An Education Intervention for Medication Adherence in Uncontrolled Diabetes in Thailand

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Abstract: Medication adherence is crucial to achieving diabetic control. This quasi-experimental two-group pre-/post-test design aimed to evaluate the effects of a medication education intervention integrated in routine services of a diabetes clinic. People with uncontrolled type 2 diabetes treated by oral medication and history of non-adherence to medication were assigned to an intervention group (n=39) and a comparison group (n=37). The intervention group received medication education intervention four times consisting of a short individual education session provided by the physician and group counseling session provided by a nurse in a diabetes clinic at weeks 1 and 3, then individual follow-up telephone counseling by a nurse at weeks 6 and 9. The comparison group received patient education as routine service. Outcome variables including knowledge of medication use, beliefs and adherence, and blood glucose level were assessed at weeks 1 and 12, using an interview questionnaire and laboratory test of HbA1c values.

The results showed the intervention group had significantly better mean changes of knowledge of medication use, medication beliefs and medication adherence, than the comparison group. In addition, HbA1c in the intervention group decreased more significantly than the comparison group. The findings imply a success of the integrated medication education intervention. Nurses within healthcare teams can initiate this education intervention in routine services of diabetes clinics. However, further testing of the intervention with other populations is required to substantiate its effects.

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Introduction

Diabetes is a significant global health problem leading to death and economic burden.[1,2] In Thailand, diabetes is one of the top five priority leading causes of death due to non-communicable diseases and the morbidity rate has continued to increase over the past decade.[3] At the time of this study, an estimated 4.02 million Thai adults had a diagnosis of diabetes in 2015 and this number is expected to increase to 5.29 million by 2040.[4] Diabetes complications can be

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controlled through treatment involving a combination of lifestyle modification to manage adequate exercise and diet control and medication therapy. The goal of treatment is to keep blood glucose within normal levels (HbA1c value below 7 %).[5,6] Adequate care and treatment can prevent or delay diabetic complications such as blindness, renal disease and cardiovascular disease and improve patient's quality of life.[1]

Glucose-lowering medications are commonly used for people with diabetes exhibiting unsuccessful blood glucose control, and using lifestyle modifications with oral medication is the most used treatment choice.[6] It was reported that use of oral glucose-lowering medication cand reduce HbA1c by 0.5 to 2%.[5,7] Despite the potential benefit of medication, adherence to medication is problematic. A number of studies found 12-54.6% of persons with type 2 diabetes showed poor adherence to oral medication (as measured by self-reports).[8-11] A study among Thais with type 2 diabetes found the problem of medication adherence appeared in various patterns such as forgetting to take, omitting doses, taking at the wrong time and delay in the time taking.[12] Knowledge levels and beliefs are still significant factors contributing to medication adherence problems among patients with type 2 diabetes. Several studies have found significant associations between medication taking and beliefs, such as necessity of anti-diabetic medications, adverse consequences of diabetes medication and its harmful effects[13, 14], susceptibility of future complication, medical treatment benefits, confidence of medication taking,[15] barrier beliefs of being away from home, and being busy.[11]

Educational strategies have been found as a popular and effective intervention in improving adherence to medication among people with diabetes.[16, 17] Interventions of counseling, tailored information and education in prior studies showed effectively improved medication adherence and glycemic control such as consultation-based interventions delivered by a clinic nurse[18], directive counseling[19], telephone counseling delivered by a pharmacist[20] and one-on-one education provided by a pharmacist.[21] However, these interventions were delivered by either pharmacists or nurses at one point during the service. We believe it would be more beneficial to diabetes care quality as a part of patient education if interventions related to medication education are provided at any potential point during the delivery of care services and health care providers particularly physicians or nurses should be involved in these interventions. Yet, this advantage has not been implemented in actual diabetes care services of hospitals in Thailand. Therefore, an intervention of medication education was initiated in the present study by integrating medication-related patient education into routine service process of diabetes clinic and involving physicians and nurses as medication educators. The provider-patient communication concept of Street et al.[22] was applied to guide educational activities by means of creating effective communication, information exchange and counseling. According to the concept, communication between providers and patients can affect health outcomes indirectly through the immediate outcome of interaction, e.g., shared understanding, satisfaction of care, motivation to adhere and trust, or intermediate outcomes, e.g., adherence, self-management skills and social support that lead to better health.[22, 23]

