

Children's Learning and Goal-Setting at a Diabetes Camp

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Abstract

Objective. This study provides information about children's learning and goal attainment related to change in their self-management skills during a diabetes camp.

Design and methods. One hundred and thirty-one children completed an evaluation for the first year (year 1), and 68 children completed an evaluation for the second year (year 2). All of the children had type 1 diabetes. During both years, parents provided information about goals for their child before camp started. Children's learning about diabetes self-management, as well as their satisfaction with camp, was assessed at the end of the camp session. In the evaluation for year 2, a goal-setting intervention was also developed, and its effectiveness was assessed through both physicians' and children's reports.

Results. Children learned new information during camp about rec-

ognizing and managing the signs of hypo- and hyperglycemia and about counting carbohydrates and rotating insulin pump sites. Children were better able to recall their self-management goals in year 2. In terms of benefiting from camp, boys reported learning more than girls about diabetes management, whereas girls were more likely than boys to report that greater opportunities to express feelings were of value.

Conclusions. Goal-setting was successful in improving children's recall of their self-management goals. Children benefited from the supportive and educational camp atmosphere. Future research should assess the benefits of camp across multiple camp settings and determine whether educational benefits have long-term effects on children's goal-setting and knowledge and whether these benefits lead to psychosocial improvements.

Approximately 1 in 400 young people < 20 years of age in the United States have type 1 diabetes.¹ Children and adolescents who have type 1 diabetes face the potential on a daily basis for acute life-threatening episodes of hypo- and hyperglycemia that can lead to respiratory and cardiac failure.² Diabetes management for children requires close attention and intervention multiple times per day, including blood glucose monitoring, insulin therapy, dietary planning, and adjustment of physical activity.^{3,4} Numerous studies have shown that children with type 1 diabetes are at risk for poor diabetes management, poor glycemic control, and long-term complica-

tions of the disease.^{5,6} Improving children's self-management skills is crucial to the survival of children with type 1 diabetes and to positive health outcomes.⁷⁻⁹

Opportunities such as those offered at diabetes camps provide children with education and support to enhance their ability to actively participate in the management of their diabetes.^{7,8} Diabetes camps are an important resource for children with diabetes, providing them with opportunities to 1) improve their knowledge of diabetes through education in a relaxed setting; 2) understand the relationship between disease process, diet, and exercise; 3) increase children's

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involvement in their own diabetes care; and 4) facilitate the psychosocial well-being of children.

The American Diabetes Association (ADA), in collaboration with the Pediatric Endocrine Society, has developed comprehensive guidelines for managing type 1 and type 2 diabetes for children attending ADA-sponsored camps.¹⁰ Children receive emotional support from counselors and medical staff, who can also serve as role models because many of these caregivers have diabetes themselves. Young people have opportunities to share their experiences and feelings about having diabetes with peers and benefit from the social support they receive at camp. Children feel that they are part of a group engaging in improved self-care, making it easier for them to develop goals for and practice mastering new aspects of their diabetes care.¹¹

The hallmark of diabetes care at any age involves understanding the interaction between knowledge of the disease and its treatment in conjunction with dietary planning and physical exercise. Diabetes camps teach this information in vivo through multiple aspects of camp, including formal education sessions, group games, and peer interactions. Children also measure their food at every meal and participate in physical exercise throughout each day. Through these activities and educational experiences, children learn about self-care and ways to achieve improved glycemic control, enhancing their knowledge of and proficiency with diabetes management skills. This, in turn, fosters healthy lifestyle changes.^{11,12}

For the camp evaluated for this study, parents had a longstanding history of providing goals for children to achieve during camp, but evaluation of children's knowledge of goals and success at goal attainment was lacking. Hence, as part of the evaluation procedure, our team began assessing parents' and children's goal-setting, agreement between parents' goals and children's learning during camp, and children's recall of and progress toward meeting camp goals.

A team approach, through which children and parents work together to improve diabetes management, can facilitate collaboration and good management.¹³ Based on this concept, the team developed a process for caregivers and children to work as a team to develop each child's goals for his or her camp experience.

The study had two primary objectives: 1) to assess agreement between parents' goals for their child's diabetes management and the child's learning about diabetes management at camp and 2) to evaluate children's perceptions of their camp experience. These objectives were achieved during a 2-year period of evaluating the outcomes of an ADA-sponsored, week-long diabetes camp in the Midwest in 2011 (year 1) and 2012 (year 2). Based on results from year 1, during which children independently set goals, in year 2, a child psychologist worked with children and parents to set joint goals. It was thought that these efforts would improve children's recall of their camp goals in year 2.

