

# Bright Systems®: A Total Quality Management Project to Improve Children's Health

*The pilot project for Bright Systems®: A Total Quality Management Project to Improve Children's Health was initiated in Pleasanton in 1991 and 1992 and implemented Regionwide in Kaiser Permanente Northern California (KPNC) in 1997. Table 1 shows the Project Team and Contact Person.*

## Background

Primary pediatric care and comprehensive health supervision have demonstrated improvements in reducing hospitalizations, operations, illness visits and missed appointments. Comprehensive health supervision visits also demonstrate improved parent satisfaction, increased maternal compliance, improved diet, and maternal self-confidence.<sup>1-4</sup>

Fifty percent of all visits to a pediatric department are considered preventive visits, or health supervision visits. A health supervision visit focuses on primary as well as secondary prevention through risk assessment, anticipatory guidance (provider counseling), screening tests, and immunizations. Routine health supervision visits are an important way to keep children healthy.<sup>5-7</sup>

Office systems have been studied as a way to improve the delivery of preventive services and have demonstrated effectiveness at improving cancer screening and physician counseling.<sup>8-14</sup> Office systems have been defined as a series of routines supported by the shared responsibilities of all practice personnel as well as by various tools.<sup>9</sup> Tools that have been studied include flowsheets, chart stickers, structured encounter forms, patient information, and questionnaires.<sup>15-27</sup> Total Quality Management (TQM) has also been suggested as a way to improve the delivery of preventive services.<sup>29,30</sup>

Injury prevention and environmental tobacco smoke counseling have been identified as high priorities for health supervision.<sup>31-34</sup> Injuries are the leading cause of death in children and adolescents beyond the first year of life and in 1986, more than 22,000 US children aged 0 to 19 years died of injuries. Injuries are estimated to be responsible for 600,000 hospitalizations and 16 million emergency department visits each year. The annual medical cost of childhood injuries is estimated to be over \$7.5 billion.<sup>35-37</sup> The effectiveness of physician injury prevention counseling has been demonstrated in several studies.<sup>33,34,38</sup> In addition to injuries, smoking and exposure to environmental tobacco smoke (ETS) pose serious threats to children's health. Approximately 43% of children two months to 11 years of age live in homes with at least one smoker. Exposure to environmental tobacco smoke is associated with sudden infant death syndrome (SIDS), bronchiolitis, acute otitis media, middle ear effusions, asthma, altered lipid profiles, and cancer. Environmental tobacco smoke contributes to an estimated 6200 childhood deaths and \$4.6 billion in direct medical expenses every year.<sup>31,32,39</sup> The effectiveness of brief physician counseling reinforced by written patient information on changing health behaviors has been demonstrated in several studies.<sup>40-42</sup>

Despite the demonstrated effectiveness of comprehensive health supervision, studies have shown that the amount of time spent during the health supervision visit to deliver anticipatory guidance is often limited to 8.4% of the total visit time.<sup>43</sup> Other studies have demonstrated that injury prevention counseling is covered less than 50% of the time.<sup>44-46</sup> Few pediatricians routinely take parent smoking histories.<sup>47</sup> Behavioral concerns from parents are also often not covered.<sup>44,45</sup>

**Fifty percent of all visits to a pediatric department are considered preventive visits, or health supervision visits.**

**Table 1. Team contributing to Bright Systems®: A Total Quality Management Project to Improve Children's Health**

**Team member names/titles:** Scott M. Gee, MD, Project Director, Associate Director for Preventive Medicine, Regional Health Education; Pamela Larson, MPH, Project Manager, Director of Prevention & Self-Care; Regional Health Education; Linda Rieder, MPH, Pediatric Program Manager, Regional Health Education; Valerie Sheehan, MPH, Pediatric Program Coordinator, Regional Health Education; Kimmie Lee, RD, MPH, Publications Coordinator, Regional Health Education; Rachele Mirkin, MPH, Interregional Consultant, Care Management Institute.

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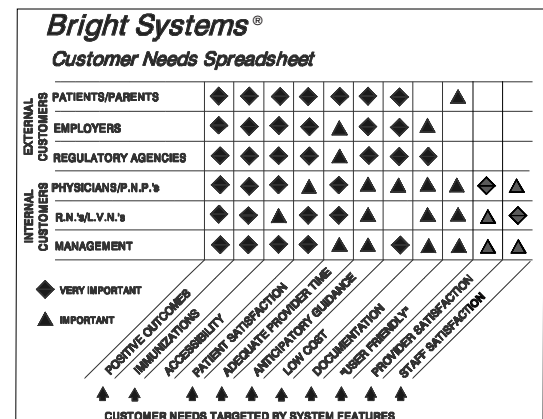


Figure 1.



