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ORIGINAL ARTICLE

Diabetes Technology and the Human Factor

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Introduction

The impressive progress achieved in recent years in diabetes technologies has made diabetes technological devices such as continuous subcutaneous insulin infusion (CSII) and continuous glucose monitoring (CGM) a significant part of diabetes treatment. Many studies conducted in recent years emphasized the advantages of using these technologies.

The concept of the ''human factor'' in diabetes technologies as discussed in this chapter has several different aspects. First, it can refer to the way patients are satisfied with the use of the device and whether it is perceived convenient or inconvenient. For example, is the device perceived as ''user friendly'' (easy to learn and to operate, comfortable, does not cause many hassles). Second, there is the issue of effectiveness of the technology as it relates to their day-to-day diabetes management. For example, there is an improvement in glycemic control when one diabetes treatment regimen is compared to another (i.e., CSII vs. multiple daily injections (MDI)).

Those two fundamental aspects may have different meanings for different groups. For example, different age groups (toddlers, children, adolescents, young adults, adults, and older people) can see different advantages and disadvantages in technological devices. The feasibility and utility of technological devices also need to fit the environments in which they will be used, such as school, the work place, and/or home. Specific subgroups such as diabetic youth with eating disorders can have unique interactions with diabetes technologies.

In addition, diabetes technologies can be used as a measurement device, providing more rich and accurate data about patients' self-care that can contribute to our understanding of concepts such as adherence and satisfaction, and they can provide measurement tools to assess how glycemic control can effect cognition and intelligence. The present chapter will review articles published in the last year that have studied some of these issues.

Treatment satisfaction in the sensor-augmented pump therapy for A1C reduction 3 (STAR 3) trial

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*Diabetes Med 2013; **30**: 464–67*

Aim

To identify insulin delivery system perceptions that contributed to improvements in general satisfaction with insulin therapy (treatment satisfaction) that were more significant in subjects using sensor-augmented pump therapy than those using multiple daily injections with self-monitoring of blood glucose.

Methods

The sensor-augmented pump therapy for A1C Reduction 3 (STAR 3) trial was a randomized 12-month clinical trial that compared sensor-augmented pump therapy to multiple daily injections + self-monitoring of blood glucose in both adults and children. The Insulin Delivery System Rating Questionnaire measured perceptions of convenience, problems, interference with daily activities, blood glucose monitoring burden, social burden, clinical efficacy, diabetes worries and psychological well-being, as well as treatment satisfaction. The authors conducted different multiple regression analyses for the 334 adult patients and 147 pediatric patients and their caregivers to evaluate the independent correlations ($p < 0.05$) between change from baseline to follow-up in user perceptions and treatment satisfaction.

Results

Increased convenience was correlated with better treatment satisfaction in all user groups. Reduced interference with daily activities (caregivers), reduced social burden

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(adults), and increased efficacy (both) also were correlated with better treatment satisfaction.

Conclusions

Convenience was found to be the major factor in treatment satisfaction among children, while perceived clinical efficacy was also a primary determinant among adults, reflecting different emphases on the treatment process itself versus treatment results. Among adult patients and caregivers, improved treatment satisfaction was also a function of reductions in social burden and interference with daily activities (respectively), reflecting concern with the wider psychosocial influence of sensor-augmented pump therapy on their lives.

The pump was a saviour for me. Patients' experiences of insulin pump therapy

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*Diabetes Med 2013; **30**: 717–23*

Aims

The present study was part of a larger study investigating the potential long-term effects of glycemic control and treatment satisfaction in people with type 1 diabetes mellitus who changed their insulin regimen from multiple daily insulin injections to insulin pump therapy. A total of 46 participants who made the transition between May 1999 and February 2004 participated. The aim of the study was to describe experiences of the effect of insulin pump therapy in adults with type 1 diabetes mellitus after >5 years' use of an insulin pump.

Methods

During spring 2009, 16 of the individuals were interviewed through a narrative approach on the influence of insulin pump therapy on daily life. The interviews were analyzed using content analysis.

Results

Insulin pump therapy was experienced as both a shackle and a lifeline. Six subthemes emerged: subjected versus empowered; dependent versus autonomous; vulnerable versus strengthened; routinized versus flexible; burdened versus relieved; and stigmatized versus normalized.

