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Effect of Caries Control on Restoration Survival in High-Risk Children

A Prospective Cohort Study

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Abstract

Children who are at a significant risk of developing cavities and thus undergoing multiple restorative procedures will likely experience higher rates of restoration failure; however, little is known about how structured caries-protocols for controlling disease can affect survival rates of restorations for patients at high-risk of caries. The goal of the study was to gather evidence regarding the effect of structured caries-control protocols involving caries-risk assessments, topical fluoride/silver diamine fluoride treatments, sealants and enhanced oral hygiene education on the 24-month survival rate of restorations in high-caries-risk children compared to those receiving traditional restorative care. In this prospective cohort study, 340 high-caries-risk children between the ages of 4-10 were enrolled (170 per group) and participated in the study for 24 months. Evaluators used modified United States Public Health Service criteria to evaluate the restorations, and the data were analyzed by using the Kaplan-Meier survival analysis and multivariable Cox regression. Of the 340 children enrolled, 320 completed a restoration evaluation at 24 months. A total of 944 restorations were evaluated as well. The cumulative survival rate for restorations in the study group receiving structured caries-control protocols was significantly ($p<.001$) higher (84.1%) than that of the study group receiving traditional restorative care (59.7%). Other variables that had a statistically significant association with restoration failure included treatment with conventional care, posterior tooth location, poor oral hygiene and non-adherence to recall appointments. Based on the findings of this study, implementation of structured caries-control protocols into a restorative treatment plan greatly improved restoration survival rates for high-caries-risk children and supports the use of structured caries-control protocols in routine pediatric dental care pathways.

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Introduction

Worldwide, dental caries is still one of the most common chronic diseases affecting children, although it is unevenly distributed, with a minority of children having a greater share of the disease burden. High-risk caries patients have characteristics such as recurrent cavitation, heavy biofilm accumulation, a high frequency of fermentable carbohydrate intake, and limited access to preventive dental services. Because of these factors, and because nearly all restorative treatments alone are inadequate to stop the progression of disease in these children, restorations placed in a biologically active carious environment will generally experience accelerated marginal breakdown, secondary caries, or premature failure.

The longevity of primary teeth and permanent restorations are influenced by a mix of factors, including those related to dental materials, the dentist, and the patient. For patients, the active presence of decay will have the largest effect on how long a restoration will last; for example, an existing restoration may need to be replaced if there are new cavities at the margins of that restoration. A study conducted over 24 months comparing restorative techniques used to treat carious primary molars found that the outcomes of restorations varied significantly by both the position of the tooth and the technique used, demonstrating that it is not possible to determine how long

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restorations will last based solely on the restorations themselves and not also taking into account the broader peri-operative decay environment in which they will be placed [1]. This finding is further supported by a study involving prospective evidence and longer intervals between re-evaluation of restorations in the permanent molars with developmental enamel defects, which similarly demonstrated that the survival of restorations placed following the selective removal of carious dentin depended on both the severity of the baseline lesion and the length of time between evaluations [2].

Caries Risk Assessment (CRA) Tools - The Caries Management by Risk Assessment (CAMBRA) Protocols have been developed to move away from a purely restorative, drill-and-fill approach toward a more personalized and preventive approach by stratifying patients by their risk and applying individually tailored preventive and restorative strategies [3]. CAMBRA provides a framework for caries management in both children and adults through a systematic assessment of multiple features associated with caries (e.g., pathogenic bacteria, frequent snacking, reduced salivary flow) and established protective factors (i.e., fluoride exposure, antimicrobial therapy) that influence the risk of developing caries and will drive the ultimate treatment approach [4].

