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The Effectiveness of a Preventive Recall Strategy in Children Following Dental Rehabilitation Under General Anesthesia

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The Effectiveness of a Preventive Recall Strategy in Children Following Dental Rehabilitation Under General Anesthesia

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Dentistry at Virginia Commonwealth University.

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Abstract

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By Katherine Anne Nordeen, DDS

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Purpose: This was a pilot study to assess the impact of a preventive strategy following full-mouth dental rehabilitation (FMDR) under general anesthesia in children with early childhood dental caries.

Methods: Sixty-six patients completed FMDR and were included in the analysis. At the consultation visit, caries risk assessment (CRA) and dental exam information were recorded, and caregivers completed an oral health knowledge (OHK) questionnaire. Patients returned for a post-surgery and recall visit. Caregivers received oral hygiene instructions in a motivational-interviewing style.

Results: At the consultation visit all patients were high risk. At the post-surgery visit, only 47% remained high risk (chi-square P<0.0001), and at the recall visit, 54% were high risk (P < .0001). Caregivers with higher OHK scores tended to be those individuals whose CRA went from high to moderate risk.

Conclusions: Preliminary data demonstrates that the preventive strategy is effective in reducing CRA level in children following FMDR.

Introduction

Early childhood caries (ECC) is a rapidly progressing form of dental caries that occurs in young children that begins soon after teeth erupt. It is defined by the presence of one or more decayed, missing, or filled tooth surfaces in any primary tooth in a child 71 months of age or younger.[1] Potential consequences of ECC include pain, infection, loss of school days, decreased ability to learn, and increased treatment costs.[2, 3]Additionally, children with ECC are predisposed to developing future carious lesions in their permanent and primary dentition. [4, 5]

The treatment for ECC is often full mouth dental rehabilitation (FMDR) under general anesthesia (GA) due to the child's inability to tolerate necessary dental procedures. Furthermore, literature has shown that children who have dental work completed under GA are more likely to experience new carious lesions after the FMDR, and often require subsequent dental treatment under GA. Caries relapse rates have been reported between 37-79% in children 6-24 months following FMDR under GA.[5-12] Almeida et al. observed a caries recurrence rate of 79% up to 24 months following treatment under GA, with 17% of these children requiring additional GA for further dental treatment.[10] Worthen et al. reported that 20% of children treated under GA prior to the eruption of the primary second molars required an additional GA.[12] GA provides optimal conditions for comprehensive dental treatment, however this adds between $1,000 and $6,000 to the cost of dental care.[13]

There is a need for an effective preventive strategy that will decrease the caries relapse rates in children following dental rehabilitation under GA. While aggressive restorative treatment under GA eliminates consequences of the disease, Gregory et al. demonstrated that MS levels remain unchanged following successful restorative procedures, leaving the patient at high risk for future caries and an additional GA visit.[14] Furthermore, low attendance rates at post-operative and recall visits have been reported across the literature.[5-11] Foster et al. reported 39% attendance at the post-operative visit in a retrospective review.[9] Similarly, Jamieson and Vargas observed 54% attendance at the post-operative visit.[15] In Primosch's prospective study, a 60% attendance was observed among patients who were required to attend an additional pre-surgery preventive visit, while attendance among the control group was 48%.[11] Mathu-Muju et al. observed a 47% attendance rate at the GA post-operative visit.[16] The literature reports even lower rates of attendance at the 6-month recall visit following surgery, ranging from 13-31%.[11, 15, 17, 18] Sheller et al. suggested that there may be value in actively pursuing caregivers to promote preventive habits with more aggressive preventative measures, adding that it would be less costly than repeat GA procedures.[19]

Numerous studies have evaluated the attendance rates and effectiveness of preventive recall programs in children who receive treatment under GA, but none with less than a 6-month recall interval.[5-12, 15-19] The American Academy of Pediatric Dentistry (AAPD) recommends the use of a risk-based recall interval for all patients after completion of the caries risk assessment (CRA). Risk assessment instruments assist dental providers in the identification of oral health indicators that place children at high, moderate, or low risk for developing caries.[20] The greatest indicator of future caries is past caries experience; therefore, patients who have undergone GA for dental rehabilitation are assigned a level of high caries-risk initially.[4, 21] Although the

presence or history of caries is the strongest predictor for future caries, it offers little utility in screening for caries-free children at risk for ECC. Although multiple CRA instruments exist, these prediction models have yet to be validated for accuracy in the pediatric population.[22, 23] Furthermore, no CRA instruments have been validated among an ECC population with respect to their risk for future caries.

The AAPD guidelines state that high caries-risk patients should return every 3 months for recall visits, which is inclusive of children burdened by ECC.[20] Additionally, the AAPD supports the use of a fluoride varnish for high caries risk children every 3 months. Although there are specific guidelines for caries management according to each patient's risk status, current payment models generally reimburse topical application of fluoride every 6 months, with similar limitations on the periodicity of exams, radiographs and prophylaxis, regardless of the patient's caries-risk level. Therefore, the 3-month recall interval is not routinely followed. Instead of reimbursing for preventive treatment, the current payment model rewards restorative treatment.[24] Kannelis et al. found that less than 2% of Iowa's Medicaid-enrolled children 6 and under who received any dental services accounted for 25% of all dollars spent on this age group during one fiscal year, including hospital-based dental treatment under GA.[25] Sheller et al. suggested that increased funding for aggressive preventative measures for high-risk children may be less costly than repeat GA.[19] A meta-analysis of the literature has shown that there is insufficient evidence based on previous randomized controlled trials (RCTs) to support or refute the traditional 6-month recall interval advocated by most providers.[26] Recent findings from a quality improvement project, the Early Childhood Caries Collaborative, have demonstrated improved oral health outcomes with the implementation of risk-based disease management protocol including more frequent recalls and increased preventive measures in children under 5 years. [27]

These findings demonstrate a need for additional RCTs to identify recall intervals that result in improved oral health outcomes, especially for children with ECC.

At preventive recall visits, oral health information must be communicated in an effective manner between the dentist and caregiver. When speaking with caregivers about oral health prevention, no higher than a sixth-grade reading level should be used.[28] Studies have also shown that passively delivering a message to patients about oral health behaviors does not effect change in their behavior.[29, 30] Motivational interviewing (MI) is emerging as an effective intervention technique to educate and motivate pediatric patients and caregivers to make positive changes in health behaviors.[31] MI is a patient-centered approach that encourages individuals to talk about their perception of health problems and personal goals, discuss the pros and cons of changing, ultimately enabling them to resolve their ambivalence to change.[32] MI techniques have been employed successfully in the management of chronic conditions when traditional advice-giving has failed.[33] It is logical then that MI techniques should be used to assist caregivers in the management of ECC in their children. Several studies have shown that when caregivers of pediatric dental patients receive OHI in an MI style, the caregivers demonstrated improved oral health behaviors and the patients had less caries.[34-36] A goal selection sheet is an adjunctive instrument routinely utilized during MI. The oral health goal sheet for caregivers has several items in picture form that represent ideas for positive oral health behavior changes. After completing the CRA and dental exam, the provider summarizes the findings and explains the caries process to the caregiver. The caregiver and provider then review the goal sheet, and the caregiver is asked to select 1-2 home behaviors from the goal selection sheet to work towards. The use of a goal selection sheet during MI allows caregivers to set self-management goals, and

by revisiting goals at subsequent recall visits, caregivers can receive positive reinforcement for the goals met and discuss obstacles faced in achieving the selected goal.[37]

The purpose of this study was to determine if the implementation of a preventive recall strategy utilizing MI techniques, more frequent recall intervals, and goal-setting will decrease the future caries risk level and incidence of new caries in an ECC population following FMDR under GA.

Aim 1: To assess the effect of a preventive recall strategy on the change in CRA level over time at post-surgery and recall visits.

Aim 2: To assess the impact of the caregiver's baseline oral health knowledge (OHK) on future CRA level at post-surgery and recall visits.

Materials and Methods

The subjects for the study were recruited from the VCU Pediatric Dental Clinic between July 2014 and February 2015, after they were identified as needing FMDR under GA at their consultation visit due to ECC. Inclusion criteria were as follows: 1) children with extensive caries; 2) treatment planned for FMDR under GA; 3) less than 6 years of age. Exclusion criteria were as follows: 1) non-English speaking caregivers; 2) caregivers who chose not to participate in the study at the consultation visit. Informed consent was obtained from the caregivers of the eligible participants by pediatric dental residents and faculty, after explaining the aim and procedures of the study. After consent was obtained, the guardian completed a 36-item questionnaire regarding demographic information, patient medical history, current dietary and oral health behaviors of both caregiver and patient, and a brief 11-item OHK assessment. The OHK assessment underwent a pre-test prior to administration to participants. The information from the subject's CRA and findings from the dental exam were recorded from the consultation visit. The CRA instrument used at VCU follows the AAPD guidelines. The CRA instrument assigns patients an overall caries risk level of high, moderate or low, based on the caregiver's responses to the CRA questions, and the findings from the dental exam. For the dental exam, the caries status of each presenting tooth surface was recorded by lesion site and activity using a modified version of the International Caries Detection and Assessment System (ICDAS) criteria. The presenting tooth surfaces were scored as being caries-free (0), non-cavitated incipient lesion

(1), caries cavitated into enamel or dentin (2), or restored (3). All consultation examinations were performed by calibrated pediatric dentistry faculty or residents. One pediatric dentist (KN) saw the study patients for all appointments following GA.