### Process

Bright Systems<sup>®</sup> began as a TQM Project at the Department of Pediatrics at Pleasanton in 1991. Surveys of doctors, nurses, and administrators from both TPMG and KFH were used to develop the customer needs spreadsheets (Figure 1) along with surveys of Health Plan members. Customer needs were transferred to the Bright Systems<sup>®</sup> products and processes through a series of Juran quality planning spreadsheets. Construction of the office system began with the Physician Practice Survey and was followed by Speed Charting, Healthy Kids—Healthy Futures, and Safety Questionnaires projects. The Safety Questionnaires are used to collect age-specific parent safety behavior data. The questionnaires are distributed in the waiting room and collected anonymously. The data from these questionnaires are used for the continuous quality improvement and quality control activities of Bright Systems<sup>®</sup>. The completed office system was implemented and evaluated at Pleasanton in 1992.

The success of the program spread rapidly, and four clinics implemented the program in 1993. Regional Health Education (RHE) Matching Grant funds were obtained in 1994 to support the dissemination of the program. The dissemination of Bright Systems<sup>®</sup> followed the process described by Rogers in “Diffusion of Innovations.”<sup>48-50</sup> The early adopters would not use the program without adaptation and made significant improvements in the office system tools as part of the adaptation process. It became clear that adaptation would have to occur to achieve widespread dissemination. RHE staff provided on-site facilitation to overcome local barriers to implementation and support for local adaptation. Later it was decided to use the entire PRECEDE model of change (Figure 2)<sup>51-52</sup> and utilize predisposing, enabling, and reinforcing strategies at each new site. Customer contracts were used to set limits on the degree of local adaptation. The Safety Questionnaire preimplementation data were used to focus the injury prevention counseling (Speed Charting) and written parent information (Healthy Kids—Healthy Futures) on the specific safety issues identified by the service population. Physician consensus was also used to adapt the office system to each clinic. The adaptation of the office system through the combined use of parent safety behavior data and physician consensus had four significant outcomes:

1. It improved acceptance of the office system by physicians and nonphysician staff, which facilitated dissemination.

2. Physicians learned more about health supervision and quality improvement by participating in the adaptation of the office system.
3. The system had a greater effect at improving parent safety behaviors.
4. The office system tools were continuously improved, and new tools were developed.

The adaptability of Bright Systems<sup>®</sup> clearly separated this office system from other “out-of-the-box” office systems such as “Put Prevention into Practice,” which has had difficulty gaining acceptance.<sup>13,14</sup> Adaptation of the office system was followed by implementation and postimplementation Safety Questionnaire data collection and analysis. On-site surveys and chart reviews were also performed at all facilities to determine the actual use of the system. Postimplementation Safety Questionnaire data were presented to each facility with suggestions for continued improvement.

With the improvements of the office system from the “early adopters” and refinement of the implementation process, dissemination entered the “middle adopters” phase of diffusion.<sup>47</sup> This phase was characterized by rapid dissemination. In order to meet the increased customer demands, additional funding was acquired from the Successful Practices Implementation Program in 1996. The Health Questionnaires (for health risk assessment) were added to the basic office system in 1996 as part of the “Guidelines for Prevention and Health Promotion” implementation strategy.