Study Aim

To evaluate whether a medication education intervention (MEI) integrated into the routine service of a diabetes clinic and provided by physicians and nurses, could improve the knowledge of medication use, medication beliefs and medication adherence as well as blood glucose levels among patients with uncontrolled diabetes.

Methods

Design and Setting: A quasi-experimental, two-group pre-/post-test design, conducted at a diabetes clinic of a general hospital in central Thailand.

Ethical Consideration: The research protocol was approved by the Ethics Review Committee for Human Research, Faculty of Public Health, Mahidol University, Bangkok Thailand (MUPH 20:2-192). All potential participants were adequately informed of research objectives and procedures as well as their rights to participate voluntarily in the study or withdraw at any time. All were invited to sign an informed consent form before the study commenced. Participants' information was kept confidential and reported as aggregated data.

Sample: This was determined using a formula of comparing the two group means for experimental design[24] with an equal sample size in both groups. The calculation was based on data of medication compliance obtained from a related quasi-experimental study among people with diabetes[25] for a significance level of 0.05 with a power of 80%. A sample of 37 was then required for each group. Twelve cases, calculated based on the 15 % attrition rate of a similar study,[26] were added to mitigate the dropout. A total of 86 participants, 43 in each group, was finally achieved. They were recruited using the inclusion criteria: (a) diagnosed with type 2 diabetes for ≥ 1 year; (b) treated by oral medication; (c) uncontrolled glycemic level (HbA1c ³ 7%); (d) no diabetic retinopathy or renal complications; (e) history of non-adherence to medication; (f) literate in the Thai language; and (g) willing to participate in the study. Participants were excluded if they could not participate completely in the MEI or had their treatment changed to insulin injections. Potential participants were identified preliminarily by screening from medical treatment folders. Those meeting the first five criteria were listed according to their treatment follow-up schedules and dates attending the Tuesday and Friday clinics. The listed participants attending the Tuesday clinic were assigned to the intervention group, while those attending the Friday clinic were assigned to the comparison group. On each of the clinic dates, participants in the lists were interviewed on their follow-up dates, and were assigned to one of the groups.

Intervention and Data Collection: This was conducted between October, 2012 and February, 2013.

The Medication Education Intervention (MEI) was a set of patient education activities integrated in the routine services of the diabetes clinic. It consisted of two main components: (a) a short individual education delivered by the physician when visiting at the clinic and (b) two approaches of counseling delivered by the nurse, either group counseling at the counseling room and telephone counseling at the patient's home. The MEI was delivered successively to participants at weeks 1, 3, 6 and 9 during the 12 weeks of the study (See **Figure 1**). In weeks 1 and 6, on clinic follow-up dates, participants individually received a short individual education session (10-15 minutes) from the physician. The physician assessed participants' needs of medication related-information using the information recorded from the screening unit, then exchanged and gave specific information needed to correct misunderstanding and negative medication beliefs. After visiting the physician, participants were referred to the counseling room and received a 30-45 minute session of group counseling (3-5 patients) from the nurse. The sessions helped patients to (a) recognize their problems of uncontrolled blood glucose level, (b) understand needs of adherence to medication, and negative consequences of medication taking and (c) gain positive beliefs regarding medication taking. Instrumental supports, e.g., a sample drug set, reminder card and leaflet on the use of oral diabetic medication, were also provided. In weeks 3 and 9, participants received individual follow-up telephone counseling delivered by the same nurse to maintain their medication taking and to counsel on emerging problems related to medication tasking barriers.

