

Creation and evaluation of a method for improving self-management skills for patients with type 1 diabetes utilizing an Internet bulletin board

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Creation and evaluation of a method for improving self-management skills for patients with type 1 diabetes utilizing an Internet bulletin board

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Abstract

This study was carried out to create and evaluate the effects of an Internet bulletin board for self-management support that would allow type 1 diabetes patients to acquire information and learn specific measures for the improvement of blood glucose control as well as provide a point of contact for psychological support. The bulletin board operated from January 4, 2010 until January 31, 2011. Bulletin board membership was restricted to type 1 diabetes patients, their families, medical care professionals (physicians and nurses), and the researcher (webmaster). Troubles being faced by patients, ideas about glucose control, and professional knowledge from medical staff were exchanged on the bulletin board. The researcher obtained permission from the patients to obtain output self-monitoring of blood glucose, attended the examination of the patients, and asked questions to clarify the relationship between the data and the daily behavior of the patients at the outpatient clinic. The effects of this study were evaluated based on the changes of HbA1c, measurement of blood glucose, and changes of blood glucose control, diabetes-related stress, and interviews. As a result, HbA1c decreased significantly over eight months compared with levels at the beginning of the study and remained significantly different for five months. Only two subjects shifted to greater than three times per day from fewer than three times per day. Both the group that wrote about their self-evaluation on the bulletin board and the group that did not write about their self-evaluation showed improvement in the acquisition of information. The group that described their self-evaluations on the bulletin board became more aware of changes in blood glucose measurement and control. The Problem Area in Diabetes Survey (PAID) consists of 20 items addressing diabetes-related stress, with higher total scores indicating higher diabetes-related stress, including stress related to treatment, and a higher score also means a lower Quality of Life (QOL). Items whose scores showed particularly significant increases were item 1, "Not having clear and concrete goals for your diabetes care," item 7, "Not knowing if your mood or feeling are related to your diabetes," and item 11, "Feeling constantly concerned about food and eating" ($p < 0.01$). Blood glucose awareness training (BGAT) is a method that helps patients predict blood sugar from actions prior to measurement and bring the predicted value close to an actual value. While BGAT focuses on equipping patients with the ability to predict their blood glucose level, this study is original in its focus on the improvement of self-management by way of, for example, the acquisition of information and blood glucose control.

There have been no reports on effective measures using an Internet bulletin board with the participation of both patients and medical professionals. This study provided support measures that allowed type 1 diabetes patients to discuss methods of blood glucose control and other efforts on an Internet bulletin board.

Key words

type 1 diabetes mellitus, self-management, control, support, evaluation

Introduction

Type 1 diabetes mellitus is an autoimmune disease characterized by insufficient amounts of insulin to control blood glucose, requiring lifelong treatment through self-management that involves the daily regulation of insulin according to activity and conditions. Type 1 diabetes onset occurs at younger ages compared with type 2 diabetes, and there are significant differences among individuals related to growth, exercise, and diet. The psychological impact of the disease can also result in significant changes in blood glucose and difficulty in control. It has also been reported that self-management of blood glucose involves significant psychological burden at different developmental stages, which causes problems in achieving treatment goals^{1,2)}. Although summer camps for diabetes patients have been offered, they are limited to children, making it difficult to fully address issues faced by all type 1 diabetes patients. Additionally, the incidence of type 1 diabetes mellitus in children (14 years old or younger) in Japan is 2.4 per 100,000 people³⁾, making it hard for patients to share information on treatment and for physicians to gain the experience required to give the most effective advice. Studies have examined type 1 diabetes patient psychology⁴⁻⁶⁾; however, there are insufficient reports on specific methods of support that can be offered. These results suggested that the need for patients to have someone to consult with or some other means of obtaining information and learn about specific measures for diabetes control.

This study was based on an existing study which concluded that two obstacles to providing support for type 1 diabetes patients are blood glucose control and psychological conflict. Kawahigashi described the psychological characteristics of patients with type 1 diabetes, and identified categories associated with relationships with others around patient and categories that strongly represented the characteristics of type 1 diabetes as a disease with a low incidence and as a disease that required injections and hypoglycemia prevention. Type 1 diabetes patients have feelings of resistance toward looking healthy when they are ill, while

strongly wishing to be healthy. And it was suggested that they are more likely to have a psychological conflicts that influence diabetes control, when they have this conflict for a long period of time⁷⁾. Patients with type I diabetes reported feelings of difficulty in performing daily activities such as eating, exercise, administering injections, hypoglycemia prevention, and coping with hypoglycemia while considering their relations with others. Kawahigashi suggested the necessity of creating a way which works for these two types of psychological characteristics to control type 1 diabetes.

This study, therefore, was carried out to create and evaluate the effects of an Internet bulletin board for self-management support that would allow type 1 diabetes patients to acquire information and learn specific measures for the improvement of blood glucose control as well as provide a point of contact for psychological support.

Explanation of the method utilizing the internet bulletin board

1. The utilization of an Internet bulletin board for self-management support

1) Establishing a membership bulletin board on the Internet

Patients may access this bulletin board via computer or mobile phone and post comments, questions, and responses using anonymous screen names. After registering, members receive a password and explanation of login procedures. As the webmaster for the bulletin board is conducting research as well as promoting support, registrants receive a written explanation of the need to obtain personal information for identification purposes and medical data from clinic visits, and a request for permission to obtain and use such information and data.