After consent was obtained, the participants were then randomly assigned to either the case group (3-month recall interval) or the control group (6-month recall interval) following GA. Randomization was completed with computer generation. A one-month post-surgery appointment was required for both groups. At the post-surgery appointment, a new CRA and dental exam were completed in the manner previously described. The caregiver was then asked to select a home oral health behavior goal from a goal selection sheet to work towards reducing the patient's caries risk. The patients then returned for a recall visit either 3 or 6 months following the date of their GA visit, depending on the group to which they were randomly assigned. At each recall visit, the CRA, dental exam, prophylaxis, and fluoride varnish were completed, and the guardian selected a new oral health behavior goal. Throughout each visit, the pediatric dental resident incorporated MI techniques to address high caries-risk issues identified in the CRA, including: asking open-ended questions, reflective listening, and the use of the goal selection sheet to identify which oral health behavior changes are important and possible for the caregiver. The dental exam and CRA information were extracted from the dental record at the initial visit, the post-surgery visit, and recall visits. The oral health behavior goal chosen by the caregiver was extracted from the dental chart at the post-operative and recall visits.

Approval for this study was obtained from the Institutional Review Board, Committee on Human Research (VCU IRB# HM 20001296).

Data analysis

The outcome variable for Aim 1 is CRA level, designated as high, moderate and low. A two-group t-test was used to compare the CRA level at the consultation visit to the CRA level at the post-surgery visit and recall visit respectively. The outcome variables for Aim 2 are baseline caregiver OHK score, out of 11 possible correct items, compared with CRA level at post-surgery and recall visits. All analyses were performed using SAS software (SAS Institute Inc, Cary NC). The primary results will be reported using an intent-to-treat analysis at the completion of the 3-year study. That is, patients will be analyzed in the groups to which they were randomized. However, for this 2-year interim report, analyses will be performed using the recall interval groups actually observed. That is, a patient randomized to a 3-month recall may actually not return until the 6-month time point, and it's possible that a patient randomized to a 6-month interval could actually return earlier. All data available on a patient will be included in each analysis. The planned recruitment of 100 patients takes into account that there will be some dropout at each time point. It is anticipated that there will be sufficient power to make comparisons at the 6-month time interval. If 10% of patients improve in CRA from the highest level of risk to reduced risk in the 6-month recall group and 35% improve in the 3-month group, then 100 patients (50 per group) will have 82% power to detect a difference at alpha=.05. For the second aim, 100 patients will result in 84% power to detect a 0.6SD difference.

All study variables will be entered into a REDCap database. Results will be described using counts/percentages or means/SD, as appropriate. 95% confidence intervals will be reported for all of the estimates. All analyses were performed using SAS software (SAS version 9.3, JMP version 11, SAS Institute, Inc., Cary NC)

Results

The results will be presented in 6 sections. First, the patients in the study are described. Then the relationships between oral health knowledge and care-giver behavior are described. In the following sections caries risk assessment and its relationship with oral health knowledge are tested. The oral health goals are then briefly described. And finally, the results of the dental examination are presented.

Patient Characteristics

In this prospective study, as of February 13, 2015 there were 90 patients and caregivers who were eligible and consented to the study. Equal numbers (45 each) were randomized to the control condition and the intervention. However, some patients did not have their surgery for various reasons: patient and caregiver failing surgery appointment, cancelling appointment due to illness, financial and insurance issues, caregiver-cited scheduling conflicts, or caregiver's apprehension to dental treatment and/or general anesthesia. These patients and caregivers were contacted multiple times to reschedule their surgery appointment. Eleven patients have upcoming surgery appointments. There were 66 patients who did receive FMDR and are thus included in the results below.

Figure 1 shows the flow of patients from eligibility, through randomization, and into GA surgery. As noted, there were equal numbers of those successfully completing surgery in each group. After surgery, there was to be a post-surgery visit approximately one month later, and 36

patients (out of 66) completed this follow-up. Seventeen patients failed their follow-up, and 13 more have upcoming visits. Of the 53 patients who have had one month pass after surgery, 36 attended (68%) their post-surgery visit. After surgery, patients were also encouraged to attend a recall visit either at 3- or 6-months, as randomly assigned. In the control condition (6-month recall), 29 patients had not yet had 6-months pass (182 days or more). Of the 4 patients who had had 6-months pass, 2 had completed the recall visit and 2 had not. In the intervention condition (3-month recall), 17 patients had not yet had 3-months pass (91 days or more). Of those who had surgery at least 3 months ago, 11 completed the recall visit and 5 had not. One of the patients randomly assigned to a 6-month recall actually came in at 3 months and one of the patients randomly assigned to a 3-month recall actually came in at 6 months. As the study has not progressed to the point where sufficient numbers of 6-month patients were eligible for recall, the two groups were not analyzed.

This thesis reports on all patients who completed surgery under GA, irrespective of group assignment.

Figure 2 shows the flow of patients who completed surgery and then were to have been seen for a post-surgery visit. Of the 53 eligible for the post-surgery visit, 36 attended (68%) and 17 failed. An additional 13 patients have a post-surgery visit scheduled. There were 46 patients not due for a recall visit. Of the 20 due for recall, 13 returned for recall (65%). The 46 patients not due for recall were between 0 and 182 days post-surgery (median = 64.5 days). Those who had completed recall were between 112 and 210 days post-surgery (median = 169 days) and those who had not completed recall were between 93 and 204 days post-surgery (median = 168).

Of the 66 patients included in the results, the average age was 50 months (SD = 12.8, range = 21 to 71) or 4.12 years (SD = 1.07, range = 2 to 6 years). Their race is shown in Table 1.

The table also includes information on the patient recall status in order to illustrate that completion of recall does not appear associated with demographic characteristics. Overall, 27% identified as White and 62% identified as Black. Of the patients who identified as "other", they all noted that they were Hispanic or from Latin-America. Patient medical history is shown in Table 2. The most common positive medical history item was a breathing disorder (21%), followed by premature birth (11%). The "not listed" medical conditions included one each for: Alexander's Disease, cerebral palsy, mild sleep apnea, eczema, osteochondroma, and seasonal allergies.

The demographic characteristics of the adult caregiver are shown in Table 3. Again the racial groups that predominate were white (34%) and black (55%). Additionally, 9% considered themselves Hispanic. Their predominant level of education was High School (56%). Using the mid-point of the household income ranges, the average income was $22,954 (SD = $22,582). Caregivers also reported between 1-6 adults living in the child's household (including the caregiver) with an average of 2.2 adults (SD=1.1). Counting the child, there was between 1-10 children in the household (mean = 2.5, SD = 1.5). There was between 0 and 5 adults in the household employed (mean = 1.3, SD = 0.94).

The caregiver was also asked questions about their child's dental care and the results are summarized in Table 4. In response to the question "Is it very difficult to get your child to the doctor or dentist?" 27% answered Yes. They then went on to list transportation as the most common barrier (indicated by 17% of caregivers).

Knowledge and Behavior

Caregivers were then asked 11 items regarding OHK, and the results are summarized in Table 5 and

Figure 3. A “Yes” answer is correct for each item. Not everyone answered every item (75% answered 8 or more) and the number correct ranged from 1 to 11 (mean=7.6, SD = 2.23, median=8). Among all caregivers, the item answered correctly the least was “adults who have tooth decay can pass tooth decay germs to their children” (35% correct). The item answered correctly the most was “parents should start cleaning their child’s teeth as soon as the first tooth comes in” (97% correct). Table 5 demonstrates the percent of correctly answered items for caregivers who completed a recall vs. those who had not completed a recall. A much higher percent of caregivers who had not completed a recall answered correctly the items regarding “adults who have tooth decay can pass tooth decay germs to their children” and “fluoride can be used to coat and protect the teeth of infants and children” as compared to caregivers who had completed a recall (57% vs 15% and 100% vs 69%). A much higher percent of caregivers who had completed a recall answered correctly “tap water is good for children’s teeth” compared to those who had not completed a recall (54% vs 14%).

Questions regarding tooth care were asked and findings are summarized in Table 6. Caregivers and patients who had not completed a recall visit demonstrated a general trend toward higher caries-risk behaviors at baseline compared to caregivers and patients who completed a recall visit. Of those who had not completed a recall, 43% reported that their child goes to sleep while nursing or drinking something other than water, compared to only 8% of those who completed a recall. Similarly, frequency of sugary drinks between meals was also much higher at baseline for both caregiver and patient among those who had not completed a recall compared to those who had completed a recall: 71% of the “not complete” recall group reported giving their children sugary drinks between meals three times or more per day, compared to 31% of the “complete” recall group. Furthermore, 69% of caregivers in the “not complete” recall group

reported consuming sugary drinks between meals three or more times per day, compared to 36% of caregivers in the "complete" recall group.