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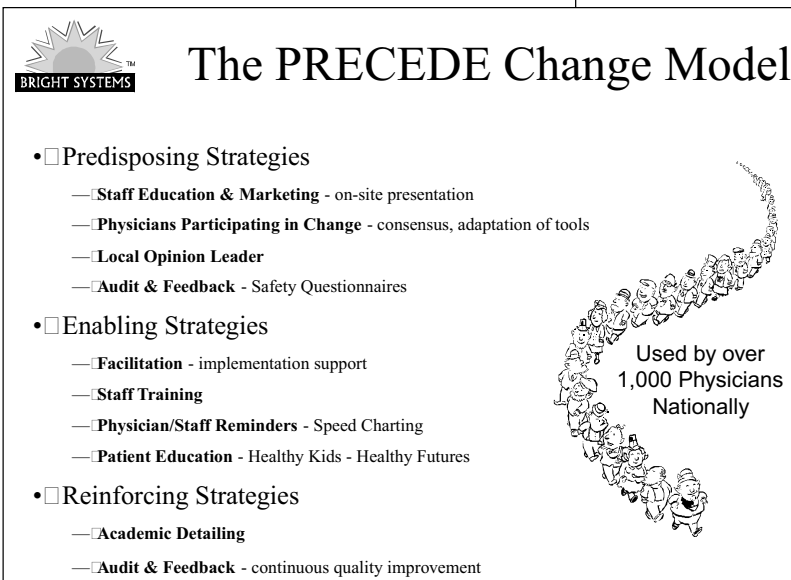


Figure 2.

**Bright Systems® targets all children from birth to 19 years as well as their families. In Northern California, this program addresses the preventive health needs of nearly half of all members.**

Bright Systems - Products & Processes			
	Bright Systems Pediatric	Healthy Beginnings Perinatal	Bright Systems Adult
Risk Assessment Questionnaires	Yes	Yes	Yes
Structured Encounter Forms	Yes	Yes	Yes
Written Patient Information	Yes	Yes	Yes
Staff Training	Yes	Yes	Yes
Patient Education Curriculum		Yes	
Group Visits		Yes	Yes
Continuous Quality Improvement	Yes		

Figure 3. The "late adopters" phase was characterized by a slower pace of dissemination.<sup>48</sup> Outreach (academic detailing) was used to encourage participation. The last six sites participated in a large parent survey (Pediatric Survey), which provided the data on improved physician counseling. Complete KP Northern California dissemination was achieved in 1997.

**Objectives**

- Design an office system that delivers consistent and comprehensive health supervision;
- Improve the quality and consistency of the anticipatory guidance given at health supervision visits;
- Improve parent safety behaviors;
- Improve physician satisfaction by reducing unnecessary work;
- Demonstrate the effectiveness and cost-effectiveness of the program;
- Disseminate the program to all facilities in Northern California.

**Methodology**

**Scope**

Bright Systems® targets all children from birth to 19 years as well as their families. In Northern California, this program addresses the preventive health needs of nearly half of all members. Although this application focuses on pediatrics, products and processes of the program have been expanded to include perinatal and adult health care delivery (Figure 3). The perinatal program, Healthy Beginnings—Integrated Perinatal Education (Figure 4) was developed as a TPMG and KFHP collaboration and is currently being disseminated. In a 1998 collaboration with Children Now,<sup>53</sup> KP identified routine health supervision visits as a potential strategy to improve early childhood development. Bright Systems® is now maintained, managed, and improved by KPNC Regional Health Education staff. The Chiefs of Pediatrics and Adolescent Medicine provide oversight for the pediatric program. The adult program is currently being evaluated.

The development and diffusion of Bright Systems® involved a multidisciplinary team (Table 1) spanning a range of departments and committees throughout TPMG, KFHP/H, and the California State Government, including:

**Kaiser Foundation Health Plan/Hospitals**

- Program Offices (Care Management Institute): Provided consultation on development of the materials and evaluation tools.
- Perinatal Services Study Group: Provided consultation on development of the Integrated Perinatal Education Program.
- Compliance and Risk Management: Verified that all materials met legal standards and regulatory requirements.
- Temperament Program: Provided consultation on parental anticipatory guidance tool.

Figure 4.

**The Permanente Medical Group**

- Facility Pediatrics Departments: Doctors, nurses, behavioral health specialists, medical assistants, receptionists, and health educators provided consultation on development of the materials and their integration into care.
- Chiefs of Pediatrics: Granted approval and endorsement of materials and system.
- Adolescent Specialists: Granted approval and endorsement of materials and system.
- Documentation Management Committee: Provided consultation on medical records standards for Kaiser Permanente.
- Committee of Health Information Managers and Physicians: Provided consultation on medical record standards for NCQA.

**California State Government**

- Department of Health Services: Provided consulting on parental anticipatory guidance and health risk assessment tools for MediCal.
- Child Health and Disability Prevention (CHDP) Program: Provided consulting on parental anticipatory guidance and health risk assessment tools.