Conclusions

Users of insulin pump therapy have different perspectives about using the technical equipment over years. Both positive and negative views emerged. However, it was difficult to identify any general trends that covered all views and can predict which individuals will be able to optimally manage pump therapy. Even so, the subthemes that emerged could be used by physicians and diabetes specialist nurses when counseling and planning educational programs aimed at supporting self-management among people using insulin pump therapy.

What are the quality of life-related benefits and losses associated with real-time continuous glucose monitoring? A survey of current users

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*Diabetes Technol Ther 2013; **15**: 295–301*

Aims

The authors examined the possible effect of real-time (RT) continuous glucose monitoring (CGM) on quality of life (QOL). Different types and frequencies of diabetes-specific QOL changes resulting from RT-CGM were explored as reported by current users and investigated what patient-reported factors predict these changes.

Subjects and Methods

Online questionnaires were completed by users of the Dexcom-7 sensor ($n = 877$) investigating their perceived QOL benefits since RT-CGM initiation and RT-CGM attitudes and behavior. Exploratory factor analysis (EFA) tested the 16 QOL benefit items to identify underlying factors. Regression analyses examined correlations between demographics and RT-CGM attitudes and behavior with the QOL factors derived from the EFA.

Results

The analysis identified three major QOL factors: Perceived Control over Diabetes, Hypoglycemic Safety, and Interpersonal Support. Improvement in QOL measures was found more in Perceived Control over Diabetes and Hypoglycemic Safety (86% and 85% of respondents, respectively), and less in Interpersonal Support (37%). Consistent independent predictors of perceived benefits were greater confidence in using RT-CGM data ($p < 0.001$), satisfaction with device accuracy ($p \leq 0.05$) and usability ($p < 0.01$), older age ($p < 0.01$), more frequent receiver screen views ($p < 0.05$), and use of multiple daily injections (Hypoglycemic Safety and Interpersonal Support, $p \leq 0.05$).

Conclusions

Diabetes-specific QOL benefits resulting from RT-CGM were frequently found. Major predictors of QOL benefits were satisfaction with device accuracy and usability and confidence in one's ability to use RT-CGM data, implying that perceived efficacy, for both device and self, are important QOL factors. Psychoeducational strategies to boost confidence in using RT-CGM data and provide reasonable device expectations might empower QOL benefits.

Comment

The subjective experience of patients concerning the use of diabetes technology has a significant effect on both patients' quality of life and adherence to diabetes regimen. The studies cited above provide complementary aspects of this important issue. As one can see, the question of what makes a device satisfactory relies heavily on the patient's expectations, values, and developmental stage.

Children preferred significantly the convenience in wearing the device and were not concerned with effectiveness as compared to adults. This finding is understandable based on our knowledge of how adolescents have a problem in appreciating the significance of future diabetes complications. It also reflects the difficulty of children and youth to tolerate inconveniences and to have deferred gratification (1,2).

Patients may also have different views about using the same device. While some patients feel that a certain technology improves their quality of life significantly, others may feel that the same technology is causing a burden. Good or bad experiences can influence the patients' motivation and emotional well-being. The knowledge obtained from patients' subjective experience can help the diabetes team to develop a psychoeducational protocol that answers issues that are relevant to the patient and help to prevent diabetes technology dropouts. As we move to in-home, in-school, and in-work closed-loop systems, it will be critical to do user evaluation studies to assess the perceived hassles of using the device as compared to the perceived benefits. What a team of engineers considers easy to use and successful may not be perceived by children, adolescents, and adults as user friendly and beneficial. Perceived benefits are best accepted if they are immediate, not delayed. Less, not more hassles in insulin dose decisions, fewer user inputs to determine a dose, fewer immediate concerns about daytime and overnight hypoglycemia, and immediate, significant and visually observed differences in postprandial glucose levels and markedly decreased glucose excursions will be immediately perceived by a CGM user as beneficial. A 0.3% decrease in A1C levels or a 5% improvement in the percent of readings in range may be statistically valid, but will not have an immediate perceived benefit to the adolescent. It will be critical that any burden of using and wearing more devices with communications issues between devices is offset by immediate benefits to the user in observed CGM readings.