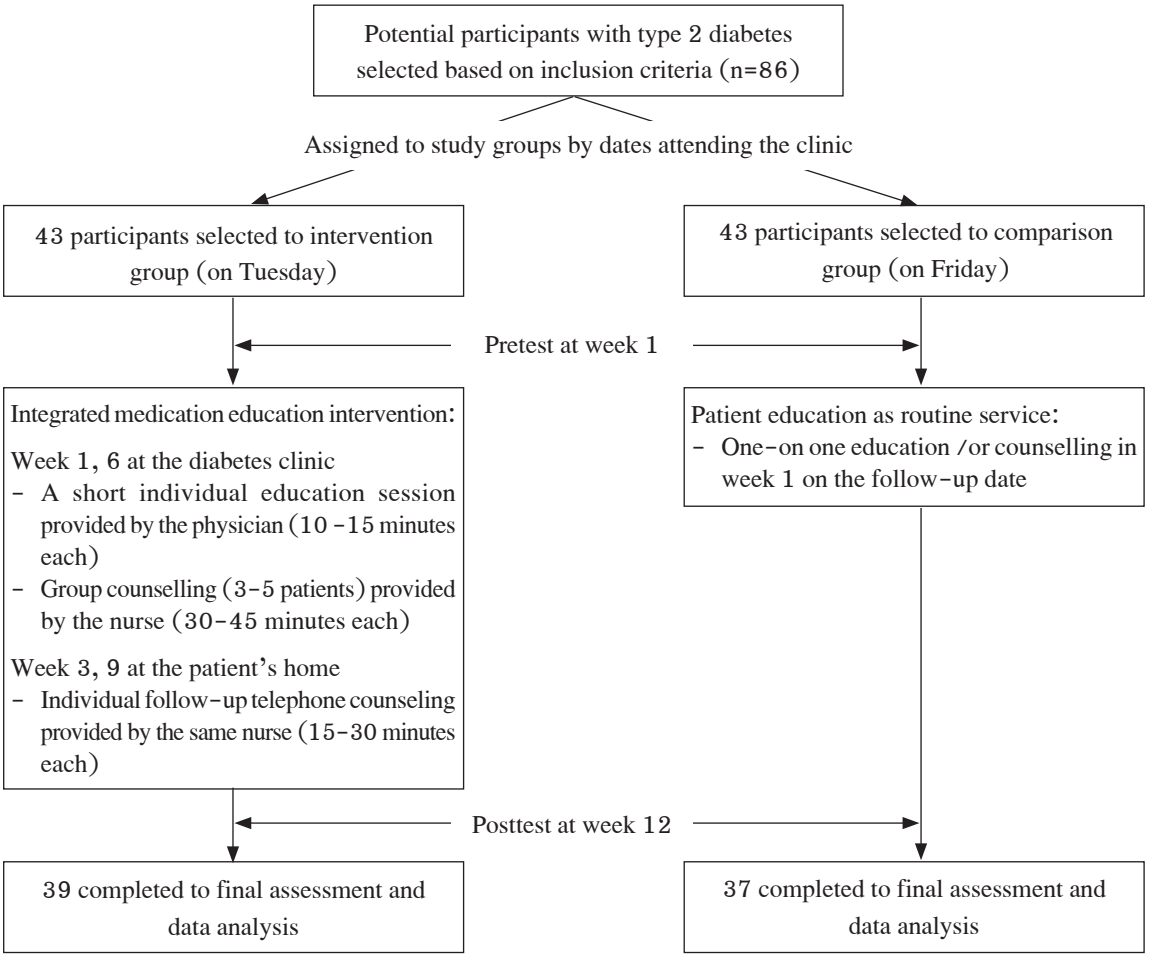

Figure 1 Intervention and data collection process of the study

The comparison group received the usual patient education service, one-on-one education (10-15 minutes) after visiting the physician at their follow-up dates. This was delivered by the nurse or health educator of the diabetes care team. Both study groups had their outcome variables assessed as a baseline in week 1 and at the end of study in week 12.