**Products**

Bright Systems® used TQM methodologies to develop a complete office system, staff training, and continuous improvement in quality of health supervision visits. The basic office system (Figure 5) includes:

- The Physician Practice Survey (health supervision guidelines spreadsheet);
- Speed Charting (age-specific structured encounter forms);
- Healthy Kids–Healthy Futures (age-specific parent information);
- Safety Questionnaires (data collection tool).

Bright Systems® covers a wide variety of health topics and particularly stresses injury prevention and environmental tobacco smoke counseling. The office system was extensively evaluated and demonstrated improvements in physician counseling, parent safety behaviors, and physician satisfaction. Dissemination of the program to KPNC and four other KP Regions used the cutting-edge strategies from Green<sup>51</sup> and Rogers.<sup>48-50</sup>

**Measures**

The Bright Systems® comprehensive program includes delivery of preventive services to infants, children, teens, and adults. Alternative care models such as group and

cluster visits were also developed. An overview of the products and processes are shown in Figures 1 to 3. These tools are all designed to deliver a consistent prevention message and reinforce self-care. Bright Systems® tools are reviewed, updated, and improved annually as part of the Guidelines for Prevention and Health Promotion revision process and to meet NCQA standards for documentation. The Bright Systems® staff manage all the products and processes and keep the office system consistent with new recommendations from external groups such as the Centers for Disease Control and Prevention (CDC) and the American Academy of Pediatrics (AAP). All the content is evidence-based and has been approved by the relevant Chiefs groups. All materials are designed for limited literacy and cultural sensitivity. Bright Systems® utilized three different survey instruments to evaluate effectiveness.

**Pediatric Survey**

This instrument collected self-reported parent behaviors and parent recall of anticipatory guidance given at health supervision visits. This survey was applied at six sites in conjunction with the 4- to 6-month visits. Chi-square tests were used for statistical testing. For the 4- to 6-month visit survey, findings were considered statistically significant at  $p < .05$ . For the 18- to 24-month visit survey, findings were considered statistically significant at  $p < .001$ . When no statistically significant difference between the proportions was found, the abbreviation NS was used.

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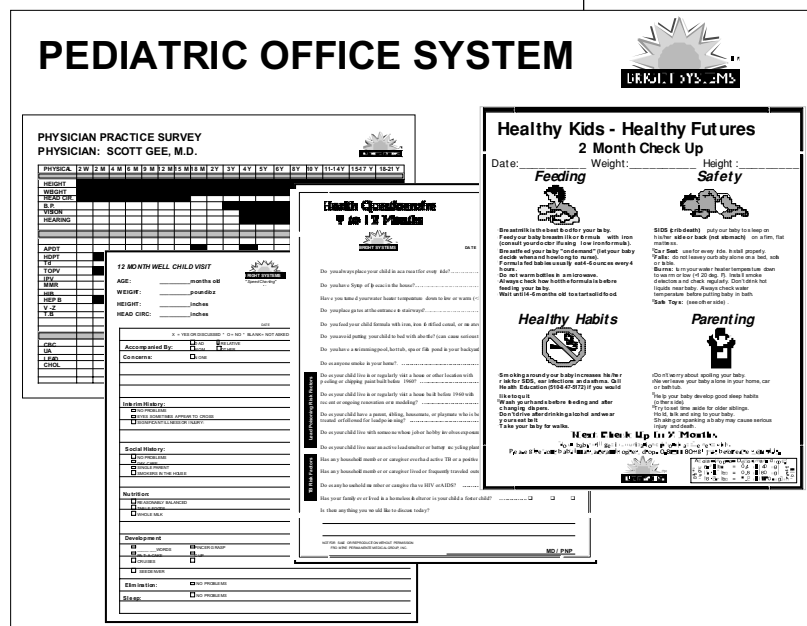


Figure 5.

**Safety Questionnaires**

These questionnaires collected self-reported parent safety behaviors. This survey was applied at four months, 9 to 11 months, and 15 to 18 months of age, before and after implementation at most sites. Chi-square tests were used, and findings were considered statistically significant at  $p < .05$ .

