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Résumé

Portrait de la cognition des patients : la compréhension des autosoins chez les patients souffrant de diabète

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L'autogestion du diabète est un processus dynamique complexe. Malgré les directives données aux patients pour leur permettre de s'auto-soigner, beaucoup ont encore de la difficulté à contrôler leur taux de glucose. La présente étude s'appuie sur les techniques de recherche en matière de prise de décision, pour étudier la conceptualisation des autosoins chez les patients ayant un contrôle glycémique faible, modéré et bon. Dix-huit personnes souffrant de diabète de type 2 ont été interrogées sur leur expérience du diabète, leur compréhension de la maladie et leur comportement relié aux autosoins. Des méthodes qualitatives ont été utilisées pour analyser les réponses et décrire les schémas cognitifs. Les auteures décrivent la compréhension des principaux aspects des autosoins et de leur relation avec l'autogestion qu'avaient les participants. Chez la majorité d'entre eux, la compréhension de la maladie était insuffisante – en général, parce que les directives fondées sur des règles les dépassaient ou qu'ils ne les comprenaient pas. La compréhension de la dynamique sous-jacente à la régulation du glucose s'est avérée essentielle à une autogestion efficace. Les éducateurs spécialisés en diabète devront enseigner la dynamique sous-jacente à l'autogestion aux patients et mettre l'accent sur l'aptitude à résoudre les problèmes et à prendre des décisions.

Mots-clés : Diabète, cognition, prise de décision

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Portraits of Patient Cognition: How Patients Understand Diabetes Self-Care

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Diabetes self-management is a complex dynamic process. Although patients are given guidelines for self-care, many still struggle with glucose control. This study uses techniques from naturalistic decision-making research to examine how patients with low, moderate, and good glycemic control conceptualize self-care. Eighteen people with type 2 diabetes were interviewed about their experiences with diabetes, understanding of the disease, and self-care behaviour. Qualitative methods were used to analyze responses and describe patterns of cognition. The authors describe participants' understanding of major areas of self-care and its relationship to self-management. The majority of participants failed to adequately understand the disease, typically because they were overwhelmed by or misunderstood rule-based instructions. Understanding of the dynamics underlying glucose regulation was found to be critical for effective self-management. Diabetes educators need to teach patients about the dynamics underlying self-management and to emphasize problem-solving and decision-making skills.

Keywords: diabetes, chronic diseases, cognition, decision making, human factors, psychology

Glucose control for people with diabetes is a complex dynamic process. One participant in the present study put it this way: "You know your body comes with an automatic control of your blood sugar and it takes care of that and did for years. But now you've lost the automatic control so you must manually take care of yourself." Diabetes self-management, like any task that calls for manual control of a dynamic process, requires considerable knowledge. But diabetes self-management entails much more than knowing about pancreatic functions and counting carbohydrates. Successful self-management requires ongoing effort to detect problems, understand dynamic relationships, and handle complex situations (Klein & Lippa, 2008).

Diabetes educators provide medically accurate information and training for newly diagnosed patients (Ellis et al., 2004; Reeves & Steil, 2004). Yet more than 60% of patients still fail to engage in appropriate self-care (Manos, 2004). For these patients the instruction and information provided are insufficient to allow them to become proficient self-managers. In order to deal with the dynamic complexity of glucose regulation,

patients need not only information but expertise as well (Hernandez, 1996; Patterson & Thorne, 2000).