Diabetes Camp Evaluation: Methods for Year 1

Evaluation participants

One hundred and thirty-one of the 144 children attending camp completed the evaluation. Campers ranged from 8 to 16 years of age (mean 11 years, 7 months, standard deviation [SD] 2 years, 1 month). There were 51 boys and 79 girls, and 1 child did not share information about his or her sex. Four children did not report their ethnic group. Of the remaining 128 children who did provide this information, 83% were Caucasian, 6% were African American, 1% was biracial, 1% was Hispanic, and 9% reported being in another ethnic group (e.g., "I am multiracial"). Children's A1C levels were obtained from the medical records reported before the start of camp (range 5.6–11.7%, mean 8.14%, SD 1.09%). Sixty percent of the children reported that they had attended diabetes camp at least once before the 2011 camp session. Although the diabetes camp accepts children with type 2 diabetes, no children with type 2 diabetes were

a part of this study. Two university-based institutional review boards approved this study.

Study procedures

Parents provided consent and children provided assent to participate in the study. Parents provided information about their goals for what their child would learn during camp through their responses to an open-ended question on an intake form completed before the start of the camp session. Children independently selected goals with their counselors during camp. On the final day of camp, children completed a camp evaluation survey. They responded to open-ended questions assessing their report of any new diabetes management tasks they had learned during camp, their recall of their camp goals, and their satisfaction with camp.

Diabetes Camp Evaluation: Year 1 Results

Parents' goals and children's learning

Information provided by parents regarding their goals for their children before camp versus what the children reported that they actually learned about diabetes management after camp is presented in Table 1. Five logistic regression analyses were conducted to examine the relationships among parents' reports of what their child needed to learn, children's sex, and children's reports of learning in five areas. Predictor variables were parents' report of what their child needed to learn and children's sex, and the outcome variable was children's reports of learning in five areas. The five areas included learning about 1) high blood glucose levels, 2) low blood glucose levels, 3) carbohydrate counting, 4) blood glucose testing, and 5) expressing feelings about having diabetes. The interaction term was not a significant predictor for any of the variables and reduced model fit; therefore, it was not included in final models.

Results for the regression model for learning about high blood glucose indicated that parents' reports that their child needed to learn about high blood glucose predicted children's reports of learning about high

Table 1. Parent Report of Child Goals Before Camp Versus Child Report of Skills Learned After Participating in Camp in Years 1 (*n* = 130) and 2 (*n* = 68)

Self-Management Task	Parent Goals Year 1 (%)	Child Learning Year 1 (%)	Parent Goals Year 2 (%)	Child Learning Year 2 (%)
Learn to cope with high blood glucose readings	9	35	3	28
Learn to self-monitor blood glucose	13.4	9.4	25.4	7.4
Learn to cope with low blood glucose readings	6.3	26	23.9	48.5
Learn about counting carbohydrates	25	32	32.8	44
Learn to express feelings about diabetes	2.4	55.4	9	72

Table 2. Children's Responses to Open-Ended Questions About What They Learned at Camp in Year 1

Theme	Quotes
Carbohydrates	11-year-old boy: "I learned how to manage my carbs" 13-year-old girl: "I learned how to count carbs better"
Coping with high and low glucose levels	11-year-old girl: "I learned you have to wait a while to check your sugars (again) if you are low." 13-year-old boy: "I learned water can help ketones"
Experience with diabetes management	11-year-old girl: "I learned to give my own shot"
Food and nutrition information	11-year-old girl: "They changed the food pyramid to a plate" 13-year-old girl: "Good food choices"
Improved self-confidence and growth as an individual	11-year-old girl: "I learned integrity" 14-year-old boy: "I learned to solve other problems I had"
Proud to be a person with diabetes	10-year-old girl: "You should be proud to be a diabetic and not ashamed" 12-year-old girl: "I learned there is nothing wrong with having diabetes"
Support	14-year-old girl: "I learned a lot about other people with diabetes" 15-year-old girl: "Camp helps me adjust as I grow older as a diabetic" 11-year-old boy: "I am not the only one with diabetes"
Use of insulin pump	8-year-old girl: "I learned to put the pump in myself" 13-year-old boy: "I learned how to change my site"