Even if the idea of managing caries based on a person's risk is appealing, the evidence that structured caries management protocols have improved the survival of restorations in high-risk children is scattered. There are systematic reviews of the CAMBRA protocol that have reported high levels of inconsistency between study designs, and they have recommended that more prospective studies occur with adequate length of follow-up to see if managing caries risk changes clinical outcomes, rather than just assessing a person’s risk to develop caries. They have identified children up to age six years old as having a lack of evidence in this area [4]. In addition, there are broader reviews of standardized caries risk assessment models that are questioning how consistently these models can predict the trajectory of disease and treatment without data to support their use when providing dental treatment [5]. There are also methodological reviews reporting similar concerns about the level and quality of evidence with pediatric caries risk assessment tools among young children [6].

Similarly, when we examine large pragmatic trials of school-based preventive programs for children using silver diamine fluoride, fluoride varnish, and glass ionomer sealants that have been developed under protocols specifically targeting low income and high risk populations [7], we find that these trials have resulted in significant decreases in caries incidence and progression among those populations [8,9]. However, most of these trials were not powered to detect differences in the survival of restorations already in place, but rather in the ability of these products to arrest or prevent caries.

This gap creates an important clinical need for providers of pediatric dental services, particularly those that are publicly funded or otherwise limited in resources, to efficiently allocate the limited resources available to them for providing care through their use of restorative materials and operative time. If the ability to demonstrate an increase in the functional longevity of restorations placed within a structured protocol for controlling caries, layered on top of conventional restorative treatment, is achieved, then the implications will directly impact treatment planning, recall scheduling and allocation of resources for pediatric dental services. Moreover, observational data support that a child already defined in the highest risk category for caries will have a greater chance of requiring restorative treatment in the future. There is a rational basis for using risk-tiered preventive care pathways [10].

The purpose of the present prospective cohort study was to compare restoration survival in high-caries-risk children receiving a structured caries-control protocol (including caries-risk assessment; topical fluoride or silver diamine fluoride application; pit-and-fissure sealants on at-risk surfaces; reinforced oral hygiene coaching), plus conventional restorative treatment, to high-caries-risk children receiving conventional restorative treatment only. The specific objectives were:

1. To estimate and compare the cumulative survival of restorations for the 24 months following placement for high-caries-risk children treated with a structured caries-control protocol versus those that have not been.
2. To identify independent clinical and behavioral predictors of restoration failure in this population using multivariable survival analysis.
3. To examine the differential effect of caries control on restoration survival based on restoration location (anterior versus posterior), and on recall adherence.

We hypothesized that high-caries-risk children treated with a structured caries-control protocol would have greater restoration survival rates at the 24 months compared to those treated with conventional restorative care only.

Material and Methods

The research was set up as a cohort study that followed participants for 24 months. The study took place in three associate clinics that provide dental care to children. The parameters of the study follow the STROBE criteria for cohort studies [11].

Prior to the recruitment of participants, ethics approval to conduct the study was secured through an Institutional Ethics Review Board (IRB). The study was also registered on clinicaltrials.gov. The consent of a parent/legal guardian was obtained in writing and children aged 7 and older provided verbal assent.

As part of the routine delivery of dental care, children (4-10 years of age) who were screened for eligibility were screened for high-risk status for caries using a caries-risk assessment instrument based on CAMBRA. Children were rated as "low" to "moderate" to "high" to "extreme" risk for development of caries based on the clinical findings (i.e., active white-spot lesion, visible plaque, multiple cavitated lesions), microbiological indicators, patterns of eating and drinking, salivary function and/or flow rate, and history of fluoride exposure [12]. All children who were identified as being high-risk or extreme risk for caries were included in this project.

To be included in the study, the children must have met the following inclusion criteria: (1) be age 4-10 at the time of enrollment; (2) be classified as high (i.e., caries risk status) or extreme caries risk (i.e., caries risk status); (3) exhibit at least one carious lesion in a primary or permanent posterior or anterior tooth which requires restoration; (4) be able to cooperate in a clinical evaluation and restorative procedure; and (5) provide written parental/guardian consent for 24 months of follow-up (guardian/parental) to participate in the study. Exclusion criteria were as follows: (1) systemic health condition or medication that is associated with independent risk for caries; (2) craniofacial malformations or craniofacial anomalies which interfere with tooth morphology; (3) a history of orthodontic treatment; and (4) anticipate moving out of the geographic area served by the study by the time of follow-up.

