

Evaluation of Behavior Change Goal-Setting Action Plan on Oral Health Activity and Status

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ABSTRACT

This experimental study determined if a “report card-like” oral health action plan was effective in improving oral health behaviors in a sample of 69 patients, ages 1 to 6 years. Participants were divided randomly into control and intervention groups. Data collected included dmft, plaque score, *Streptococcus mutans* levels and oral health behaviors. Participants in the intervention group received an oral health action plan that included: 1. child’s current caries-risk status; 2. identification issues of concern; and 3. one “goal” to improve on for the next visit. All participants returned after two months for follow-up examination and data collection.

Even though there have been significant reductions in childhood caries over the past 20 years, dental decay remains the most common chronic disease of childhood. In particular, early childhood caries (ECC) continues to be a serious public health crisis among the economically disadvantaged and minority populations.¹⁻⁴ Effects of ECC range from immediate issues, such as pain and infection, to more long-term consequences, including speech impairment, poor nutrition, negative self-image, malocclusion, learning difficulties in school and dental-related problems in adulthood.^{3,5-14}

Various methods have been used to decrease the incidence of childhood caries, some more effective than others. Regardless of the type of intervention, it is by and large agreed that early intervention has the best probability for success.^{1,15-18} The expectation is that by establishing proper oral health behaviors during early childhood, those behaviors will continue through adulthood.^{19,20} However, even if a given intervention is attempted at an early age, studies show that merely providing patients with oral health information will have only minimal impact on their oral health behavior.²¹⁻²⁵ In fact, 20 years after proposing an intensive caries prevention program, Marthalar found there were no known highly effective preventive programs for high-risk patients, due to low compliance.²⁶

Then, again, studies on goal-setting action plans modeled after the clinically accomplished medical patient carried management plans have shown promise. Goal-setting action planning allows patients to set a goal for a behavior they wish to change and allows clinicians to engage patients in a discussion of a concrete and specific action plan that can help the patient fulfill the goal. Studies of one such plan, the diabetic passport, have shown great success in adults.^{27,28} In children, asthma and obesity actions plans have shown that by providing children and their parents with an accurate written appraisal of their current health condition and specific suggestions to improve that status, there is marked improvement in their health, as well as parent and child behavior. In addition, there is noted improvement in the reliability of follow-up visits in patients who receive an action plan.²⁹⁻³²

Because of this, we explored the following: 1. whether it is feasible for clinicians to engage parents of patients with ECC risk factors in collaborative goal-setting and concrete action planning during the initial dental evaluation visit; and 2. determining the effectiveness of a personalized detailed oral health action plan in improving parent-patient oral health behaviors and oral health status of the child.

Materials and Methods

This study was approved by the Institutional Review Board of Columbia University Medical Center. In this quasi-experimental design, 69 pediatric-child patients between ages 1 and 6 years, with the majority (90%) being 2 to 5 years (mean age of 3 years), participated in the study and were divided randomly into control and intervention groups.

Patients in both groups received intraoral and extraoral examinations, a dental prophylaxis and a topical fluoride application by one trained dentist examiner. Examination data collected included DMFS, gingival health and plaque scores. During this first visit, the parents were questioned regarding the oral hygiene and diet behavior of the child in order to fulfill the six survey topics (frequency of toothbrushing with a fluoridated dentifrice, parent-assisted toothbrushing, bottle use, sippy cup use, frequency of juice consumption and frequency of between-meal snacking). Data for the reported behavior was categorized as low, moderate or high caries risk and assigned a numerical value of 0, 1 or 2, respectively.

TABLE 1.

Data Summary

Control					Intervention				
	Pre	Post	Change	P value		Pre	Post	Change	P value
Behavioral					Behavioral				
No. brushing/day	0.690	0.060	0.625	0.000*	No. brushing/day	0.730	0.000	0.730	0.000*
Who brushes	1.000	0.190	0.813	0.000*	Who brushes	0.950	0.050	0.892	0.000*
Bottle use	0.250	0.000	0.250	0.018*	Bottle use	0.570	0.030	0.541	0.000*
Sippy cup use	0.220	0.000	0.219	0.006*	Sippy cup use	0.540	0.080	0.459	0.000*
No. juice/day	0.530	0.090	0.438	0.000*	No. juice/day	0.730	0.110	0.622	0.000*
No. snacks/day	0.250	0.030	0.219	0.006*	No. snacks/day	0.300	0.030	0.270	0.006*
Total Behavior	2.940	0.380	2.563	0.000*	Total behavior	3.810	0.300	3.514	0.000*
Control					Intervention				
Biological					Biological				
S. mutans	0.660	0.690	-0.031	0.745	S. mutans	0.700	0.540	0.432	0.000*
Plaque score	0.660	0.560	0.094	0.184	Plaque score	1.080	0.110	0.973	0.000*
dmft	0.440	0.440	0.000	-	dmft	1.320	1.320	0.000	-
Gingival health	0.500	0.500	0.000	1.000	Gingival health	0.590	0.140	0.459	0.000*