blood glucose (β 1.23, standard error [SE] 0.669, Wald 3.396, $P = 0.065$, odds ratio [OR] 3.43). The sex of the child was also related to learning about high blood glucose, with boys reporting higher levels of learning than girls ($\beta -0.7774$, SE 0.388, Wald 3.968, $P = 0.046$, OR 0.461). Parents' reports of wanting their child to learn about testing was not related to children's reports about learning to test at camp; however, sex was significantly related to learning about testing at camp ($\beta -1.823$, SE 0.701, Wald 6.767, $P = 0.009$, OR 0.162). Boys learned more than

girls about testing at camp. Parents' reports of wanting their child to learn about counting carbohydrates was not related to children's reports about learning to count carbohydrates at camp. Boys learned more than girls about counting carbohydrates at camp ($\beta -0.724$, SE 0.387, Wald 3.498, $P = 0.061$, OR 0.485). Results of the regression analyses for learning about low blood glucose and expressing feelings were not significant. Only 6 of the 130 children who completed the evaluation in Year 1 remembered their two camp goals. These children listed either

counting carbohydrates or recognizing high and low blood glucose levels as their camp goals.

Children's reports of new information learned at camp

Children wrote down answers to open-ended questions assessing what new things they learned about diabetes management during camp. Eight themes, showcased in Table 2, exemplified their responses. These eight themes were agreed on by two coders who reviewed the children's responses. Some children also mentioned that they learned that exercise was important. Children often men-

tioned that the support at diabetes camp was a crucial strength of their camp experience. Many wrote that camp was “awesome.” Camp helped children learn self-management and coping skills and learn more about themselves as children who have diabetes and can manage their illness well.

Children’s perceptions of camp

Eighty-three children (63%) reported that camp was either “good” or “great” for helping them learn about diabetes management. Twenty-eight children (22%) said camp was “OK” for helping learn about diabetes management, and 17 children (13%) reported that camp “did not help.” Eighty-one percent of the children reported that camp was “very fun,” and 14% reported that camp was “fun.” Only one child reported not

liking camp. Ninety-three percent of the children reported that they would recommend camp to a friend.

Diabetes Camp Evaluation: Methods for Year 2

Evaluation participants

Sixty-eight of the 129 children attending camp completed camp evaluation forms. Eleven boys and 57 girls completed forms; 62 reported that they were Caucasian and 2 were African American. A1C levels ranged from 5.5 to 15.5% (mean 8.29%, SD 1.44%). Seventy-one percent of the children (*n* = 49) had attended diabetes camp at least once previously.

Study procedures

Year 2 procedures were similar to those described for year 1 with one exception; a new goal-setting

intervention was developed. This was developed because the year 1 evaluation indicated that the majority of children did not recall their goals. Also, parents and children developed children’s goals together because literature supports a positive relationship between shared goal-setting and diabetes management for children.¹³

For the goal-setting intervention, the children and their parent(s) met with a child psychologist during the intake process when they arrived at camp. The child psychologist described the rationale for the shared goal-setting exercise, which was to build a teamwork approach to developing the children’s goals for diabetes management. Next, parent(s) and their child established two goals that the child needed to attain at camp to help manage

Table 3. Joint Goal-Setting Intervention With Children and Their Parents in Year 2

Goal (number endorsing goal)	Quotes
Check blood glucose (<i>n</i> = 42)	“Take time to check my blood sugar” “Check blood glucose before/after eating”
Rotating/changing pump sites (<i>n</i> = 33)	“Put in my own site” “Change my pump site by myself”
Counting carbohydrates (<i>n</i> = 32)	“Do my own carb count” “Estimating carbs if food not labeled”
Improving eating habits (<i>n</i> = 21)	“Eat healthier foods; make smart choices on foods” “Learn more about nutrition”
Have a good A1C or blood glucose results (<i>n</i> = 20)	“Have my blood glucose numbers be good” “Bring down my A1C”
Learning about how to program an insulin pump (<i>n</i> = 9)	“Program my pump” “Don’t race through my pump (programming)”
Remembering to administer insulin (<i>n</i> = 7)	“Remember to bolus when I eat snacks” “Remember to take my insulin”
Exercising (<i>n</i> = 7)	“I need to exercise more” “I need to check my blood glucose after I exercise”
Learning something new about diabetes (<i>n</i> = 7)	“Learn something new about the origins of diabetes” “Learn about glucagon”
Expressing feelings (<i>n</i> = 6)	“Be happy” “Tell how I feel”
Having fun (<i>n</i> = 6)	“Have fun and a good time at camp”
Self-administering shots (<i>n</i> = 4)	“Give myself a shot in the leg”
Recognizing high and low blood glucose levels (<i>n</i> = 4)	“Know when I’m low” “Understand when I’m high”
Rotating fingers when testing blood glucose (<i>n</i> = 3)	“Rotate my fingers when I test”
Changing lancets (<i>n</i> = 3)	“Change or use different lancets”

