

Qualitative study on nursing processes to support blood glucose pattern management in Japan

Yasuko Shimizu¹, Mika Mizuno², Kyoko Uchiumi³, Natsuko Seto⁴ and Harue Masaki⁵

¹Division of Health Sciences, Osaka University Graduate School of Medicine, Osaka, Japan; ²Hara Clinic, Nagoya, Japan; ³Iwate Prefectural University Graduate School of Nursing, Iwate, Japan; ⁴Center for Medical Education, Kansai Medical University, Osaka, Japan; ⁵Chiba University Graduate School of Nursing, Chiba, Japan

A structured approach to self-monitoring of blood glucose and blood glucose pattern management (BGPM) is crucial in diabetes management. However, nursing processes for supporting BGPM among people with diabetes has not been studied. Here we described the process used by nurses certified in diabetes nursing in Japan to support BGPM among people with diabetes. Eleven nurses certified in diabetes nursing in Japan, with actual experience in supporting BGPM. We conducted semi-structured interviews with participants using an interview guide. The interview content was recorded on an IC recorder after obtaining consent. Qualitative analyses of data were conducted by qualitative synthesis. Based on the interviews with the 11 participants, 8 themes regarding the process of supporting BGPM were identified. These themes were as follows: 'underlying supportive environment: a place where you can state what has been on your mind', 'sharing goals: exploring the person's interest and finding clues', 'collaboration: finding patterns and devising measures', 'collaboration: considering effective and less burdensome blood glucose measurement and recording methods', 'leading to the next step: a long-range step-by-step perspective', 'support of active learning: utilising experiences and fostering independent thinking', 'mutual confidence: reward their efforts and trust their potential' and 'team approach: multilateral care'. Thereafter, the eight themes were schematised and the process of supporting BGPM was determined. Thus, we clarified the process of supporting BGPM and provided suggestions on how to utilise BGPM in ordinary nursing.

Key words: Diabetes nursing, Pattern management, Qualitative synthesis method (KJ method), SMBG, Education

Introduction

Diabetes treatment is dependent on diet, exercise and pharmacotherapy and persons need to manage their own daily lifestyles. Blood glucose pattern management (BGPM) is one method for evaluating and revising such self-management based on BG levels. BGPM is an 'application of a systematic analysis of data by both persons with diabetes, and healthcare providers in the daily weekly, and long-term management of blood glucose levels'.¹ BGPM is a process of recognising BG level patterns, detecting factors that cause people with diabetes (PWDs) to miss their BG level goals and discussing better techniques for diabetes management with PWDs and other healthcare professionals. Therefore, 'the process provides persons with information to make decisions regarding their diabetes self-management'.²

In BGPM, BG measurement is an important tool for aiding PWDs in understanding their BG pattern, and self-monitoring of BG (SMBG) is useful in solving problems and improving decision-making skills.³ Many studies that have not clearly described BGPM have used SMBG so that persons can understand their own BG levels and have demonstrated its efficacy in adjusting self-management.^{4–10} For example, the Dose Adjustment For

Normal Eating (DAFNE) study develops programmes to support insulin adjustment that matches the lifestyle of people with Type 1 diabetes.^{11–13} This study also included BGPM support because it included a process of learning about BG levels and analysing influencing factors. SMBG efficacy was reported in people with Type 1 diabetes and in those with Type 2 diabetes, who are not taking insulin.¹⁴ Various research results indicating methods to expand the scope for BGPM support are being published, including BG pattern analysis with continuous glucose monitoring,¹⁵ adjustments to record sheets¹⁶ and utilisation with real-time automatic messaging.

BGPM includes core concepts of the American Association of Diabetes Educators.¹⁷ Although BGPM is recommended,^{10,18–22} there is no research that shows how nurses provide support for PWDs. Relevant facts regarding BGPM nursing practices and the means to overcome attendant problems related to supporting BGPM among PWDs are needed to better distribute BGPM. In Japan, nurses with >5 years' experience in nursing (including >3 years' experience in diabetes nursing) take training for 6 months, pass the examination to obtain certification and obtain a licence as a diabetes specialist nurse (DSN). Because this training programme

includes BGPM, DSNs require the skill to support BGPM among PWDs.

Study objectives

To describe the process implemented by DSNs in Japan for supporting BGPM among PWDs.