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Due to the impracticability and potential inequities associated with implementing a randomized preventive care pathway at each of the participating clinics as part of their Standard Operating Procedures, patients were assigned to the caries-control protocol group or the standard care group via the standard care pathway currently in effect at that clinic when they enrolled; thus, the design is a non-randomized prospective cohort study. To reduce the potential for confounding as a result of the manner in which patients were allocated to their treatment groups, both of the clinics implementing the structured caries-control protocol and the clinic providing traditional restorative care only served populations that were comparable on the basis of socio-economic and demographic characteristics, and baseline comparability of intervened subjects was evaluated using validated statistical tools (Table 1).

Children in the Caries Control Protocol group received:

1. Baseline caries risk assessment (CRA) with individualized risk counseling for each child's parent/guardian.
2. Professionally applied topical fluorides (fluoride varnishes containing 22,600 ppm fluoride) applied every three months with the first dose at baseline, and silver diamine fluorides (38% w/v) applied to non-restorable or minimally cavitated carious lesions where restoration was not yet indicated.
3. Resin-based pit-and-fissure sealants placed onto caries-free or minimally affected occlusal surfaces of erupting and erupted permanent molars.
4. Structured oral hygiene instructions and dietary counseling provided and reinforced at the time of each recall visit.
5. Conventional restorative treatment of cavitated teeth using resin composites (anterior restorations and Class I/II posterior restorations) and glass ionomer/stainless steel crowns, according to standard isolation and adhesive protocols, based on the extent of the cavity.

Children in the conventional treatment group received routine dental care as defined by standard protocols using the same methods and technologies outlined above, including routine oral hygiene instructions given at the first scheduled appointment, but no structured risk stratification based on CRA, no fluoride varnish or silver diamine fluoride to be reapplied on a predetermined schedule, and sealant placement will not be included.

All restorative work on children in either treatment group was performed by fully trained Pediatric Dentistry Residents under the direct supervision of a Board-Certified Pediatric Dentist, will use the same, standardized technique for isolation during restorative procedures, cavity preparation and adhesive placing procedures to minimize any operator error.

The main objective of this study was to determine how long a restoration will last after placement (e.g., the amount of time between when a restoration is placed and when it fails). A restoration is said to have failed if there is a need for redoing or repairing it due to secondary carious lesions, fracture, loss of retention, marginal breakdown, or pulp-related problems.

Evaluators (not aware of which group the child was assigned to) evaluated restorations at 3, 6, 12, 18, and 24 months post-placement, using modified United States Public Health Service (USPHS) criteria to assess restorations. The various criteria included anatomic form, marginal adaptation, marginal discoloration, secondary carious lesions, and surface texture. Restorations that do not meet the “Alfa” (acceptable, needs no changes) or “Bravo” (acceptable with non-cavity-creating minor defect) were considered a failure. The reliability of evaluators, with 10% of examiner pairs being randomly selected for evaluation at each visit interval, was 0.86 (Cohen’s kappa).

Secondary outcomes measured were the development of new carious lesions in the area not restored, the child’s oral hygiene (at each visit assessed using a simplified plaque index) and the number of missed scheduled recall appointments (if>80%, considered adherent).

To detect a 15% difference in 24-month failure rates based on previous studies of restoration longevity in children, a priori sample size was calculated based on 85% expected success rate for the caries protocol vs 70% for standard care. Expected difference was calculated with a significance level of 0.05 and 90% power and included a design effect of 1.2 (to account for multiple restorations in each child). A minimum of 152 patients per group (N = 304) is needed; after allowing for a 10% drop out rate by 24 month follow up, final enrollment goals of 170 patients per group (N = 340) will be required.