The MEI was tested among ten different people with diabetes and then the inappropriate sequence of activities was modified. Each part of the intervention component was carried out by the same person (one physician and one nurse). The nurse, one of our research team, who delivered the counseling, had received certificates as a diabetic educator from the Thai Association of Diabetes Educator. Research assistants (RAs), who provided assistance such as screening potential participants, and preparing counseling sessions, also received explanations about the research plan.

Measurements and Instruments: Study outcome variables included knowledge of medication use, medication beliefs and medication adherence, and the HbA1c level as a clinical outcome were also obtained. Data were collected using questionnaires and laboratory records of HbA1c value. The questionnaires included 4 sections: baseline characteristics questionnaire, the

Medication Knowledge Questionnaire (MKQ), the Medication Belief Scale (MBS), and the self-reported 8-item Morisky Medication Adherence Scale (MMAS-8 Thai version). The questionnaire test was piloted in a sample of 30 patients with similar characteristics to the study participants. Knowledge of medication use is measured using the MKQ, consisting of 15 questions with multiple choices. Reliability from a pilot test showed an acceptable level with KR-20 of 0.70. The instrument's questions cover type, dose and time of medication, drug effect and side effect, management of abnormal and side effect symptoms and forgetfulness in medication taking, for example, "What are side effects of diabetes drugs?" and "What are the symptoms that might occur when taking diabetes drugs?" A score of 1 is given for correct answers and 0 for incorrect ones. The total score possible is 15, with higher scores indicating higher knowledge. Medication beliefs are measured using the MBS, consisting of 13 items with a 5-point Likert scale. The Scale includes beliefs regarding need of compliance with medical regimen (2 items); negative consequences of long-term use (3 items); and benefits and barriers to medication adherence (4 items each). An example item is: "When you take medication as prescribed regularly, your blood glucose level will become lower". Responses are scored from 1 (strongly agree) to 5 (strongly disagree) for positive items. A converted score is given for negative ones. The sum score ranges from 13 to 65 with higher scores reflecting positive belief in medication use. The pilot test showed reliability at an acceptable level with a Cronbach a of 0.80.

Medication adherence : was assessed using the self-reported 8-item Morisky Medication Adherence Scale -MMAS-8 Thai version, which was permitted by the Faculty of Nursing, Mahidol University. The MMAS-8 Thai version was translated from English to Thai previously using a double back-translation procedure and validated with an acceptable reliability level (Cronbach a_{-}=0.76).[26] The scale comprises seven items with a 2-choice response (yes/no) to assess how patients take their prescribed drugs (dose, timing, and forgetting), and one item with a 6-point rating scale to assess feelings towards their medication regimen. For the first 7 items, positive statements are scored 1 for a "Yes" answer and 0 for a "No" answer while negative ones are scored conversely. Item 8 is scored from 0 (never), 0.2 (rarely), 0.4 (once in a while), 0.6 (sometimes), 0.8 (usually) and 1 (all the time) respectively. The sum score ranges from 0 to 8 with higher scores indicating a higher level of adhering to prescribed medication.

Baseline characteristics included age, sex, education, occupation, body mass index (BMI), diabetes duration, co-morbidity, and dietary and exercise behaviors. BMI was classified as normal (<23 kg/m^2), overweight (23 to 24.99 kg/m^2), or obese (^{3} 25 kg/m^2).[27] Dietary behavior covering the recommended consumption behaviors for diabetic control was measured using six items with a 5-point frequency scale of consumption behaviors in one week: never, one to two days weekly, three to four days weekly, five to six days weekly and every day. Proper behavior was defined using the criteria of more than 75 % of the time in one week.[28] Summed score from all items was calculated and converted to percentage. Adequate exercise was defined according to recommended practice guideline for glycemic control, i.e., 150 min of moderate activity (30 min, 5 days weekly).[5,29] HbA1c value was obtained from the laboratory test records of each participant.

