivery of oral health education. The value of the “team” approach is still beyond their current experience.

All interviewed supervising instructors agreed that the UBC CDP needs to include some sort of caregiver counselling in order to maintain the oral health of these high caries risk children. They also agreed that the senior dental students are rushed in their limited, two-hour appointment time, and are more focused on providing treatment. Therefore, any caregiver counselling at UBC CDP would be more successfully delegated to dental hygiene students or more junior dental students. However, while this idea is sound, scheduling students simultaneously from different programs is always challenging due to the differing timetables of the two program’s curricula.

The dental profession’s customary paternalistic approach to patient education is often largely ineffective (101). Our intervention was based on principles of motivational interviewing (MI), which according to a recent systematic review is an effective method for altering health behaviours (102). Our findings of short-term effectiveness are in accordance with several earlier randomized controlled trials (RCTs), suggesting that an MI-based caregiver-centred strategy may at least have short term success in improving children’s dental behaviours (103). Our caregiver-centred

preventive counselling seems to be a promising strategy for promoting behaviour change in caregivers of underserved children who are receiving dental treatment in public, private or university-based clinics. Active caregiver involvement in program design is essential to change unhealthy dental behaviours in children. In addition, our intervention was based not only on input from caregivers, but also from the Health Authority staff who identified the children in needs and our dental students and instructors who delivered the patient care.

Our dental promotion was relatively straight forward to implement in our setting, and was well-accepted by caregivers of diverse ethnic backgrounds, thus it can be recommended for other settings where caregivers are "waiting" while their children receive treatment. Caregivers' active participation in the intervention should be encouraged (91); they are role models for their children (104). However, a concern is how our caregiver preventive counselling will be sustained in the future.

The positive acceptance by our caregivers of our model may have various explanations. The caregivers who enrolled in our study were already "in the waiting room", thus they did not need to take extra time from their work and home duties to participate. No extra arrangements were needed to book special rooms as the counselling sessions took place in the waiting room. Secondly, the caregivers were aware that their children had extensive dental decay requiring treatment. The high dental needs of their children may have energized the mothers to engage in the counseling sessions. Thirdly, caregivers knew that the treatment at the UBC CDP was a "one-time only" event meaning that all future dental treatment for their child would have to be financed by caregivers. Therefore, these caregivers were likely highly motivated to learn about prevention of future caries in their children. In addition, active engagement of mothers during the one-on-one intervention and their individual goal setting were likely motivating factors that contributed to improvement of

children's dental health behaviours (91). Moreover, the intervener (RS) shared language and culture with some caregivers, is an immigrant herself, as well as a mother of young children.

Our telephone follow-up assessment revealed positive changes, as reported by their mothers, in children's dental health-related behaviours. For each caregiver who did not answer the phone call on the first attempt, RS called at least three times before terminating the attempt at follow-up. Nowadays, with the option of caller identification display, it is very common not to reply to a strange caller number, hence, it was not surprising that mothers did not answer on the first call. Generally, RS would leave a detailed voice message and therefore would be successful in getting a reply on the second call attempt. This positive second response is likely related to the trusting relationship developed between RS and the participants. Moreover, some caregivers called back with enthusiasm once they knew what the call was about; they were excited to report their progress.

Self-reports are one of the most widely used approaches for collecting individual health information yet there is always little consensus on the accuracy and validity of self-reported data.

Although positive behavioural changes occurred, there was still a considerable variation regarding these changes as indicated by a rather wide range of 95% CI for the Odds Ratios (except for change in snacking behaviour). This considerable variation means that not all participants changed their behaviour in the same way after the caregiver-centred education.

## 8.1 Limitations

The limitations of our study need to be acknowledged. We recruited the majority but could not recruit all caregivers because we only had one intervenor for the one-on-one dental counselling. Consequently, not all available caregivers could be accommodated. Concomitantly, it is important

to note that the acceptance of our educational strategy was high as all caregivers we approached agreed to participate except for one who preferred to stay in the clinic.

We used only a simple pre-intervention/post-intervention assessment that was administered over the telephone, therefore our analyses were limited. In addition, we had a relatively small sample size that meant we could only perform simple bivariate analyses. The present project was a pilot study to assess the feasibility of a counselling intervention in the UBC clinic waiting rooms. If the counselling program is eventually implemented at UBC a larger sample will be recruited and their successes will be analyzed.

In the present study, some social desirability response bias (mothers reporting more positively about behaviour changes in their children) in the mothers' responses at the follow-up may have occurred, because caregivers of children receiving free treatment at our clinics might be more prone to report positively about their child's dental health behavioural changes, for fear of jeopardizing future treatment for their other children. Moreover, our follow-up was based solely on caregivers' reports; no objective clinical assessments were included. Self-reports are an obvious limitation, therefore we might expect some overly positive reporting as other studies have demonstrated (105). Future studies targeting caregivers should take this limitation into consideration and add objective measures with clinical assessment of oral self-care and dental health behavioural change.

Given dental students had limited time that was necessary for delivering dental treatment, it was not feasible to employ the dental students to assess the oral hygiene status of each child at each appointment with either plaque or gingival indices to achieve an objective measurement. In addition, even if the students could do baseline clinical assessments, the UBC CDP funding was insufficient to bring each child back for a follow-up assessment to enable before and after

comparisons. Furthermore, and based on our assessment at baseline of caregiver understanding of the causes of dental caries, it was satisfactory knowing that caregivers' knowledge in relation to snacking food options and oral self-care had improved.

Another study limitation was that only short-term follow-up was performed, a further follow-up of these caregivers and their children is necessary to evaluate if the changes reported will be sustained long-term. Moreover, some of the caregivers were lost to follow-up because of language barriers. The ability to provide follow-up calls in different languages may have increased the total number of mothers at follow-up. Unfortunately, there would be an added cost for such service.

We also cannot claim that improvements reported by caregivers were solely a result of our caregiver-centred dental education. Certainly, over the time span of the project, the mothers' behaviours related to their child's oral health may have been influenced by other sources, e.g. television, online resources, school programs. A further important limitation was that the same person delivered the counselling and did the follow-up with caregivers; an "insider evaluation". Despite the fact that this relationship helped in building a trustful relationship, some insider bias may be expected (106).

Only dental behaviours related to toothbrushing and snacking were included in the before/after assessment, but no re-test was performed regarding the change in caregiver dental awareness (oral health preventive knowledge) and retention of new information, e.g. about the etiology of dental caries. The reason for this omission was that we tried to limit the phone call conversation considering the busy daily schedules of our caregivers. To compensate for such deficiency, in the future a simple questionnaire could be mailed to each caregiver with a return address envelope.



Moreover, to overcome language barriers such a questionnaire should be translated into different languages matched to the needs of each caregiver.

## 8.2 Recommendations for Future Studies

The positive outcomes and enthusiastic participation of the caregivers suggest that our waiting room-based intervention should be continued. However, to address some of the limitations, the caregiver-centred counselling should be delegated to junior dental students or to dental hygiene students. Further, some clinical indices such as plaque or gingival indices, recorded by standardized students or involving clinical pictures after using a plaque disclosing agent, could be collected before and after the counseling intervention. A longer-term follow-up is also recommended that includes reliable and valid measures of dental behavioural change.