The development of the naturalistic decision-making paradigm within cognitive science has helped us to understand how people cope with complexity and develop the skills necessary to succeed at similar high-stakes, high-uncertainty, ill-defined tasks in real-world environments (Orasanu & Connolly, 1993). The focus of naturalistic decision-making is analysis of successful and unsuccessful decision-making by experts in critical situations (Lipshitz, Klein, Orasanu, & Salas, 2001). Such analysis has led to improved performance and decision-making in fields as diverse as driving, military operations, aviation, and anesthesiology (Kaiser & Schroeder, 2003; Klein & Steel-Johnson, 2007; Klein, Vincent, & Isaacson, 2001; Lane, Slavin, & Ziv, 2001). Although people with diabetes are not professional self-managers, the complex tasks they face are similar to those faced by many of the professionals studied in the naturalistic decision-making paradigm (Klein & Lippa, 2008). This project draws upon research in naturalistic decision-making to explore patients' cognition with regard to diabetes self-care. It has both quantitative and qualitative components. The quantitative elements, published elsewhere, examine the nature of expertise in diabetes self-management and its relationship to glycemic control. Many of the classic characteristics of expertise are shared by successful diabetes self-managers (Lippa, Klein, & Shalin, 2008). In this article we present more extensive qualitative descriptions of how proficiency in glucose regulation is related to patients' understanding of the elements of diabetes self-management.

Methods

Design

Semi-structured interviews were used to obtain rich, descriptive data on participants' understanding of type 2 diabetes and self-care practices in typical and atypical situations. All participants provided informed consent; the study protocol was approved by the Wright State University Institutional Review Board.

Participants

Twenty people with a prior diagnosis of type 2 diabetes mellitus volunteered to participate. Recruits either were introduced by friends/relatives who received course credit for their participation or volunteered after seeing a flyer in a pharmacy or grocery store. They received no remuneration. Two recruits were dropped because they had difficulty responding to the interview questions, leaving a total of 18 participants.

Material and Procedures

Each participant was interviewed individually by one or two interviewers for between 60 and 90 minutes. An interview guide ensured that all topics were covered, but in a flexible order so as to maintain a natural flow of conversation. First, the interviewer asked about the participant's demographic characteristics and clinical history. Participants were also asked about their diagnosis and how they learned about diabetes — for example, *What led up to your diagnosis? How did you learn to take care of your diabetes?* They were then asked about their daily care practices and their understanding of these practices — for example, *What is your diet like? Why do you follow this diet? Could you describe how you take care of your diabetes on a typical day?*

We used the critical incident method common in naturalistic decision-making research to look more closely at how the participants thought about diabetes (Crandall, Klein, & Hoffman, 2006; Klein, 1999). We asked the participants to describe critical incidents — those events that were particularly challenging or salient in their experience of diabetes. We also asked about situations when their glucose was high or low. For each episode recounted, we asked the participant to describe the sequence of events and what they were paying attention to in order to decide how to resolve the problem. For episodes of high blood glucose the questions included *How did you notice it was high? Did you do anything to help bring your blood sugar down?*

Finally, participants were asked direct questions about self-care, such as *What things make blood sugar go up?* During direct questioning the participants could demonstrate declarative knowledge, which, due to a lack of opportunity or a lack of understanding, might not have been apparent in descriptions of practical problem-solving and management behaviour.

Self-Care Questionnaire

After the interview, each participant completed a questionnaire derived from a standard measure (Glasgow, McCaul, & Schafer, 1987; Hampson, Glasgow, & Toobert, 1990). Items probed self-management behaviour with regard to diet, exercise, medication, and glucose monitoring, as well as the participant's lowest and highest serum glucose readings during the preceding week and most recent HbA1c result. While these self-reports likely contain some inaccuracies, the questionnaire has proved reasonably valid (correlations with active measures of behaviour range between .40 and .87) and reliable (α = .86–.97). This measure allowed us to relate understanding to self-care behaviour and glycemic control.

Transcription and Coding

Initially, six pilot interviews were transcribed and coded using literary transcription and open, emergent coding (Kowal & O'Connell, 2004; Strauss, 1987). This code list was iteratively refined to produce 78 non-redundant codes that could capture maximal content (Flick, 1998; Miles & Huberman, 1994). Codes were operationally defined using key words and concepts. Use of a computerized data-analysis program, Atlas.ti, helped us to divide transcripts into single-idea units and to apply one or more codes to each segment (Chi, 1997; Kelle, 2004). To assess coding reliability, one researcher coded a subset of transcripts on two separate occasions, 3 months apart. There was substantial agreement between codings (*kappa* = .78), supporting the reliability of the coding scheme.