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diabetes. The child psychologist wrote down each of the child's goals and shared them with the doctor(s) assigned to that child's cabin. The doctors regularly discussed these goals with the children. Each child's goals were posted on a flyer on his or her bunk bed for the duration of camp. At the end of camp, doctors rated each child's progress toward each goal on a 4-point scale with the following anchors: 4 = good, 3 = some, 2 = low, and 1 = very low.

Diabetes Camp Evaluation: Year 2 Results

Parents' goals and children's learning

Information provided by parents regarding their goals for their child before camp versus what the children reported that they learned at camp is presented in Table 1. Five logistic regression analyses, identical to those for year 1, were conducted to examine the relationships among parents' reports of what their child needed to learn, children's sex, and children's reports of what they learned during camp. The interaction term was not a significant predictor in any models and thus was not included in final models.

Sex was a significant predictor of children reporting that they learned to test their blood glucose. Findings indicated that boys learned more than girls about testing their blood glucose during camp ($\beta -2.158$, SE 1.063, Wald 4.122, $P = 0.04$, OR 0.116). Parents having a goal for their child to learn to test blood glucose was not a significant predictor of children's learning to test during camp.

Sex was also a significant predictor for having a chance to discuss feelings about having diabetes at camp. Girls reported more opportunities than boys to discuss their feelings about diabetes at camp ($\beta 2.053$, SE 0.818, Wald 6.296, $P = 0.012$, OR 7.789). Parents having a goal for their child to discuss feelings was not a significant predictor of opportunities for such discussions.

No predictors were significant for learning about high and low blood glucose or counting carbohydrates. Forty-three of the 68 children who

completed the evaluation in year 2 remembered their camp goals.

Intervention: goals established by parents and children

A summary of camp goals set jointly by parents and children in year 2 is presented in Table 3. The top three self-management goals selected together by children and parents were 1) remembering to check blood glucose regularly, 2) learning about counting carbohydrates, and 3) learning to rotate pump sites. Goals endorsed by fewer than three parent-child teams were not included in Table 3. These included: "Do not hide ketones" ($n = 1$), "Do not hide high blood glucose levels" ($n = 1$), "Keep better records" ($n = 2$), "Sleep better" ($n = 1$), "Get on a better schedule" ($n = 1$), "Wash hands" ($n = 1$), "Do not get scared on high ropes" ($n = 1$), "Improve diabetes management at school more" ($n = 1$), and "Check my diabetes supplies before I leave home" ($n = 1$). Most children and parent teams endorsed two goals, but a few endorsed either one or three goals.

Recall of goals in year 2 compared to year 1

Forty-three of the 68 children (63.24%) who completed the evaluation in year 2 remembered their camp goals compared to 4.62% in year 1. Forty-nine of the children attended camp sessions and completed evaluations in both years 1 and 2. Of this subgroup, 6 of the 49 (12%) remembered their goals in the year 1 evaluation. In contrast, 43 (88%) of the same children remembered their goals in year 2 after the goal-setting intervention.

Children's reports of new information learned at camp

Children's reports of what they learned at camp were analyzed by two coders. Six major themes emerged: 1) improved learning about how to cope with high blood glucose, 2) learning more about eating healthy foods, 3) improved ability to independently count carbohydrates, 4) learning about how to give a shot or administer a bolus, 5) learning that it is important to test one's blood glucose regularly, and 6) camp

was valued as a very supportive experience through which children could be with others who experienced the same things that they were experiencing. The children did suggest a few areas for improvement, including 1) having the counselors make sure that no one is treated "meanly" by others in the cabin, 2) improving the diet and medical educational activities by making them more fun and interesting, and 3) allowing children to take naps if needed. The themes were similar to those discovered in year 1, which were depicted in Table 2.