2) Members

Bulletin board membership is restricted to type 1 diabetes patients, their families, medical care professionals (physicians and nurses), and the researcher (webmaster).

3) Information exchange among members

Members are free to write about anything on the bulletin board. However, if type 1 diabetes

patients provide advice to other patients, they are required to clearly indicate the source of the information, such as from written material, experience, etc. Figure 1 shows the Internet

bulletin board.

4) Support for blood glucose control

(1) At the outpatient clinic

The researcher obtained permission from the

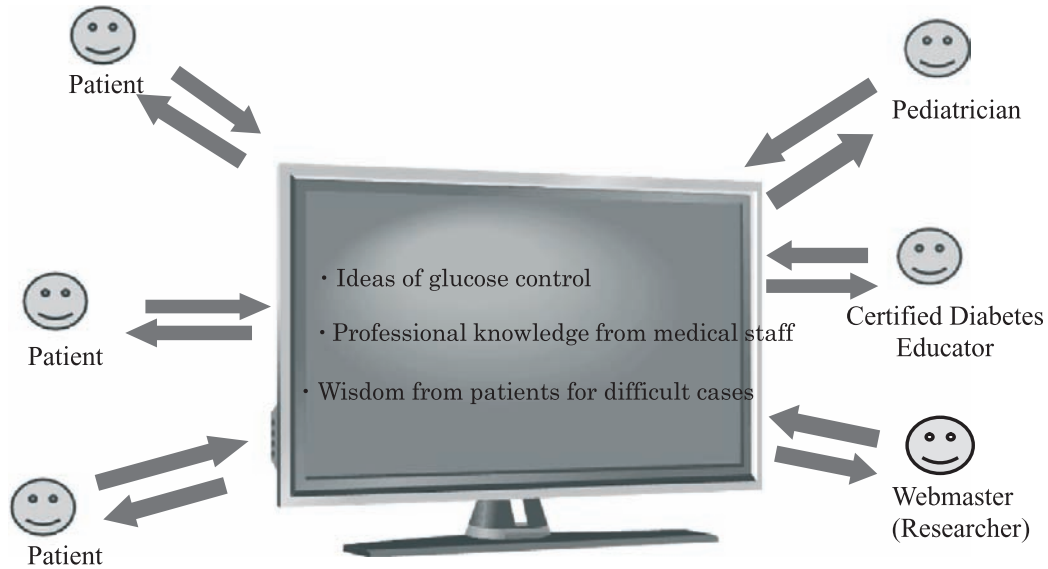


Figure 1. Membership Internet bulletin board for self-management support for patients with type 1 diabetes