We used means and standard deviations to summarize the baseline characteristics of continuous variables; frequency and percentage to summarize categorical variables. Differences between the independent samples were determined using the independent-samples t test or the chi-square test for numeric data and categorical data, respectively. Restoration-level survival time was assessed with the Kaplan-Meier method and compared between groups using the log-rank test. A robust (Huber-White) sandwich variance estimator was used to account for clustering of restorations within children. The multivariable Cox proportional hazards regression was used to estimate the adjusted hazard ratio (HR) with 95% confidence interval (CI) for restoration failure, with covariates chosen a priori based on clinical relevance and prior literature (group assignment, tooth site (anterior, posterior), restoration material; baseline caries-risk category; oral hygiene status; recall adherence). The proportional hazards assumption was evaluated using Schoenfeld residuals. A two-sided $p < 0.05$ was the threshold for statistical significance. All analyses were completed with commonly available statistical software packages for survival analysis.

Results

A total of 410 children were screened, and 340 were found to be eligible for the study and therefore enrolled (170 each in both groups). Over the course of the 24-month follow-up period, 20 children were lost to follow-up (8 in the caries-control protocol arm and 12 in the conventional care arm), primarily due to withdrawal of consent or relocation. Ultimately, 320 children completed the 24-month follow-up (162 caries-control protocol, 158 conventional care) and were included in the overall survival analysis data set, thereby providing 944 restorations (481 vs 463, respectively). Participant flow can be viewed in Figure 1.

As displayed in Table 1 (see Methods), the baseline demographic and clinical characteristics were equal between the groups; and there were no differences (all $p > 0.05$) between the groups in age, sex distribution, baseline dmft (decayed, missing or filled teeth) or DMFT (decayed, missing, or filled teeth), risk for caries (tooth decay), basic oral hygiene or household income brackets — which validates the comparisons between the groups in all characteristics tested.

Our 24-month study found that while restoration survival rates were good (84.1%) for cases treated under the caries-control protocol, only about half (59.7%) of all restorations repaired with conventional care lasted at least 24 months. Cumulative survival rates measured with Kaplan-Meier survival curves were statistically significantly different ($p<0.001$) at the 6-month follow-up. Cumulative failure rates were also statistically significantly different between groups ($p<0.001$) and had significantly increased for subjects receiving conventional care by the end of the follow-up period. The number of restorations that failed for participants in the caries-control protocol was consistently lower than that of the conventional care group at each evaluation point (see Table 2). In general, this trend is consistent with the divergence of Kaplan-Meier curves for both treatment groups displayed in Figure 2.

There are significant differences in the success rate of restoration after 24 months based on the location of the tooth and the individual's

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behavior. Figure 3 illustrates these findings. Anterior restorations had a higher success rate than posterior restorations. Specifically, success rates for anterior restorations in the caries-control protocol group (91.4%) were greater than those for posterior restorations (80.2%). Similarly, in the conventional care group, anterior restorations had a higher success rate (78.9%) than posterior restorations (52.1%). Children with good oral hygiene exhibited significantly more successful restorations than children who had poor oral hygiene in both groups; further, successful restorations were significantly associated with adherence to scheduled recall visits for both groups. Among children with poor oral hygiene, the caries-control protocol group had an absolute difference of 23.3% (71.3% vs. 48%) in success rate compared to the conventional care group. Among children who do not adhere to their scheduled recall visits, the absolute difference in success rates was 26.6% (68.5% vs. 41.9%) between the two groups. These results suggest that the structured behavior modification of the caries-control protocol conferred the greatest relative advantage to children who exhibit high behavioral risks of failure.

The multivariable outcome of restoration failure was measured using Cox proportional hazards regression in the table below. The allocation to the conventional care group remained an independent predictor of restoration failure, even after accounting for other factors (e.g., tooth location, restoration material, baseline caries risk, oral hygiene, and recall adherence). The hazard ratio for being assigned to conventional versus emergent care was greater than 1 (adjusted hazard ratio [aHR]=2.63) at the 95% confidence interval (CI). In other words, participants who received treatment from a dentist using only conventional care were more likely to experience restoration failure than those who received treatment from a dentist using both emergent and conventional care; the aHR of failure also applied for restorative disaster restoration in the case of patients with posterior teeth, poor oral hygiene and no adherence to recall visits. However, there was no statistical significance for baseline classification as extreme caries risk; its hazard ratio was greater than unity but not statistically significant (aHR=1.34). Also, the proportional hazards assumption was not violated for any of the covariates (Schoenfeld residuals p all>.10).