## **Chapter 9: Conclusions**

The caregiver-centred preventive dental education implemented in the waiting rooms of UBC's two children's dental clinics was a feasible strategy for oral health education, and was well-supported by the clinic administration. The program was well-accepted by the caregivers of high caries risk children; they were committed to all phases of the study, enthusiastic about dental education, and no caregiver withdrew from the study. Caregivers reported short-term improvements in their children's dental health behaviours, which demonstrated the program's short-term effectiveness after follow-up.

Given that the dental students providing the treatment have insufficient appointment time for the caregiver-centred dental health education, this task should be delegated to other individuals. Such dental health education can be provided in the waiting room by junior dental students and/or dental hygiene students.

## References

1. Pitts NB, Stamm JW. International Consensus Workshop on Caries Clinical Trials (ICW-CCT)—Final Consensus Statements: Agreeing Where the Evidence Leads. *J Dent Res*. 2004 Jul 1;83(suppl 1):C125–8.
2. Canada, Health Canada. Report on the Findings of the Oral Health Component of the Canadian Health Measures Survey, 2007-2009 [Internet]. Ottawa, Ont.: Health Canada; 2010 [cited 2016 Jul 17]. Available from: <http://www.deslibris.ca/ID/224533>
3. Casamassimo PS, Thikkurissy S, Edelstein BL, Maiorini E. Beyond the dmft: the Human and Economic Cost of Early Childhood Caries. *J Am Dent Assoc*. 2009;140(6):650–657.
4. Finucane D. Rationale for Restoration of Carious Primary Teeth: A Review. *Eur Arch Paediatr Dent*. 2012 Dec;13(6):281–92.
5. Fontana M, Young DA, Wolff MS, Pitts NB, Longbottom C. Defining Dental Caries for 2010 and beyond. *Dent Clin North Am*. 2010;54(3):423–440.
6. Fisher J, Glick M, Committee FWDFS, others. A New Model for Caries Classification and Management: the FDI World Dental Federation Caries Matrix. *J Am Dent Assoc*. 2012;143(6):546–551.
7. Pretty IA, Ekstrand KR. Detection and Monitoring of Early Caries Lesions: a Review. *Eur Arch Paediatr Dent*. 2016 Feb;17(1):13–25.
8. Kidd E a. M, Fejerskov O. What Constitutes Dental Caries? Histopathology of Carious Enamel and Dentin Related to the Action of Cariogenic Biofilms. *J Dent Res*. 2004 Jul 1;83(suppl 1):C35–8.
9. Kolenbrander PE. Oral Microbial Communities: Biofilms, Interactions, and Genetic Systems [1]. *Annu Rev Microbiol*. 2000;54:413.
10. Featherstone JDB. The Continuum of Dental Caries—Evidence for a Dynamic Disease Process. *J Dent Res*. 2004 Jul 1;83(suppl 1):C39–42.
11. Selwitz RH, Ismail AI, Pitts NB. Dental caries. *The Lancet*. 2007;369(9555):51–59.
12. Dentistry AA of P, others. Policy on Early Childhood Caries (ECC): Unique Challenges and Treatment Options. 2007 [cited 2016 Jul 13]; Available from: <http://dms.ufpel.edu.br/ares/handle/123456789/247>
13. Palmer CA, Kent R, Loo CY, Hughes CV, Stutius E, Pradhan N, et al. Diet and Caries-associated Bacteria in Severe Early Childhood Caries. *J Dent Res*. 2010 Nov 1;89(11):1224–9.

14. Kutsch, V Kim, Young, Douglas A. New Directions in the Etiology of Dental Caries Disease. *J Calif Dent Assoc.* 2011 Oct 1;39(10):716.
15. Hong L, Levy SM, Warren JJ, Broffitt B. Association between Enamel Hypoplasia and Dental Caries in Primary Second Molars: A Cohort Study. *Caries Res.* 2009;43(5):345–53.
16. Schroth RJ, Harrison RL, Moffatt MEK. Oral Health of Indigenous Children and the Influence of Early Childhood Caries on Childhood Health and Well-being. *Pediatr Clin North Am.* 2009 Dec;56(6):1481–99.
17. Rowan-Legg A. Oral Health Care for Children – a Call for Action. *Paediatr Child Health.* 2013 Jan;18(1):37–43.
18. WHO Commission on Social Determinants of Health, World Health Organization, editors. Closing the Gap in a Generation: Health Equity through Action on the Social Determinants of Health: Commission on Social Determinants of Health Final Report. Geneva, Switzerland: World Health Organization, Commission on Social Determinants of Health; 2008. 246 p.
19. da Fonseca MA, Avenetti D. Social Determinants of Pediatric Oral Health. *Dent Clin North Am.* 2017 Jul;61(3):519–32.
20. Paula JS de, Ambrosano GMB, Mialhe FL. The Impact of Social Determinants on Schoolchildren's Oral Health in Brazil. *Braz Oral Res.* 2015;29(1):1–9.
21. Lasser KE, Himmelstein DU, Woolhandler S. Access to Care, Health Status, and Health Disparities in the United States and Canada: Results of a Cross-National Population-Based Survey. *Am J Public Health.* 2006 Jul;96(7):1300–7.
22. Edelstein BL. Disparities in Oral Health and Access to Care: Findings of National Surveys. *Ambul Pediatr.* 2002;2(2):141–147.
23. Samim F, Aleksejuniene J, Zed C, Salimi N, Emperumal CP. Dental Treatment Needs in Vancouver Inner-City Elementary School-Aged Children. *Int J Dent [Internet].* 2013 [cited 2017 Jan 29];2013. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3687495/>
24. Bernab   E, Hobdell MH. Is Income Inequality Related to Childhood Dental Caries in Rich Countries? *J Am Dent Assoc.* 2010;141(2):143–149.
25. Trubey RJ, Moore SC, Chestnutt IG. Parents' Reasons for Brushing or Not Brushing their Child's Teeth: a Qualitative Study. *Int J Paediatr Dent.* 2014 Mar;24(2):104–12.
26. Guideline on Caries-risk Assessment and Management for Infants, Children, and Adolescents. [cited 2016 Jul 25]; Available from: [http://gbdha.org/@/Files/\\_files/7/file.pdf](http://gbdha.org/@/Files/_files/7/file.pdf)