Data analysis: SPSS version 18 statistical software was used to perform data analysis. Descriptive statistics was used to describe baseline characteristics and outcome variables and normality of the data distribution was tested using the Kolmogorov-Smirnov test. Independent t-test for continuous and normally distributed variables and chi-square test for categorical variables were used to examine differences between the two groups in baseline characteristics and outcome variables at pretest with two-sided significance level of .05. To evaluate effects of the intervention, difference

in mean change of the outcome variables were analyzed using independent t-test with one-sided significance level of .05

Results

Of the 86 participants initially recruited to the study at pretest, 76 still remained at the end of the study for data analysis, 39 in the intervention group and 37 in the comparison group. No statistical differences were found between the intervention and comparison groups concerning all their socio-demographic and biological characteristics ($p > 0.05$). The baseline data showed that both intervention and comparison groups were aged in their early fifties with an average age of 51 and 52 years, had mean duration of illness for 9 and 7 years, and a mean BMI for 26.37 and 25.54 kg/m^2 respectively. The proportion of obese participants was slightly higher in the intervention group than the comparison group. Most participants (70% and above) of both groups were female, had obtained primary level of education, received one or two types of medication, and had improper dietary and exercise behaviors. About one third of participants worked as employees, while around one fourth were the unemployed or vendors (**Table 1**).

Table 1 Baseline characteristics of the recruited patients at pretest by groups and test of group differences

Baseline characteristics	Intervention group (n=39)		Comparison group (n=37)		p-value
	n	%	n	%	
Age (year)					.772 [a]
≤ 44	8	20.5	5	13.5	
45-54	15	38.5	15	40.5	
55-60	16	41.0	17	46.0	
$\overline{X}$(SD)	51.64(7.65)		52.14(7.14)		
Sex					.510[b]
Male	9	23.1	11	29.7	
Female	30	76.9	26	70.3	
Education					.683[b]
Primary level	33	84.6	30	81.1	
Secondary level and higher [c]	6	15.4	7	18.9	
Occupation					.628[b]
Vendor	7	17.9	11	23.7	
Agriculture	7	17.9	5	15.8	
Employee	16	41.1	12	36.8	
Unemployed/not working	9	23.1	9	23.7	
Body mass index (kg/m^2)					.398[a]
18.5-22.99	8	20.5	12	32.4	
23.0-24.99	9	23.1	9	24.3	
≥ 25.0	22	56.4	16	43.3	
$\overline{X}$(SD)	26.37(3.67)		25.54(4.77)		

Table 1 Baseline characteristics of the recruited patients at pretest by groups and test of group differences (Continued)

Baseline characteristics	Intervention group (n=39)		Comparison group (n=37)		p-value
	n	%	n	%	
Duration of diabetes (year)					.065[a]
1-5	14	35.9	14	37.8	
6-10	13	33.3	18	48.6	
11-20	12	30.8	5	13.5	
$\overline{X}$(SD)	9.15(4.98)		7.19(4.08)		
Medication number (type)					.115[b]
1-2	30	76.9	34	91.9	
3	9	23.1	3	8.1	
Co-morbidities					.348[b]
Yes	31	79.5	33	89.2	
No	8	20.5	4	10.8	
Dietary behavior					.396[a]
Improper	34	87.2	30	81.1	
Proper	5	12.8	7	18.9	
Exercise behavior					.264[b]
Inadequate	34	87.2	35	94.6	
adequate	5	12.8	2	5.4	

[a] independent t-test; [b] Chi-square test (2-sided)

No significant difference was found in mean score of knowledge of medication use, medication belief, medication adherence and mean value of HbA1c between the two groups at pretest. Changes in all outcome variables were observed after the 12-week study period. The mean score of knowledge of medication use among patients in the intervention group increased from 7.64 to 12.64, while those in the comparison group slightly increased (8.78 to 9.84). Obviously, the knowledge mean change of the intervention group was significantly higher than that of the comparison group (+5.00 vs. +1.05; $p < 0.001$) (**Table 2**).