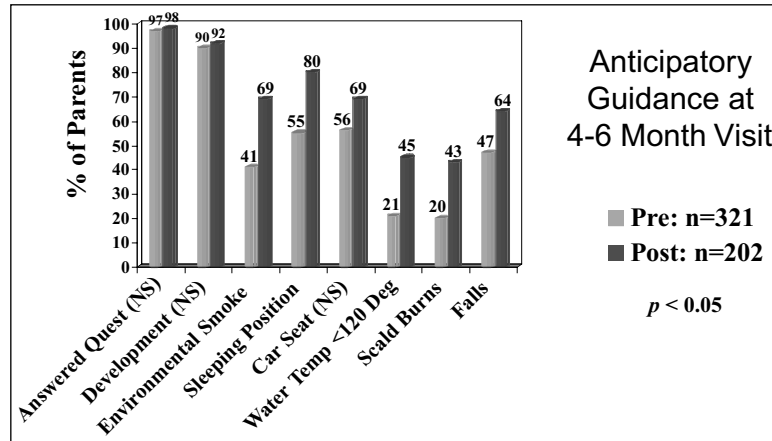


Figure 6.

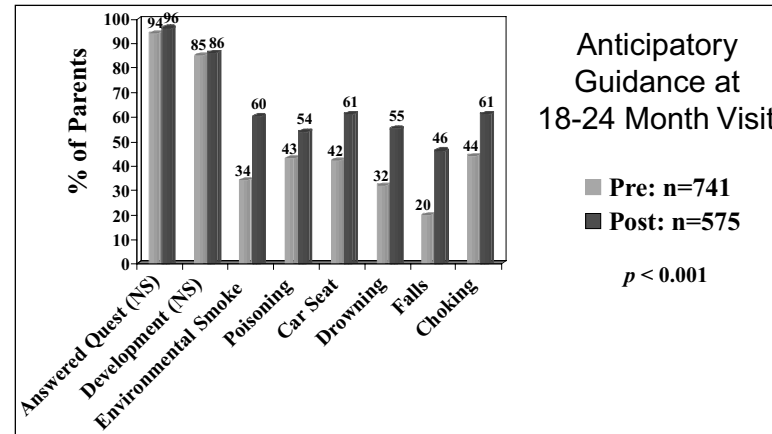


Figure 7.

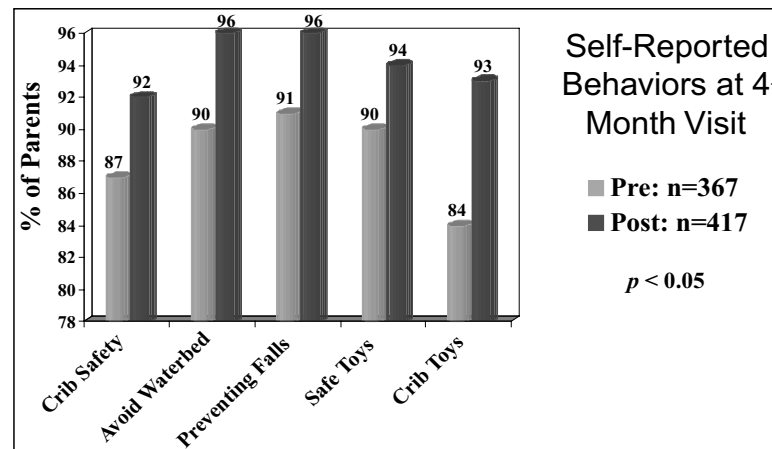


Figure 8.

**Physician and Practitioner Survey**

This survey collected data on provider satisfaction with the office system. This questionnaire was sent to a random sample of 81 pediatricians in KPNC after Regionwide implementation of Bright Systems®. The response rate was 67% (55 of 81 surveys were returned). A *t* test was used, and findings were considered statistically significant at  $p < .05$ .

**Results**

**Improved Quality of Patient Care**

**Pediatric Survey**

Three hundred twenty-one parents of children aged four to six months completed the preimplementation survey, and 202 completed the postimplementation survey. Parent recall of the anticipatory guidance given by the physicians at the four- to six-month health supervision visits are shown in Figure 6. Significant improvements ( $p < 0.05$ ) in delivery of anticipatory guidance were reported for environmental tobacco smoke (↑28%), correct sleeping position (↑25%), hot water temperature < 120 ° F (↑24%), reducing the risk of scald burns (↑23%), and reducing the risk of falls (↑17%).