27. Schwendicke F, Dörfer CE, Schlattmann P, Page LF, Thomson WM, Paris S. Socioeconomic Inequality and Caries a Systematic Review and Meta-Analysis. *J Dent Res*. 2015 Jan 1;94(1):10–8.
28. Canadian Dental Association. CDA Position on Use of Fluorides in Caries Prevention. Ott CDA [Internet]. 2012 [cited 2016 Jul 22]; Available from: <http://www.fluoridation.com/CalgaryFluoride/ElkeBabiuk.pdf>
29. Featherstone JD, Domejean-Orliaguet S, Jenson L, Wolff M, Young DA. Caries Risk Assessment in Practice for Age 6 through Adult. *CDA*. 2007;35(10):703.
30. Council O. Policy on Social Determinants of Children’s Oral Health and Health Disparities. *Oral Health*. 47:48.
31. Kühnisch J, Ekstrand KR, Pretty I, Twetman S, Loveren C van, Gizani S, et al. Best Clinical Practice Guidance for Management of Early Caries Lesions in Children and Young Adults: an EAPD Policy Document. *Eur Arch Paediatr Dent*. 2016 Jan 5;17(1):3–12.
32. Kumar S, Tadakamadla J, Kroon J, Johnson NW. Impact of Parent-Related Factors on Dental Caries in the Permanent Dentition of 6–12 Year Old Children: A Systematic Review. *J Dent*. 2016 Mar;46:1–11.
33. Kagihara LE, Niederhauser VP, Stark M. Assessment, Management, and Prevention of Early Childhood Caries. *J Am Acad Nurse Pract*. 2009 Jan 1;21(1):1–10.
34. Adair PM, Pine CM, Burnside G, Nicoll AD, Gillett A, Anwar S, et al. Familial and Cultural Perceptions and Beliefs of Oral Hygiene and Dietary Practices among Ethnically and Socio-economically Diverse Groups. *Community Dent Health*. 2004 Mar;21(1 Suppl):102.
35. Featherstone JD. The Science and Practice of Caries Prevention. *J Am Dent Assoc*. 2000;131(7):887–899.
36. Cate JM ten, Featherstone JDB. Mechanistic Aspects of the Interactions Between Fluoride and Dental Enamel. *Crit Rev Oral Biol Med*. 1991 Jan 1;2(3):283–96.
37. Zero DT. Dentifrices, Mouthwashes, and Remineralization/Caries Arrestment Strategies. *BMC Oral Health*. 2006;6(Suppl 1):S9.
38. Wright JT, Hanson N, Ristic H, Whall CW, Estrich CG, Zentz RR. Fluoride Toothpaste Efficacy and Safety in Children Younger than 6 Years. *J Am Dent Assoc*. 2014 Feb;145(2):182–9.
39. dos Santos APP, Nadanovsky P, de Oliveira BH. A Systematic Review and Meta-analysis of the Effects of Fluoride Toothpastes on the Prevention of Dental Caries in the Primary Dentition of Preschool Children. *Community Dent Oral Epidemiol*. 2013 Feb;41(1):1–12.

40. Canadian Dental Association [Internet]. [cited 2017 May 21]. Available from: [https://www.cda-adc.ca/en/about/position\\_statements/fluoride/](https://www.cda-adc.ca/en/about/position_statements/fluoride/)
41. Spolsky VW, Black BP, Jenson L. Products: Old, New, and Emerging. CDA. 2007;35(10):724.
42. Azarpazhooh A, Main PA. Fluoride Varnish in the Prevention of Dental Caries in Children and Adolescents: a Systematic Review. J-Can Dent Assoc. 2008;74(1):73.
43. Lawrence HP, Binguis D, Douglas J, McKeown L, Switzer B, Figueiredo R, et al. A 2-Year Community-Randomized Controlled Trial of Fluoride Varnish to Prevent Early Childhood Caries in Aboriginal Children. Community Dent Oral Epidemiol. 2008 Dec;36(6):503–16.
44. American Dental Association Council on Scientific Affairs. Professionally Applied Topical Fluoride: Evidence-Based Clinical Recommendations. J Am Dent Assoc. 2006;8(137):1151–9.
45. Marinho VC, Worthington HV, Walsh T, Chong LY. Fluoride Gels for Preventing Dental Caries in Children and Adolescents. In: The Cochrane Collaboration, editor. Cochrane Database of Systematic Reviews [Internet]. Chichester, UK: John Wiley & Sons, Ltd; 2015 [cited 2017 May 27]. Available from: <http://doi.wiley.com/10.1002/14651858.CD002280.pub2>
46. Rosenblatt A, Stamford TCM, Niederman R. Silver Diamine Fluoride: A Caries “Silver-Fluoride Bullet.” J Dent Res. 2009 Feb 1;88(2):116–25.
47. dos Santos VE, Filho AV, Ribeiro Targino AG, Pelagio Flores MA, Galembeck A, Caldas AF, et al. A New “Silver-Bullet” to Treat Caries in Children – Nano Silver Fluoride: A Randomised Clinical Trial. J Dent. 2014 Aug;42(8):945–51.
48. Petersen PE. The World Oral Health Report 2003: Continuous Improvement of Oral Health in the 21st Century – the Approach of the WHO Global Oral Health Programme. Community Dent Oral Epidemiol. 2003 Dec 1;31:3–24.
49. Sheiham A, James WPT. A Reappraisal of the Quantitative Relationship between Sugar Intake and Dental Caries: the Need for New Criteria for Developing Goals for Sugar Intake. BMC Public Health. 2014;14(1):863.
50. Moynihan PJ, Kelly SAM. Effect on Caries of Restricting Sugars Intake. J Dent Res. 2014 Jan;93(1):8–18.
51. Burt BA, Pai S. Sugar Consumption and Caries Risk: a Systematic Review. J Dent Educ. 2001;65(10):1017–1023.
52. Touger-Decker R, Van Loveren C. Sugars and Dental Caries. Am J Clin Nutr. 2003;78(4):881S–892S.

53. Heyman M, Abrams S. Fruit Juice in Infants, Children, and Adolescents: Current Recommendations. *Pediatrics*. 2017;139(6).
54. Vogel L. Food Guide under Fire at Obesity Summit. *Can Med Assoc J*. 2015 Jun 16;187(9):E256–E256.
55. Harrison RL, Wong T. An Oral Health Promotion Program for an Urban Minority Population of Preschool Children. *Community Dent Oral Epidemiol*. 2003;31(5):392–399.
56. Krasse B. The Vipeholm Dental Caries Study: recollections and reflections 50 years later. *J Dent Res*. 2001;80(9):1785–1788.
57. Cochrane NJ, Reynolds EC. Calcium Phosphopeptides -- Mechanisms of Action and Evidence for Clinical Efficacy. *Adv Dent Res*. 2012 Sep 1;24(2):41–7.
58. Raphael S, Blinkhorn A. Is There a Place for Tooth Mousse® in the Prevention and Treatment of Early Dental Caries? A Systematic Review. *BMC Oral Health* [Internet]. 2015 Dec [cited 2017 May 27];15(1). Available from: <http://bmcoralhealth.biomedcentral.com/articles/10.1186/s12903-015-0095-6>
59. Jannesson L, Renvert S, Kjellsdotter P, Gaffar A, Nabi N, Birkhed D. Effect of a Triclosan-Containing Toothpaste Supplemented with 10% Xylitol on Mutans Streptococci in Saliva and Dental Plaque. *Caries Res*. 2002;36(1):36–39.
60. Ly, K. A., Milgrom, P., Rothen M. Xylitol, Sweeteners, and Dental Caries. *Pediatr Dent*. 28(2).
61. Leake JL. Why Do We Need an Oral Health Care Policy in Canada? *J-Can Dent Assoc*. 2006;72(4):317.
62. Leake JL, Birch S. Public Policy and the Market for Dental Services. *Community Dent Oral Epidemiol*. 2008 Aug 1;36(4):287–95.
63. Moerenhout, T., Borgermans, L., Schol, S., Vansintejan, J., Van De Vijver, E., Devroey, D. Patient Health Information Materials in Waiting Rooms of Family Physicians: Do Patients Care? *Patient Prefer Adherence* 7 2013.
64. Jackson RA, Stotland NE, Caughey AB, Gerbert B. Improving Diet and Exercise in Pregnancy with Video Doctor Counseling: A Randomized Trial. *Patient Educ Couns*. 2011 May;83(2):203–9.
65. Gilliam ML, Martins SL, Bartlett E, Mistretta SQ, Holl JL. Development and Testing of an iOS Waiting Room “App” for Contraceptive Counseling in a Title X Family Planning Clinic. *Am J Obstet Gynecol*. 2014 Nov;211(5):481.e1-481.e8.
66. Rhodes, K V, Lauderdale, D S, Stocking, C B, Howes, D S, Roizen, M F, Levinson, W. Better Health While You Wait: A Controlled Trial of a Computer-Based Intervention for