*P<0.05

My child's risk for tooth decay is...	AT HOME I can help my child	WITH MEALS I can help my child by...
 ☐ Low  ☐ Medium  ☐ High	☐  Brushing twice a day with a fluoride toothpaste ☐  Helping my child brush their teeth ☐  Switching from the baby bottle to an infant cup ☐  No bottle or only water in bottle at bedtime	☐  Giving fewer snacks throughout the day ☐  Eating more healthy foods ☐  Drinking juice only with meals ☐ _____

Figure 1. Oral Health Action Plan consists of assessment of patient's current caries risk and list of suggestions on how to improve that status. Parent and dentist together choose one particular recommendation they feel is doable.

Thirty-two patients in the control group received routine, verbally dispensed oral hygiene and diet instructions targeting the specific needs of the patient. In addition to the routine oral health instructions given to the control group, the 37 patients in the intervention group received a personalized oral health action plan (Figure 1). The action plan consisted of an assessment of the patient's current caries risk and a list of suggestions on how to improve that status. The parent and dentist together chose one particular suggestion they felt was achievable.

All patients were asked to return after two months, at which time patients again received a dental examination and parental survey regarding oral hygiene and diet. Data collected at initial and follow-up visits were compared and analyzed using a paired t-test and Pearson chi square analysis and SPSS (SPSS for Windows, Rel. 15.0. 2006. Chicago: SPSS Inc.).

Results

Table 1 summarizes data collected. Initial visits revealed that in the control and intervention groups, 69% and 68% of patients, respectively, brushed their teeth at least once a day. Of these, 75% in the control group and 62% in the intervention group receive parental assistance while brushing. The control group reported 81% of patients do not use a bottle at all; however, 6% do use the bottle at bedtime. In the intervention group, 57% of patients never use a bottle, with 14% using a bottle in bed. The control and intervention group data showed that 78% and 57% of patients, respectively, do not use a sippy cup, but that of those who do use a sippy cup, up to 11% use it at bedtime. When asked about diet, 50% of control group patients and 35% of intervention group patients reported drinking juice no more than twice a day. Additionally, the majority of patients, 75% and 73% in control and intervention groups, respectively, reported eating in-between meal snacks one or two times a day.

On clinical examination, 91% of the control group was observed to have little-to-no visible plaque and 51% had healthy gingiva. Similarly, the intervention group was noted to have little-to-no visible plaque in 84% of patients and healthy gingiva in 43% of patients. In case and control groups, the DMFS was found to be 78% and 62%, respectively, with a range of 0 to 4 in both groups. *S. mutans* cultures revealed that 50% of control and 86.5% of intervention group pa-

tients had low levels. All baseline measures showed the control and intervention groups to be equivalent, with the exception of *S. mutans* levels and plaque scores, which were significantly higher in the intervention group.

At the follow-up visits, 93% of patients in the control group reported brushing twice a day, with assistance in 84% of cases. One hundred percent of the patients in the intervention group reported brushing two times a day, with 95% receiving assistance. In the control group, no patients reported use of a bottle or sippy cup at any time, while in the control group, 3% of patients reported bottle and sippy cup use. At follow-up, 91% of the control group reported drinking juice fewer than two times a day and 97% reported snacking less than twice a day. In the intervention group, 89% of patients reported drinking juice no more than twice a day, and 97% of patients reported eating snacks fewer than two times a day.

Follow-up examination revealed that 94% of the control and 100% of the intervention group had little-to-no visible plaque, and 87% and 50%, respectively, had healthy gingiva. In both groups, the DMFS remained unchanged at 78% in the control and 62% in the intervention. *S. mutans* testing in the control group showed 44% of patients had low levels, 44% had moderate levels and 13% had high or too numerous to count. The intervention group data showed 95% of patients having *S. mutans* levels in the low range.