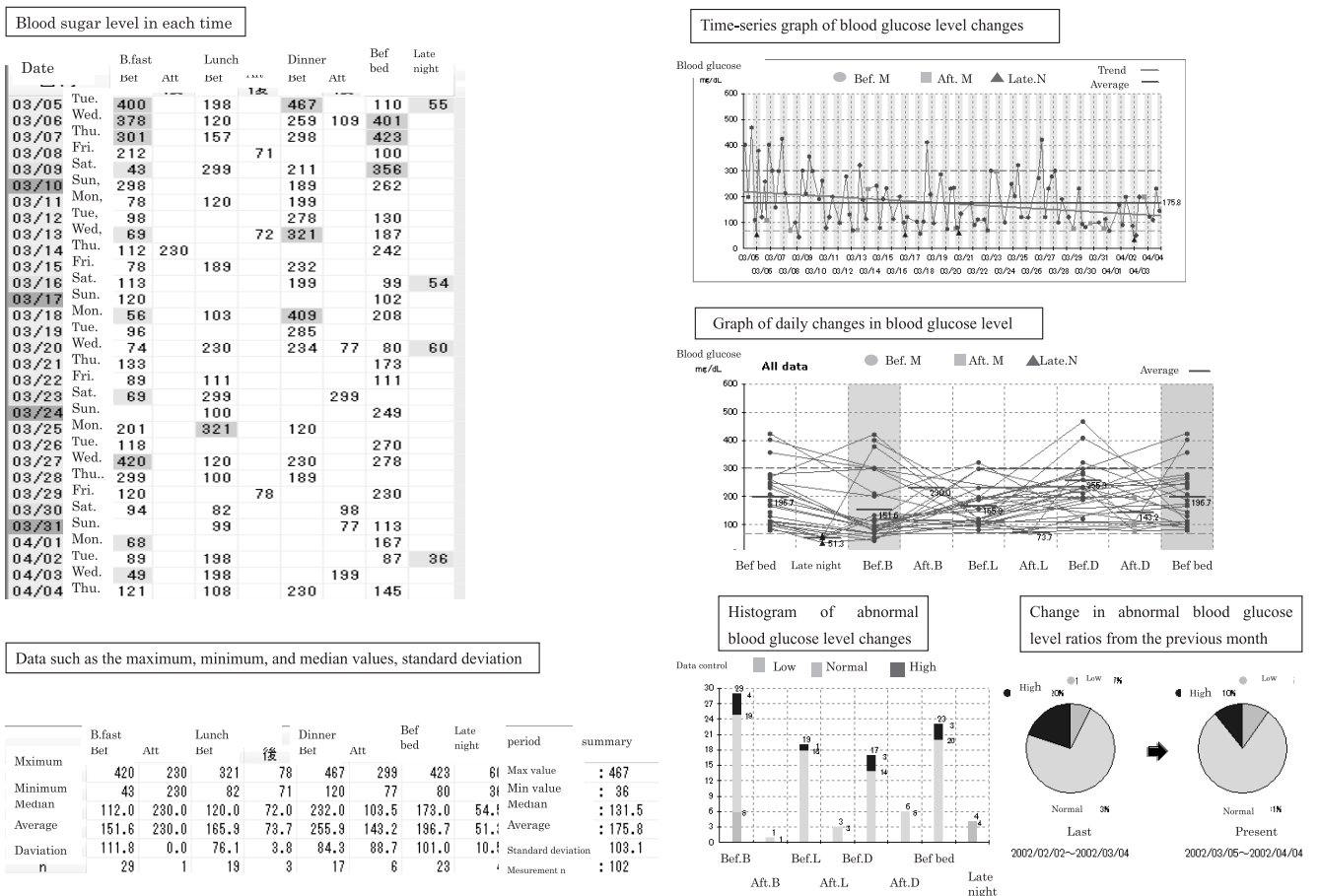


Figure 2. Image of MEQNET SMBG Viewer

patients to obtain output self-monitoring of blood glucose (SMBG) data using blood glucose level management software (MEQNET SMBG ViewerVer. 1.41: ARKRAY), which provides data such as the maximum, minimum, and median values, standard deviation, a time-series graph of blood glucose level changes, a graph of daily changes in blood glucose level, a histogram of abnormal blood glucose level changes, and change in abnormal blood glucose level ratios from the previous month (Figure 2). The researcher also attended the examination of the patients and asked questions to clarify the relationship between the data and the daily behavior of the patients. Furthermore, the researcher provides topics for the bulletin board, if necessary.

(2) Posting on the bulletin board

The researcher/webmaster asks questions on important matters in participatory screening during examinations at the outpatient clinic and posts these along with patient responses on the bulletin board.

5) Information management and the protection of privacy

Personal information provided by the individual registering as a bulletin board member is managed by the webmaster according to the privacy policy, which only allows the webmaster access to personal information. The webmaster manages medical data while others, even the patients and their families, are not allowed access. If someone gains fraudulent access, the webmaster is notified immediately. In addition, the webmaster asked participants to sign a nondisclosure agreement to prevent the disclosure or leak of information, including the password for accessing and the content obtained through the bulletin board, to outsiders.

Methods

1. Participants

The subjects of the study were type 1 diabetes patients seen at the pediatric outpatient clinic at a university hospital. Consent for participation in the study was obtained prior to the start of participation. Three of the 28 patients (visiting the

hospital from October to November in 2009) asked to participate in this study refused consent citing trouble viewing and posting on the bulletin board. Patients who were not interested in the bulletin board or who had no Internet connection were excluded from the subjects.

2. Explanation

To ensure the protection of privacy, explanations of the study objectives were provided to individual participants in a private room at the outpatient clinic. The parents or guardians of participants elementary school-aged subjects attended the explanation. The presence or absence of interest in the bulletin board and access to the Internet were also confirmed.

3. Study period

The bulletin board was set up in mid December 2009 and was operated from January 4, 2010 to January 31, 2011.

4. Data collection

The effects of Internet bulletin board utilization in this study were evaluated based on the following index:

1) Impact on blood glucose control

*HbA1c (%): HbA1c was measured each month and observed for changes.

*Specific value of blood glucose (mg/dl) level for each subject and the number of readings: Subjects were asked to bring their self-management notebook and blood glucose measurement tool to examinations. During examinations, data were analyzed by SMBG data analysis with the MEQNET SMBG Viewer and all the blood glucose measurement values that were not observed from the self-management notebook were collected.

Definition of hyperglycemia & hypoglycemia

Hyperglycemia: Preprandial blood glucose >150,
Postprandial blood glucose >200

Hypoglycemia: Preprandial blood glucose <70,
Postprandial blood glucose <90

2) Impact on treatment behavior

*Acquisition of information, measurement of blood glucose, and changes of blood glucose control: We examined the acquisition of information, blood glucose measurements and control methods using the interview results to find differences between

Table 1. The Problem Areas in Diabetes Survey (PAID) items

PAID item
1. Not having clear and concrete goals for your diabetes care?
2. Feeling discouraged with your diabetes treatment plan?
3. Feeling scared when you think about living with diabetes?
4. Uncomfortable social situations related to your diabetes care (e.g., people telling you what to eat)?
5. Feeling of deprivation regarding food and meals?
6. Feeling depressed when you think about living with diabetes?
7. Not knowing if your mood or feeling are related to your diabetes?
8. Feeling overwhelmed by your diabetes?
9. Worrying about low blood sugar reactions?
10. Feeling angry when you think about living with diabetes?
11. Feeling constantly concerned about food and eating?
12. Worrying about the future and the possibility of serious complications?
13. Feelings of guilt or anxiety when you get off track with your diabetes management?
14. Not "accepting" your diabetes?
15. Feeling unsatisfied with your diabetes physician?
16. Feeling that diabetes is taking up too much of your mental and physical energy everyday?
17. Feeling alone with your diabetes?
18. Feeling that your friends and family are not supportive of your diabetes management efforts?
19. Coping with complications of diabetes?
20. Feeling "burned out" by the constant effort needed to manage diabetes?

those who wrote on the bulletin board and those who did not.