- Screening and Health Promotion in the Emergency Department. *Ann Emerg Med*. 2001;37(3):284–91.
67. Michie S. Making Psychological Theory Useful for Implementing Evidence Based Practice: a Consensus Approach. *Qual Saf Health Care*. 2005 Feb 1;14(1):26–33.
  68. Jabareen Y. Building a Conceptual Framework: Philosophy, Definitions, and Procedure. *Int J Qual Methods*. 2009;8(4):49–62.
  69. Conner M, Norman P, editors. *Predicting Health Behaviour: Research and Practice with Social Cognition Models*. 2. ed., repr. Maidenhead: Open Univ. Press; 2007. 385 p.
  70. Huff R.M., Kline M.V., Peterson D.V. *Health Promotion In Multicultural Populations*. A Handbook for Practitioners and Students. 3rd ed. SAGE Publication, Inc.; 2015. 64-100 p.
  71. Stajkovic AD, Luthans F. Social Cognitive Theory and Self Efficacy: Implications for Motivation Theory and Practice. 1979 [cited 2016 Aug 10]; Available from: [https://www.researchgate.net/profile/Alex\\_Stajkovic/publication/258995495\\_Social\\_cognitive\\_theory\\_and\\_self-efficacy\\_Implications\\_for\\_motivation\\_theory\\_and\\_practice/links/00b7d5299300b9f0c2000000.pdf](https://www.researchgate.net/profile/Alex_Stajkovic/publication/258995495_Social_cognitive_theory_and_self-efficacy_Implications_for_motivation_theory_and_practice/links/00b7d5299300b9f0c2000000.pdf)
  72. Green L.W., Kreuter M.W. *Health Program Planning: An Educational And Ecological Approach*. 4th ed. McGraw-Hill Companies; 2005.
  73. Mezirow J. A Critical Theory of Adult Learning and Education. *Adult Educ Q*. 1981 Sep 1;32(1):3–24.
  74. Brookfield, Stephan. *Understanding and Facilitating Adult Learning*. Jossey-Bass higher education series; 1986.
  75. Prochaska JO, DiClemente CC. Transtheoretical Therapy: Toward a More Integrative Model of Change. *Psychother Theory Res Pract*. 1982 Fal;19(3):276–88.
  76. Prochaska JO, Norcross JC, DiClemente CC. *Changing for Good* [Internet]. Avon Books New York; 1995 [cited 2016 Sep 6]. Available from: <http://healingunleashed.com/wp-content/uploads/2014/03/CHANGE-BOOK.pdf>
  77. Hollister C. M., Anema M. G. Health Behavior Models and Oral Health: a Review. *Journal of Dental Hygiene*. 78(3).
  78. Weinstein P, Harrison R, Benton T. *Motivating Parents to Prevent Caries in their Young Children-One-Year Findings:–Weinstein, Harrison, and Benton (2004)*. Cree Health Publ. 2010;



79. Borrelli B, Tooley EM, Scott-Sheldon LA. Motivational Interviewing for Parent-Child Health Interventions: A Systematic Review and Meta-analysis. *Pediatr Dent*. 2015;37(3):254–265.
80. Rollnick S, Heather N, Bell A. Negotiating Behaviour Change in Medical Settings: The Development of Brief Motivational Interviewing. *J Ment Health*. 1992 Jan;1(1):25–37.
81. Gao X, Lo ECM, Kot SCC, Chan KCW. Motivational Interviewing in Improving Oral Health: A Systematic Review of Randomized Controlled Trials. *J Periodontol*. 2014 Mar;85(3):426–37.
82. Noordman J, de Vet E, van der Weijden T, van Dulmen S. Motivational Interviewing within the Different Stages of Change: An Analysis of Practice Nurse-Patient Consultations Aimed at Promoting a Healthier Lifestyle. *Soc Sci Med*. 2013 Jun;87:60–7.
83. Smith DE, Heckemeyer CM, Kratt PP, Mason DA. Motivational Interviewing to Improve Adherence to a Behavioral Weight-Control Program for Older Obese Women with NIDDM: A Pilot Study. *Diabetes Care*. 1997 Jan 1;20(1):52–4.
84. Collins S., Britten N., Ruusuvaori J. Patient Participation in Health Care Consultations : Qualitative Perspectives. [Internet]. Buckingham, US: Open University Press; 2007 [cited 2016 Aug 19]. Available from: <http://site.ebrary.com/lib/ubc/reader.action?docID=10197061>
85. Martins RK, McNeil DW. Review of Motivational Interviewing in Promoting Health Behaviours. *Clin Psychol Rev*. 2009 Jun;29(4):283–93.
86. Weinstein P, Harrison R, Benton T. Motivating Mothers to Prevent Caries: Confirming the Beneficial Effect of Counseling. *J Am Dent Assoc*. 2006;137(6):789–793.
87. Harrison R, Benton T, Everson-Stewart S, Weinstein P. Effect of Motivational Interviewing on Rates of Early Childhood Caries: A Randomized Trial. *Pediatr Dent*. 2007;29(1):16–22.
88. Kawamura M, Komabayashi T, Sasahara H, Okada M, Taguchi N, Ogawa T. PRECEDE-PROCEED Model Modification in Community-Based Oral Health Promotion by Using the Linear Structural Relations Programme. *Oral Health Prev Dent*. 2010;8(4):315–21.
89. Manios Y, Grammatikaki E, Androutsos O, Chinapaw MJM, Gibson EL, Buijs G, et al. A Systematic Approach for the Development of a Kindergarten-Based Intervention for the Prevention of Obesity in Preschool Age Children: the ToyBox-Study. *Obes Rev*. 2012 Mar 1;13:3–12.
90. Crosby R, Noar SM. What is a Planning Model? An Introduction to PRECEDE-PROCEED. *J Public Health Dent*. 2011 Jan 1;71:S7–15.
91. Harrison RL, Wong T. An Oral Health Promotion Program for an Urban Minority Population of Preschool Children. *Community Dent Oral Epidemiol*. 2003;31(5):392–399.