Terminology

Blood glucose pattern management BGPM refers to a method aimed at improving BG control by ascertaining changes (patterns) in BG levels and conducting a systematic and multidimensional analysis of factors contributing to these patterns. Here BGPM includes reviewing SMBG or HbA1c results and identifying patterns in BG levels by PWDs and nurses to determine the changes required.

DSNs DSNs are specialists trained in diabetes nursing and are certified by Japanese Nursing Association (JNA) (In Japan, JNA has named the DSN certification as Certified Nurse in Diabetes Nursing). DSN obtain certification by accumulating more than 5 years of experience, obtaining a national licence for nurses and then passing the credentialing examination conducted by JNA after completing the required education programme for certification. Supporting BGPM is a recognised role of DSNs. The accreditation of DSNs was started in 2002, and in 2017, the number of certified nurses is 863.

Medical care is provided to PWDs in Japan in accordance with the national health insurance system. DSNs directly provide nursing to PWDs receiving outpatient care or to those who are hospitalised. They are also responsible for providing advice on diabetes nursing to nurses who are not diabetes specialists and implementing training; however, the assignment of DSNs in hospitals does not directly affect medical remuneration (remuneration received by the hospital for the medical care provided).

Although the adjustment of drugs (e.g. insulin) may be required during BGPM support, DSNs do not have the authority to prescribe or adjust drugs in Japan. Despite this, DNNs conduct BGPM support while creating proposals and consulting with doctors regarding adjusting the type and amount of insulin in accordance with the status of PWDs.

Method

Research participants

Those with a DSN licence and actual experience in supporting BGPM were selected.

Recruitment

We selected certified participants for our study. The selection criteria were that they were DSNs, had experience in supporting BGPM in PWDs and had consented to participate in this research. Some participants were selected because they had experience in supporting BGPM and had agreed to participate in this research in our previous

study. We then asked them to introduce other qualified participants to our study.

Data collection

We (YS and MM) conducted one-on-one semi-structured interviews with participants in Japanese using an interview guide. The questions included the following: please tell me how to proceed with support for blood sugar pattern management and what are the important points for supporting it? Each interview was individually conducted for approximately 1 hour in a room where privacy was maintained. The interview content was recorded on an IC recorder after obtaining consent, and it was converted into data as a verbatim record. Interviews lasted for 40–80 minutes.

Data analysis

Qualitative analysis was performed according to the qualitative synthesis method (KJ method). The qualitative synthesis method originally developed by Kawakita was adopted in this study.^{23–26} Kawakita explains that this method of analysis is suitable for identifying a rational framework and order from complicated and diverse contents of phenomena. The qualitative synthesis method (KJ method) was performed according to the following procedure. First, the content supporting BGPM was individually extracted from a verbatim record of interviews as codes. Next, the codes were repeatedly checked, similar codes were identified and categories were created for each group. Each category was accompanied by an explanation text summarising its meaning; the new category became a new code and was used for categorising the next stage. During qualitative integration, to advance categorisation by carefully examining the similarity between semantic contents of each code, the number of codes gathered in one categorisation step was limited to approximately 2–4. Because of this, categorisation was repeated many times until the number of categories was 6–8. These final categories then formed themes. By structuring the ultimately derived themes, the process was revealed.

Ensuring credibility and authenticity

Data analysis was conducted by two researchers (MM and YS). Before data analysis, MM received basic training in the qualitative synthesis method (KJ method). YS is a licensed basic trainer of the qualitative synthesis method (KJ method). At each stage of the analysis, we mutually confirmed the coding and categories and proceeded with mutual agreement.

Study ethics

Written informed consent was obtained from all participants, who understood that participation was voluntary and that all information would be stored securely. Ethical approval was obtained from the Health Science Ethics Committee of Osaka University School of Medicine (approval number 204).

Results

Participants

A total of 11 participants were interviewed. Participants were females aged 38–55 years, with nursing experience of 8–22 years. They had been certified in diabetes nursing for 1–14 years.

Theme of supporting BGPM

The number of codes extracted from the interviews of 11 participants was 412. Categorisation was repeated 10 times. Finally, eight themes were identified for nursing processes to support BGPM. These eight themes are elaborated below.

(1) Underlying supportive environment: fostering interest and motivation for self-management.

As a premise of supporting BGPM, participants built relationships with PWDs so that they could state what has been on their mind, which would foster interest and motivation for self-management. BGPM was not initiated at the beginning of the interaction. Participants supported PWDs concerns and problems while respecting their intentions or thoughts.