Caries Risk Assessment

A caries risk assessment was completed at the consultation visit and the results are summarized by recall group in Table 8. As patients returned for subsequent visits, the prevalence of these risk factors change. At the consultation visit, 100% of 66 patients were high risk; at the post-surgery visit, only 47% (17/36) remained high risk (chi-square $P<0.0001$). At the recall visit, 54% were high risk (7/13), which was also a significant reduction ($P < 0.0001$). See Table 9 and

Figure 4. Between the consultation visit and the post-surgery visit, an increase in protective behaviors and decrease in high risk behaviors is observed. A similar trend of improvement in caries risk behaviors is observed between the post-surgery visit and the recall visit. Figure 4 demonstrates the change in each caries risk item at each visit. There was some rebound observed at the recall visit in the percent of caregivers reporting greater than three between-meal sugar-containing snacks or drinks (19% at the post-surgery visit and 31% at the recall visit). The percent of patients with white spot lesions increased between the post-surgery (17%) and recall visit (23%).

Oral Health Knowledge and CRA

At the post-surgery visit, the caregivers with higher OHK scores tended to be those individuals whose CRA went from "high" to "moderate" (high-caries risk level: mean OHK score= 6.6 vs moderate-caries risk level: mean score = 7.7, $P = 0.1012$). The sample size for the recall visit was small (N=13), so the support for the relationship of CRA change at the recall with

OHK score is weaker (high-caries risk level: mean OHK score= 7.0 vs moderate-caries risk level: mean OHK score = 7.5, $P > 0.7$).

Goals

Thirty-five caregivers selected oral health home behavior goals from the goal sheet at the post-surgery visit. “Brushing 2x daily with fluoridated toothpaste” was most frequently selected by caregivers (29%) at the post-surgery visit, followed by “less or no candy or junk food”, which was selected by 23% of caregivers. At the recall visit, 12 caregivers selected goals, with “brushing 2x daily with fluoridated toothpaste” again chosen most frequently (33%). Equal numbers of “less or no juice”, “drink tap water”, and “less or no candy and junk food” were selected at the recall visit (25% each).

Dental Examination

Dental examinations were performed at each visit and each tooth scored by surface and caries activity. At the consultation visit, 76% of patients had 20 teeth scored (50/66), and there were 5 patients with 19 teeth scored, 4 with 18 scored, 2 with 17 scored, and 5 with 16 scored. After dental surgery, since some teeth were extracted, the number of teeth ranged from 9 to 20. At the post-surgery visit, the average number of teeth scored was 16.7 (SD=2.8), as versus 19.4 (SD=0.15) at the consultation visit. At the recall visit (13 patients) the number of teeth ranged from 13 to 20 (mean=16.6, SD=2.4). This corresponded to an average of 84.8 surfaces scored at the initial consultation (SD=6.5), to an average of 72.0 surfaces scored at the post-surgery visit (SD= 13.1) and 71.6 surfaces scored at the 3- or 6-month recall (SD=12.5).

At the consultation visit, 72% of sites were caries free, 2.6% had white spot lesions, 21.7% were cavitated into the dentin or enamel, and 3.8% were restored. Not included in these percentages were the teeth not scored. These teeth represented either the unerupted teeth or teeth

extracted prior to consultation visit due to caries or trauma. Table 10 shows a comparison of sites across time after surgery. In panel A, the scores for the post-surgery visit are shown across the rows and the scores for the recall visit are shown across the columns. Due to dental surgery, the number of restored sites goes from 3.8% to 49.4%. At the post-surgery visit 0.5% of surfaces demonstrated a white-spot lesion. Between the post-surgery visit and recall visit, 8 surfaces with white-spot lesions remained white-spot lesions, and 4 surfaces that were caries free at the post-surgery visit became white-spot lesions at the recall visit. No surfaces were scored as cavitated at either the post-surgery or recall visits. At the recall visit, 50% of surfaces were scored as restored, 48.5% as caries free, and 1.4% as having a white-spot lesion.

Figure 5 demonstrates the distribution of the surfaces by lesion activity (caries free, white-spot lesion, cavitated, and restored) at the post-surgery and recall visits.

Discussion

Early Childhood caries affects 28% of children between 2-5 years of age. [38] 40% of children have caries by the time they begin kindergarten.[39] Children of low socioeconomic status are disproportionately affected, with 33% of low-income children experiencing 75% of the caries burden. Additionally, oral health disparities exist among racial and ethnic minorities.[40] The demographics of the population in the present study reflect the statistics on ECC as reported by the most recent National Health and Nutrition Examination Survey, demonstrating that black and Hispanic children, along with families below poverty level, experience more caries.[41] The racial composition of this study population is 62% black, 27% white, and 12% Hispanic or Latin American. The average income is $22,954, with an average family size of 2 adults and 2 children; the 2014 federal poverty guidelines determined by the Department of Health and Human Services for a family of 4 was $23,850.[42]

Access to care and utilization remains an issue for patients of low socioeconomic status and those with Medicaid insurance.[43] Caregiver-cited access to care barriers have included transportation, finding providers, long waiting times, and disrespectful and discriminatory status.[44] In the present study, 27% of caregivers reported difficulty in getting their child to the doctor or dentist, and transportation being the most common reason cited (17%). Only 5% of caregivers cited distance as a barrier. Interestingly, a higher percent of caregivers who returned for a recall visit reported difficulty getting to appointments, with transportation as the most

common barrier, compared to caregivers who had not completed a recall. Primosch et al. found no difference in recall attendance or failure rates following dental rehabilitation among Medicaid-insured ECC patients who traveled more than one hour for their appointment.[11] In contrast, Enger et al. reported a significant difference in follow-up compliance with respect to distance traveled, with patients living within the city returning at higher rates than those living outside the city.[45] Distance is just one element of the transportation barrier that negatively impacts patients of low socioeconomic status and their ability to keep appointments, along with finances and the inconvenience of public transportation. Syed et al. examined multiple studies and found conflicting results when comparing transportation barriers for urban vs. rural patients as well as length of distance traveled and the effect on healthcare utilization.[46] Yang et al. studied the missed appointments among 183 urban caregivers and their children, with 25% of the failure owing to lack of transportation.[47] Over 25% of caregivers in the present study cited transportation as a barrier while only 5% cited distance, supporting existing evidence that urban patients experience difficulty getting to appointments.

In the present study, 68% (36/53) of patients eligible for the one-month post-surgery visit attended. Foster et al. reported 39% attendance at the post-surgery visit in a retrospective review.[9] Similarly, Jamieson and Vargas observed 54% attendance at the post-operative visit.[15] In Primosch et al.'s prospective study, a 60% attendance was observed among patients who were required to attend an additional pre-surgery preventive visit, while attendance among the control group was 48%.[11] Mathu-Muju et al. observed a 47% attendance rate at the post-surgery visit.[16] In the present study, the post-surgery visit attendance (68%) is sustained at the 3-month recall visit (65%), although the sample size for the recall visit is small (N=20) as most patients have not had enough time elapse since surgery. This is in contrast to the literature, which reports much

lower rates of attendance at a recall visit 6 or more months following surgery, as well as a decrease in attendance from the post-surgery visit to the 6-month recall visit. Additionally, numerous studies have reported on the incidence of new caries observed 6 months after surgery. Jamieson and Vargas reported 13% attendance at the 6-month recall, with 25% having new carious lesions.[15] Primosch et al. reported that the improved attendance observed at the post-surgery visit was not sustained at the 6-month recall, with 31% attendance, and 38% of these patients presented with new carious lesions.[11] Berkowitz et al. reported 39% caries recurrence 5-12 months following surgery.[7] In the present study, 12 of the 13 patients attended a 3-month recall visit, and an additional patient attended a 6-month recall visit. Four surfaces that were caries free at the post-surgery visit were found to be incipient lesions at the recall visit, and 8 surfaces with incipient lesions at the post-surgery visit did not progress to cavitation at the recall visit. These findings suggest that the additional 3-month recall visit may be an effective preventive measure to decrease the rate of new cavitation seen at the 6-month recall as reported in previous studies. Additionally, the implementation of a more frequent, 3-month recall interval may be more effective than the traditional 6-month recall with respect to maintaining patient and caregiver attendance at recall visits.

Overall, caregivers generally had good oral health knowledge, with an average score of 8 correct items out of 11 possible. In a similar survey administered by Lee et al. to caregivers of children less than 6 years of age, the average total knowledge score was 7.5 correct items out of 11 total.[48] Lee et al. found that caregiver oral health literacy (OHL) was associated with oral health status, but found no significant relationship between OHL and OHK or oral health behaviors. Caregivers in the present study with higher OHK scores tended to be those individuals whose CRA level went from high-risk at the consultation visit to moderate-risk at the

post-surgery and recall visits, although this finding was not statistically significant. A greater percent of caregivers who had not completed a recall answered correctly more knowledge items as compared to those who had completed a recall. The lack of relationship between OHK and behavior in the present study supports Lee et al.'s findings. Primosch et al. analyzed the parental preventive practices and values pre-operatively on an ECC population and found no statistically significant difference in any of the variables between those who returned for a recall and those who had not.[11] The findings from previous studies and the present study suggest that the relationship between OHL, OHK, behaviors and outcomes are complex.

