

## **Self-Management phase Peter (diabetes mellitus 1)**

Peter wants to visit his internist for his quarterly checkup at the hospital. He has been diagnosed with Type 1 DM since he was 19 years. Thus for 24 years he has been living with Type 1 DM. Quite a long time. Peter and his internist make an appointment. Before this appointment Peter is scheduled for some lab research and is invited to fill out some online questionnaires in the online patient portal

### Week 1

Peter is interested to use POWER2DM and starts the web-service at his laptop Saturday morning after his visit to the internist. POWER2DM offers Peter a visual tour of the system, because this is his first visit. Peter accepts and gets acquainted with the various functions of POWER2DM. In the tour Peter is invited to personalize his account. He can upload a photo, connect his digital agenda with POWER2DM, set ringtones and time zone and choose an avatar who will guide him through the system and can be asked for help. He also wants to receive news about POWER2DM and Diabetes once a week through his email account which he enters in the system.

POWER2DM also inquires if Peter uses certain glucose monitors by providing a list of possible monitors. Peter selects his device. POWER2DM offers to log his data directly from his monitor into the online log-book of Power2DM. Peter agrees and goes through the steps to link his monitor to POWER2DM. This check is also done for other measures/wearables.

In the next step of the tour POWER2DM asks for other specific apps or wearables that may provide useful information for the management of his Diabetes. Peter realizes that his Fitbit data can be uploaded to POWER2DM. Peter follows the instructions how to connect his Fitbit to POWER2DM. Peter is pleased that also other medical devices like blood pressure monitors or pulsioxymeters may interact with POWER2DM, although he is not using those devices at the time. He also uses the app "mySugr Diabetes Logbook", but to his disappointment it is not possible to link this app with POWER2DM. However, POWER2DM tells him that POWER2DM provides its own logbook.

During the tour he is also asked about privacy and security settings. Peter has to indicate which health professionals take care of his diabetes and who are allowed access to his personal data. He allows his internist and his specialized Diabetes nurse to access his data. POWER2DM also asks if other people, like a partner, child, parent or friend may have access. Peter decides that the care of his Diabetes is his own responsibility and does not allow private persons to access his data. He also does not want links with his Twitter or Facebook account. He indicates that he wants to be warned if someone tries to access his data, who he did not approve of.

### Value Compass

The psychologist also explained Peter that for a successful execution of the treatment plan, the treatment goals have to agree with his goals and values in life. Personal life goals and values describe what is most important, satisfying and enjoyable in a person's life. Like a compass they can guide a person in the direction that he most wants to go in his life. As Peter wants to have a life full of vitality despite diabetes, he decides to use the "Value Compass" of the Action Plan Engine in order to become more aware of his personal values and to specify them. POWER2DM guides Peter with questions through the Value Compass. Peter realizes that currently two of his personal values are impaired by his diabetes:

- He enjoys running but because of his fear of hypos he nearly stopped his favorite sport. That is something Peter already discussed with his doctor. Being aware that jogging is really a pleasure to him, he is willing to monitor his blood glucose more strictly to avoid hypos and being able again to enjoy jogging without fear.
- Another personal value was painting comics and pictures such as still lifes. He knows that he needs good eyes and calm hands for this hobby. He realises that if he wants to carry on with his hobby in later age, he has to manage his diabetes properly.

After finishing the value check, POWER2DM advises Peter to take the next step to specify the way he wants to manage his diabetes as discussed with his internist.

### Self-management Goals and Activities (Action Plan Engine)

Power2DM shows Peter his self-management goals and plans. Power2DM asks Peter whether these are feasible, and whether he is capable and willing to achieve it. Peter agrees that he is capable and willing to achieve the self-management goals, but they are not feasible. Power2DM asks why they are not feasible enough and Peter indicates that the self-management goals and plans are not specific enough yet. Power2DM provides Peter the opportunity to renew his self-management goals and plans. Based on the treatment goals and on his personal values Peter specifies the following self-management goals:

- Within the next month, monitor blood glucose measurements before going to sports, meetings with his friends from the university and family events
- Carrying quick carbs daily
- Blood glucose monitoring 4 times per day; if Peter meets this goal for the next 6 months he wants to register to one of these expensive, but excellent painting workshops of his favorite artist
- Jogging at least 2 times per week