First, I was concerned about PWD's facial expressions and initiated involvement. She said she had no intention of stopping snacking because of her diabetes. It took me some time until I could talk to her. (DSN-F)

When I listened carefully to PWD, I found that he was not convinced about the doctor's treatment plan and I suggested that he have his doctor explain the treatment plan to him again. After that, his facial expression got brighter. (DSN-J)

Rather than supporting BGPM from the beginning, I think it's important to focus on something of real interest to PWD. (DSN-J)

(2) Sharing goals: exploring the person's interest and finding clues.

At the start of BGPM, participants asked PWDs about their thoughts on diabetes and SMBG and explored their concerns regarding or interest in their BG level. Participants found clues to support BGPM based on PWD's concerns and interests, even if what they thought PWD should do was temporarily not considered. Through co-operative thinking, PWD and nurse could solve PWD's problems and share BGPM goals.

I ask PWDs what they are worried about, not what I am worried about. I ask PWDs what they feel while doing self-management in their daily living. (DSN-F)

First of all, I (a nurse) wanted him to implement protein restriction because of his diabetic nephropathy, but he was worried about his hypoglycaemia. Because of that, he and I worked on improving the hypoglycaemia utilising BGPM. After that,

when the hypoglycaemia was improved, he exhibited increased self-efficacy and could now work on protein restriction. (DSN-J)

(3) Collaboration: finding patterns and devising measures.

After sharing goals with PWDs, participants along with PWDs tried to identify BG patterns and factors of the patterns. Subsequently, they proposed solutions that PWDs can implement in their lives among many options, including insulin adjustments. Participants devised measures to follow these solutions with PWDs. They thought it was important to propose the execution of measures by which PWDs can realise the effectiveness.

I and a PWD who worked in a cake shop found a rising pattern of BG during Christmas or Valentine's day, when he had to make plenty of cakes, so we devised a plan for adjusting the basal amount of insulin at that time. (DSN-C)

When utilising BGPM, it is not enough for a nurse to point out whether the PWD's BG level is high or low. PWDs should know because if they do not know how to deal with it specifically, they will not be able to feel an effect of BGPM. (DSN-J)

(4) Collaboration: considering effective and less burdensome means.

Participants suggested a timing and/or frequency of SMBG that was not a heavy burden but was also effective for PWDs. For example, if the time of BG measurement is recorded, it is not necessary to force yourself to measure exactly 2 hours after a meal. If it is difficult to measure during the day, you can try measuring before going to bed.

Participants thought that it was important for PWDs to record living conditions in addition to BG levels because recording them increased reflective self-awareness in PWDs and/or made it possible to examine multifarious influencing factors of BG patterns.

I think it is important to be able to have a time to reflect on the whole day when you measure BG before going to bed. It is easier to measure BG before going to bed. (DSN-G)

When I suggested to a PWD that he measure BG at 2 h after he ate snacks, he was willing to try it. (DSN-G)

(5) Leading to the next step: a long-range and step-by-step perspective.

Participants were supporting PWDs to master BGPM in a step-by-step manner rather than in a short period while paying attention to not make them anxious. They had a long-range perspective that supported the step-by-step approach, which would lead to mastery of BGPM.

First of all, a PWD and I tried to deal with hypoglycaemia, although her HbA1c level was very high. When the hypoglycaemia was improved, she became more willing to ask me questions and her attitude towards self-management had become more positive. Then she wanted to improve her HbA1c. (DSN-J)

When I start to support BGPM, I tell PWDs that I will implement it gradually, so it will be fine. (DSN-G)

(6) Support of active learning: utilizing experiences and fostering independent thinking.

Participants paid attention to PWDs who did not think BGPM was so difficult initially. Therefore, participants did not provide PWDs too much information at first and explained BGPM in simple terms. Because participants considered that the process in which PWDs learn by themselves was important, they promoted their reflections on the basis of their experiences and promoted thinking and questioning by PWDs themselves.

When a PWD learns the basics of BGPM and asks me more questions than before, I think the BGPM education is going well. DSN-H)

There are some PWDs who can give their own answers if I wait for a while after their reflection. Nurses have to wait while PWDs think for themselves. (DSN-G)

(7) Mutual confidence: reward their efforts and trust their potential.

Participants stated they try not to forget that it is troublesome for PWDs to measure BG and/or take records

every day, although they tended to focus on things that PWDs could not do. Participants encouraged PWDs to be pleased with any improvements in BG control and commended their efforts and hard work even if improvements were not observed, increasing PWDs' self-esteem and confidence to focus on the next step. Participants believed PWDs had the potential to do it.