Over the course of 24 months there was a reduction in disease incidence on tooth surfaces previously unaffected in the group receiving the care control protocol (18.5% of children developed at least one new carious lesion) as compared to the conventional care approach (41.8% of children), with this difference being statistically significant (χ^2 = 26.4, degrees of freedom = 1, p < <0.001). The retention of sealants applied to teeth of patients in the caries-control protocol group was 86.2% at 24 months. There were no reported serious adverse events related to the application of silver diamine fluoride, fluoride varnish, or restorative procedures by either group, although 14 children did experience discoloration of the teeth because of silver diamine fluoride application which is expected due to the known properties of this agent.

Discussion

In this prospective cohort research, a structured approach for managing cavities combined with traditional methods for restoring teeth produced a significant difference in the percentage of restored teeth surviving at 24 months (84.1%) compared to traditional methods alone (59.7%) in a group of children who had been determined to be at high risk for developing cavities. After adjustment for other variables affecting the results (including location of teeth, type of restoration material used, severity of cavities before treatment, oral hygiene and adherence to the prescribed schedule for seeing a dentist after treatment), children treated with only traditional procedures had an over two-fold greater adjusted risk of their restored teeth failing than children treated with the structured protocol.

This cohort's overall survival estimates are largely comparable to the previous prospective comparisons of restorative treatment options on carious primary molars, where long-term clinical outcomes were found to depend on the type of restoration, the specific tooth being treated, and how long follow-up was done, during the same 24-month observation period [1]. This study builds on this body of research by providing further prospective evidence that a structured multi-faceted carious control intervention that is layered onto restorative treatment will improve the performance of restored teeth and, thus, emphasizes that carious risk is a modifiable factor to long-term restoration and not simply a predictive factor. Furthermore, it suggests that each child's base level of risk for carious lesions is strongly correlated with whether they will need to have additional restorative treatment performed in the future [10].

You also find a similar result in high-risk, low-income children's school-based pragmatic trials evaluating caries prevention intervention, including treatment using silver diamine fluoride and glass ionomer sealants delivered as a structured system of preventive care versus typical care, have shown significant reductions in the rate of developing new cavities and the progression of existing cavities over time [8,9]. While they were primarily performed to evaluate cavity arrest/prevention, not restoration, the finding that structured preventive care was superior to ad-hoc (typical) care in high-risk children correlates with these results and gives external credibility to this observed effect.

Observational follow-up research examining the comparative effectiveness of caries-risk stratified care pathways has also linked the baseline risk classification to the probability of requiring future restorative treatment methods in children and adolescents [10]. This provides further discussion of the conceptual basis for risk tiered preventative interventions as they are outlined in the current protocol. Conversely, systematic reviews evaluating the clinical effectiveness of the CAMBRA protocol have found a lack of available and methodologically diverse evidence regarding whether CAMBRA based care impacts hard clinical endpoints (rather than just risk classifications) and have cited the evidence gap in the pediatric population under 6 years [4]. Furthermore, broader systematic reviews on the literature regarding caries risk assessment have also highlighted the need for evidence to support clinical outcomes, rather than only risk classifications [13]. The present study, which focuses primarily on the hard endpoint of restoration longevity rather than purely a measure of caries increment, contributes to addressing part of this identified evidence gap.