3) Impact on subject psychology

*Diabetes-related stress: Diabetes-related stress of the subjects was measured at the beginning and end of the study using the Problem Area in Diabetes Survey (PAID). Table 1 shows PAID items. According to Ishii (2001), "PAID is a questionnaire measuring diabetes-specific emotional distress, including the impact of diabetes treatment, symptoms, and complications impacting social functions and psychological conditions, recognized as one of the QOL questionnaire specified for diabetes patients. This questionnaire consists of 20 items and exhibits high internal reliability with a 0.95 Cronbach α . All items address diabetes-related stress, with higher total scores indicating higher diabetes-related stress, including stress related to treatment. A higher score also means a lower QOL."⁸⁾ The perfect score for each PAID item is five points. The total score is applied to the next expression: (total score -20) \times 1.25. The total perfect score is converted to 100 points. A score of greater than 60 points indicates a feeling of intermediate burden, and a score of 70 points or more indicates a feeling of high burden.

4) Age, gender, and duration of disease: These items were obtained from the medical records of the subjects

5. Data analysis

1) HbA1c

The change of HbA1c indicated differences in the average between start time and every one month. Paired t-test was used for the valuation of significance.

The object: All examples (because when the parent manages, the children learns for the future)

2) Impact on treatment behavior

We wrote down what the patients shared about the influence on their self-care behaviors.

3) Impact on subject psychology

The PAID total score and the average of each item revealed significant difference at the beginning and the end of the study. Paired t-test was used for the valuation of significance.

The object 2) & 3): 21 patients who were able to reply to the PAID questionnaire and interview by themselves. (While the method of blood sugar management is same for the parent and the patient, only the patient feels the psychological impact of diabetes.)

All statistical software were run on Excel2007

Table 2. Overview of type1 diabetes patient participants at the beginning of the study

Age	20.3 ± 9.8 years (5-40 years of age)	
Attributes	Kindergartener* (1), Elementary school student** (4), Junior high school student (1), High school student (8), University student (2), Adult (9)	
Gender	Male 7, Female 18	
Duration of disease	12.3 ± 10.1 years (1 month-35 years)	
Treatment	MDI*** : 16	CSII**** : 9
HbA1c before intervention	5.0-5.9%: 2	6.0-6.9%: 10
	7.0-7.9%: 9	8.0-8.9%: 2
	9.0-9.9%: 1	10.0% or more: 1

*The mother participates in the bulletin board to assist the kindergartener.

**Elementary school students participate in the bulletin board with their father or mother.

***Multiple daily injections

****Continuous subcutaneous insulin infusion

(12.0, 6565, 5003) SP2.

6. Ethical consideration

The invitation to participate in this study included a written explanation of study objectives, the voluntary nature of the study, the ability to withdraw from study participation at any time, the freedom to participate or not participate in discussions, as well as assurance that participation or non-participation in this study would have no impact on future treatment, that in the event of publication of the results of this study, participants would be anonymized to prevent identification, and that the study results would be made available. It was also explained that this study uses an Internet bulletin board with the password settings, browsing limited to members, and use of screen names. Privacy policies were established for the management of information; however, participants received notice that the existence of and adherence to such policies did not completely alleviate the possibility of information leakage under the server management by a service provider. Written consent was obtained from all participants.

This study was reviewed and approval by the Medical Ethics Committee of Kanazawa University.

Results

1. Overview of participants (Table 2)

A total of 25 type 1 diabetes patients gave consent to participation in the study (example A to Y). Among these subjects were kindergarteners, who posted on the bulletin board with help for

writing from their families, and elementary school students, who posted with their families. A total of 20 cases from 25 examples posted on the bulletin board answered a questionnaire and participated in an interview. In five of 25 examples, a parent posted on the bulletin board in place of their child. Furthermore, one of five examples could reply independently to the PAID questionnaire and interview. Non-patient participants on the bulletin board included eight individuals including two pediatricians, five diabetes nutritionists, and one researcher (webmaster). An overview of type 1 diabetes patient participation is shown in Table 2. There were no dropouts during the period of bulletin board operation.

2. Number of logins to the bulletin board (Figure 3)

The bulletin board operated from January 4, 2010 until January 31, 2011, reaching to 258 comments and 2394 visitor counts.

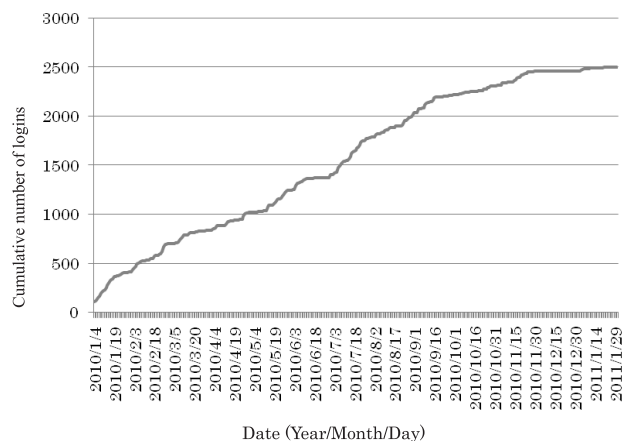


Figure 3. Number of logins to the bulletin board

Table 3. Contents of the bulletin board

	Content of the bulletin board
From patient to medical person	<ul style="list-style-type: none"> ● About medicine (kind and sustained time) ● About relations between movement and blood sugar ● About relations between movement and quantity of insulin ● About overeating ● About pierced earrings ● About a diabetes-related books
From patient to patient	<ul style="list-style-type: none"> ● About symptoms of hypoglycemia and hyperglycemia ● About change in the quantity of insulin by season ● About New Year holidays and blood sugar ● About supplementary diet at the time of hypoglycemia ● About adjustment of insulin by school activity, the event ● About body sense ● About type 1 diabetes mellitus publications ● About how to get along with type 1 diabetes mellitus