Insulin regimens and clinical outcomes in a type 1 diabetes cohort: the SEARCH for Diabetes in Youth study

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*Diabetes Care 2013; **36**: 27–33*

Aims

To study the patterns and correlations of insulin regimens and change in regimens with clinical outcomes in a heterogeneous population of children with newly diagnosed type 1 diabetes.

Research Design and Methods

The study sample consisted of adolescents with type 1 diabetes who completed a baseline SEARCH for Diabetes in Youth study visit, which occurred generally between 4 and 16 months postdiagnosis of diabetes, and at least one follow-up visit. Demographic, diabetes self-management, physical, and laboratory measures were collected at study visits, with follow-up visits at 2–3 years postdiagnosis. Insulin regimens and change in regimen compared with the initial visit were categorized as more intensive (MI), no change (NC), or less intensive (LI). The authors investigated associations between insulin regimens, change in regimen, and outcomes including A1C and fasting C-peptide.

Results

About 51.7% out of the 1,606 subjects (with a mean follow-up of 36 months) changed to an MI regimen, 44.7% had NC, and 3.6% changed to an LI regimen. Subjects who were younger, non-Hispanic white, and from families of higher income and parental education and who had private health insurance were more likely to be in MI or NC groups. Those in MI and NC groups had lower baseline A1C ($p = 0.028$) and smaller increase in A1C over time than LI ($p < 0.01$). Younger age, continuous subcutaneous insulin pump therapy, and change to MI were associated with higher probability of achieving target A1C levels.

Conclusions

Insulin regimens were intensified over time in more than half of the subjects but varied by sociodemographic domains. As more intensive regimens were correlated with better outcomes, early intensification of management may help to achieve better outcomes in all children with diabetes. Although intensification of the insulin regimen is preferred, the choice of an insulin regimen should be tailored according to the child and family's ability to adhere with the prescribed regimen.

Comment

This study emphasizes that changing to more intense insulin regimens, including diabetes technologies (i.e., CSII and CGM), is correlated with certain socioeconomic and sociodemographic characters such as ethnicity, families with higher income, higher parental education, and private health insurance. It is also associated with better glycemic control and lower HbA1c levels. These findings are consistent with several studies indicating that social support and socioeconomic status (3) (and not only the patient's personal or subjective experience) have a major influence on the adherence potential both in diabetes in general and in diabetes technology regimens.

Sensor-augmented pump therapy in very young children with type 1 diabetes: an efficacy and feasibility observational study

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*Diabetes Technol Ther 2012; **14**: 762–64*

Aims

The purpose of this study was to assess the efficacy and feasibility of sensor-augmented pump (SAP) therapy in very young children with type 1 diabetes (T1D).

Subjects and Methods

SAP (Dexcom [San Diego, CA] Seven Plus usage combined with insulin pump) therapy was retrospectively evaluated in 28 children (15 boys) younger than 7 years (mean age, 5.8 ± 1.2 years; range, 3–7 years), with T1D. Glycosylated hemoglobin (HbA1c) was evaluated at baseline and at the end of the study, as were efficacy and feasibility of the system, using a rating scale (with 3 being the most positive).

Results

SAP was used for at least 6 months by 85% of patients, with a generally good satisfaction (92%). The greatest perceived benefit was the reduced fear of hypoglycemia (score of 3, 81%). HbA1c was significantly better only in subjects with baseline HbA1c $>7.5\%$ ($p = 0.026$).

Conclusions

The authors conclude that SAP therapy is feasible in preschool children with T1D, and in patients with a HbA1c > at baseline, it provides a 0.9% decrease.

Real-time continuous glucose monitoring systems in the classroom/school environment

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*Diabetes Technol Ther 2013; **15**: 409–12*

Aims

Children with type 1 diabetes (T1D) spend 4–7 hours/day in school with minimal supervision of their diabetes management. The use of real-time continuous glucose monitoring (RT-CGM) may provide an increased level of supervision of the child's diabetes management. Because there is no published information on the impact of using RT-CGM in the classroom/school environment, the authors sought to make this assessment.

Subjects and Methods

Children with T1D using RT-CGM, their caregivers, and teachers completed a questionnaire about RT-CGM in the classroom/school environment.