The results indicate that from both a clinical and health systems viewpoint, the costs of additional amount of time spent and materials used in conducting a caries risk assessment, applying topical fluoride/silver diamine fluoride, and placing sealants to provide preventive care, will have a favorable return on investment through significantly lower restoration failure rates and, therefore, fewer repeat restorative procedures over time. This is particularly relevant to publicly funded or resource-limited paediatric dental services, as repeated failures of restorative care represent a clinical burden for children receiving multiple operative interventions and constitute a resource burden for the service.

The findings from the subgroups further indicate that the effect of the structured protocol was not the same for all children but appeared to be particularly strong in those with poorer oral hygiene and poor recall adherence, the very children that are conventionally deemed to be the most difficult to manage with preventive strategies. This suggests that structured protocols to provide caries control will provide their greatest benefit clinically at those times when unstructured, ad hoc preventive advice is least likely to work by itself, and thus further support the idea of establishing scheduled, protocol-driven preventive contacts (rather

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than a one-time instance of advice) as part of the restorative care pathway for high-risk children.

This research has multiple strengths. First, it has a prospective study design that is a priori and therefore clinically relevant, with 24 months of follow-up that is clinically meaningful; blinding of outcome assessment with validated criteria established by the USPHS; formal multivariable adjustment for known confounding variables; and adherence to the STROBE criteria for reporting observational cohort studies [11].

There are also limitations of this research that should be considered. For one, this research utilized existing clinic-based care delivery paths to assign participants to groups for this study rather than using random assignment. While baseline characteristics were similar between groups, the possibility of residual confounding due to factors not being measured (i.e., clinic-level or family-level) cannot be ruled out and is considered a limitation of the study. As noted previously, this is an inherent limitation of prospective cohort studies relative to randomized controlled trials. A second limitation is that although each of the bundles of preventive interventions (CRA, fluoride/silver diamine fluoride, sealants and behavioral coaching) were all provided through the use of a structured protocol, it is not possible for the present design to differentiate the effect of each individual component on the observed survival benefit; this is also a limitation noted in the expanded Cochrane database review [4]. There was a modest loss to follow-up (5.9%) with slightly higher rates among participants receiving conventional care, which could not be assumed to be entirely non-differential with respect to restoration outcomes. Restoration material selection was not performed according to a standardized assignment, but instead based on clinical judgment, which introduces the possibility for indication bias; however, the use of restoration material was statistically controlled for through inclusion as a covariate in the multivariate model. Finally, this study was conducted in one geographic location with multiple clinics, therefore care must be taken in generalizing absolute survival estimates to other healthcare settings, populations and materials systems; however, the relative direction and consistency of the effect are likely to be more broadly generalizable.

A group of children who have an increased risk of having cavities had a written cavity control protocol followed to them and had a higher percentage of cavity-free teeth (24 months) when compared to standard cavity restoration methods. The posterior tooth location, poor hygiene, and non-compliance to follow-up appointments were significant predictors of restored teeth needing replacement aside from the written protocol. Children that had a greater likelihood of developing cavities based on their risk profile but were involved in the structured cavity control protocol appeared to show the greatest reduction in the risk of having to replace cavity restorations. This evidence can be used to support the use of structured, risk-based caries control protocols with normal restoration of caries to children that have an increased risk of developing cavities. These results may provide evidence-based restoration data for developing pediatric dental treatment protocols and for determining appropriate allocation of funds needed to support pediatric dental services.

Future research should use cluster-randomized designs to create the strongest evidence of a causal relationship between structured caries-control protocols and restoration healing while minimizing the potential for confounding due to allocation bias. The use of component-level trials would use randomized experimental conditions to evaluate each part of the caries-control protocols (such as sealants alone; silver diamine fluoride alone; behavioral counseling alone) and how they compared with an integrated or combined protocol to establish which component(s) provide the greatest effect and in what combination provide the best cost-effectiveness. Follow-ups with a time frame longer than 24 months would establish whether the restorative health benefits experienced in this study continue, decrease or increase in their effect over time and through the natural processes of moving from primary to permanent teeth.