Seven hundred forty-one parents of children aged 18 to 24 months completed the preimplementation survey, and 575 completed the postimplementation survey. Parent recall of the anticipatory guidance given by the physicians at the 18- to 24-month health supervision visits are shown in Figure 7. Significant improvements ( $p < 0.001$ ) in the delivery of anticipatory guidance were reported for environmental tobacco smoke (↑26%), syrup of ipecac use (↑11%), car seat use (↑19%), supervision around water (↑23%), window locks on upper-story windows (↑26%), and reducing risk of choking (↑17%).

**Safety Questionnaires**

Three hundred sixty-seven parents of children aged four months completed the preimplementation survey, and 417 completed the postimplementation survey (Figure 8). Significant improvements ( $p < 0.05$ ) in parents' self-reported safety behaviors at the four-month health supervision visit were demonstrated for crib safety (↑55%), avoiding waterbeds (↑6%), preventing falls (↑5%), avoiding crib toys (↑9%), and using safe toys (↑4%).

Three hundred thirty-one parents of children aged 9 to 11 months completed the preimplementation survey, and 440 completed the postimplementation survey (Figure 9). Parents at the 9- to 11-month visit reported improvement ( $p < 0.05$ ) in turning down the water temperature to less than 120°F (↑10%). This improvement corresponds with the 24% increase in provider counseling for risk reduction noted at the 4- to 6-month visit (Figure 6).



Three hundred seventy parents of children aged 15 to 18 months completed the preimplementation survey, and 513 completed the postimplementation survey (Figure 10). Significant improvements ( $p < 0.05$ ) in parents' self-reported safety behaviors at the 15- to 18-month visit were demonstrated for preventing poisoning ( $\uparrow 5\%$ ), preventing falls ( $\uparrow 8\%$ ), avoiding choking foods ( $\uparrow 9\%$ ), and knowing the Heimlich maneuver ( $\uparrow 13\%$ ).

### Improved Physician and Practitioner Satisfaction

#### Physician & Practitioner Survey

Physicians and practitioners reported benefits, including improved documentation, time-saving, and improved counseling (Table 2).

Would you recommend to other physicians?	Yes
Speed charting	88%
Healthy Kids—Healthy Futures	96%
Health questionnaires	97%

### Improved Member Satisfaction

#### Member Satisfaction (part of the Pediatric Survey)

Seven hundred forty-one parents of children ages 18 to 24 months completed the preimplementation survey, and 575 completed the postimplementation survey. Although not statistically significant, small improvements were demonstrated for questions about satisfaction with the doctor or nurse practitioner (NP) (Table 3).

Survey question	Percent of parents answering "Yes"	
	Before	After
Did the doctor/NP answer all of your questions and address your concerns?	94%	96%
Did the doctor/NP seem concerned about you and your child?	85%	88%
Did the doctor/NP spend enough time with you?	86%	89%

### Evaluation

#### Relevance to Patient Care

Bright Systems<sup>®</sup> increased physician counseling on environmental tobacco smoke by 26% to 28% and injury prevention counseling by 11% to 26%. The improvements in parents' self-reported safety behaviors of 5% to 13% provide further evidence of the effectiveness of physician counseling at improving safety behaviors. In a recent article, Quinlan et al,<sup>38</sup> reported on the outcomes of a telephone survey of US households used to determine the rate of injury prevention counseling received among US children. The rates of injury prevention counseling reported by parents from the Bright Systems<sup>®</sup> program were much higher than the national average for having syrup of ipecac in the home (37% higher) and use of a car seat (30% higher). Nine of the 12 injury prevention topics for anticipatory guidance (Figures 6 and 7) exceeded the Healthy People 2000 goal of 50%.<sup>7</sup> Improvements in environmental tobacco smoke and injury prevention counseling did not come at the expense of answering all of the parents' questions or screening for developmental milestones. We believe this achievement constitutes evidence that we succeeded in developing a single office system that delivers comprehensive health supervision while at the same time emphasizes key issues. We estimate that routine physician injury prevention counseling combined with written patient information could save \$5.50 in medical costs per health supervision visit for children aged 0 to 4 years.<sup>54</sup> At a cost of \$0.09 in materials per health supervision visit, Bright Systems<sup>®</sup> is a highly cost-effective intervention.

#### Innovation and Leadership

Bright Systems<sup>®</sup>, the only fully integrated office system entirely designed using TQM methodologies, has demonstrated significant improvements in quality and achieved large-scale dissemination. This program uses office systems, staff training, and continuous quality improvement to form a data-driven health care delivery system for improving health outcomes. Bright Systems<sup>®</sup> has demonstrated the effectiveness of the systematic application of a multifaceted approach to improving physician performance and satisfaction. As a "grassroots" TQM project driven from bottom to top, Bright Systems<sup>®</sup> has been a breakthrough in organizational learning for KPNC.