When I am checking values of BG for supporting BGPM, I tend to point out only the problems of PWDs. So, I also try to point out good things. (DSN-C)

Even PWDs who do not seem to be interested in diabetes are coming to a clinic regularly because they care and/or are worried about something. I think they have potential. (DSN-J)

(8) Team approach: multilateral support.

Participants described that collaborating with a team gave them multilateral viewpoints and increased their skills in BGPM. Building a relationship of trust with physicians made supporting BGPM easier than before. Goals could be shared and information exchange was more accessible with a team of health professionals.

When a case conference about BGPM was held, I noticed factors affecting BG that I did not notice before the case conference. (DSN-B)

Physicians trust me, so they do not say my proposal is useless. (DSN-E)

I gave a lecture about BGPM to nurses. (DSN-C)

Process of supporting BGPM

The eight themes were shown as a process like Figure 1.

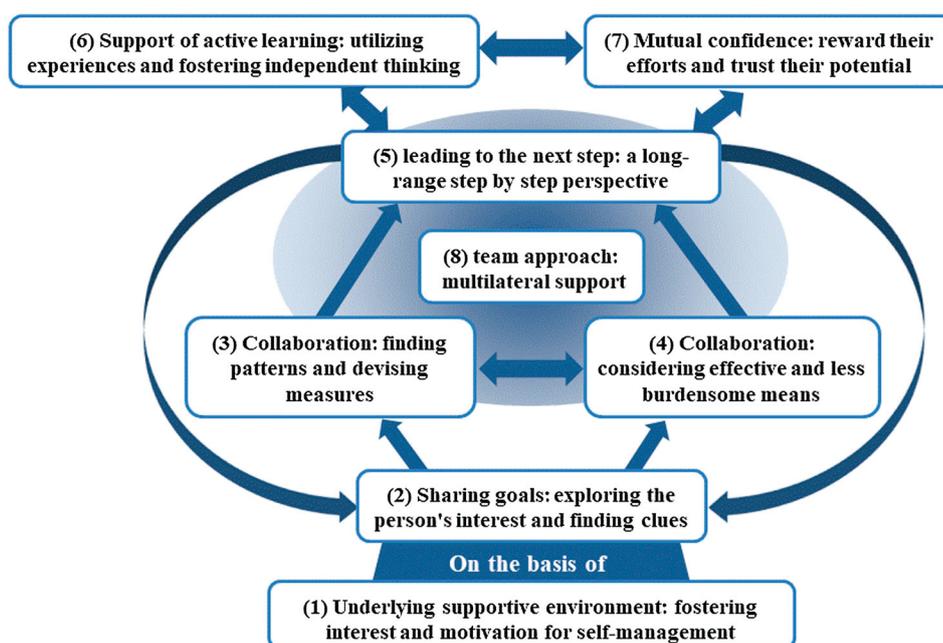


Figure 1. The nursing processes to support blood glucose pattern management in Japan.

Discussion

Pearson and Bergenstal²⁷ demonstrated that pattern management involves five basic steps:

1. know the target BG range,
2. gather required data: BG levels, carbohydrates/meal, insulin doses, activity levels, schedule, physical and emotional stress,
3. look for patterns,
4. assess influencing factors,
5. take action.

A comparison of processes clarified here indicates that step 1 is included in ‘sharing goals: exploring the person’s interest and finding clues’ and that steps 2, 3, 4 and 5 are included in ‘(3) collaboration: finding patterns and devising measures’. ‘(4) Collaboration: considering effective and less burdensome means’ could be described as the content required to support SMBG measurement and provide records for step 2. Although the AADE core curriculum states that ‘the first step in pattern management is to identify BG goals and monitor BG levels 4–6 times per day’,²⁸ the participants had not necessarily started pattern management following this prescribed method. There were instances when, hints and clues regarding the person’s interest, such as them saying ‘I am worried about my BG levels’, were used to construct countermeasures based on the currently available data, despite the person not frequently measuring their BG; PWDs were encouraged to measure their BG at points that could allow them to understand their own patterns so as to prevent hypoglycaemia. Detecting patterns based on frequent BG measurements and necessary collected data is the most reliable and effective method. However, in actual care situations, encouraging the PWD to frequently measure their BG from the start and requiring precise information gathering is often too demanding for PWDs and does not lead to pattern management utilisation. Therefore, nurses do not consider this to be an ideal method and they appear to propose methods in accordance with the person’s interests or those that do not place too much burden on the PWD while utilising pattern management. Polonsky *et al.* reported that offering support with BG level record sheets devised for peoples with Type 2 diabetes who were not undergoing insulin therapy led to improvement in BG levels even if the mean number of times BG was measured was 0.97–0.77/day.¹⁴ The Diabetes Attitudes, Wishes and Needs study²⁹ mentioned ‘the need to focus on psychosocial concerns to improve DM outcomes’. The results of our study indicate that in pattern management care, it is vital that care takes psychosocial worries into account rather than simply pushing the PWD to adopt, what we believe to be, the ideal method. If evidence for patient-focussed adjustments to care methods clarified in this study could be demonstrated similarly to that observed in the study by Polonsky *et al.*, the scope for pattern management utilisation could be further widened.