Results

The RT-CGM was well tolerated in the classroom/school environment. Seventy percent of parents, 75% of students, and 51% of teachers found RT-CGM useful in the classroom/school environment. The students found the device to be more bothering than did the adults (both parents and teachers). However, all three groups thought that RT-CGM improved their comfort with diabetes management at school.

Conclusions

The authors conclude that RT-CGM is useful and not perceived as a significant hassle in the classroom/school environment. An improvement in the education materials provided to teachers could further increase RT-CGM acceptance in the classroom/school environment.

Comment

Parents and caregivers of children with diabetes experience a heavy burden as a result of the demands of the diabetes regimen requirements and the anxiety about their child's health and even life. The efforts are endless and deal with unexpected eating patterns, extreme glucose variability, and inconsistencies in insulin sensitivity. The anxiety caused by the possible consequences of severe hypoglycemic or hyperglycemic events to the young child can affect both the parents' quality of life and daily functioning. Another challenging situation is sending the child to school without the parents' direct supervision and often without a professional team or even a person who knows how to manage diabetes.

These two interesting studies suggest that increasing the use of diabetes technologies among children and even young children can help ease this burden. The studies indicate that using technological devices is both safe and feasible. These findings are concordant with previous studies that showed the potential of using diabetes technologies in children (4).

Continuous glucose monitoring and cognitive performance in type 2 diabetes

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*Diabetes Technol Ther 2012; **14**: 1126–33*

Aims

Type 2 diabetes is correlated with reductions in cognitive function that are in turn correlated with glycated hemoglobin (HbA1c) levels, but there are no data on whether changes in cognition is associated with postmeal glucose spikes. The authors investigated the correlations between cognition and glucose levels measured by a continuous glucose monitoring system (CGMS) both before and after a weight loss diet.

Subjects and Methods

A total of 44 white participants with type 2 diabetes (59.0 ± 6.2 years old; body–mass index, 32.8 ± 4.2 kg/m^2; HbA1c, 6.9 ±1.0%) completed an 8-week energy-restricted (~6–7 MJ, 30% deficit) diet. Cognitive functioning (short-term memory, working memory, speed of processing [inspection time], psychomotor speed, and executive function) was evaluated during four practice sessions, baseline, and week 8. Parallel glucose levels were collected using the CGMS in 27 participants. Results were evaluated by fasting blood glucose (FBG), postprandial peak glucose (G_{max}), time spent >12 mmol/L (T>12), and 24-hour area under the glucose curve (AUC_{24}).

Results

Although there was a fall in FBG of 0.65 mmol/L after 8 weeks, digits backward outcome was associated with FBG at both week 0 and week 8 ($r = -0.43$, $p < 0.01$ and $r = -0.32$, $p < 0.01$, respectively). Digits forward outcome was associated with FBG ($r = -0.39$, $p < 0.01$), G_{max} ($r = -0.46$, $p < 0.05$), and AUC_{24} ($r = -0.50$, $p < 0.01$) at week 0 and FBG ($r = -0.59$, $p < 0.001$), G_{max} ($r = 0.37$, $p = 0.01$), AUC_{24} ($r = -0.41$, $p < 0.01$), and percentage weight loss ($r = 0.31$, $p < 0.01$) at week 8. Cognitive function was not changed by weight loss, sex, baseline lipid levels, or premorbid intelligence levels (National Adult Reading Test).

Conclusions

FBG, G_{max}, and AUC_{24} were associated with cognitive function, and an energy-restricted diet for 8 weeks did not change this relationship.

Outpatient assessment of determinants of glucose excursions in adolescents with type 1 diabetes: proof of concept

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*Diabetes Technol Ther 2012; **14**: 658–64*

Aims

Although controlled inpatient studies on the effects of food, physical activity (PA), and insulin dosing on glucose excursions exist, the information is quite limited. The authors report in this study the use of continuous glucose monitors (CGM), accelerometers, insulin dose data from both insulin pumps and memory pens, and meal information from logs and photos over 5 days in 30 youth with type 1 diabetes (T1D) as a proof-of-principle pilot study.