Table 4. HbA1c change: Average values and standard deviation

January 2010	February 2010	March 2010	April 2010	May 2010	June 2010	July 2010
7.1 ± 1.07%	7.0 ± 1.06%	7.0 ± 1.07%	7.2 ± 1.32%	7.0 ± 1.25%	6.9 ± 1.18%	6.8 ± 1.10%
August 2010	September 2010	October 2010	November 2010	December 2010	January 2010	February 2010
6.7 ± 0.72**%	6.7 ± 0.87**%	6.6 ± 0.72**%	6.7 ± 0.78**%	6.8 ± 0.80**%	7.0 ± 0.86%	7.1 ± 0.88%

*p<0.01, **p<0.05 (Significant difference in comparison with the beginning of the study through paired t-test)

3. Contents of the bulletin board (Table 3)

Table 3 shows contents of the bulletin board.

4. Blood glucose control change (Table 4 & Figure 4)

Table 4 & Figure 4 shows that changes of HbA1c. HbA1c decreased significantly over eight months compared with levels at the beginning of the study and remained significantly different for five months; namely, August (p<0.01, t=2.82), September (p<0.01, t=3.98), October (p<0.01, t=4.18), November (p<0.01, t=3.07), and December (p<0.05, t=2.17). Paired t-test was used for the valuation of significance.

5. Changes in the number of blood glucose level self-measurements (Table 5)

Table 5 shows changes in number of blood glucose level self-measurements. According to the DCCT study, intensive insulin therapy with the multiple daily injections (MDI) based on the separation of insulin into additional insulin (bolus) to cover meals and basic insulin (basal) resulted in significantly lower HbA1c compared with the

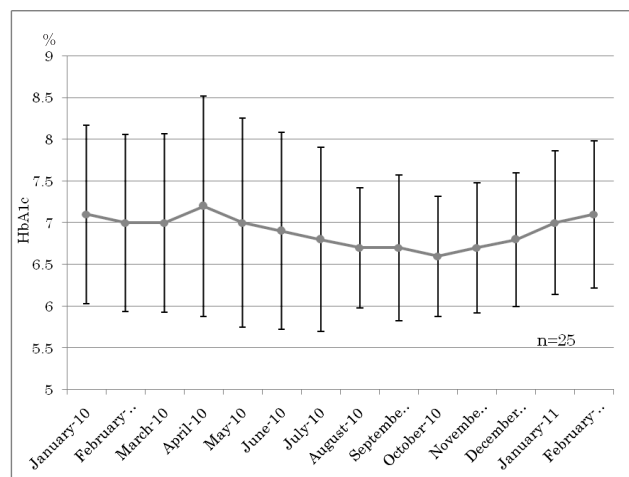


Figure 4. Changes of HbA1c (Average values and standard deviation)

existing method of taking two injections per day and proved more effective for preventing and reducing complications⁹). Therefore, it was necessary to measure blood glucose level greater than three times per day according to the frequency of injections and to divide subjects into two groups to examine changes; one group

Table 5. Changes in the number of blood glucose measurements

Number of blood glucose measurements	Number of subjects	At the end of the study	Number of subjects	Remarks
3 times or more	13	Maintain 3 or more times	11	Blood glucose was measured periodically, or at the time of low and high blood glucose.
		From less than 3 times to 3 or more times	2	The number of measurements increased and the subjects began utilizing the measurements. While both of the subjects measured three or more times and managed the blood glucose level well, they stated their anxiety about high blood glucose and complications.
Less than 3 times	10	Maintain less than 3 times	9	Three subjects measured their blood glucose level sufficiently and controlled it well from before. Two subjects have basal insulin secretion and no difficulty in controlling their blood glucose level. Four subjects know it is better to increase the frequency of measurement, but do not measure because it is a hassle.
		From 3 or more times to less than 3 times	1	The subject understood the importance of blood glucose measurement at the beginning of the study; however, the subject found it troublesome to visit the nursing office for measurement and, in addition, had no subjective symptoms of hyperglycemia, which reduced the frequency of measurement.
Unknown	2	Unknown	2	Neither subject brought the self-management notebook and blood glucose measurement tool. One subject wrote questions about blood glucose control, and he/she began to measure it when necessary (e.g. before exercise). The other subject is not keeping records in the notebook; however, he/she is measuring, and giving advice related to psychological issues on the bulletin board.

administering injections greater than three times per day and one group administering injections fewer than three times per day. Only two subjects shifted to greater than three times per day from fewer than three times per day. Only one subject shifted to administering injections fewer than three times per day from greater than three times per day. Frequency of injections and changes in frequency were unknown for two subjects because they forgot bringing their self-management notebook and blood glucose measurement tools.