92. McKenzie J. F., Neiger B.L., Thackeray R.T. Planning, Implementing and Evaluating Health Promotion Programs. A Primer. 5th ed. San Fransisco: Pearson, Benjamin Cummings.; 2009. 16-57 p.
93. Clarke A. Situational Analysis [Internet]. 2455 Teller Road,Thousand Oaks California-91320 United States of America: SAGE Publications, Inc.; 2005 [cited 2017 Jun 16]. Available from: <http://methods.sagepub.com/book/situational-analysis>
94. healthy-kids.pdf [Internet]. [cited 2017 Feb 16]. Available from: <http://www2.gov.bc.ca/assets/gov/british-columbians-our-governments/organizational-structure/ministries-organizations/social-development-social-innovation/healthy-kids.pdf>
95. UN Committee on the Rights of the Child CRC. Definitions of the Right to Health (art. 24) [Internet]. 2013 [cited 2017 Jul 9]. Available from: [http://www.claiminghumanrights.org/health\\_definition.html](http://www.claiminghumanrights.org/health_definition.html)
96. Watt RG, Heilmann A, Listl S, Peres MA. London Charter on Oral Health Inequalities. J Dent Res. 2016;95(3):245–247.
97. Petersen PE, Kwan S. Equity, Social Determinants and Public Health Programmes - the Case of Oral Health: Equity, Social Determinants and Public Health Programmes. Community Dent Oral Epidemiol. 2011 Dec;39(6):481–7.
98. Rowan-Legg A. Oral Health Care for Children - A Call for Action. Paediatr Child Health Oakv. 2013 Jan;18(1):1–10.
99. Cruz GG d. Dental Screening and Referral of Young Children by Pediatric Primary Care Providers. PEDIATRICS. 2004 Nov 1;114(5):e642–52.
100. Amin MS, Elyasi M, Valiushka A, Perez A. Feasibility of Implementing a Community-Based Oral Health Educational Tool for Newcomers in Alberta: Perspectives of Frontline Community Leaders. J Can Dent Assoc. 2016;82:g23–g23.
101. Satur J, Gussy M, Morgan M, Calache H, Wright F. Evidence Based Review of Oral Health Promotion. Consortium of the University of Melbourne Co-operative Research Centre for Oral Health Science and Dental Health Services Victoria. 2006. Health Educ J. 2010;(3)(69):257–66.
102. Yevlahova D, Satur J. Models for Individual Oral Health Promotion and their Effectiveness: a Systematic Review. Aust Dent J. 2009 Sep;54(3):190–7.
103. Mohammadi TM, Hajizamani A, Bozorgmehr E. Improving Oral Health Status of Preschool Children Using Motivational Interviewing Method. Dent Res J. 2015;12(5):476.
104. Mattila M-L, Rautava P, Sillanpää M, Paunio P. Caries in Five-Year-Old Children and Associations with Family-Related Factors. J Dent Res. 2000;79(3):875–881.

105. Adams SA, Matthews CE, Ebbeling CB, Moore CG, Cunningham JE, Fulton J, et al. The Effect of Social Desirability and Social Approval on Self-Reports of Physical Activity. *Am J Epidemiol.* 2005 Feb 15;161(4):389–98.
106. Bonner A, Tolhurst G. Insider-Outsider Perspectives of Participant Observation. *Nurse Res.* 2002 Jun;9(4):7.

## Appendix A: Brief Introduction- Part1



### THE INVITATION SHEET FOR PARENTS/CAREGIVERS

Title of Study: **Waiting Room Time: An Opportunity for Caregiver Oral Health Education**

Dear Caregiver,

You are invited to participate in a study being conducted by researchers from UBC Faculty of Dentistry. If you agree to participate you will be interviewed and we will ask a number of questions related to your child's dental health. All information will be collected and used confidentially.

The interview will occur while your child is being treated and may take up to 15-20 minutes.

You will be given a \$10 CAD grocery card as thanks for your participation.

If you are interested, please let us know and a team member will contact you.

On behalf of the study group:

Dr. Jolanta Aleksejuniene

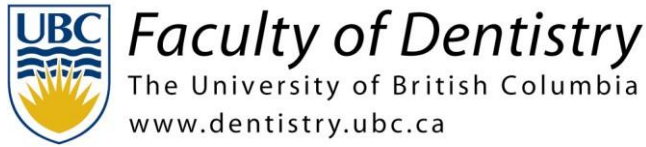
Assistant Professor

Chair, Division of Preventive and Community Dentistry,

Faculty of Dentistry, University of British Columbia

tel: XXX XXX XXXX

## Appendix B: Caregiver Consent



### CONSENT FORM FOR PARENTS/CAREGIVERS

**Title of Study:** The Parent in the Waiting Room- Engaging Families in Oral Health Promotion

**Principal Investigator:** Dr. Jolanta Aleksejūnienė, UBC, Department of Oral Health Sciences, contact Phone Number: (xxx) xxx-xxxx

**Emergency Telephone Number:** (xxx) xxx-xxxx contact Dr. Jolanta Aleksejūnienė 24hours, 7-days a week.

#### 1. THE INVITATION

You are invited to participate in a study being conducted by the UBC Faculty of Dentistry researchers.

#### 2. YOUR PARTICIPATION IS VOLUNTARY

Your participation is entirely voluntary, so it is up to you to decide whether or not to take part in this study. Before you decide, it is important for you to understand what the research

involves. This consent form will tell you about the study, why the research is being done, what will happen to you during the study and the possible benefits, risks and discomforts.

If you wish to participate, you will be asked to sign this form. If you do decide to take part in this study, you are still free to withdraw at any time and without giving any reasons for your decision.

If you do not wish to participate, you do not have to provide any reason for your decision not to participate nor will you lose the benefit of any medical care to which you are entitled or are presently receiving.

Please take time to read the following information carefully before you decide.

### **1. WHO IS CONDUCTING THE STUDY?**

The Faculty of Dentistry, University of British Columbia is conducting the study. There are no conflicts of interests.

### **2. BACKGROUND**

The present study aims to add oral health promotion involving parents to already existing UBC Children's Dental Program.

### **3. WHAT IS THE PURPOSE OF THE STUDY?**

1. To assess the knowledge, behaviours and goals of participating parents regarding their child's dental health.

2. To document the parents' suggestions and recommendations for appropriate oral health promotion.

#### **4. WHO CAN PARTICIPATE IN THE STUDY?**

All invited.

#### **5. WHAT DOES THE STUDY INVOLVE?**

This study will take place in the UBC Children Dental. A total of 60-70 caregivers will be enrolled for the entire study.

The information about you will be used anonymously to plan strategies aiming to improve oral health of children. In this study, you will be interviewed and asked about different aspects related to the UBC Children's Dental Program.