Similar results were found for both medication belief and medication adherence. The intervention group had increased mean score of medication belief (48.33 to 61.33) and medication adherence (4.67 to 7.56). In the comparison group, a small increase in medication belief (46.97 to 51.16) and medication adherence (4.78 to 5.56) was observed. Testing differences of the mean change revealed a significant difference for both medication belief (+13.00 vs. +4.19; $p < 0.001$) and medication adherence (+2.89 vs.0.77; $p < 0.001$) (**Table 2**).

The average HbA1c value of the intervention group was 9.66% at pretest, then decreased slightly to 8.81% at posttest, while that of the comparison group remained nearly the same value (9.71% and 9.67%). The statistical test showed significant difference of mean change between the two groups (-0.85 vs.-0.04; $p< 0.001$) (**Table 2**).

Table 2 Mean comparison of the outcome variables and their changes after the12-week study period for the intervention and comparison groups

Outcome variables	Intervention group $\bar{X}$(SD)	Comparison group $\bar{X}$(SD)	Mean difference (95% CI of the difference)	p-value
Knowledge of medication use				
Pretest	7.64 (2.74)	8.78 (2.49)		.062[a]
Posttest	12.64 (1.59)	9.84 (2.51)		
Change	5.00 (2.42)	1.05(1.90)	3.94 (2.94 to 4.94)	<.001[a]
Medication belief				
Pretest	48.33 (6.59)	46.97(6.57)		.371[a]
Posttest	61.33 (6.67)	51.16(6.98)		
Change	13.0 (8.27)	4.19(6.76)	8.81 (5.34 to12.27)	<.001[a]
Medication adherence				
Pretest	4.67 (1.46)	4.78 (1.44)		.845[b]
Posttest	7.56 (1.01)	5.56 (1.54)		
Change	2.89 (1.52)	0.77 (1.60)	2.12 (1.40 to 2.83)	<.001[a]
HbA1c				
Pretest	9.66 (1.96)	9.71(1.42)		.901[a]
Posttest	8.81 (1.37)	9.67(1.50)		
Change	-0.85(1.26)	-0.04(0.81)	-0.81 (-1.30 to-.33)	.001[a]

[a] Independent t-test ; [b] Mann- Whitney U test

Discussion

This study found significant positive changes from baseline of all study outcome variables among participants in the intervention group, compared with the comparison group after evaluations over the 12 weeks of study. This indicates that the MEI was effective. An increase in knowledge of medication use and a more positive belief in medication were consistent with related studies, that investigated the effect of pharmacists' education input using four sessions of one-on-one education[21] and pharmacist counseling of people with diabetes after three or four counseling sessions.[19, 30] As a result of our designed MEI, improvement of knowledge and medication beliefs of the participants were a combined effect of medication-related information and education received from both physicians and nurses. The findings emphasize the importance of providing specific and needed information, and counseling. Additionally, the findings also support the concept that quality and effective communication of health care providers (both physicians and nurses) can enhance a person's understandings of medication and motivation to adhere to that medication.[22] Although a significant increase was found for both knowledge and beliefs about medication, some critical evidence was noted. Some knowledge content remained unimproved, even though the overall score revealed significant improvement. About 70% of participants still answered incorrectly concerning the side effects of diabetes medicine, suggesting that future research should investigate the extent and manner of ways to enhance a person's ability to store medication related-information. In addition, the small magnitude of change in positive medication belief found in the intervention group (about 26%) increased from the pretest. This might be due to the statistical regression effect in the experiment[31] where the mean score of the

study group was somewhat high before receiving the intervention.