Subjects and Methods

There were a total of 30 participants (20 on insulin pumps, 10 receiving multiple daily injections; 15 ± 2 years old; diabetes duration, 8 ± 4 years; hemoglobin A1c, 8.1 ± 1.0%). Participants continued their existing insulin regimens, and time-stamped insulin dosing data were obtained from insulin pump downloads or insulin pen digital logs. Time-stamped cell phone photographs of food pre- and postconsumption and food logs were used to augment 24-hour dietary recalls for days 1 and 3. These variables were incorporated into regression models to predict glucose excursions at 1–4 hours postbreakfast.

Results

CGM information on both days 1 and 3 were obtained in 57 of the possible 60 participant-days with an average of 125 daily CGM readings (out of a possible 144). PA and dietary recall data were obtained in 100% and 93% of subjects on day 1 and 90% and 100% of subjects on day 3, respectively. All of these variables affected glucose excursions at 1–4 hours after waking, and 56 of the 60 subject-days contributed to the modeling analysis.

Conclusions

Outpatient high-resolution time-stamped data on the main inputs of glucose variability in youth with T1D are feasible and can be modeled. Future applications include using these data for *in silico* modeling and for monitoring outpatient iterations of closed-loop studies, as well as to enhance clinical advice regarding insulin dosing to match diet and PA behaviors.

Frequency of mealtime insulin boluses as a proxy measure of adherence for children and youths with type 1 diabetes mellitus

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*Diabetes Technol Ther 2013; **15**: 124–28*

Background

Electronic measures of adherence can be better than patient report. In type 1 diabetes, frequency of blood glucose monitoring (BGM), as measured by patients' home blood glucose meters, has already been identified as a valid proxy of adherence. The authors present methodology to calculate adherence using insulin pump data and assess the reliability and validity of this methodology.

Subjects and Methods

Blood glucose meter records, insulin pump data, and corresponding hemoglobin A1c (HbA1c) levels were randomly obtained from clinical and research databases for 100 children and adolescents (referred to hereafter as youths) with type 1 diabetes (mean ± SD age, 12.7 ± 4.6 years). Youths' mean frequency of daily BGM was calculated. In addition, the authors calculated a mean mealtime insulin bolus score (BOLUS): youths received 1 point each for a bolus between 0600 and 1000 hours, 1100 and 1500 hours, and 1600 and 2200 hours (maximum of 1 point/meal or 3 points/day).

Results

Simple associations between youths' HbA1c level, age, frequency of BGM, and insulin BOLUS scores were found to be significant. Partial associations and multiple regression analyses revealed that insulin BOLUS scores better explain variations in HbA1c levels than the electronically data frequency of daily blood glucose measures.

Conclusions

The authors concluded that their procedures for calculating insulin BOLUS scores using insulin pump records were better than the frequency of BGM in predicting youths' HbA1c levels.

Comment

Psychological evaluations and tests are usually based on a subjective foundation whether it may be observations, subjects' self-reports (i.e., questionnaires), or even psychometric evaluations. There is no objective way (i.e., blood test or MRI) to study concepts such as cognition or adherence. Obtaining dates about bolus omission or glucose excursions in adolescents with diabetes may be used to measure adherence in a way that is beyond the patient's self-report or the impression of his or her parent. This, of course, does not mean that the objective measures will entirely replace the subjective ones; rather, they will be complementary. The subjective measures will provide the personal experience of the subject as well as theoretical concepts that will enrich the objective methods (e.g., the concept of executive functioning that enables us to define different factors concerning our ability to concentrate and make plans) (5).

Another interesting possibility derived from these articles is to build personal tailor-made programs for patients. The patient and the diabetes team will be able to specifically point out what exactly are the problems and barriers that cause poor glycemic control. There have been a number of other studies that have pointed out the importance of not missing meal boluses (6–8), and this study again confirms this finding and shows that a missed meal bolus is of even greater significance in predicting A1c levels when compared to the frequency of blood glucose testing. These findings again provide additional evidence for the value of a hybrid or full closed-loop system to overcome issues with a missed meal bolus, particularly in adolescents.

Disordered eating behaviors in youth with type 1 diabetes: prospective pilot assessment following initiation of insulin pump therapy

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*Diabetes Technol Ther 2013; **15**: 428–33*

Aims

Type 1 diabetes patients are at risk for developing disordered eating behaviors, especially related to insulin manipulation. Implementation of insulin pump therapy may enhance either normalization of eating behaviors or a greater focus on food intake due to renewed emphasis on carbohydrate counting. Prospective studies are needed to evaluate disordered eating behaviors at the time of implementation of pump therapy using diabetes-specific measurement instruments.