We found that in ‘(5) leading to the next step’, ‘(6) support of active learning’ and ‘(7) mutual confidence’, which are the underlying themes of this study, DSNs offered care so that PWDs could learn through their experiences in BG pattern management while slowly acquiring the skills to use it themselves. DAFNE, a programme for people with Type 1 diabetes, which includes the concept of pattern management,^{30,11} describes the necessity of first implementing intensive learning for carbohydrate counting and insulin adjustment methods over 5 days. Pearson and Bergenstal²⁷ also described the necessity of intensive education when first implementing care. In the study by Polonsky *et al.*,^{14,31,32} adjusting record sheets and explaining methods used made pattern management throughout subsequent follow-up possible. Some of the participants in our study considered it important to follow a step-by-step approach based on experiences, such as ‘If you start from difficult topics such as carbohydrate counting and methods of insulin adjustment, the PWD could feel that this would be very hard and become discouraged’. It is not easy to continuously measure and record BG for pattern management.^{33–35} When considering care, in accordance with each PWD’s characteristics, and short-term intensive learning, the clarification of care that will facilitate pattern management learning with continuous involvement, as indicated by Powers² appears to be important for widening the scope for pattern management utilisation.

Thus, our study found that nurses in Japan consider (2) ‘sharing goals’ based on (1) ‘underlying supportive environment’ to be important for initiating pattern management. In doing this, nurses appeared to offer support that made it easier for PWDs to utilise BGPM in their daily lifestyles. By focusing on (4) ‘collaboration: considering effective and less burdensome means’ and (5) ‘leading to the next step’, long-term, rather than short-term, support for GBPM could be offered. Because of the limited number of SMBG measurements and the fact that the ideal measurement timing was missed at the initial time point, nurses could not perform BGPM at first. Instead of doing so, the nurses offered support by suggesting the timing of SMBG where patterns could be determined even with a small number of measurements. These results suggest that the range of BGPM utilisation had expanded by being demonstrated in practice, leading to better self-management. As no previous studies have reported such findings, we consider our study to be novel.

Pattern management leads to increased self-monitoring ability. Such self-monitoring is important to allow PWDs to sort options that are important for them to skilfully incorporate meals and self-management into their lifestyle. Advances in CGM devices and information technology will ensure that blood sugar patterns can be calculated on computers in the immediate future. It remains important for nurses to continue to fulfil their role of offering support with (1) ‘underlying supportive

environment', (2) 'sharing goals' and (3) 'support of active learning' while utilising pattern management to help individuals increase their ability to self-monitor.

Limitations of this study and future issues

Results of this study were clarified based on interviews with participating DSNs. Thus, the fact that we did not participate in and observe actual care situations in PWDs may be a limitation to data collected in this study. However, because we could interview 11 DSNs with different years of experience and who worked at facilities with different characteristics, we believe that we were able to obtain highly diverse data and clearly demonstrate the state of care, including nurses' intentions based on their previous experience and their future objectives.

Going forward, effects and evidence of BGPM will need to be investigated based on these results.

Conclusion

BGPM plays an important role in helping PWDs to incorporate their diabetes regimen into their daily lifestyle. The results of this study revealed that when supporting BGPM, nurses consider the person's interests and suggestions for aiding them in incorporating BGPM into their lifestyle and consider it important to start (2) 'sharing goals'. These results suggest that the flexible and creative utilisation of BGPM in accordance with the individual lifestyles of PWDs makes it possible to implement long-term, rather than short-term, support, which could lead to possibilities of expanded opportunities for BGPM utilisation.

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