Caries risk assessment level changed significantly from the pre-surgery consultation visit to post-surgery and recall visits. Prior to surgery, 100% of patients were high caries risk due to presence of multiple carious lesions. At the post-surgery visit, 47% of patients were high caries risk, and the remaining 53% were moderate risk. Of the patients presenting for a recall visit, 54% were determined to be high caries risk with 46% demonstrating moderate risk. Current CRA instruments rely upon findings from the clinical examination, caregiver-reported oral health behaviors, and the overall judgement of the dental provider to designate a patient as high, moderate or low caries risk. Presently, caries is the single most reliable predictor for future caries.[21] Twetman et al. argues that this predictor is far from ideal, and caries risk may not only change over time in individuals but also on a community level. [49] According to the AAPD CRA instrument, the patients in the present study could remain high risk indefinitely due to history of caries. [20] Additionally, the AAPD definition tends to demonstrate high sensitivity but low specificity, thus resulting in over-diagnosing patients as high-caries risk. [50] Patients in the present study were determined to be moderate risk at a post-surgery visit only if caregivers answered "no" to the following high risk factors: patient put to bed with bottle containing natural or added

sugar, more than 3 between-meal sugar-containing snacks or drinks, and patient has obvious white spot lesions or decay present. Additionally, to be considered moderate risk, patients had to report "yes" to the following protective risk factors: patient receives fluoridated drinking water or supplements, and patient's teeth brushed daily with fluoridated toothpaste.

In a systematic review of the literature examining the effectiveness of ECC prevention modalities, Twetman found that fluoridated toothpaste is the most cost effective method for ECC prevention, in addition to topical fluoride application at least twice yearly.[51] Additionally, community water fluoridation, which began in 1945, has proven to be the most economical way to deliver fluoride to all members of a community and has greatly reduced the incidence of caries. [52] Although the frequency of consumption of fermentable carbohydrates has been implicated in numerous studies on ECC, including nighttime bottle feeding, the relationship between sugar consumption and caries is much weaker in the presence of adequate fluoride exposure.[50, 53, 54] However, sugar is more powerful as a risk factor in those patients without regular exposure to fluoride.[55] Centers for Disease Control and Prevention reported that in 2006, 69% of the U.S. population served by community water systems received optimally fluoridated drinking water. Several variables indicate that patients in the present study are receiving inadequate amounts of optimally fluoridated water. Thirty percent of caregivers reported that they have fluoride in their drinking water, 21% reported no fluoride in the drinking water, and an additional 48% were unsure. Sixty-four percent of caregivers reported that their child drinks water daily from the tap or refrigerator. Although tap water is effective in delivering fluoride on a community level and reducing caries, it is no longer the only source of fluoride, and the risk of fluorosis must now be weighed against the anti-caries benefit.[56] Although 82% of caregivers reported brushing their child's teeth daily with fluoridated toothpaste, it is possible that the lack

of fluoridated water intake may partially contribute to their increased caries risk. Caregivers may not be aware of the health benefits of community water with optimal fluoride concentration; only 52% of parents answered "yes" to "tap water is good for children's teeth", and 38% answered "don't know" to the same question. Quiñonez and Locker surveyed a Canadian population regarding knowledge of and support for community water fluoridation, and found that people with greater income and education were more likely to know about community water fluoridation; in contrast, those who opposed fluoride were more likely to access dental care with public insurance.[57] Similarly, Mummery et al. investigated public opinion regarding water fluoridation in a Queensland population, and found that people in relatively higher areas of socioeconomic advantage were more likely to support the addition of fluoride to local drinking water and agree that it is safe.[58] Increasing efforts to educate caregivers of high caries risk about the benefits and safety of systemic water fluoridation may be effective in reducing caries on a population level.

Caregivers in the present study received oral health education through the use of MI techniques instead of traditional health education, which includes advice-giving sessions by professionals, and/or the dissemination of information via written material including pamphlets, posters, and media campaigns. [59] Although traditional health education is the most common method used by providers to deliver a preventive health message, this approach has not shown to be effective in motivating parents to make the recommended changes. [29, 30] Motivational interviewing differs from traditional advice giving in that it is a patient-centered approach encouraging individuals to talk about their perception of health problems and personal goals, and discuss the pros and cons of making recommended changes.[32] Harrison et al. demonstrated the protective effect of MI versus traditional advice-giving; children whose caregivers who received

OHI in an MI style demonstrated 46% lower caries rate 2 years following the intervention, compared to children whose caregivers received OHI in a traditional style.[36] The MI techniques implemented in this study included asking open-ended questions, reflective listening, and the incorporation of a goal selection sheet to identify the home behavior changes that seemed important and possible for the caregiver. Caregivers were asked to select one goal from the sheet after the completion of the CRA, dental exam, and oral health education. Through MI techniques and goal selection, caregivers play an active role in oral health education and caries management, compared to the passive learning style offered by traditional health education. As caregivers continue to return for recall visits, selected goals will be reviewed, and caregivers will have the opportunity to discuss challenges and/or successes in meeting the goal.

There were limitations to this study. The relatively high rate of both post-surgery and recall visit attendance in this study may be partially explained by increased efforts by both clinic receptionists and the dental provider to schedule and reschedule the study patients when they failed or cancelled their appointments. Additionally, volunteer bias may account for a higher percent of attendance at follow-up visits when compared to past studies, which were mainly retrospective in nature; caregivers who were willing to participate in the study may have been more motivated to return for follow-up care regardless of participation. Furthermore, caregivers and patients who returned for follow-up care demonstrated a general trend toward lower caries-risk behaviors at baseline compared to caregivers who had not completed a recall visit, as reported in the pre-surgery questionnaire.

Future studies should address whether or not the preventive strategy implemented in this study will result in reduced incidence of new caries following FMDR. As the present study continues, differences in CRA level and incidence of new caries will be evaluated among

patients who return at 3-month vs. 6-month recall intervals over a one-year period following FMDR. A secondary aim will be to evaluate the effect of oral health education using MI techniques by evaluating for change in caregiver OHK at the 6-month recall visit.

Conclusions

The purpose of the study was to determine if the implementation of a preventive recall strategy utilizing MI techniques, more frequent recall intervals, and goal-setting would decrease the caries risk in an ECC population following FMDR. A secondary aim was to determine the effect of caregiver OHK prior to intervention on CRA levels at post-surgery and recall visits. Prior to FMDR, all patients were high caries risk. At both the post-surgery and recall visits, patients demonstrated statistically significant reduction in caries risk. Caregivers with higher OHK scores tended to be those individuals whose risk level improved at post-surgery and recall visits, although the association was not statistically significant. Preliminary data suggests that the preventive recall strategy is effective in reducing CRA level in ECC children following FMDR.

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Tables

Table 1. Patient Demographics (n=66)

Child's race	N	Percent
White/Caucasian	18	27%
African American or Black	41	62%
Asian	6	9%
Native Hawaiian or Pacific Islander	0	0%
American Indian or Alaskan Native	2	3%
Other	8	12%

Notes: Since child's race was a "check all that apply" item, the n's will not sum to 66, nor will the percentages total 100%.

Table 2. Patient Medical History

Medical history	N	Percent
Breathing disorder	14	21%
Heart disorder	2	3%
Brain disorder	5	8%
ADD/ADHD	3	5%
Premature birth	7	11%
Blood disorder	0	0%
Developmental Delay	5	8%
Genetic disorder/syndrome	2	3%
Other medical condition not listed	5	8%

Notes: Since medical history was a "check all that apply" item, the n's will not sum to 66, nor will the percentages total 100%.

Table 3. Adult Caregiver Demographics

Characteristic	N	Percent
White/Caucasian	22	34%
African American or Black	35	55%
Asian	6	9%
Native Hawaiian or Pacific Islander	0	0%
American Indian or Alaskan Native	4	6%
Other	5	8%
Do you consider yourself to be Spanish, Hispanic, or Latino/a?	6	9%
What is the highest level of education that you have completed?		
Elementary and middle school	2	3%
high school	36	56%
College	23	36%
Graduate school beyond college	3	5%
Which of the following categories best represents the combined income of all family members in your household for the past 12 months?		
Less than $5,000	12	19%
$5,000-$9,999	7	11%
$10,000-$19,999	12	19%
$20,000-$29,999	7	11%
$30,000-$39,999	8	13%
$40,000-$49,999	3	5%
$50,000-$79,999	3	5%
$80,000-$99,999	1	2%
$100,000 or more	1	2%
Don't know	10	16%

Note: N=64 since two people in the not-due group did not fill out this page.