In the next step Peter breaks down his self-management goals into short-term activities. He uses the calendar in POWER2DM and specifies the following activities:

- Monitor blood glucose at 7:00, 12:00, 18:00 and 21:00, daily and as a repeating activity; Peter activates a reminder for the next 2 weeks, because after 2 weeks he should be used to this activity and assumes that he needs no more reminder for this activity
- Jogging on Wednesday and Friday, 18:30, reminder for the monitoring bag and quick carbs

### Specification of Treatment plan Quick carbs

Power2DM shows Peter his treatment plan to carry quick carbs. By answering POWER2DM's questions he realizes that his plan is not specific enough. The education module of POWER2DM offers Peter an explanation regarding quick carbs and a list to choose from (e.g., Smarties, honey, dextrose tablets). He decides to carry dextrose tablets because they are small and won't melt like Smarties. To get started with carrying dextrose tablets he first has to buy them. He specifies when and where he will buy the tablets in his digital agenda (Buying dextrose tablets and preparing a bag with monitoring equipment and quick carbs, scheduled for Monday 17:00). He agrees that POWER2DM sends him a reminder an hour before that time (JITAI). Peter also agrees that POWER2DM sends him reminders to check if he has still enough tablets. Peter also consents that POWER2DM will invite him to review his action plan by email every week.

A special feature of POWER2DM are the prediction services. The internist told him that using this service would improve his control over hypos. He would be better able to recognize a hypo in time and take quick carbs to prevent the negative effects. So, when Peter finishes specifying the 'quick carbs' action plan, POWER2DM invites him for an educational module how to use the short-term prediction service KADIS. Peter learns which data to enter and how. Also the feedback graphics are explained. To his pleasant surprise he learns that the Fitbit data can be used for KADIS, estimating the amount of exercise, and also the data of his glucose monitor. However, he still has to enter his food intake and insulin injects. He learns that he has to use KADIS 3 consecutive days so the system can determine his personal fingerprint. A part of this calibration phase is that thresholds for hypes and hypos need to be set in collaboration with the specialized diabetes nurse. These thresholds are used to send warnings to Peter. Another important aspect is that Peter learns to use KADIS in these 3 days. When the KADIS system is calibrated to Peter's diabetes, Peter can activate a module that will warn him that a hypo is due in 15 minutes so that Peter has time to take his quick carbs.

Peter decides that planning his 'quick carb', jogging and glucose monitoring activities and learning to use KADIS is sufficient for now. He will go through the treatment plan for "blood glucose monitoring for special events" on a later time. POWER2DM asks him to set a date when he wants to start with this latter treatment plan, so that the system can remind him.

During the next week Peter executes his Action Plan and records data about his activities with his glucose monitor devices and his smartphone.

#### Month 1 (weeks 2-4)

Peter has bought his dextrose tablets at the supermarket and now he always carries them. He did not even need the reminder to buy the tablets, because he had already bought the tablets when he was reminded. He had some spare time and had bought the tablets, without changing the reminder in his digital agenda. When he was reminded he felt good that he already had bought them. When POWER2DM asked if he succeeded in buying the tablets in the weekly review he could answer affirmatively. POWER2DM displays a motivational message (BCT – provide feedback on performance).

Using KADIS was a different story. The link between his glucose monitor and KADIS did not work very well, so he had to enter the glucose data by hand quite often. In addition, entering all these data was quite challenging and reminding him daily that his life was not an ordinary one. After 2 days he was really fed up with the whole system and was entering imaginary data. His specialized diabetes nurse was warned by POWER2DM that really strange data were entered into KADIS. The nurse called Peter to inquire how things were going on. Peter told her about his frustration with the KADIS system. The nurse understood and suggested him to get a different glucose monitor that would better link with KADIS. The nurse arranged that Peter got a different monitor. She advised him to take a break and restart using KADIS after a week. The nurse entered a reminder for Peter in POWER2DM that he would start using KADIS again.

Peter starts using KADIS again and this time the glucose monitor works very well. He does not have to enter the glucose data by hand anymore. What is still tiresome is entering the food intake. It takes quite some time and therefore he fills in the food intake only in the evening. Then he usually forgets a few things he has eaten during the day. POWER2DM warns him that without timely registrations of his food intake KADIS cannot predict. At the weekly review of action plans in POWER2DM Peter admits that using KADIS is not going very well because of the food intake registrations. POWER2DM refers Peter to the barriers

analysis of the Action Plan Engine. By guiding questions he is able to locate specific barriers. It seems that entering the food intake is a very boring activity that is easily forgotten. POWER2DM suggests possible coping strategies how to cope with his barrier. (BCT – barrier identification / problem solving).