Subjects and Methods

A total of 43 adolescents with type 1 diabetes, 10–17 years of age, participated in a multicenter pilot study, and were evaluated before pump initiation and after 1 and 6 months of pump therapy. Adolescents completed the Diabetes-specific Eating Problems Survey-Revised (DEPS-R), a validated questionnaire of risk for both diabetes-specific and general disordered eating behaviors.

Results

Adolescents (45% female), 13.3 years old with diabetes for 2.1 years, had a mean hemoglobin A1c of 8.3% ± 1.3% (68 ± 14.5 mmol/mol) at baseline. DEPS-R scores decreased over time ($p = 0.01$). Overall rate of high risk for eating disorders was low. Overweight/obese adolescents endorsed more disordered eating behaviors than normal-weight subjects. DEPS-R scores were associated with *z*-score for body–mass index at all three time points and with hemoglobin A1c levels after 1 and 6 months. There was no significant difference in hemoglobin A1c over the 6 months; however, it was higher in overweight/obese participants than in normal-weight participants.

Conclusions

Initiation of insulin pump therapy was correlated with diminished endorsement of disordered eating behaviors in adolescents with type 1 diabetes. Longer follow-up studies are

needed to evaluate the influence of insulin pump therapy on glycemic control, weight status, and disordered eating behaviors in this vulnerable population.

Comment

This study is a great example of "thinking outside the box." Some clinicians have been concerned that using more intense insulin management in children with potential eating disorders could worsen their eating disorder, giving them an additional tool to manipulate their eating behavior. This article is encouraging in that the exact opposite was seen. The great meal flexibility with pump therapy decreased tendencies toward disordered eating behaviors. Adolescents with disordered eating behaviors and diabetes should be treated and understood differently than general eating disorders. The authors emphasize that the demands of conventional insulin regimens might encourage disordered eating; thus, instead of only talking with the patients about their eating disorders and body image issues, more flexible eating patterns enabled by insulin pump therapy improved some of the disordered eating. A specific questionnaire was developed emphasizing the importance of having a diabetes-oriented eating disorder questionnaire (9). This approach indicates that psychological treatment for patients with diabetes demands profound understanding of the disease and the challenges as well as the different regimens and the way they affect the patient's life.

Psychometric evaluation of the adherence in diabetes questionnaire

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*Diabetes Care 2012; **35**: 2161–66*

Aims

The purpose of this study was to evaluate the psychometric properties of a short, new, self-administered questionnaire (17–19 items) for evaluating the adherence behavior of children and adolescents with type 1 diabetes and their parents. This questionnaire has different versions depending on the method of insulin administration: continuous subcutaneous insulin infusion (Adherence in Diabetes Questionnaire [ADQ]-I) or conventional insulin injection (ADQ-C).

Research Design and Methods

In this trial, 1,028 caregivers and 766 children and adolescents 2–17 years old were assigned through the Danish Registry of Childhood Diabetes and completed the national web survey. The survey included the ADQ and psychosocial measures of self-efficacy, parental support, family conflict, and aspects of diabetes-related quality of life. HbA(1c) was measured in a central laboratory. The psychometric properties of the ADQ were evaluated, and the correlation with glycemic control was assessed.

Results

There was good internal consistency for both the youth and caregiver reports and strong agreement between the caregiver and youth reports. Higher ADQ scores, indicating better adherence, were related with better self-efficacy, more parental support, less diabetes-related conflict, and less experience with treatment barriers. Factor analysis supported maintaining the one-factor structure of the ADQ. Higher ADQ scores were correlated with lower HbA(1c) levels.

Conclusions

The ADQ showed good psychometric properties. The ADQ appears to be a valuable questionnaire for evaluating adherence in families with children and adolescents with type 1 diabetes in both clinical and research settings, although the test–retest reliability and sensitivity to change of the instrument still needs to be established.