Table 4. Barriers to Child Dental Care

Barriers	N	Percent
Very difficult to get your child to the doctor or dentist	17	27%
Transportation	11	17%
Distance	3	5%
Finances	7	11%
Job Conflict	3	5%
Fear/Anxiety	4	6%
Other	2	3%
Is your child NOT covered by health insurance?	2	3%
Is your child NOT covered by dental insurance?	4	6%
Does your child participate in public assistance programs?	33	52%

N=64

Table 5. We would like to know your opinion about children's dental health

Knowledge item	N	Percent
Drinking juice from a sippy cup or bottle throughout the day can cause tooth decay.		
Yes	48	73%
No	17	26%
Don't know	1	2%
Putting a child to bed with a bottle containing milk or juice can cause tooth decay in teeth.		
Yes	45	68%
No	19	29%
Don't know	2	3%
Adults who have tooth decay can pass tooth decay germs to their children.		
Yes	23	35%
No	25	38%
Don't know	18	27%
Fluoride can be used to coat and protect the teeth of infants and children.		
Yes	52	79%
No	6	9%
Don't know	8	12%
All children should be checked by a dentist by the age of one, or around the time the first tooth comes in.		
Yes	54	82%
No	4	6%
Don't know	8	12%
Tooth decay in a child's baby teeth affects his/her overall health.		
Yes	44	67%
No	11	17%
Don't know	11	17%
The risk of getting tooth decay increases when a person eats sugary snacks and drinks between mealtimes.		
Yes	58	88%
No	3	5%
Don't know	5	8%
Tooth decay in baby teeth can cause infections that can spread to the face and other parts of the body.		
Yes	35	53%
No	8	12%
Don't know	23	35%
Parents should start cleaning their child's teeth as soon as the first tooth comes in.		
Yes	64	97%
No	0	0%
Don't know	2	3%

Tap water is good for children's teeth.		
Yes	34	52%
No	7	11%
Don't know	25	38%
Cavities in the baby teeth put children at higher risk for cavities in the permanent teeth.		
Yes	47	71%
No	6	9%
Don't know	13	20%

Table 6. Child and parent tooth care and eating habits

	Recall							
	Not complete		Complete		Not due		Total	
Child's tooth care	N	%	N	%	N	%	N	%
How often does an adult brush your child's teeth?								
Daily	6	86	13	100	44	67	63	95
Weekly	1	14	0	0	1	2	2	3
Monthly	0	0	0	0	0	0	0	0
Never	0	0	0	0	1	2	1	2
How often are your child's teeth brushed with fluoride toothpaste?								
Daily	3	43	12	92	39	59	54	82
Weekly	2	29	0	0	2	3	4	6
Monthly	1	14	0	0	1	2	2	3
Never	1	14	1	8	4	6	6	9
How often are your child's teeth brushed with non-fluoride toothpaste?								
Unanswered	0	0	2	15	1	2	3	5
Daily	3	43	3	23	11	17	17	26
Weekly	1	14	1	8	3	5	5	8
Monthly	0	0	0	0	0	0	0	0
Never	3	43	7	54	31	47	41	62
How often do you check your child's teeth for anything unusual?								
Unanswered	0	0	0	0	1	2	1	2
Daily	3	43	5	38	21	32	29	44
Weekly	2	29	4	31	11	17	17	26
Monthly	2	29	3	23	9	14	14	21
Never	0	0	1	8	4	6	5	8
When brushing, how often do your child's gums bleed?								
Unanswered	0	0	0	0	1	2	1	2
Daily	1	14	0	0	2	3	3	5
Weekly	0	0	0	0	3	5	3	5
Monthly	1	14	1	8	4	6	6	9
Never	5	71	12	92	36	55	53	80
Does your child usually (throughout the day) drink from a bottle or sippy cup?								
No	5	71	10	77	35	53	50	76
Yes	2	29	3	23	11	17	16	24
How often does your child go to sleep while nursing, or go to sleep while drinking something besides water from a bottle/sippy cup?								
Unanswered	0	0	0	0	1	2	1	2
Daily	3	43	1	8	9	14	13	20
Weekly	1	14	0	0	1	2	2	3
Monthly	0	0	2	15	1	2	3	5
Never	3	43	10	77	34	52	47	71

	Recall							
	Not complete		Complete		Not due		Total	
Child's tooth care	N	%	N	%	N	%	N	%
How often do you give your child sugary snacks such as raisins, candy, cookies, cakes or cereal between meals?								
Unanswered	0	0	1	8	1	2	2	3
Three or more times a day	2	29	2	15	5	8	9	14
One or two times a day	4	57	8	62	27	41	39	59
Weekly	1	14	1	8	8	12	10	15
Monthly	0	0	0	0	3	5	3	5
Never	0	0	1	8	2	3	3	5
How often do you give your child sugary drinks such as regular soda, sweet tea, chocolate milk, strawberry milk, fruit juice, sports drinks or koolaid between meals?								
Unanswered	0	0	0	0	1	2	1	2
Three or more times a day	5	71	4	31	11	17	20	30
One or two times a day	0	0	8	62	24	36	32	48
Weekly	1	14	1	8	8	12	10	15
Monthly	0	0	0	0	1	2	1	2
Never	1	14	0	0	1	2	2	3
How often does your child typically drink tap water- including filtered water from the refrigerator?								
Daily	2	29	7	54	33	50	42	64
Weekly	4	57	1	8	6	9	11	17
Monthly	0	0	1	8	0	0	1	2
Never	1	14	4	31	7	11	12	18
Is there fluoride in your drinking water at home?								
Yes	2	29	6	46	12	18	20	30
No	3	43	1	8	10	15	14	21
Don't know	2	29	6	46	24	36	32	48
Have you had tooth decay, fillings and/or pulled teeth in the last two years?								
No	3	43	4	31	25	38	32	48
Yes	4	57	9	69	21	32	34	52
How often do you brush your teeth with fluoride toothpaste?								
Daily	6	86	12	92	40	61	58	88
Weekly	0	0	1	8	2	3	3	5
Monthly	0	0	0	0	0	0	0	0
Never	1	14	0	0	4	6	5	8
How often do you eat sugary snacks such as raisins, candy, cookies, cakes, or cereal bars between meals?								
Three or more times a day	2	29	1	8	8	12	11	17
One or two times a day	3	43	5	38	21	32	29	44
Weekly	1	14	4	31	13	20	18	27
Monthly	1	14	2	15	3	5	6	9
Never	0	0	1	8	1	2	2	3

	Recall							
	Not complete		Complete		Not due		Total	
Child's tooth care	N	%	N	%	N	%	N	%
How often do you drink sugary drinks such as regular soda, sweet tea, chocolate milk, strawberry milk, sports drinks, kool aid or fruit juice between meals?								
Three or more times a day	4	67	4	36	8	13	16	26
One or two times a day	0	0	7	64	25	40	32	52
Weekly	1	17	0	0	8	13	9	15
Monthly	1	17	0	0	4	6	5	8

Table 7. Goals

	Time Point			
	GA followup		Recall	
Goal choice	N	%	N	%
Regular dental visits for child	3	9	0	0
Family receives dental treatment	3	9	0	0
Healthy snacks	1	3	1	8
Brush with fluoride toothpaste 2x	10	29	4	33
No soda	4	11	1	8
Less or no juice	5	14	3	25
Wean off bottle	4	11	0	0
Only water or milk in sippy cup	2	6	0	0
Chew gum with xylitol	2	6	0	0
Drink tap water	5	14	3	25
Less or no candy and junk food	8	23	3	25

Note: 35 patients chose goals at GA follow-up, and 12 patients chose goals at recall.

Table 8. Caries Risk Assessment, comparison of recall groups

	Recall							
	Not complete		Complete		Not due		Total	
Risk items	N	%	N	%	N	%	N	%
High Risk Factors								
Primary Caregiver has active caries?								
Unanswered	0	0	2	17	2	4	4	6
No	5	71	6	50	26	57	37	57
Yes	2	29	4	33	18	39	24	37
Patient has >3 between meal sugar-containing snacks or beverages per day?								
No	0	0	2	17	12	26	14	22
Yes	7	100	10	83	34	74	51	78
Patient is put to bed with a bottle containing natural or added sugar?								
Unanswered	0	0	0	0	1	2	1	2
No	5	71	11	92	37	80	53	82
Yes	2	29	1	8	8	17	11	17
Patient has obvious white spot lesion(s) or decay present?								
No	0	0	1	8	2	4	3	5
Yes	7	100	11	92	44	96	62	95
Patient has restorations present?								
No	6	86	11	92	33	72	50	77
Yes	1	14	1	8	13	28	15	23
Moderate Risk Factors								
Patient has a special health care need?								
No	5	71	5	42	39	85	49	75
Yes	2	29	7	58	7	15	16	25
Patient has plaque on teeth?								
No	2	29	1	8	4	9	7	11
Yes	5	71	11	92	42	91	58	89
Patient has intraoral appliance(s)?								
No	7	100	12	100	46	100	65	100
Patient has defective restoration(s)?								
No	6	86	12	100	42	91	60	92
Yes	1	14	0	0	4	9	5	8
Protective Factors								
Patient receives fluoridated drinking water or fluorinated supplements?								
Yes	2	29	7	58	30	65	39	60
No	3	43	4	33	15	33	22	34
Not sure	2	29	1	8	1	2	4	6
Patient brushes teeth daily with fluoridated toothpaste?								
Unanswered	0	0	0	0	1	2	1	2
No	0	0	2	17	3	7	5	8
Yes	7	100	10	83	42	91	59	91

	Recall							
	Not complete		Complete		Not due		Total	
Risk items	N	%	N	%	N	%	N	%
Number of times per day brushing with fluoridated toothpaste								
Unanswered	1	14	0	0	2	4	3	5
0 times per day	0	0	2	17	3	7	5	8
1 time per day	2	29	6	50	19	41	27	42
2 times per day	3	43	4	33	21	46	28	43
3 or more times per day	1	14	0	0	1	2	2	3
Patient receives additional home measures (Prevident, MI paste, etc)?								
Unanswered	0	0	0	0	1	2	1	2
No	7	100	12	100	45	98	64	98
Patient received fluoride varnish in last 6 months?								
Unanswered	0	0	1	8	1	2	2	3
No	7	100	6	50	27	59	40	62
Yes	0	0	5	42	18	39	23	35
Overall assessment of caries risk:								
High	7	100	12	100	46	100	65	100