Peter tries for a third time to use KADIS properly and now it goes well. To motivate Peter to use KADIS the gaming version is activated by the specialist nurse. Peter is randomly coupled to another novice KADIS user and they compete who is the best in entering the food intake. Peter likes the competition-aspect of entering the food intake. He really wants to beat this other POWER2DM user. He soon masters the super-expert level and gets very well in the table charts. The real benefit is that KADIS now gets correct data to predict hypens and hypos. At the end of the first month Peter receives a warning from KADIS that he needs to take quick carbs. Peter is so surprised that he does not believe it. He does not act on this warning. Unfortunately KADIS was right and Peter experiences the start of a hypo, before he takes his quick carbs. Peter realizes the benefits of KADIS' warning and next time he will take it seriously.

#### Month 2-4

Peter receives the reminder from POWER2DM to start with his second treatment plan “blood glucose monitoring for special events”. The Goal and Plan check shows that the plan needs more specification before executing it. First, the focus will be on the soccer events. Peter trains once a week on Thursday and has a match on Sunday. The training is a fixed time once a week (8.00-9.30 PM), but the matches differ in time on Sunday. Peter activates reminders for his soccer dates to be send to his smartphone. He will be reminded of preparing and bringing a bag with monitoring equipment to these events. First, he has to prepare this bag and place it next to his soccer gear. Next, he needs to make a detailed action and coping plan. For instance, Peter has to check his glucose level 30 minutes before the game to decide to take extra carbs or an insulin inject. He has to decide where he can do that privately, because he does not want other people to watch him. So, he decides that he does that at home, just before he leaves. POWER2DM action planning engine assists Peter in specifying his actions, by asking questions that Peter have to fill in and POWER2DM can provide some suggestions. In doing so, Peter comes up with a plan in case the soccer match is outbound. In that case he will check his glucose level in his car. The whole action plan is broken down in a chronological order what Peter has to do to execute this plan.

POWER2DM suggests that Peter asks a soccer friend to help him execute this plan, because it is quite an elaborated plan. This friend will also provide social support. Peter first does not like this suggestion, because he wants to be treated as a normal person by his friends, but he acknowledges that the help of his friend would be very supporting. Peter and his friend Whatsapp each other before a match and his friend helps him before and after the game with monitoring his glucose levels and balancing his food intake, soccer exercise and insulin shots. POWER2DM checks whether Peter perceives this plan to be feasible and Peter agrees.

POWER2DM suggest that Peter can use KADIS to get a clearer picture of balancing food intake, exercise, and insulin injects to retain at a stable glucose level during soccer training and matches. Peter agrees, because he is already experienced in using KADIS. He clearly recognizes the benefits.

The first 2 or 3 weeks it is quite a conscious processing of the steps that need to be taken to execute the plan. Getting the bag, checking if everything is in the bag. Check glucose level 30 minutes before the game and after the game. Also other back-up plans are thought off, given unexpected barriers that happened, like a parking area quite far away from the soccer

field. For Peter it is great that his friend helps him with thinking of new solutions how to deal with new barriers. Also the emotional support is appreciated. Using KADIS clarifies what the best combination of food intake and insulin injects is during the soccer training and matches. KADIS shows the effects of food intake and exercise hours before the game.

After 3 to 4 weeks monitoring glucose levels during soccer becomes habitual. Peter does not have to think about what to take in his bag, also balancing everything to prevent hypos or hypers during the training and game goes very well. Only last time when he had a cold, things needed a closer monitoring.

All in all he feels much more normal now he manages his diabetes much better, so that he hardly has hypos or hypers anymore.

### Evaluation and Feedback

Peter returns to the internist for his quarterly check-up. His internist is already informed by the POWER2DM reports that Peter is doing fine at the moment. Peter and the internist evaluate the successes and failures in past 4 months. Also using POWER2DM is evaluated. Peter's HbA1c is fine and also his quality of life is improved. There is no problem to be analyzed. Peter and the internist decide that Peter can continue with the same treatment goals and plans in the next 4 months.