#### **6. WHAT ARE THE POSSIBLE HARMS AND SIDE EFFECTS OF PARTICIPATING?**

There are no risks related to this study.

#### **7. WHAT ARE THE BENEFITS OF PARTICIPATING IN THIS STUDY?**

You will benefit from participating in this study by:

- ☐ Acquiring oral-health related knowledge

#### **8. WHAT HAPPENS IF I DECIDE TO WITHDRAW MY CONSENT TO PARTICIPATE?**

Your participation in this research is entirely voluntary. You may withdraw from this study at any time. If you decide to enter the study and to withdraw at any time in the future, there will

be no penalty or loss of benefits to which you are otherwise entitled, and your future medical care will not be affected.

If you choose to enter the study and then decide to withdraw at a later time, all data collected about you during your enrolment in the study will be retained for analysis. By law, this data cannot be destroyed.

#### **9. WHAT HAPPENS IF SOMETHING GOES WRONG?**

There will be no costs to the subject or legal representative for participation in this study. Signing this consent form in no way limits the legal representative's or subject's legal rights, against the sponsor, investigators, or anyone else.

#### **10. AFTER THE STUDY IS FINISHED**

Study results will be available upon request.

#### **11. WHAT WILL THE STUDY COST ME?**

There will be no reimbursement for study related expenses and you will be given a 10 CAD grocery card as thanks for your participation.

#### **12. WILL MY TAKING PART IN THIS STUDY BE KEPT CONFIDENTIAL?**

Your confidentiality will be respected. No information that discloses your identity will be released. However, research records and medical records identifying you may be inspected in the presence of the Investigator or his or her designate by representatives



### **13. WHO DO I CONTACT IF I HAVE QUESTIONS ABOUT THE STUDY DURING MY PARTICIPATION?**

If you have any questions or desire further information about this study before or during participation, you can contact Dr. Jolanta Aleksejūnienė, UBC, Department of Oral Health Sciences, contact Phone Number: (xxx) xxx- xxx.

Your confidentiality will be respected. No information that discloses your identity will be released or published without your specific consent to the disclosure. However, research records and medical records identifying you may be inspected in the presence of the Investigator or his or her designate by representatives of the UBC Research Ethics Board for the purpose of monitoring the research. However, no records which identify you by name or initials will be allowed to leave the Investigators' offices.

### **14. WHO DO I CONTACT IF I HAVE ANY QUESTIONS OR CONCERNS ABOUT MY RIGHTS AS A SUBJECT DURING THE STUDY?**

If you have any concerns about your rights as a research subject and/or your experiences while participating in this study, contact the Research Subject Information Line in the University of British Columbia Office of Research Services by e-mail at [RSIL@ors.ubc.ca](mailto:RSIL@ors.ubc.ca) or by phone at 604-822-8598.

## **15. SUBJECT CONSENT TO PARTICIPATE**

- I have read and understood the subject information and consent form.
- I have had sufficient time to consider the information provided and to ask for advice if necessary. I have had the opportunity to ask questions and have had satisfactory responses to my questions.
- I understand that the information (age, gender, treatment plan) collected from dental charts will be kept confidential and that the result will only be used for scientific objectives.
- I understand that my participation in this study is voluntary and that I am completely free to refuse to participate or to withdraw from this study at any time without changing in any way the quality of care that I receive.
- I understand that I am not waiving any of my legal rights as a result of signing this consent form.
- I understand that there is no guarantee that this study will provide any benefits to me.
- I have read this form and I freely consent to participate in this study.
- I have been told that I will receive a dated and signed copy of this form.

### **SIGNATURES**

**Printed name of a**

**Signature**

**Date**

**Caregiver/Parent/Guardian**

**Printed name of witness**

**Signature**

**Date**

## **Appendix C: Caregiver Questionnaire**

### **The Interview Guide**

### **CODE ID**

### **Guiding Questions for Parents**

**Introduction:** First the interviewer introduces herself and asks the interviewee's name and name of child receiving dental treatment.

**The interviewer tells the interviewee:**

**Please ask me to repeat any questions that are unclear.**

**Getting acquainted**

**Q1A. Are you -----?**

**child's name**

- 1. Parent ☐**
- 2. Grandparent ☐**
- 3. Other relative ☐**

**Q2.A. How many children are in this (child's name) household and what are their ages?**

**B. Tell me who else lives in the household?**

**Q3. A. Where were you born? .....**

**B. Where was ..... born? .....**

**child's name**

**Q4. How many years has ..... lived in Canada?**

**child's name**

**Getting to the UBC CDP (University of British Columbia, Children's Dental Program)**

**Q5. How did you learn about the program? (check all that apply)**

- 1. Teacher ☐
- 2. School nurse ☐
- 3. Neighbour ☐
- 4. Friend ☐
- 5. Family member ☐
- 6. Advertisement (school newsletter) ☐
- 7. Family doctor ☐
- 8. Others (specify).....

**Q6. Tell me how you got here today? (check all that apply)**

- 1. Car ☐
- 2. Public transit ☐
- 3. Bus provided by the program ☐

**Q7. How long did it take you to get here? Specify (in minutes)..... Q8. What are your reasons for enrolling your child in the UBC CDP?**

### **Child's Dental Experience**

**Q9. Is this ..... first visit to a dentist?**

**child's name**

- 1. Yes ☐ If yes, proceed to Q12.**
- 2. No ☐ If not, tell me more about child's experience with previous visits.**

**Q10. What treatment was done in the past? (check all that apply)**

- a. Check-up ☐
- b. Cleaning ☐
- c. Filling or caps ☐
- d. Pulling tooth/teeth out ☐
- e. Not sure/do not remember ☐

**Q11. Was any treatment done while your child was asleep i.e. under general anesthesia?**

- 1. Yes ☐
- 2. No ☐

**Q12. Is this ..... first visit to the UBC Children's Dental Program?**

child's name

- 1. Yes ☐
- 2. No ☐

**Q13. What is the reason for your visit today? (check all that apply) f.**

- Check-up ☐
- g. Cleaning ☐
- h. Cavities ☐
- i. Filling or caps ☐
- j. Toothache or mouth pain ☐
- k. Other reason, specify.....