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Results for initial and follow-up visits were compared and analyzed. In all six oral hygiene and diet behavior reported measures there was a statistically significant improvement noted in both control and intervention groups. In the control group, there were no statistically significant changes seen in any of the biologic markers. However, in the intervention group, the *S. mutans* levels, plaque scores and gingival health showed statistically significant ($P < .05$) improvement when comparing initial and follow-up examinations.

Discussion

Similar to its medical counterparts, a goal-setting action plan, including discussion of current oral health status and methods for improvement, is completed with patients at initial dental visits. To boost the probability that patients will be successful with their action plan, clinicians ask them to choose one item on a pictogram that they can carry out, and help patients tailor-make an action plan they consider achievable. Parents are encouraged to choose one item with a high probability of success, because successes in making a behavior change, no matter how minute, increases parent self-efficacy.

When considering the data collected on initial visits for both the control and intervention groups, it is interesting to note that approximately 30% of children who participated in this study reported toothbrushing with fluoride dentifrice twice a day. However, the ma-

jority of children in both groups reportedly received assistance while toothbrushing. This data demonstrates that although the AAPD currently recommends parent-assisted, twice-daily toothbrushing with fluoridated dentifrice, the vast majorities of parents in this study were not aware of the guidelines or made a behavioral change.

Other baseline data shows more encouraging statistics. The vast majority of children in this study drank juice fewer than four times a day, with 35% to 50% having juice two times or less. Almost 75% of children consume only one or two between-meal snacks a day. In addition, although most children were not reported to use a bottle or sippy cup, of those that did, 10% and 6% used a bottle or sippy cup, respectively, at bedtime. In view of this data, it seems that many parents are aware of the recommendations regarding diet, but not as informed on the subject of oral hygiene. This might suggest that although pediatricians, nurses, teachers and others are actively engaging patients and parents in diet and nutrition instruction, oral health behaviors are not being discussed until the child first goes to the dentist. That notion is concerning when considering that the average patient age in this study is 3 years old, at which time poor oral health habits may have formed and the dental caries process may already have begun.

Data collected in this study revealed many other intriguing results, most notably, the statistically significant changes in both the control and intervention groups in all six areas of self-reported oral

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health and diet behaviors. This implies that regardless of the means of disseminating the oral health information, patients and parent do understand the recommendations. However, although parents comprehend the orally dispensed advice routinely given by the dentist, as in the control group, and are able to "correctly" answer the questions at the follow-up visit, the biological and clinical markers obtained at the follow-up imply that they are not adhering to those recommendations. In contrast, the patients and parents in the intervention group not only reported improved oral hygiene and diet behaviors, but that improvement was demonstrated with statistically significant changes in biological and clinical factors. One may infer, therefore, that providing patients with an oral health action plan specifying one particular goal does not necessarily increase patient and parent understanding of the dentist's recommendations compared to verbally dispensed instructions, but it does improve compliance with those suggestions.

Although the data collected in this study strongly supported the hypothesis that goal-setting action planning enhances patient and parent compliance with oral health behaviors and improves oral health status, there were limitations and inconsistencies found. The most noteworthy irregularity was the disparity in control and intervention groups at initial examination in the areas of plaque score and *S. mutans* level. Pearson chi square analysis revealed that the intervention group had significantly higher *S. mutans* level and plaque score averages at the initial visit. However, since this study is evaluating the improvement of the oral health measures, the change noted within the groups between initial and follow-up visits is still statistically significant. This discrepancy could probably be accounted for considering the other three major limitations of this study: the sample size, observation time and potential examiner bias. A larger sample size would allow for better randomization and more equivalent sample groups. Further, perhaps increasing the observation time to a six-month follow-up may have resulted in a more complete study. Finally, since this was a single blind study, upon follow-up examination, experimenter bias has to be considered and results may be skewed. Nevertheless, the promising results of this pilot study will, it is hoped, promote the completion of similar, larger studies focusing on the use of goal-setting action planning in the dental office. Goal-setting action planning, with clinician and patient together deciding on concrete behavior change goals, may be more effective in encouraging healthy behaviors than conventional clinician-directed instruction.

Conclusions

Overall, in this study, the following was observed:

- Collaborative goal-setting between clinicians and parents of child patients for improved health behaviors is viewed favorably by parents and has a positive impact on clinical outcomes, as evidenced by a decrease in plaque and gingivitis, as well as reduction in *S. mutans* counts on microbial analysis.
- Considering this, behavior change goal-setting action plans may be a promising technique for assisting parents in improving child oral health status and behaviors. ▄

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