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Table 1. Baseline demographic and clinical characteristics of Participants by group.

p-value	Conventional Care Group (n = 170)	Caries-Control Protocol Group (n = 170)	Characteristic
0.612	6.9 (1.5)	6.8 (1.6)	Mean age, years (SD)
0.748	79 (46.5)	82 (48.2)	Female sex, n (%)
0.403	5.6 (2.3)	5.4 (2.1)	Mean dmft/DMFT at baseline (SD)
0.712	118 (69.4)	121 (71.2)	Caries-risk category: High, n (%)
0.712	52 (30.6)	49 (28.8)	Caries-risk category: Extreme, n (%)
0.734	61 (35.9)	58 (34.1)	Good baseline oral hygiene, n (%)
0.659	108 (63.5)	104 (61.2)	Low household income bracket, n (%)
—	471	489	Total restorations placed at baseline, n

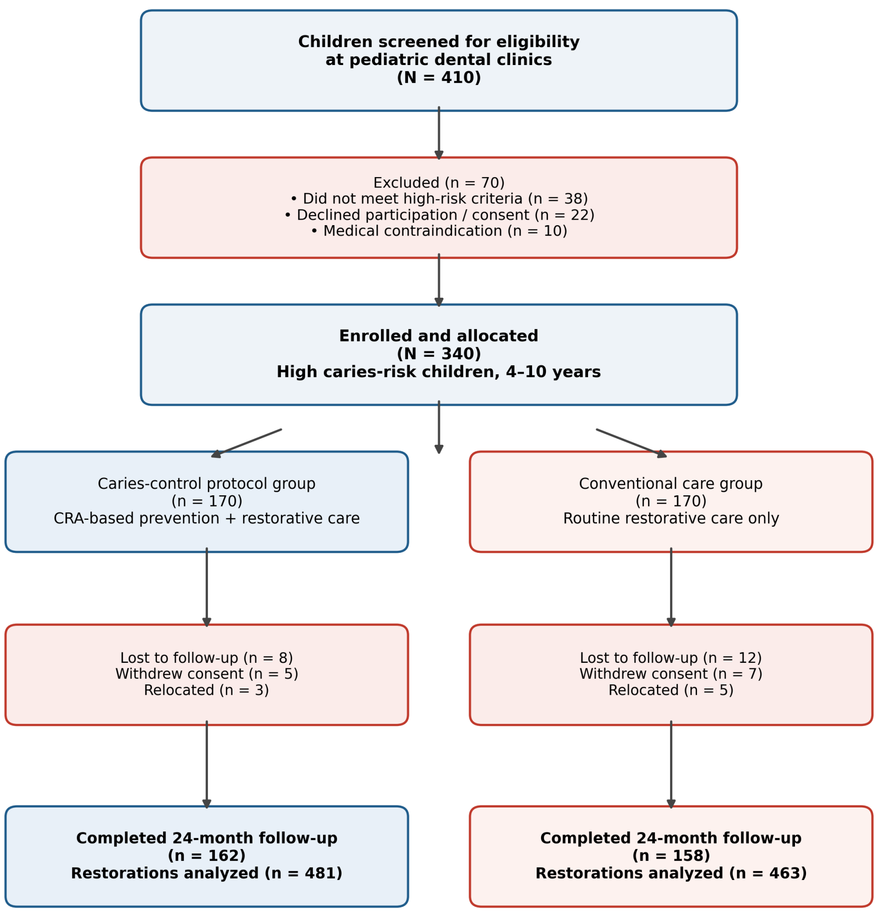

Figure 1. Flow diagram of participant enrollment, allocation, and follow-up across the 24-month study period.

Table 2. Cumulative restoration survival rate by follow-up interval and caries-control group.