6. Changes in measurement method

We showed subject T & L as examples of changes in measurement method. Subject T posted on the bulletin board and subject L did not. The blood glucose level of subject T in January 2010 differs from the HbA1c level (8.4%), which shows that subject T did not measure the blood glucose level at the proper time. The number of subject T's measurements at that time was 2.8 times per day. However, the number of measurements increased to 4.4 times per day in August 2010, and as subject T was able to identify the pattern of low blood glucose in the early morning and high blood glucose during the daytime, subject T began to

administer appropriate additional insulin injections. The HbA1c level of subject T in August was 8.6%, but gradually lowered to 7.6% in September and to 7.1% in October.

In subject L's case, the number of measurement from January to May 2010 was 0.8 times per day. However, the average of the number of times from June 2010 to January 2011 was 3.6 times per day. Although the HbA1c level of subject L was 7.8–8.5% during from January to July in 2010, it fell to 6.8–7.2% during from August 2010 to January 2011.

7. Changes in self-management behavior (Table 6 & 7)

Table 6 and 7 show the changes in subject self-management behavior. The number of subjects who were able to reply to the interview by themselves was 21. Both the group that wrote about self-evaluation on the bulletin board and the group that did not write showed improvement in the acquisition of information. The group that described self-evaluations on the bulletin board became more aware of changes in blood glucose measurement and control. According to the self-evaluations, subjects acquired information on low blood glucose, basic injection methods and food

Table 6. Self-evaluation for changes in information acquisition, blood glucose measurement and control methods

	Information acquisition	Awareness of changes in blood glucose measurement methods	Awareness of changes in blood glucose control methods
9 subjects who have posted on the bulletin board	7 (77.8%)	3 (33.3%)	5 (55.6%)
12 subjects who have not posted on the bulletin board	8 (66.7%)	3 (25.0%)	1 (8.3%)
21 subjects in total	15 (71.4%)	6 (28.6%)	6 (28.6%)

*21 subjects who were able to answer an interview by themselves

Table 7. Evaluation and examples

Evaluation	Examples
Information	<ul style="list-style-type: none"> • Understood effective ways of using insulin. • Understood how others handle at the time of low blood glucose. • Understood the differences in supplementary foods for preventing and at the time of low blood glucose. • Understood the need to be aware of blood glucose control even when getting ears pierced. • Reconfirmed basic injection procedures. • Understood diet regarding blood glucose.
Blood glucose level measurement methods	<ul style="list-style-type: none"> • Started measuring before exercise. • Started measuring often based on the SMBG data. • Became easier to perceive blood glucose level through frequent measurement.
Blood glucose level measurement control methods	<ul style="list-style-type: none"> • Started taking supplementary food after measuring blood glucose instead of at the time of low blood glucose without measurement. • Started taking additional insulin considering the duration of activity from the previous injection. • Started taking additional insulin when they measure a spike during more frequent measurement. • Started taking additional insulin even for a small amount of snacks. • Started being careful about diet and exercise.

closely associated with blood glucose level, essential information for patients. Subjects also mentioned that they started to measure their blood glucose when necessary, such as before exercise. They also mentioned attempting to adjust their blood glucose level through exercise and diet, and take additional insulin as appropriate when the blood glucose level increased after meals and when eating snacks.

Furthermore, subjects whose blood glucose level measurement and control changed mentioned at the final interview that, “Blood glucose measurement is a big hassle, but measurement made me aware of my blood glucose level. As blood sugar control improved, frequency of the hypoglycemic increased, and hypoglycemia led to rebound afterward. When I saw a level of 300 or 400 for blood glucose, I got worried. I became anxious about worse control as the control got better. Therefore, my anxiety

increased more than when I wasn’t measuring my blood glucose.”

8. Comparison of total PAID score and average PAID scores at the beginning and end of the study (Figure 5 & 6)

Figure 5 shows the total PAID score at the beginning and end of the study targeting 21 subjects who responded to the questionnaire. At the beginning of the study, the total PAID score was 24.5 point, and at the end of the study total PAID score was 31.4 point. The total PAID score at the end of the study showed significant increases ($p < 0.01$, $t = -3.04$) compared with the beginning of the study.

Figure 6 shows the average scores of PAID at the beginning and end of the study targeting 21 subjects who responded to the questionnaire. Average PAID scores increased for all items, and items whose scores showed particularly significant

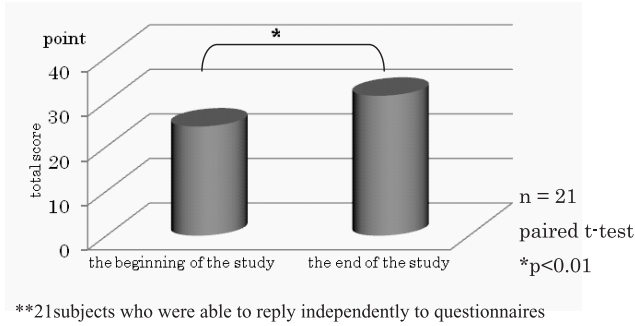


Figure 5. Comparison of total PAID scores at the beginning and end of the study

increases were item 1: “Not having clear and concrete goals for your diabetes care?” ($p < 0.01$, $t = -2.96$), item 7, “Not knowing if your mood or feelings are related to your diabetes” ($p < 0.01$, $t = -3.78$) and item 11, “Feeling constantly concerned about food and eating” ($p < 0.01$, $t = -2.96$). Paired t-test was used for the valuation of significance.