Children's perceptions of camp

Forty-seven children (69%) reported that camp was "good" or "great" for helping them learn about diabetes management. Eleven children (16%) said camp was "OK" in helping them improve diabetes management, and 4 children reported that camp did not help. Camp was perceived as a fun place. In response to the question about whether camp was fun, 81% ($n = 55$) of the children said camp was "very fun," 13% ($n = 9$) reported that camp was "fun," and 6% ($n = 4$) said camp was "OK." No children reported that camp was "not fun." Importantly, 62 of the children (93%) reported that they would recommend camp to a friend.

Discussion

The ADA's goals for teaching children diabetes self-management at camp include accurate measurement of blood glucose levels, understanding of the impact of exercise on blood glucose levels, and acute and long-term management of hypo- and hyperglycemia.¹⁰ These goals are consistent with research indicating that such goals are beneficial for improving healthy lifestyles and self-management for children who have diabetes.⁷⁻⁹

As seen in previous research,¹¹ camp was a positive experience for the majority of children. Children reported that camp was helpful in improving their ability to manage their diabetes and increasing their sense of belonging and social support. The joint goal-setting intervention in year 2, through which parents and children worked

together to develop camp goals, was successful. Doctors reported that a majority of children were achieving their camp goals. Additionally, more children remembered their camp goals in year 2 than in year 1.

The results of the logistic regression analyses for year 2, through which parental goals (i.e., goals set only by parents before camp) were compared to children's reported learning did not indicate a strong match between parent goals (i.e., set before camp and without input from their child) and children's learning, which was similar to the results in year 1. Although unexpected, this finding is consistent with other research showing that parents and their children can have differing perceptions of what a child needs to learn and actually does learn at camp.¹⁴

In the future, in addition to joint goal-setting, it also will be important for parents and children to discuss which of their goals differ and determine whether they should work as a team toward goals that are not initially consistent. Allowing parents and children more time to process similarities and differences in goals is a perspective-taking exercise that may improve understanding and support for both members of the parent-child team.

Children benefited from camp in other ways. For example, they learned about identifying and managing blood glucose "highs" and "lows," improving their ability to identify signs of hypo- and hyperglycemia. Staff were instrumental in assisting children in independently counting carbohydrates at meals and snack times, which is a key aspect of the training that occurs at diabetes camps.^{11,12} Qualitative data from this study also indicated that children learned key information about managing their insulin pumps, including rotating sites and programming boluses. They benefited from learning about eating nutritious foods in diet education sessions and through increased vegetable intake and other healthful food choices at mealtimes. Another theme evident in children's qualitative responses is that they learned to be "proud of being a dia-

betic" and that their self-confidence improved as a result of attending camp. Children also reported that camp was a place to express their feelings about diabetes. Thus, the diabetes knowledge and sense of social belonging that children receive at camp are both invaluable contributions of the camp experience.¹¹

Findings from this study suggest that learning experiences differ for boys and girls at camp. For example, quantitative results from year 1 indicated that boys learned more about recognizing symptoms of hyperglycemia, testing their blood glucose levels, and counting carbohydrates at diabetes camp. During year 2, boys reported more than girls that they learned about testing blood glucose levels. Conversely, during year 2, girls were more likely than boys to report benefiting from opportunities to express their feelings at camp.

It is important for adults to consider sex differences when designing educational activities. At camp, nightly "cabin chats" were held to summarize daily learning. Boys may benefit more than girls from reviewing what they have learned about self-management during these discussions, whereas girls may gain additional benefit from not only reviewing what they have learned, but also having the opportunity to express their feelings about coping with and managing their diabetes.

Limitations and future directions

Data were cross-sectional and relied on self-report. Future longitudinal studies are needed to assess change in children's roles in diabetes self-management before and after camp. Moreover, behavior observations would provide an objective means to verify children's reports of the skills they learned during camp.

More children completed the evaluation for year 1 than for year 2. This may have occurred because the children did not wish to complete the same evaluation questions 2 years in a row and may have skewed the findings for year 2. Providing an incentive may have improved completion of evaluations.

Also, a pre-camp assessment of children's knowledge about diabetes management would provide docu-

mentation to assess whether boys knew more or less than girls before attending camp. Assessing sex differences in learning and possibly related changes in self-management skills remains a goal for future studies.

It also will be important to determine whether children continue to employ the self-management skills they learn at camp after camp ends. Conducting longitudinal research to assess whether camp participation is related to long-term improvement in self-management, psychosocial functioning, and enhancement of autonomy and self-confidence will provide valuable information that will lead ultimately to improvement in the design of diabetes camp programs.

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