Comment

Adherence is a significant issue in diabetes treatment, and there are several potential advantages of using this new questionnaire. First of all, it was simplified to allow the patients and their caregivers to answer the questions online without the need for a trained professional to be with them to administer the questionnaire. This allows for the possibility of doing large Internet-based surveys. In addition, it has different versions for patients using either conventional injections or insulin pump therapy, making it more sensitive to the unique aspects of adherence with these two modes of therapy. The authors sought to identify the specific components of adherence to different aspects of the diabetes regimen (insulin administration, blood glucose measurements, carbohydrate counting, physical activity, and CSII management). The questionnaire was built on both patients' interviews and diabetes experts' reviews. This method represents a very balanced approach that takes into consideration the patients' point of view about their diabetes in order to improve their functioning.

A profile of self-care behaviors in emerging adults with type 1 diabetes

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*Diabetes Educ 2013; **39**: 195–203*

Aims

The target of this study was to characterize everyday diabetes self-care behaviors and to assess correlations among self-care behaviors, psychosocial adjustment, and glycemic control in an understudied sample of emerging adults with type 1 diabetes.

Methods

A total of 49 emerging adults (65% women; age 18–26 years) completed two diabetes interviews to evaluate

self-care behaviors and self-report measures of psychosocial adjustment. Glycemic control was evaluated through hemoglobin A1C.

Results

Diabetes self-care behaviors varied widely and were mostly suboptimal; only a small percentage of subjects showed self-care behaviors consistent with national and international recommendations. Psychosocial adjustment was within normal limits and was not related to frequency of self-care behaviors in this sample. Mean glycemic control (8.3%) was higher than the recommended A1C level (<7.0%) for this age group. Use of intensive (e.g., multiple daily injections or pump) insulin regimens was associated with better glycemic control.

Conclusions

Most of the participants in this study did not engage in optimal daily diabetes self-care. Intensive insulin therapy was correlated with better glycemic control without corresponding psychosocial distress. Diabetes care behaviors could be improved in this age group, and emerging adults may benefit from targeted education and behavioral support to improve diabetes self-management and to achieve better health outcomes.

Characterizing the transition from paediatric to adult care among emerging adults with type 1 diabetes

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Aims

The purpose of this study was to describe the transition of adolescents with type 1 diabetes from childhood to adult healthcare services, study the connection of this transition with self-care and glycemic control, and distinguish adolescents who received medical treatment from different physicians in terms of demographic and parent relationship variables.

Methods

A total of 118 adolescents with type 1 diabetes participated in a prospective study that examined the transition from the pediatric to adult healthcare systems and were assessed during their senior year of high school (time 1) and 1 year later (time 2). Data on self-care, glycemic control, and parent relationship were collected.

Results

Most of the adolescents saw a pediatric endocrinologist at both evaluations ($n=64$); others saw an adult care physician at both evaluations ($n=26$) or transitioned from a pediatric endocrinologist to an adult care physician ($n=19$). Nine youth saw no physician between time 1 and time 2. There were group differences in demographic and parent relationship variables and self-care behavior and glycemic control related to the transition of care. Patients who stayed in the pediatric healthcare system had the best self-care and did not show a decline in glycemic control through the study period.

Conclusions

Early transition from the pediatric healthcare system to the adult healthcare system is correlated with psychosocial variables and poor glycemic control. Future study should identify factors that determine optimal timing and strategies to avoid worsening of care and control during this transition.

Comment

Emerging adulthood is a relatively new concept referring to the age period from the late teens to the mid to late 20s (age 18–25). It has been referred to as, "A new term to a new phenomenon," describing the sociological phenomenon in industrialized countries where persons at this age group feel that they are "no longer adolescents and not yet adults." They are not dependent on their parents like in their youth, but they cannot be completely independent like adults (10). This group may also have issues in obtaining good health benefits if they are not in a country with socialized healthcare; that is, they may be in school or working part time in a job that does not provide healthcare benefits. In addition, a position statement published by the American Diabetes Association in 2011 emphasized potential risk at this age group for poor glycemic control and associated problems in adherence to their diabetes treatment (11).

This complicated age group is also challenging when considering the use of diabetes technology. For some emerging adults, using insulin pump therapy has caused them distress. It is encouraging to know that using intensive insulin therapy has been positive for most patients. The pediatric diabetes team should carefully assess its late adolescents/young adults to be sure that they are mature enough to make the transition to an adult clinic, which is, generally speaking, less supportive than the pediatric diabetes clinic.

Author Disclosure Statement

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