Data Analysis

Analyses combined descriptive statistics with qualitative description. Descriptive statistics summarized demographic characteristics and provided the frequencies at which participants mentioned different aspects of self-care (i.e., diet, carbohydrates, glucose monitoring). Qualitative descriptions permitted identification of patterns of reported self-care and a detailed view of patients' problem-solving processes. Participants varied tremendously in terms of level of adherence, glycemic control, and understanding of diabetes. To address this variation, we divided the participants into three groups according to reported level of glycemic control: those with poor glycemic control (HbA1c greater than 7.0), those with moderate control (HbA1c between 6.0 and 7.0), and those with good control (HbA1c less than 6.0). The first group had eight participants; the other two groups had five participants each.

Results

Participants varied in terms of time since diagnosis (*range* = 8 months–35 years; *mean* = 10.8 years; *SD* = 10.0) and age (*range* = 19–76 years; *mean* = 53.9 years; *SD* = 17.3). The sample included 7 women and 13 men, varying in education (8 high school or less; 8 college; 2 postgraduate) and vocation. Four participants had worked in fields related to health care. There were no significant differences between poor-, moderate-, and good-control groups in terms of demographic characteristics. Reported A1c results ranged from 3 to 18, with 58% of the results falling over the recommended guideline of 6.5. For the preceding week, the (reported) highest blood glucose readings ranged from 86 to 450 mg/dl (*mean* = 180.2 mg/dl; *SD* = 109.4) and the lowest from 65 to 130 mg/dl (*mean* = 90 mg/dl; *SD* = 23.1).

All participants reported having access to information about diabetes self-care. Eight participants had attended classes on diabetes self-care and 10 had received personal instruction and nutritional counselling from a doctor, nurse, or dietitian. In addition, 12 reported reading books or pamphlets about diabetes self-care. All participants received diabetes care at least every 6 months from a family doctor or an endocrinologist.

The following sections present patient portraits — qualitative descriptions capturing the cognition and problem-solving differences among participants with poor, moderate, and good glycemic control. Each portrait is designed to exemplify how a patient with a particular level of control thinks about diabetes.

Portrait: Poor Glycemic Control

> *I am probably not a good diabetic.… I take my medicine. I work a lot of hours, probably a good number of hours during the day…I am doing physical exercise…. There [are] real basic rules. I try not to eat as much bread, things like that. I try to eat more vegetables. I try to eat more fruit. And even eating the fruit — there is a fructose in there and a sugar in there… Do I do it [monitor] daily? No…if you're lucky I am doing it once a week, sometimes once a month.*

This participant was typical of those who had poorly controlled glucose. He reported that his most recent A1c result was 9.0, and he admitted to struggling with self-management behaviours. He had health insurance that paid for his diabetes care and he had taken a 2-day diabetes education course. He acknowledged that diabetes was "something that I am aware of every day." His failure to achieve glycemic control seemed to stem not from lack of motivation or intelligence, but rather from insufficient understanding of self-care. This patient exemplifies three trends found in the cognition of poorly controlled self-managers: oversimplification of rules (i.e., bread is bad; vegetables are good), poor understanding of the purpose of recommended self-care, and little understanding of the functional dynamics of glucose control.

Medication. The factor that was easiest for most poorly controlled patients to understand was medication, because they were used to taking prescription drugs for medical problems. The participant quoted above took his medication "most of the time," though he did not understand its function and had no idea how to handle missed doses. Moderate adherence to prescriptions with minimal understanding was typical of those with poor glycemic control. For example, three quarters of these participants did not know the names and dosages of the drugs they were taking. A typical description would be "I don't know what it is; it starts with a *G*."