**Q14. What do you think has caused the cavities in your child's teeth?**

**Q15. What treatment ‘do you think’ the child needs? (check all that apply)**

**a) Check-up**

**b) Cleaning ☐**

**c) Filling or caps ☐**

**d) Pulling tooth/teeth out ☐**

**e) Other, specify.....**

**Later check what treatments the child’s chart to reference**



## **Oral health behaviour**

**Now I would like to talk about your child's dental habits.**

**Q16. Who brushes your child's teeth?**

- a. Child alone ☐**
- b. Child with help from sibling ☐**
- c. Child with help from parent/caregiver ☐**
- d. Parent/caregiver only ☐**

**Q17. What kind of toothpaste does your child use?**

**Q18. Have you been shown how to brush your child's teeth?**

- 1. Yes ☐**
- 2. No ☐**

**Q19. Are your child's teeth brushed before he/she goes to bed?**

- 1. Yes ☐**
- 2. No ☐**

**Q20. If your child is hungry for a snack between meals what does he/she usually like to eat?**

**Q21. If your child is thirsty between meals what does he/she usually like to drink?**

**Q22. Do you believe there is anything that can prevent your child getting cavities again?**

**1. No** ☐

**2. Yes** ☐

**If yes, explain**

**Parents/caregivers spend a lot of time in the waiting room during their child's visit.**

**We would like to use some of this time to help you to improve your children's dental health.**

**Q23. Would you participate?**

**1. Yes ☐**

**2. No ☐**

**Q24. How would you prefer to participate?**

**a. One-to-one counselling by student dentists ☐**

**b. Pamphlets & pictures ☐**

**c. Short videos ☐**

**d. Other, specify**

**Q25. Tell us your ideas about how this program can improve your children's dental health, especially involving parents in the waiting room.**

**Thank you for your time, I would like to know if you have anything to add.**

## **Appendix D: Health Authority Staff Questionnaire**



***Faculty of Dentistry***

The University of British Columbia  
[www.dentistry.ubc.ca](http://www.dentistry.ubc.ca)

## **UBC Children's Dental Program**

### **Health Authority Interview Guide**

**Q1. Tell me your ideas about how to enhance the prevention or oral health promotion component of our program?**

**Q2. What do you think we could do as far as engaging caregivers in the waiting room in the prevention either at DC or in the UBC Oral Health Centre?**

## Appendix E: Instructors' Questionnaire



**Faculty of Dentistry**

The University of British Columbia  
www.dentistry.ubc.ca

The Interview Guide

CODE ID

### Guiding Questions for Instructors

Introduction: First the interviewer introduces herself and asks the instructor's name.

Getting acquainted

Q1. Are you a

**1. General dentist**

**a. Yes/No**

**b. Number of years in practice \_\_\_\_\_**

**c. Number of years teaching at UBC \_\_\_\_\_**

**2. Pediatric specialist**

**a. Yes/No**

**b. Number of years in practices \_\_\_\_\_**

**c. Number of years teaching at UBC \_\_\_\_\_**

**3. Pediatric dentistry graduate student**

**a. Yes/No**

**b. Number of years in practice prior to UBC \_\_\_\_\_**

Children come to the UBC Children's Dental Program for one course of treatment. Their families are of low income, have no dental benefits and are unlikely to be treated anywhere else. We would like to improve the preventive component of our program.

Q3. What do you think are the reasons that our child patients have extensive caries?

Q4. Tell me your ideas about how to enhance the prevention or oral health promotion component of our program?

Q4a. If "caregivers in the w.r." is not mentioned, specially ask: What do you think we could do as far as engaging caregivers in the waiting room in prevention either here at Douglas College or in the UBC Oral Health Centre?

## Appendix F: DMD's Questionnaire

Getting acquainted

Introduction: First the interviewer introduces herself and asks the instructor's name.

Children come to the UBC Children's Dental Program for one course of treatment. Their families are of low income, have no dental benefits and are unlikely to be treated anywhere else. We would like to improve the preventive component of our program.

**Q1. As a 4<sup>th</sup> year student you treated children in the OHC in Term 1 and now at Douglas College. At both clinics, what were your biggest challenges to providing oral health counseling to the children's caregivers? (if students cannot think of anything, you might prompt them: was it lack of time? parent's not interested? you were not sure what to say or do? Language barriers? etc.)**

**Q2. Tell me your ideas about how to enhance the prevention or oral health promotion component of the Children's program?**

**Q3. If “caregivers in the w.r.” is not mentioned, specially ask: What do you think we could do as far as engaging caregivers in the waiting room in prevention either here at Douglas College or in the UBC Oral Health Centre?**

Q2. What are your observations as a dental student regarding the counselling the children’s caregivers get from the students about oral health?

Q3. Tell me your ideas about how to enhance the prevention or oral health promotion component of our program?

Q3a. If “caregivers in the w.r.” is not mentioned, specially ask: What do you think we could do as far as engaging caregivers in the waiting room in prevention either here at Douglas College or in the UBC Oral Health Centre?



## Appendix G: Caregiver-Centred Power Point Presentation



## Tooth Decay

- most common chronic disease in children
- occurs at any age, even the very young
- affects baby and adult teeth
- affects front and back teeth



## Baby Teeth

- start to form before birth
- first tooth appears between 6 -10 months of age
- usually 20 baby teeth
- **important!** baby teeth hold space for adult teeth
- begin to fall out between 6 -7 years of age
- replaced by adult teeth



## Teeth Facts

We have 2 sets of teeth:

1. baby or primary teeth



Courtesy of Dr. Vilma Brukienė

2. adult or permanent teeth



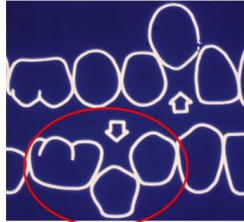
## How baby teeth hold space



The adult teeth are still in bone!

If baby tooth lost early,  
the space will close;

not enough space left for  
adult tooth!



## Around 6 to 7 years of age

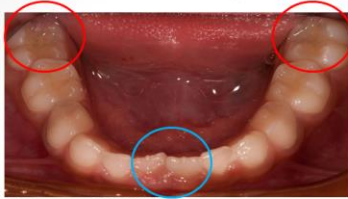
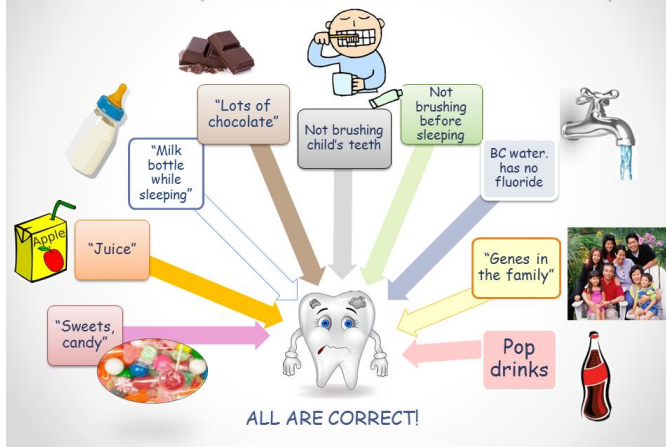


Photo courtesy of Dr. R. Harrison

- front baby teeth start to fall out and will be replaced by adult front teeth.
- **do not forget** that new adult teeth (molars) appear **BEHIND** the last baby tooth at the back of the mouth!
- no baby tooth will have fallen out in this area!
- back adult molars are hard to brush

## What other parents have told us causes tooth decay

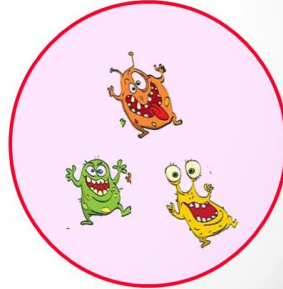




The healthy tooth weakens because of

1. sugary foods & drinks

2. bacteria in the mouth



## How TOOTH DECAY Starts

when we eat and drink



sugary food and drinks  
stick to our teeth



Photo courtesy of Dr. R. Harrison

Bacteria in our  
mouth



Use sticky, sugary food and drinks



To produce



**Acid** removes calcium from the tooth enamel!  
The tooth enamel starts to break down!  
This is the beginning of tooth decay



## First Signs of Tooth Decay

White, chalky spots on tooth surfaces



Photo courtesy of Dr. R Harrison

but tooth decay can be STOPPED and SLOWED DOWN so these white and chalky spots do not develop into cavities!