9. Evaluation of the bulletin board

The object was 21 people who were able to reply independently to the interview. A total of 13 patients (62.0%) replied that “The bulletin board was necessary”, and 8 patients (38.0%) replied that “The bulletin board is not necessary to write in it now, but might be necessary sometime”.

Discussion

This study was carried out to create and evaluate the effects of an Internet bulletin board for self-management support that would allow type 1 diabetes patients to acquire information and learn specific measures for the improvement of blood glucose control as well as provide a point of contact for psychological support. Based on the results, the originality and the effectiveness of the Internet bulletin board, the limitations of this study, and recommendations for nursing care are described below.

1. Originality of the study

While there are studies on Internet use by type 1 diabetes patients and home care patients for e-mail etc. consultation with physicians about treatment¹⁰⁻¹³⁾, such studies focus on one-to-one interaction between the physician and patient. In addition, interventional studies using the Internet exist; however, they focus on diabetes educational

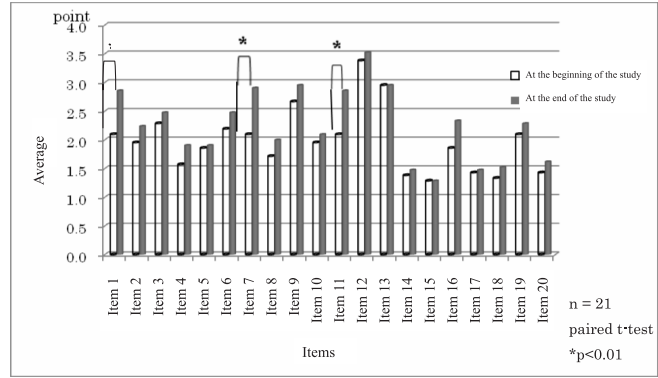


Figure 6. Comparison of average PAID scores at the beginning and end of the study

Figure 6. Comparison of average PAID scores at the beginning and end of the study

programs on the Internet and one-to-one on-line support¹⁴⁻¹⁷⁾. The advantage of one-to-one contact is clear; however, this method of support also creates a significant burden on the physician in terms of time, and may actually prevent improvement of self-management ability because they depend too much upon the physicians’ advice meaning the content of consultation may be limited to clinical matters only. The Internet bulletin board, on the other hand, makes it possible for individuals to share experience and information with others, thereby reducing the physician’s burden. Internet bulletin boards for type 1 diabetes patients, such as on mixi, do exist; however, such boards are unmonitored and have no membership screening. In this study, the researcher (webmaster), who explained the objectives of the study and obtained permission to obtain data, including the comments on the bulletin board and examination results to identify individual subjects, became the promoter of the support measures and provided questions and SMBG data feedback on a one-to-one basis with subjects on every examination. Medical professionals were also included as members, which compensates for the weak points of mixi. In addition, this method applies group dynamics, which enables work with individual type 1 diabetes mellitus patients depending on their level of knowledge and methods of diabetic control. There have been not reported on effective measures using an Internet bulletin board with a participation of both patients and medical professionals.

Furthermore, blood glucose awareness training

(BGAT) was suggested by Cox et al. as a method of intervening in the blood glucose control of type 1 diabetes patients¹⁸⁾. This method encourages patients to repeatedly train themselves to predict their blood glucose level from their subjective symptoms, time, content, and size and frequency of meals, insulin amount and duration of activity, and physical movements, and analyzing the differences using the actual values, to closely match the predicted and actual values. Under this method, however, it is essential to determine the number of blood glucose level measurements, which causes a psychological burden and leads to increased dropouts. However, there were no dropouts during the present study. One of the reasons may be that this study allowed participants to forego the requirement to measure blood glucose level. While BGAT focuses on equipping patients with the ability to predict their blood glucose level, this study focused on the improvement of self-management by way of, for example, the acquisition of information and blood glucose control, which shows the originality of this study.

2. Evaluation of Internet bulletin board for self-management support.

HbA1c significantly decreased from the eighth month point of the study compared with the level at the establishment of the bulletin board, and remained significantly low for five months until the 12th month. HbA1c reflects average blood glucose over a period of one to two months; therefore, it took between six and seven months before the effects of the Internet bulletin board and blood glucose level management software were seen. This period can be considered a time during which patients adjust themselves to the disease and think about their daily self-management; however, this is only speculation. In addition, it has been reported that involvement among patients could improve blood glucose control compared with involvement with nurses¹⁹⁾. The results of this study show that it takes time for effects to be seen with involvement among patients, but that the results are indeed effective. On the other hand, the mean HbA1c after 1 year was equal to the mean HbA1c at the beginning of this study. However, as for the

standard deviation one year later, unevenness becomes small in comparison with the standard deviation at the beginning of this study. The patient whom a value of HbA1c came to have good HbA1c talked about the agony of blood sugar measurement in the interview at completion. In a preceding study, patients with type 1 diabetes reported that “blood sugar measurement and an injection are troublesome”. As for measuring blood sugar more than three times per day, it is guessed that it is a burden than a medical person think. In addition, the reason why the mean was restored is that hypoglycemia increased due to the decrease of HbA1c, resulting in it remaining at 7%, which has less influence from hypoglycemia.