Monitoring. Poorly controlled participants also did not understand the purpose of monitoring or its relationship to other self-care activities. All but one of these participants said that regular monitoring was important, yet only half of them actually monitored regularly — the other half either never monitored or, like the participant portrayed above, did so sporadically. Except for one person, who was on a sliding insulin scale, none of the participants in this group could describe the purpose of glucose monitoring. Only two participants said they would seek medical help if they had extraordinarily high readings (i.e., over 400) and none reported modifying their self-care in response to glucose readings.

Exercise. Most participants with poor glycemic control did not exercise. Others (as captured in the portrait) had, after their diagnosis, reinterpreted daily work or household activities as physical exercise. These participants neither increased their physical activity in response to their diabetes nor moderated their physical activity in accordance with their glucose levels; rather, they relabelled their daily activities to be more in accord with self-care recommendations. None of the participants with poor glycemic control articulated a relationship between exercise and glycemic control. This lack of understanding, combined with a busy lifestyle, may have been a factor in their poor adherence.

Diet. Six of the participants with poor glycemic control had some set of rules for controlling their glucose levels. These participants had developed simplified dietary systems that acknowledged the importance of limiting carbohydrates and they adhered to some principles with respect to "healthy eating," such as following a balanced diet or eating fruits and vegetables. It is not clear how many of these rules came from diabetes education materials and how many simply fit popular notions of a healthy diet. Participants sometimes found these simplified dietary rules confusing. For example, the patient described above apparently saw a contradiction between eating more fruits and limiting sugar intake. Participants pointed to difficulties maintaining an appropriate diet because of busy schedules and lack of healthy alternatives to fast food.

Two of the participants with poor glycemic control had only a vague understanding of dietary control:

> Researcher: *You said that you have a kind of diet.*
> Participant: *Not really organized. I mean, I know some things I shouldn't eat too much of.... I eat less than I used to, I think, and I don't use much sugar on stuff.*

This participant understood that diet is important but did not know what food choices to make. Participants often reported following one or two simplistic dietary principles — for example, avoiding foods with refined sugar — but otherwise neglecting to control carbohydrate intake.

Problem-solving. Blood glucose levels change in response to many factors, such as illness and stress, which are outside patient control. It is therefore important for people with diabetes to be able to identify and address unsafe glucose levels. Participants who had poor control had difficulty detecting and resolving problems. When asked about episodes of high or low glucose, only two participants could describe an episode of hypo- or hyperglycemia that was sufficiently mild to be treated at home. Both episodes were detected via subjective symptoms associated with low blood sugar and in both cases the participant ate to elevate their glucose. In one case this was effective; in the other case overeating resulted in hyperglycemia 2 hours later. The other six participants in this group could not detect minor glucose imbalances using symptoms and did not monitor enough to detect imbalances using serum glucose levels. They reported one or more incidents requiring emergency room care because of glucose imbalance. Such poor problem-solving is consistent with limited understanding.

Summary. Overall, the participants with poor glycemic control had little understanding of basic self-care. They:

- did not know how medication works nor what to do if unable to adhere to their prescriptions
- did not know the function of glucose monitoring, how to interpret serum glucose levels, or how to use feedback to modify behaviour
- were unable to interpret subjective symptoms or glucose levels in order to detect problems and could not take action to remediate problems
- did not understand the role of exercise in glucose control and therefore were unmotivated to increase their level of exercise
- were confused by the dietary instructions they had been given and defaulted to simplified dietary systems
- did not know the factors entailed in diabetes self-care sufficiently to adjust self-care behaviours to lifestyle demands

Portrait: Moderate Glycemic Control

> *I watch my diet. I try to keep my carbs even with every meal. I take oral medicine… I do…three to four carb servings… [I test] at least once a day, sometimes twice a day…[it depends on] what my first one was in the morning or if I'm sleeping different[ly] or if I'm doing something different.*

This participant was typical of those with moderate glycemic control. Her most recent reported A1c result was 6.9 and she ranked in the middle for self-reported adherence. She worked as a unit clerk in a hos-

pital and had taken diabetes education classes. She believed that she knew how to handle diabetes but was concerned about modifying her diet to accommodate both her diabetes and her high cholesterol, a complexity not covered in her classes. She struggled with balancing the demands of two disorders. Others reported similar difficulty managing multiple diagnoses. Typical of individuals with moderate glycemic control, she understood the basics and was trying to make sense of the principles behind self-care. However, she had difficulty in complex and atypical situations.