Note: N=65

Table 9. Caries Risk Assessment, change across time

	Time Period					
	Consultation		GA followup		Recall	
Risk items	N	%	N	%	N	%
High Risk Factors						
Primary Caregiver has active caries?						
Unanswered	4	6	1	3	0	0
No	37	57	13	36	4	31
Yes	24	37	22	61	9	69
Patient has >3 between meal sugar-containing snacks or beverages per day?						
Unanswered	0	0	1	3	0	0
No	14	22	28	78	9	69
Yes	51	78	7	19	4	31
Patient is put to bed with a bottle containing natural or added sugar?						
Unanswered	1	2	1	3	0	0
No	53	82	32	89	13	100
Yes	11	17	3	8	0	0
Patient has obvious white spot lesion(s) or decay present?						
No	3	5	30	83	10	77
Yes	62	95	6	17	3	23
Patient has restorations present?						
No	50	77	0	0	0	0
Yes	15	23	36	100	13	100
Moderate Risk Factors						
Patient has a special health care need?						
No	49	75	25	69	5	38
Yes	16	25	11	31	8	62
Patient has plaque on teeth?						
No	7	11	7	19	7	54
Yes	58	89	29	81	6	46
Patient has intraoral appliance(s)?						
No	65	100	33	92	12	92
Yes	0	0	3	8	1	8
Patient has defective restoration(s)?						
No	60	92	36	100	12	92
Yes	5	8	0	0	1	8
Protective Factors						
Patient receives fluoridated drinking water or fluorinated supplements?						
Unanswered	0	0	1	3	0	0
Yes	39	60	18	50	8	62
No	22	34	14	39	5	38

	Time Period					
	Consultation		GA followup		Recall	
Risk items	N	%	N	%	N	%
Not sure	4	6	3	8	0	0
Patient brushes teeth daily with fluoridated toothpaste?						
Unanswered	1	2	1	3	0	0
No	5	8	2	6	0	0
Yes	59	91	33	92	13	100
Number of times per day brushing with fluoridated toothpaste						
Unanswered	3	5	1	3	0	0
0 times per day	5	8	2	6	0	0
1 time per day	27	42	8	22	6	46
2 times per day	28	43	20	56	7	54
3 or more times per day	2	3	5	14	0	0
Patient receives additional home measures (Prevident, MI paste, etc)?						
Unanswered	1	2	1	3	0	0
No	64	98	28	78	11	85
Yes	0	0	7	19	2	15
Patient received fluoride varnish in last 6 months?						
Unanswered	2	3	0	0	0	0
No	40	62	0	0	0	0
Yes	23	35	36	100	13	100
Overall assessment of caries risk:						
High	65	100	17	47	7	54
Moderate	0	0	19	53	6	46

N=65

Table 10. Change between post-surgery follow-up and 3- or 6-month recall, Counts on all Tooth surfaces

	Recall							
Post surgery	(missing visit)	not scored	0-caries free	1-white spot lesion	2-cavitated	3-restored surface	Total	Percent
not scored	323	146	0	0	0	0	469	
0-caries free	1044	4	276	4	0	0	1328	50.1
1-white spot lesion	5	0	0	8	0	0	13	0.5
2-cavitated	0	0	0	0	0	0	0	0.0
3-restored surface	972	0	0	0	0	338	1310	49.4
Total	2344	150	276	12	0	338	3120	
Percent			44.1	1.9	0.0	54.0		

Note: Missing visit=dental examination not performed. Not scored=dental examination performed and surface unscored. Cavitated=cavitated in enamel or dentin.