Furthermore, this study provided support measures that allowed type 1 diabetes patients to discuss methods of blood glucose control and other efforts on an Internet bulletin board. The content of the posts were viewed by participants and were rated as helpful for the improvement of self-management. Those who regarded it as a good way to acquire information accounted for 71.4%, which indicates that it is effective. Meanwhile, those who reported an increase in the number of blood glucose measurements and changes in the number of measurements accounted for 28.6%, which is not significantly high number. However, some patients who had never worried about their blood glucose levels before became anxious about them, and some patients changed their supplementary food intake. It is reported that type 1 diabetes patients focus on being normal, and hiding the fact that they have type 1 diabetes due to the fear that others may avoid them⁷⁾. They never mention feeling low blood glucose symptoms to others and try to not to think about being a type 1 diabetes. These attitudes interfere with the acquisition of information about the disease and blood glucose control. In this meaning, the current study helped subjects to become more interested in blood glucose levels and diet, which is significant.

Meanwhile PAID scores, which show the degree of diabetes patient stress, increased for all items. In particular, item 1, “Not having clear and concrete goals for your diabetes care?,” item 7,

“Not knowing if your mood or feelings are related to your diabetes,” and item 11, “Feeling constantly concerned about food and eating” showed significantly higher PAID scores compared with the beginning of the study. The results of this study indicated that becoming aware of blood glucose control interrupts the development of future vision and increases stress about daily self-management. These outcomes fall into the category of “worrying about the disease will not solve any problems” which the subjects need to address in the process of accepting type 1 diabetes. For this reason, the present study is meaningful for patients who are experiencing difficulty in accepting their disease because it provides the impetus for individuals suffering from type 1 diabetes to confront their situation, which is an important step in the acceptance process.

3. Limitations of this study and the recommendations for nursing care

Type 1 diabetes mellitus patients have different conditions and goals depending on the duration of the disease; therefore, it is difficult to educate individuals in groups. This study aimed to improve individual self-management skills using group dynamics. This study revealed that education in groups of approximately 20 patients was effective. However, the number of subjects in this study was insufficient to determine which age groupings this method might be most effective for, which is a limitation of this study.

This study also suggested that if the person who can take the communication frequently with the doctor, who can confirm the contents of the bulletin board once a day with the detailed knowledge about type 1 diabetes mellitus becomes a webmaster and apply this study method in a group of approximately 20 patients, group dynamics become effective. It also revealed the desirability of having one doctor who has the authority to make decisions on treatment policy. When all these conditions are satisfied, healthcare professionals may be able to achieve effective care for individual patients with type 1 diabetes who have different problems and goals.

It is important for short-term support for stress

that we help patients with type 1 diabetes to not feel guilty when they are unable to measure. In addition, if patients become good at control, they can reduce the number of measurements. The purpose of this study was not only to decrease the number of measurements, but also to share the ideas about glucose control.

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インターネット掲示板を活用した1型糖尿病患者の自己管理能力向上支援方法の試作および評価

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要 旨

本研究は、1型糖尿病患者の血糖コントロール改善のために必要な知識の獲得、困った時の具体的な対処方法の獲得、心理面に関する相談相手の獲得を可能にする方法として、「インターネット掲示板を活用した自己管理能力向上支援方法」を試作し、その効果を明らかにした。2010年1月4日から2011年1月31日まで掲示板を開設した。参加者は、1つの医療機関に通院する1型糖尿病患者とその家族、医療者（医師・看護師）、研究者（掲示板管理人）とする。掲示板では、患者が困っていること、血糖コントロールの工夫、専門家である医療スタッフからのアドバイスがやり取りされる。研究者は患者の許可を得て、自己血糖測定データを得、診察場面に同席し、データと患者の日々の療養行動に気付くような質問をする。本研究方法の効果は、HbA1cの推移、血糖の測り方および血糖コントロールの仕方の変化、糖尿病への負担感、と面接に基づいて評価する。HbA1cは研究開始時と比べて8ヵ月後に有意に低くなり、12か月目までの5ヶ月間に渡って有意差が持続した。自己評価に関して書き込みをした群と書き込みをしていない群共に知識の獲得に効果があったが、血糖の測り方の変化やコントロールの仕方の変化を自覚しているのは書き込んだ群の方に効果があった。糖尿病問題領域質問表（The Problem Area in Diabetes Survey: PAID）は糖尿病に関する負担感情を表す20項目からなり、総得点が高い方が生活の質（Quality of Life: QOL）が低いとする糖尿病特異的質問紙である。PAIDの平均得点で有意に得点が上昇したのは、項目1「糖尿病の治療法について、はっきりとした、具体的な目標がない」、項目7「自分の気持ちや感情が糖尿病と関連しているかどうか分からない」、項目11「常に食べ物や食事が気になる」であった（ $p < 0.01$ ）。血糖を測る前に行動から血糖を予測して実測値に近づけて行くトレーニングを行うthe blood glucose awareness training: BGATでは、血糖値の予測能力を付けることを目的とするのに対して、本研究では、知識の獲得や血糖コントロールなどの自己管理能力向上を目的とする点に独創性がある。