Cumulative Survival % (Control)	Restorations at Risk (Control)	Cumulative Survival % (Intervention)	Restorations at Risk (Intervention)	Follow-up Interval
100	471	100	489	Baseline
95.2	463	98.6	481	3 months
90.8	447	96.9	474	6 months
79.4	414	92.8	461	12 months
68	385	88	447	18 months
59.7	463	84.1	481	24 months

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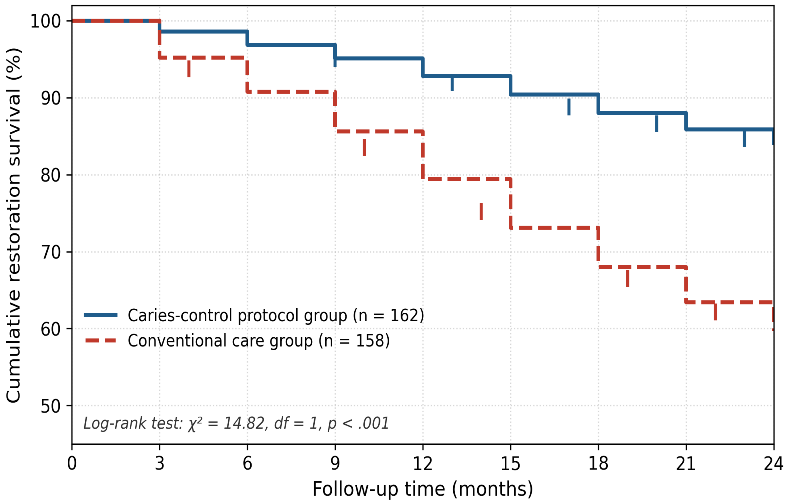

Figure 2. Kaplan–Meier estimates of cumulative restoration survival by caries-control group over 24 months of follow-up. Tick marks denote censored observations.

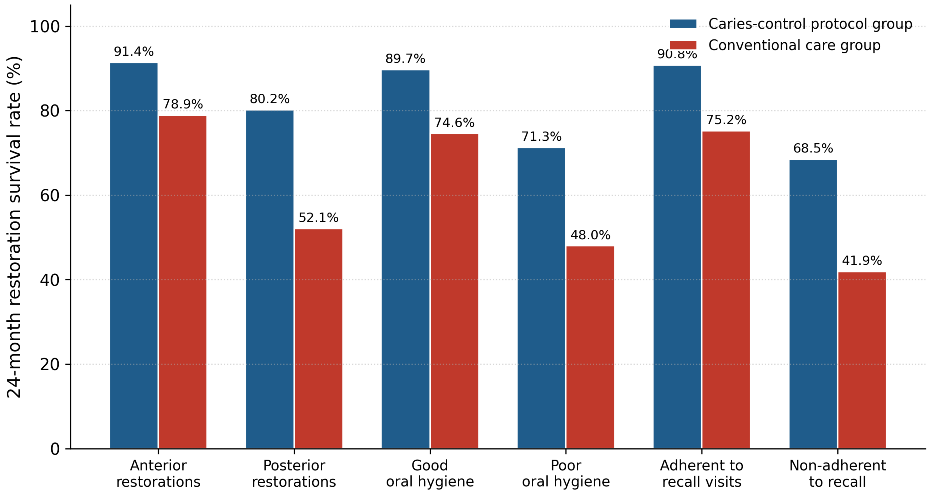

Figure 3. Twenty-four-month restoration survival rate by clinical subgroup and caries-control group.

Table 3. Multivariable Cox proportional-hazards regression for predictors of restoration failure.

p-value	95% CI	Adjusted HR	Predictor
<0.001	1.84, 3.76	2.63	Conventional care (vs. caries-control protocol)
<0.001	1.68, 3.45	2.41	Posterior tooth location (vs. anterior)
<0.001	1.97, 4.21	2.88	Non-adherence to recall (vs. adherent)
<0.001	1.42, 2.96	2.05	Poor oral hygiene (vs. good)
0.086	0.96, 1.87	1.34	Extreme caries risk (vs. high)
0.109	0.47, 1.08	0.71	Stainless steel crown (vs. resin composite)
0.372	0.82, 1.69	1.18	Glass-ionomer restoration (vs. resin composite)