Medication. Like most of the participants with moderate glycemic control, this woman did not understand exactly how her medications worked but did know their names and dosages and did take them regularly. She had a theory that her medication made her metabolize food better. Three of the five participants with moderate glycemic control described medication functioning as centred on using glucose better or keeping glucose out of the blood.

Monitoring. All participants with moderate glycemic control monitored their glucose regularly. Three of these participants monitored on a schedule multiple times per day and used the readings to keep a general watch on their glucose levels:

> *I check my blood sugar three times a day. I check it when I get up in the morning, I check it…at dinnertime or just before dinnertime to see whether it's real high or if it's up there a little bit or if it's real low, and then I check it before I go to bed.*

The other two monitored regularly but timed their monitoring in response to somatic cues and unusual events that they thought might be linked to glucose imbalance. For example, the portrayed participant monitored at least once a day but would monitor a second time if she felt that something had disturbed her glucose levels. Participants in this group knew how to interpret their glucose readings and often modified their activities in response to a reading, such as by eating fewer carbohydrates after a high reading.

Exercise. Like participants with poor glycemic control, those with moderate control did not articulate or understand the connection between exercise and glucose levels. And, like those with poor control, three of these participants interpreted daily activities as exercise. Only one understood that exercise helped maintain healthy glucose levels.

Diet. Participants with moderate glycemic control had a significantly more sophisticated understanding of diet than those with poor control. Some, like those with poor control, had general rules for controlling their glucose. However, whereas those with poor control tended to focus on eliminating food groups, these participants were more likely to focus on controlling the number of servings of different food groups per meal.

In the above quote, the participant speaks of having "three to four carb servings" per meal. However, even these more sophisticated rules were inadequate for dealing with unusual events such as vacations or bouts of illness.

Two participants found the number of rules overwhelming. One of these had created an overly simplified system similar to those used by the participants with poor control. The other became engrossed in the details of the rules provided and lost track of the dietary principles behind the rules:

> *…the person in dietary [said], when we asked…what butter to choose, she [said] you see what the first ingredient is and if it says water that's the best type of butter…and salads if you like salads or love vegetables…fish is good… Oriental food they cook so fast that sometimes not as much fat will go into that. And you can eat those and it doesn't hurt you as much.*

Problem-solving. Four of the five participants with moderate glycemic control recognized routine glucose imbalances. Problems were detected either through somatic cues that prompt monitoring or during routine glucose monitoring activities. The participants who detected glucose irregularities responded to low glucose levels by eating or by drinking a sugary beverage. However, no one in this group reported taking action to ameliorate high glucose levels. The mechanisms of raising glucose were better understood than those of lowering glucose. This may be because glucose can be raised quickly, while lowering high glucose levels has a longer time course.

Summary. Participants with moderately controlled glucose had some understanding of self-care procedures but did not fully grasp the principles behind them. They:

- had a vague understanding of how medications work, though probably insufficient to guide action in the case of disruptions
- monitored regularly and in some cases used monitoring to provide feedback on unusual events
- did not understand the purpose of exercise for self-care and therefore were unmotivated to exercise beyond their daily activities
- followed fairly sophisticated dietary rules but were sometimes overwhelmed by the number and complexity of those rules
- were adept at detecting problems but could not take action to ameliorate high glucose levels

Portrait: Good Glycemic Control

Five participants had well-controlled glucose levels. These participants fell into two distinct patterns of self-care. Two maintained the same routine

every day, eating the same foods and engaging in the same activities. One of these was a 63-year-old retired truck driver:

> Participant: *I eat three times a day — certain times, certain food.*
> Researcher: *So, the same thing every day?*
> Participant: *Every day.*
> Researcher: *What do you eat every day?*
> Participant: *Boiled egg for breakfast, salad for lunch, and sometimes a chicken breast [in] the evening, if not maybe another salad. And I also eat popcorn.*

The other three participants in this group had a good understanding of diabetes and the demands of self-care:

> *I test four times. I test once in the morning, and then three times 2 hours after I eat. At night I may not test 2 hours after I eat; I might test before I go to bed because I like to see what happens after fasting. So the testing allows me to track what is going on.... I try not to have more than 50 carbohydrates a meal. I noticed that I can have between 50 and 80 and not have it go up and I won't feel sick with my sugar up. I noticed that if I have less than 50, 2 hours later my sugar is down [and] I am going to have to eat a candy bar or something to get it back up, or a piece of bread... I try to walk an hour a day.*

This participant was diagnosed 3 years previously and had a reported A1c of 5.9. Although he had never taken a diabetes education class, he had spent time reading and received instructions from his family physician. His cognition was typical of those with well-controlled glucose levels: he had a detailed understanding of the requirements of self-care, knew why each of the actions he took was effective, and viewed diabetes as a dynamic control system involving taking actions, monitoring feedback, and adjusting activity accordingly.

Medication. All of the participants who achieved control through understanding and one of the participants who achieved control through routine knew the names and dosages of their medications. Three of these four also understood the physiological mechanisms of their medications.

Monitoring. All of the participants in this group monitored multiple times a day, according to a schedule. They also monitored when they were uncertain how their bodies would respond to eating unusual foods, to illness, or to other atypical events. Monitoring was central to their self-care practices, because they used glucose levels as feedback to customize their self-care regimens:

> *I had wings and pizza one night, and I had three pieces, and 2 hours later it was fine. My sugar was fine. Then about 2 weeks later I had four at a*

> *party… I took my blood sugar 2 hours later and it was at 225. I looked at my wife and I said, "Hey, look at this — three pieces don't affect me but four pieces do."*

Here, monitoring helped to shape future choices. Only the three participants who had a detailed understanding of diabetes mentioned using glucose monitoring to modify self-care behaviours.

Exercise. Only two of those with well-controlled glucose levels (one who controlled via routine and one who controlled via understanding) exercised regularly. However, unlike the participants in the other groups, four of the five participants in this group understood that exercise can lower glucose levels in both the short term and the long term.

Diet. Some participants achieved good control by eating the same foods every day, while others did so by knowing how various foods are metabolized and by developing idiosyncratic diets. The pizza incident recalled above documents how food choices can be moderated by careful attention to diet and feedback from glucose monitoring.

Problem-solving. The two participants who controlled their diabetes by routine had problems only when they experienced an uncommon event such as an infection, and were then treated by a health professional. The three participants who achieved control via understanding were adept at detecting problems. They were able to monitor their bodies and match somatic cues to general glucose levels; they integrated symptom awareness with glucose monitoring to diagnose glucose imbalances. They were also able to manage both hypo- and hyperglycemia. These three were the only participants in the sample who had strategies to ameliorate high glucose.

Summary. Participants with well-controlled glucose levels:

- fell into two patterns — they either had a fixed routine, or depended on an in-depth understanding of self-care and of how medications function
- monitored multiple times a day, according to a schedule
- did not exercise more than the participants with low or moderate control but understood the link between exercise and glycemic control

Those with an in-depth understanding also:

- used monitoring to determine the efficacy of their self-care behaviours
- developed idiosyncratic diets based on subjective feedback and glucose monitoring
- were able to detect and ameliorate episodes of hypo- and hyperglycemia