**At a cost of \$0.09 in materials per health supervision visit, Bright Systems<sup>®</sup> is a highly cost-effective intervention.**

**Bright Systems® as exemplified by its implementation in our environment, sets the national standard for quality health supervision.**

**Transferability**

Bright Systems® office tools have been successfully disseminated throughout the KPNC, four other KP Regions, and two county health departments. Plans are underway to implement Bright Systems® within the Group Health Cooperative. Dissemination and implementation of the program utilized cutting-edge strategies to improve physician performance and acceptance of change<sup>51,55-62</sup> and has greatly contributed to organizational learning. The relative success of the interregional dissemination should be tempered by the inability to implement the entire program (which includes physician consensus building, education/training, and continuous quality improvement) because of lack of resources and staff to facilitate interregional dissemination. Although the office system alone may have important benefits, the process by which the program is implemented and maintained probably provides greater long-term organizational benefit than the office system tools by themselves.

**Summary and Conclusions**

Bright Systems® has provided the foundation of physician consensus and systematic structure on which the information technology systems of the 21<sup>st</sup> century will be built. The development and implementation of the Bright Systems® office system has led to improvements in injury prevention and environmental tobacco smoke exposure counseling by physicians at health supervision visits. Improvements in self-reported safety behaviors by parents were also demonstrated. Improvements in injury prevention counseling have been associated with decreased childhood injuries.<sup>35,56,59</sup> We estimate that Bright Systems® should save \$5.50 in direct medical costs per health supervision visit based on improvements in injury prevention counseling.<sup>54</sup> At a cost of \$0.09 in office materials per health supervision visit, this program is a highly cost-effective intervention. Physician and practitioner satisfaction with the program has also been demonstrated. In conclusion, Bright Systems® as exemplified by its implementation in our environment, sets the national standard for quality health supervision. ❖

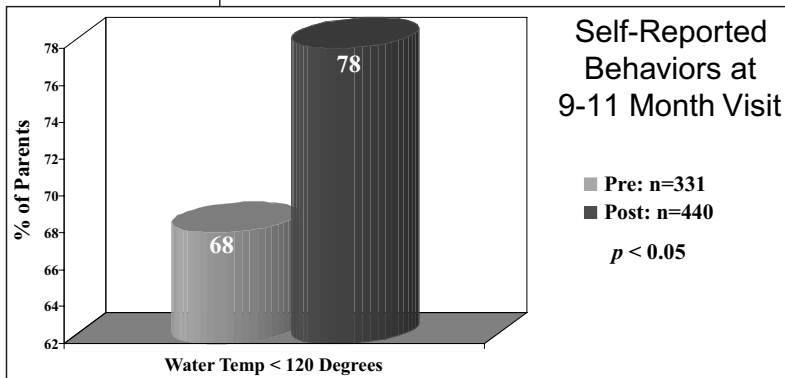


Figure 9.

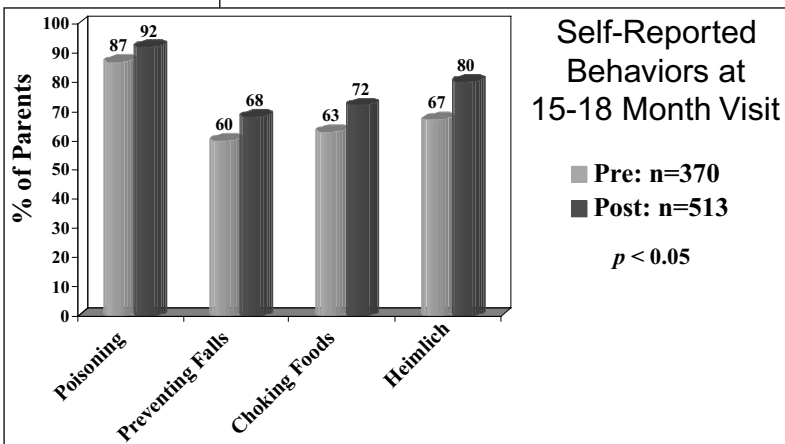


Figure 10.

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