## But if NOTHING is done .....

- white, chalky spots will likely develop into cavities!
- "cavities" may look like soft 'brown pits' on the tooth
- soft tooth enamel will break down



Photo courtesy of Dr. WS Cheung



Photo courtesy of Dr. WS Cheung

- tooth gets weaker and weaker!
- the decay goes deeper into the tooth!
- now, cavity needs to be filled by a dentist



If the child does not visit a dentist...



Photo courtesy of Dr. WS Cheung

- the teeth get badly damaged
- an "abscess" may appear on the gum!

Consequences of advanced tooth decay



Problems chewing healthy foods



Poor sleeping for your child....and you



Child not able to study at school



Child may not want to smile



Photo courtesy of Dr. WS Cheung

An infected, untreated tooth may  
lead to infection and swelling  
which needs immediate attention!



Photo courtesy of Dr. P. Leggott

Child's adult teeth may come in crooked



Photos courtesy of Dr. D. Kennedy



Because baby teeth are lost too early  
not enough space for adult teeth!

Remember  
tooth decay can be prevented





## FLUORIDE slows down tooth decay by making the tooth stronger

Brush with  
fluoride toothpaste



Fluoride makes  
teeth stronger

Fluoride  
varnish at the  
dentist



## How you can slow down tooth decay

Help brush your child's teeth  
twice a day



morning & before sleep

Use SOFT  
CHILD SIZE toothbrush



Keep  
TEETH  
CLEAN



Use only SMALL AMOUNT of  
fluoride toothpaste



Brush child's teeth  
2 minutes each time

## How you can stop or slow down tooth decay



2-3 Healthy Snacks



Eat  
HEALTHY



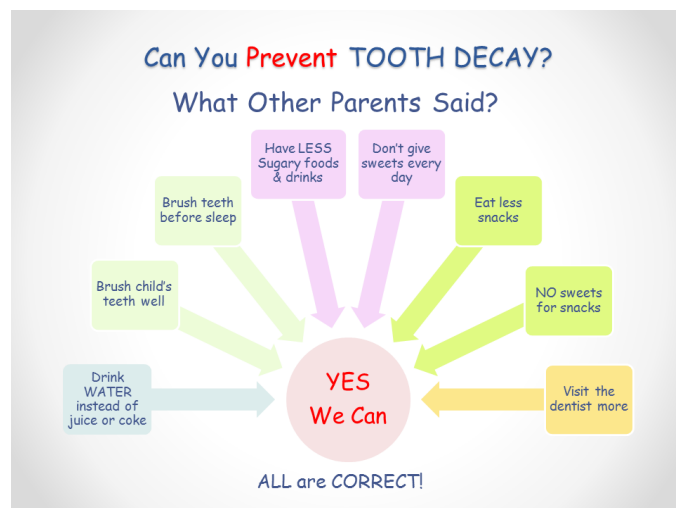
Drink water, not juice



Say NO to ALL Pop Drinks



Save sweets ONLY for  
SPECIAL TIMES



## Appendix H: Brief Introduction- Part2



### THE INVITATION SHEET FOR PARENTS/CAREGIVERS

Title of Study: **The Parent in the Waiting Room- Engaging Families in Oral Health**

Dear Caregiver,

You are invited to participate in a study being conducted by researchers from UBC Faculty of Dentistry. If you agree to participate you will be interviewed and we will ask a number of questions related to your child's dental health. After the interview a researcher will provide a face-to-face dental education presentation, each caregiver is invited to ask questions. All information will be collected and used confidentially.

The interview will occur while your child is being treated and may take up to 15-20 minutes.

You will be given toothbrushes and toothpastes as thanks for your participation.

If you are interested, please let us know and a team member will contact you.

On behalf of the study group:

Dr. Jolanta Aleksejuniene

Assistant Professor

Chair, Division of Preventive and Community Dentistry,

Faculty of Dentistry, University of British Columbia

tel: XXX XXX XXXX

## Appendix I: Pre-education Questionnaire

### The Interview Guide

### CODE ID

### Guiding Questions for Parents

**Introduction:** First the interviewer introduces herself and asks the interviewee's name and name of child receiving dental treatment.

The interviewer tells the interviewee:

Please ask me to repeat any questions that are unclear.

Getting acquainted

Q1A. Are you -----?

child's name

1. Parent ☐
2. Grandparent ☐
3. Other relative ☐

Q2.A. How many children are in this (child's name) household and what are their ages?

B. Tell me who else lives in the household?

## **Oral health behaviour**

**Now I would like to talk about your child's dental habits.**

**Q3. Who brushes your child's teeth?**

- 1. Child alone ☐**
- 2. Child with help from sibling ☐**
- 3. Child with help from parent/caregiver ☐**
- 4. Parent/caregiver only ☐**

**Q4. What kind of toothpaste does your child use?**

**Q5. Have you been shown how to brush your child's teeth?**

- 1. Yes**
- 2. No ☐ ☐**

**Q6. Are your child's teeth brushed before he/she goes to bed?**

- 1. Yes**
- 2. No ☐**

**Q7. If your child is hungry for a snack between meals what does he/she usually like to eat?**

**Q8. If your child is thirsty between meals what does he/she usually like to drink?**

**Q9. What do you think has caused the cavities in your child's teeth?**

**Q10.Do you believe there is anything that can prevent your child getting cavities again?**

**1. Yes** ☐

**2. No** ☐

**If yes, explain**

## Appendix J: Post-education Questionnaire

### The Interview Guide

### CODE ID

### Guiding Questions for Parents

**Introduction:** First the interviewer introduces herself and asks the interviewee's name and name of child receiving dental treatment.

The interviewer tells the interviewee:

Please ask me to repeat any questions that are unclear.

Getting acquainted

Q1A. Are you -----?

child's name

1. Parent ☐
2. Grandparent ☐
3. Other relative

Q2. Did you find any difficulty making the changes you chose for your family?

1. Yes
2. No

If yes, explain

Thank you for your time, I would first like to know if you have anything to add.

## **Oral health behaviour**

**Now I would like to talk about your child's dental habits.**

**Q3. Who brushes your child's teeth?**

- 1. Child alone**
- 2. Child with help from sibling ☐**
- 3. Child with help from parent/caregiver ☐**
- 4. Parent/caregiver only ☐**

**Q4. What kind of toothpaste does your child use?**

**Q5. Are your child's teeth brushed before he/she goes to bed?**

- 1. Yes**
- 2. No**

**Q6. If your child is hungry for a snack between meals what does he/she usually like to eat?**

**Q7. If your child is thirsty between meals what does he/she usually like to drink?**