Figures

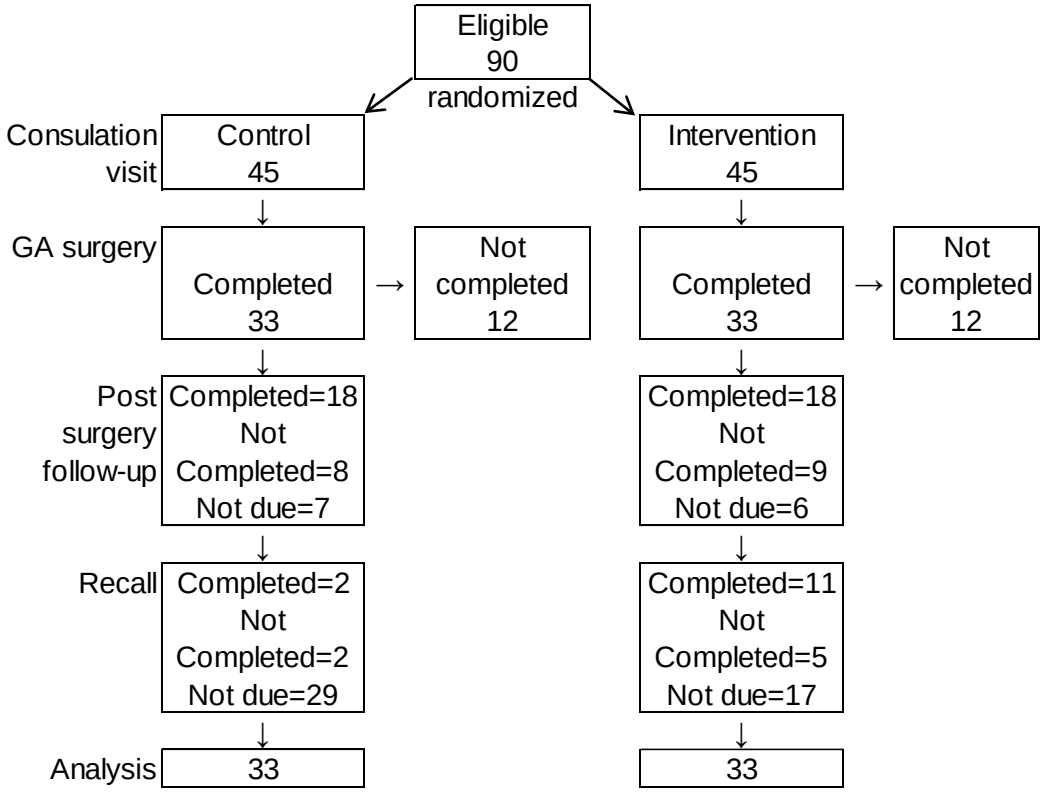

Figure 1. Patient Flow for the Designed Study

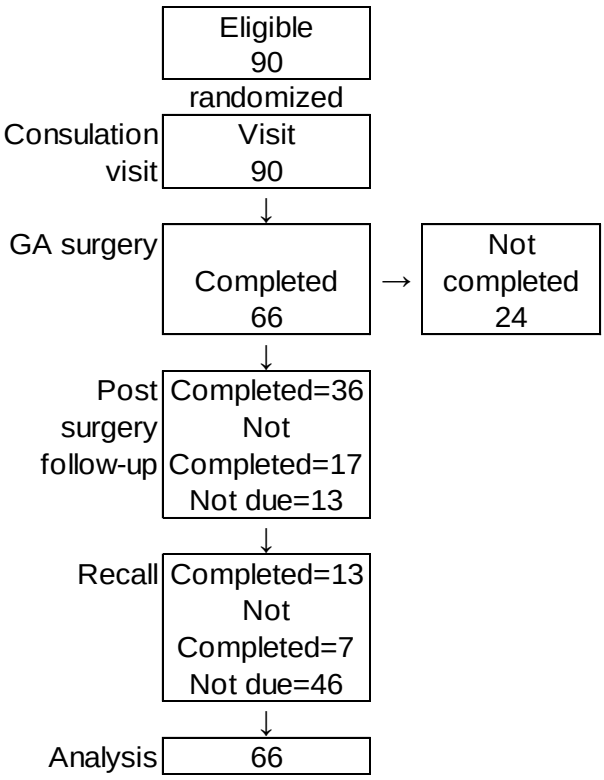

Figure 2. Patient Flow for the Analyzed Study

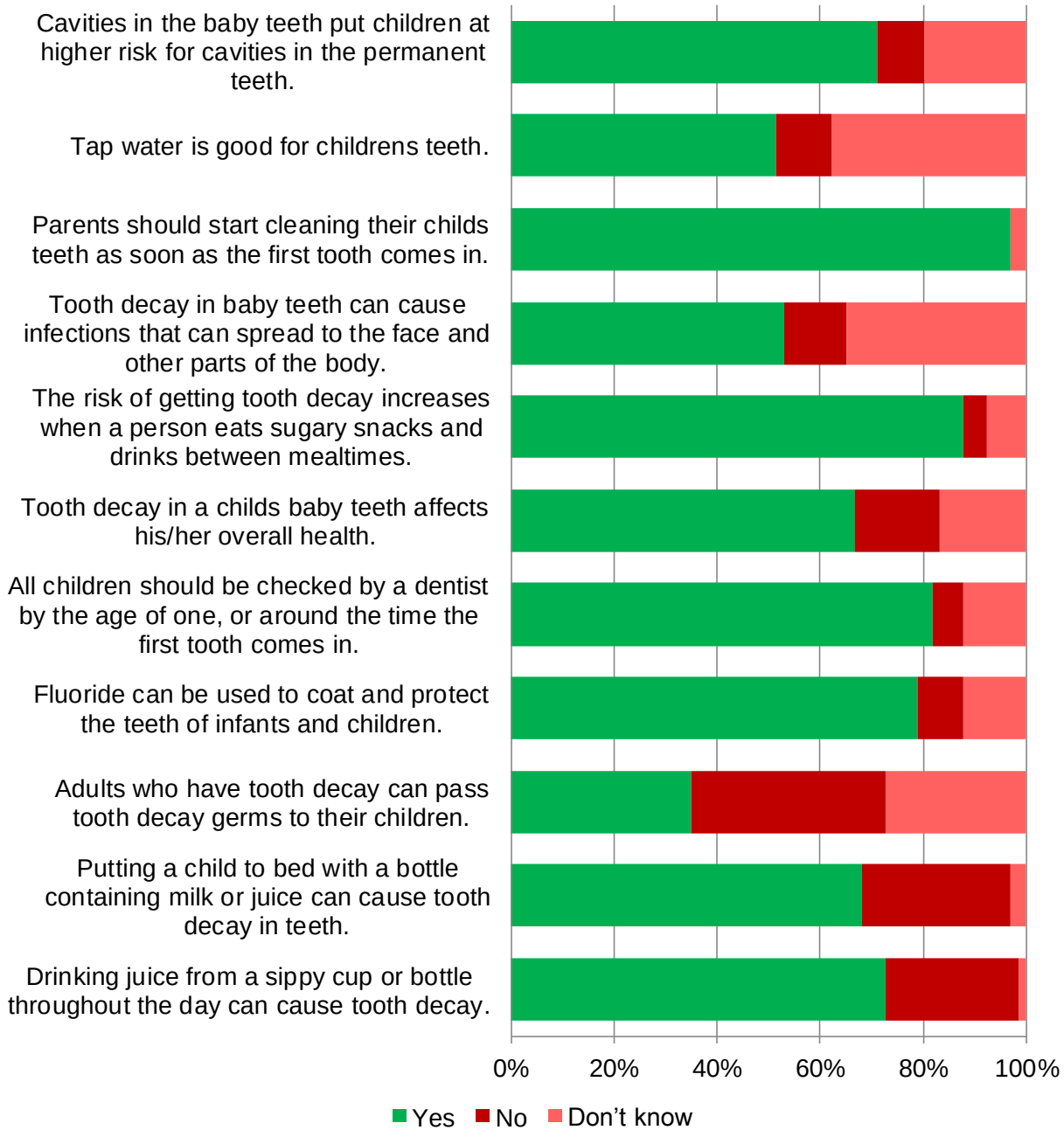

Figure 3. We would like to know your opinion about children's dental health

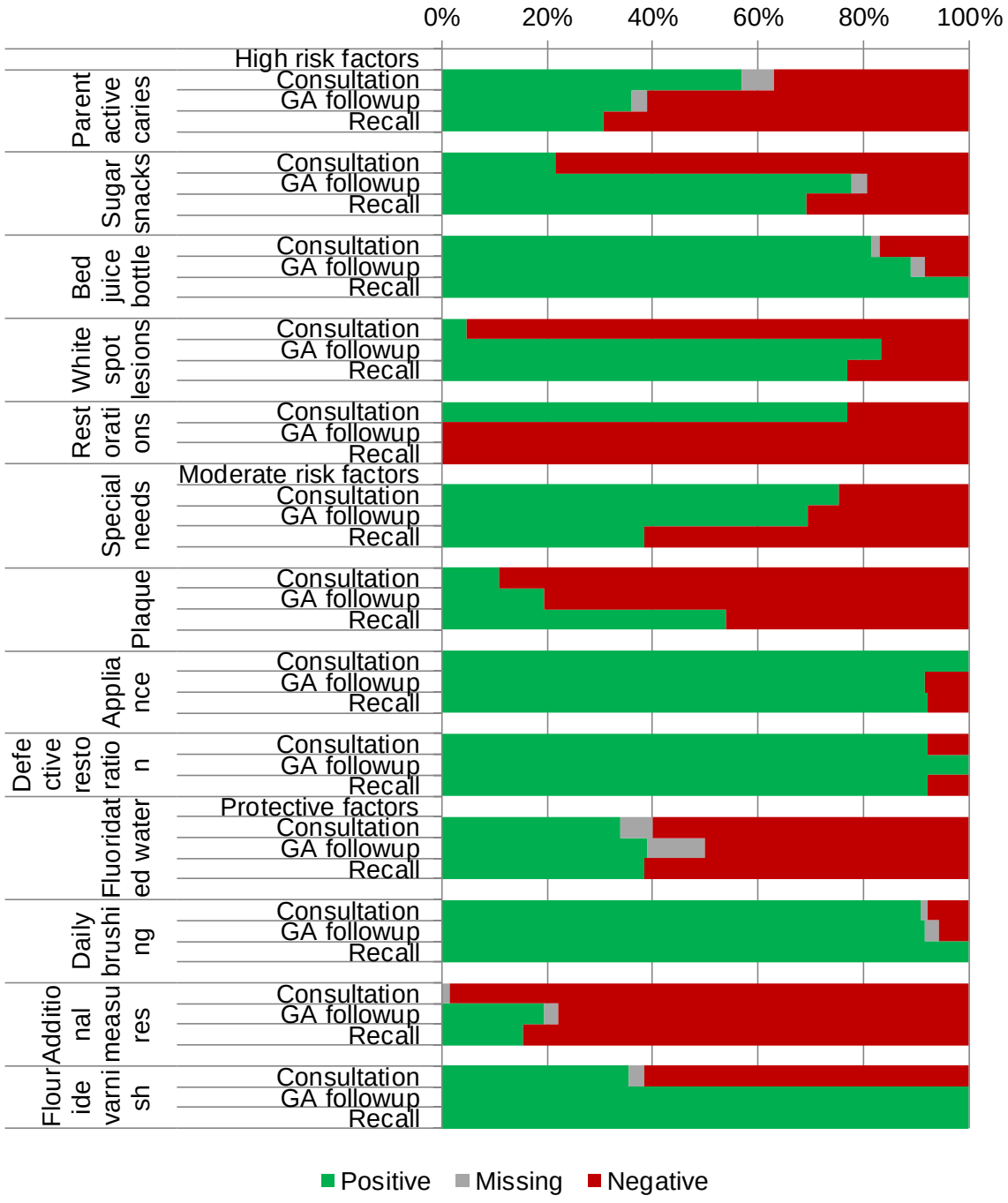

Figure 4. Caries Risk Assessment, change across time

Note: Positive= No for risk factors and Yes for protective factors. Negative = Yes for risk factors and No for protective factors

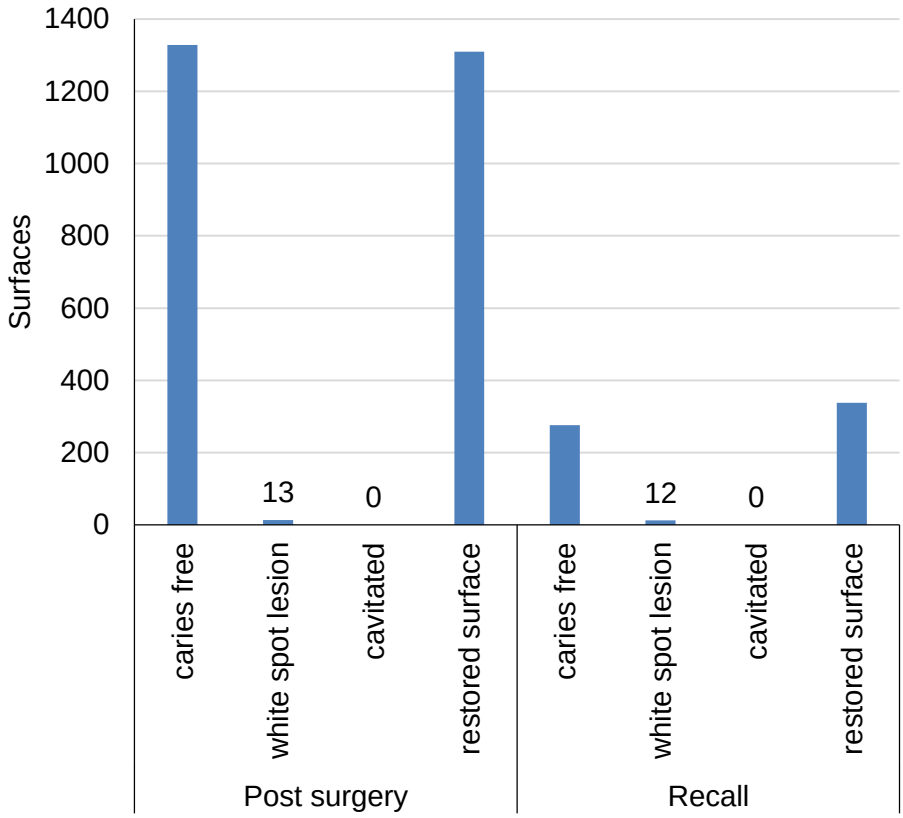

Figure 5. Tooth surfaces, change across time

Appendix 1

We are conducting a study about risks for tooth decay. Please select the best answer to the following questions. Thank you.