Conclusions

Like other domains that require the management of dynamic control systems, effective diabetes self-management calls for the development of the skills and expertise needed to solve problems and understand functional relationships. We have described some of the ways in which diabetes self-managers with different levels of glycemic control understand self-care. Those participants with poor control had no understanding of the dynamics of glycemic control. They did not know the components of self-care, could not interpret serum glucose monitoring results, and were confused by the dietary instructions they had received. They could not plan appropriate self-care regimens and could not detect or recover from glucose imbalances. Those with moderate levels of glycemic control had a basic understanding of the procedures necessary for daily self-care but did not understand the relationships among these procedures. As a result they had trouble adapting self-care guidelines when faced with unusual external events or physiological circumstances. They could plan their daily self-care but could not incorporate disruptive events into their plans or recover from imbalances. Among those with good glycemic control, some controlled their glucose through strict regimentation while others used feedback to control their glucose. The former group had a limited understanding of diabetes self-care, whereas the latter group had developed sophisticated mental models of the dynamics underlying diabetes and used frequent monitoring to help modify actions in order to control those dynamics; this group was able to engage in detailed planning, decision-making, and problem-solving.

Implications for Diabetes Training

Current diabetes training provides patients with critical basic rules and procedures to help them get started with self-management and handle routine self-care activities. Nevertheless, most patients have critical gaps in their understanding of appropriate self-care behaviours and the principles behind them. Many of the participants with poor glycemic control found the rules to be too complex. Such patients need help applying the rules they have learned to their daily lives so as not to become overwhelmed, confused, and frustrated. Instead of being given standard information in large classes, these patients could benefit from individualized instruction and recommendations tailored to their own lives. Spreading instruction across several months so that patients can incorporate lifestyle changes slowly and providing ongoing professional feedback about their self-care behaviours could also be beneficial. Those with moderate glycemic control used rules and procedures effectively during routine care but could not go beyond the rules to compensate for glucose imbal-

ances or coordinate diabetes care with unusual events or circumstances. Such patients need help understanding how to use the principles behind glucose control and practice in decision-making and problem-solving. Those who had well-controlled glucose levels and used feedback to control their diabetes had started self-care with rules and procedures but had slowly, over time, modified the guidelines they were given to accommodate increasing knowledge about the specific functioning of their own bodies.

So how should we go beyond the rules to teach people with diabetes how to control their glucose levels? The key is to give patients the cognitive tools they need to understand glucose dynamics, plan self-care, make decisions about self-management, and recover from glucose imbalances. Teaching people what to eat is a good start, but we need to move beyond this, teaching them to make good decisions on their own and solve problems as they arise. While there have been studies looking at the role of problem-solving in diabetes self-management, there have been few attempts to teach self-management problem-solving skills (Hill-Briggs, 2003; Patterson & Thorne, 2000). One way to provide these skills is to give patients the opportunity to practise making decisions about their self-care in a safe environment and to give them feedback on their choices. Training based on cognition and decision-making has been effective in improving planning, decision-making, and recovering from negative events in many complex domains (Pliske, McCloskey, & Klein, 2001). Decision-making and problem-solving could be taught in diabetes education classes through a series of carefully developed scenarios. Each scenario would present a problem related to self-care and the educator would help the class to think through the problem and evaluate different alternatives. In this way, patients would learn how to react to unusual situations (such as holidays or business trips) and critical events (such as high and low glucose levels). Moreover, by working through multiple scenarios patients would learn what aspects of the environment and their actions affect their glucose and how to use that information to make effective decisions.

Diabetes self-care is complex and difficult. It entails the management of a dynamic system and the coordination of many different elements. Understanding patient cognition and providing training for decision-making and problem-solving cannot solve the problems of diabetes self-care. There are many other social, medical, and institutional problems that must also be addressed. But examining how patients understand self-care and the dynamics of glucose regulation may at least allow us to use tools that have been developed for solving similarly complex problems in other domains to help improve patient education, autonomy, self-care, and glucose control.

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