These basic questions are about your child's age and background.	
How old is your child?	Age: _____
What is *your child's* racial background? (check all that apply)	☐ White/Caucasian ☐ African American or Black ☐ Asian ☐ Native Hawaiian or Pacific Islander ☐ American Indian or Alaskan Native ☐ Other (specify)_____

Please help us understand your child's medical history (Select all that apply to your child)	
☐ **Breathing disorder** (examples: asthma, reactive airway disease)	☐ **Premature birth** (more than 3 weeks before the child's due date)
☐ **Heart disorder**	☐**Blood disorder** (Sickle cell anemia, hemophilia)
☐ **Brain disorder** (examples: autism, seizures, cerebral palsy)	☐**Genetic (hereditary) disorder/syndrome**
☐ **ADHD/ADD**	☐ **Developmental Delay**
☐ Other medical condition not listed:_____ _____ _____ _____ _____	**Does your child take medications**? ☐Yes ☐No If yes, please list medications:_____ _____ _____ _____

We would like to know your opinion about children's dental health.	**(Circle one)**
1. Drinking juice or milk from a sippy cup or bottle throughout the day can cause tooth decay.	Yes No Don't know
2. Putting a child to bed with a bottle containing milk or juice can cause tooth decay in teeth.	Yes No Don't know
3. Adults who have tooth decay can pass tooth decay germs to their children.	Yes No Don't know
4. Fluoride can be used to coat and protect the teeth of infants and children.	Yes No Don't know
5. All children should be checked by a dentist by the age of one, or around the time the first tooth comes in.	Yes No Don't know
6. Tooth decay in a child's baby teeth affects his/her overall health.	Yes No Don't know
7. The risk of getting tooth decay increases when a person eats sugary snacks and drinks between mealtimes.	Yes No Don't know
8. Tooth decay in baby teeth can cause infections that can spread to the face and other parts of the body.	Yes No Don't know
9. Parents should start cleaning their child's teeth as soon as the first tooth comes in.	Yes No Don't know
10. Tap water is good for children's teeth.	Yes No Don't know
11. Cavities in the baby teeth put children at higher risk for cavities in the permanent teeth.	Yes No Don't know

Now we want to ask about your child's tooth care.	(Circle one)
12. How often does an adult brush your child's teeth?	Daily Weekly Monthly Never
13. How often are your child's teeth brushed with fluoride toothpaste?	Daily Weekly Monthly Never
14. How often are your child's teeth brushed with non-fluoride toothpaste?	Daily Weekly Monthly Never
15. How often do you check your child's teeth for anything unusual?	Daily Weekly Monthly Never
16. When brushing, how often do your child's gums bleed?	Daily Weekly Monthly Never

Next we ask about your child's eating habits	(Select one)
17. Does your child usually (throughout the day) drink from a bottle or sippy cup?	Yes No
18. How often does your child go to sleep while nursing, or go to sleep while drinking something besides water from a bottle/sippy cup?	Daily Weekly Monthly Never
19. How often do you give your child sugary snacks such as raisins, candy, cookies, cakes, or cereal between meals?	☐ Three or more times a day ☐ One or two times a day ☐ Weekly ☐ Monthly ☐Never
20. How often do you give your child sugary drinks such as regular soda, sweet tea, chocolate milk, strawberry milk, fruit juice, sports drinks or koolaid between meals?	☐ Three or more times a day ☐ One or two times a day ☐ Weekly ☐ Monthly ☐Never
21. How often does your child typically drink tap water-including filtered water from the refrigerator?	Daily Weekly Monthly Never

22. Is there fluoride in your drinking water at home?	Yes No Don't Know

These questions are about your teeth and your tooth care.	**(Circle one)**
22. Have you had tooth decay, fillings and/or teeth pulled in the last two years?	Yes No
23. How often do you brush your teeth with fluoride toothpaste?	Daily Weekly Monthly Never

These questions are about your eating habits	**(Select one)**
24. How often do you eat sugary snacks such as raisins, candy, cookies, cakes, or cereal bars between meals?	☐ Three or more times a day ☐ One or two times a day ☐ Weekly ☐ Monthly ☐Never
25. How often do you drink sugary drinks such as regular soda, sweet tea, chocolate milk, strawberry milk, sports drinks, kool aid or fruit juice between meals?	☐ Three or more times a day ☐ One or two times a day ☐ Weekly ☐ Monthly ☐Never

The following questions are about you and your child's dental care	**(Select one)**
26. Is it very difficult to get your child to the doctor or dentist?	Yes* No
*If you answered "Yes" to question 26, please check all reasons that apply from the list that makes it difficult for you to get your child to the doctor or dentist:	☐ Transportation ☐ Distance ☐ Finances ☐ Job Conflict ☐ Fear/anxiety ☐ Other: _____ _____ _____ _____ _____

27. Is your child covered by health insurance?	Yes No Don't Know
28. Is your child covered by dental insurance?	Yes No Don't Know
29. Does your child participate in public assistance programs (example: WIC, Healthy Start, etc.)?	Yes No Don't Know

Now tell us a little bit about you…	
30. What is <u>your</u> racial background? (check all that apply)	☐ White/Caucasian ☐ African American or Black ☐ Asian ☐ Native Hawaiian or Pacific Islander ☐ American Indian or Alaskan Native ☐ Other (specify)- _____
31. Do you consider yourself to be Spanish, Hispanic or Latino?	Yes No
32. What is the highest level of education that you completed?	☐ Elementary and Middle School ☐ High School ☐ College ☐ Graduate school beyond college
33. Counting you, how many adults live in the child's household? specify a number:	#Adults:_____
34. Counting your child, how many children live in the household? specify a number:	#Children:_____
35. How many adults in the household are employed? Specify a number:	#Adults:_____

36. Which of the following categories best represents the combined income of all family members in your household for the past 12 months? (select one)	☐ Less than $5,000 ☐ $5,000-$9,999 ☐ $10,000-$19,999 ☐ $20,000-$29,999 ☐ $30,000-$39,999 ☐ $40,000-$49,999 ☐ $50,000-$79,999 ☐ $80,000-$99,999 ☐ $100,000 or more ☐ Don't know

Thank you so much for answering these questions. This information will better help us to learn more about the relationship between tooth decay and children's dental health.

Appendix 2

Caries Risk Assessment

High Risk Factors

Primary caregiver has active caries? Y/N

Patient has > 3 between meal sugar-containing snacks or beverages per day? Y/N
(example: sippy cup or bottle with fluid other than water) Describe.

Patient is put to bed with a bottle containing natural or added sugar? Y/N

Patient has obvious white spot lesion(s) or decay present? Y/N

Patient has restorations present? Y/N

Moderate Risk Factors

Patient has a special health care need? Y/N

Patient has plaque on teeth? Y/N

Patient has intraoral appliance(s)? Y/N

Patient has defective restoration(s)? Y/N

Protective Factors

Patient receives fluoridated drinking water or fluorinated supplements? Y/N/not sure

Patient brushes teeth daily with fluoridated toothpaste? Y/N,
if yes choose: 0/1/2/3 or more times a day

Patient receives additional home measures (Prevident, MI paste, etc)? Y/N

Patient received fluoride varnish in last 6 months? Y/N

Overall assessment of dental caries risk? High/Moderate/Low

Appendix 3

Name: **Date:**

Subject #: **Axium#**

2nd Molar	**lst Molar**	**Canine**	**Lateral**	**Central**	
A m o d b l	B m o d b l	C m d b l	D m d b l	E m d b l	**Upper Right**
J m o d b l	I m o d b l	H m d b l	G m d b l	F m d b l	**Upper Left**
K m o d b l	L m o d b l	M m d b l	N m d b l	O m d b l	**Lower Left**

T	S	R	Q	P	**Lower Right**
m o d b l	m o d b l	m d b l	m d b l	m d b l	

0 – Caries free **Please Circle Visit:** **Consult** **GA followup**
1 – White spot lesion
2 – Cavitated in enamel or dentin **3-Month Recall** **6-Month Recall**
3 –restored surface

Appendix 4

GOAL SELECTION SHEET

Select the goal that you would like to work towards by circling it.
Then, on a scale of 1-10, circle how confident you are that you can accomplish the goal.

Self-management Goals for Parent/Caregiver

Patient Name_____ DOB_____

Regular dental visits for child

Family receives dental treatment

Healthy snacks

Brush with fluoride tooth-paste at least twice daily

No soda

Less or no juice

Wean off bottle (At least no bottle for sleeping)

Only water or milk in sippy cup

Chew gum with xylitol

Drink tap water

Less or no candy and junk food

IMPORTANT:
The last thing that touches your child's teeth before bed-time is the tooth-brush with fluoride toothpaste.

Circle the goals you will focus on between today and your next visit.

On a scale of 1-10, how confident are you that you can accomplish the goals? 1 2 3 4 5 6 7 8 9 10

Not likely Definitely

My promise: I agree to the goals circled and understand that staff may ask me how I am doing with my goals.

Date:_____ Signed by:_____

Review Date:_____Comments: _____Staff Initials:_____

Review Date:_____Comments: _____Staff Initials:_____

Vita

Katherine Anne Nordeen was born on June 14, 1984 in Minneapolis, Minnesota. She received her Bachelor of Arts in Spanish from the University of Illinois in 2006. She completed her Doctor of Dental Surgery degree from the University of Minnesota in 2010. After working for three years in a public health dental clinic, she decided to pursue a career in Pediatric Dentistry. Katherine will complete her Pediatric Dentistry Residency at Virginia Commonwealth University in June 2015.