Significantly increased medication adherence in our study corresponds to related studies using either pharmacists' counseling interventions[19, 21, 32, 33], a nurse's consultation interventions[17] and an educational session on medication combined with follow-up phone calls.[34] A study using an integrated care intervention involving an integrated care manager collaborating with a physician to offer education and guideline-based treatment recommendation to persons with type 2 diabetes also showed similar results of significant improvement in oral medication adherence.[35] These studies consistently showed improvement in adherence after evaluation at different study durations between three and nine months, despite different measures of medication adherence used, for example, pill count and self-report. Our findings of improved medication adherence could have resulted from increased knowledge and more positive beliefs in medication use of the participants after receiving the four successive medication education activities. This was supported by the notion that increasing an individual's knowledge will prompt a behavior change[36] and changing beliefs in advantage and disadvantage of a recommended behavior will influence the likelihood of performing the behavior.[23]

The significantly decreased HbA1c value (-0.85%) showed similar findings to that found in related studies examining the effect of education intervention on change in HbA1c values; and reporting mean changes between -0.70 and -0.98.[19, 21, 33, 35] Our result was inconsistent with a study that found no significant change of HbA1c value after receiving a nurse's consultation intervention.[18] Notably, more decreased HbA1c values were found among the studies that were evaluated over longer study periods (6-9 months), as compared with our study.[19, 21,33] The HbA1c values of this study, evaluated at 12 weeks after intervention, did not reach the recommended target of a glycemic control lower than 7%. One explanation is that achieving targets of glycemic control simultaneously also needs to focus on changing other diabetes self-care behaviors, especially dietary control and proper exercise.[5,6] Our study specifically focused on changing medication-taking behavior, and the baseline data revealed evidence that most of the participants performed improper dietary and exercise behaviors and their HbA1c values were nearly 10% on average. Therefore, our intervention might not be intensive enough to lower HbA1c values as recommended within a 3 month period.

Limitations Since the MEI was carried out in a hospital where most participants were characterized by low socioeconomic status and lived in rural areas, the study results might not be generalizable to the general population. The self-reported medication scale, the MMAS-8Thai Version, was chosen to measure medication adherence in our study. Though the original scale has been proved for its concurrent and predictive validity and is recommended as a screening tool in outpatient settings[37], some recall bias might have occurred due to the subjective measures. Assessing outcome variables of adherence to medication and HbA1c in particular within 12 weeks is a short duration that might not imply persistence of the behavior and effective glycemic control.

Conclusions and Recommendations for Nursing Practice

Our study provides evidence that the integrated MEI can improve knowledge of medication use, medication beliefs and medication adherence as well as glycemic control among patients with uncontrolled diabetes. This intervention, as a supplement to patient education, implies potential benefit for supporting diabetic care quality in the routine services of a diabetes clinic. Initiation and implementation of the intervention can be led and advocated by nurses as one of health care team in a diabetes clinic. However, future research

needs to (a) explore the effect of the intervention on glycemic control, measured by extending the length of observed time period, (b) investigate the persistence of the medication regimen and (c) examine the effects of the intervention in different populations.

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โปรแกรมสุขศึกษาเพื่อการใช้ยาอย่างต่อเนื่องในผู้ป่วยเบาหวานที่ไม่สามารถควบคุมระดับน้ำตาลในประเทศไทย

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บทคัดย่อ : การใช้ยาอย่างต่อเนื่องมีความสำคัญต่อความสำเร็จในการควบคุมโรคของผู้ป่วยเบาหวาน การวิจัยกึ่งทดลองแบบสองกลุ่มวัดสองครั้ง นี้มีจุดมุ่งหมายเพื่อประเมินผลของกิจกรรมสุขศึกษาเรื่องยาที่บูรณาการเข้าในบริการประจำของคลินิกเบาหวาน ผู้ป่วยเบาหวานที่ไม่สามารถควบคุมน้ำตาลในเลือดที่ได้รับการรักษาด้วยยารับประทานและมีประวัติรับประทานยาไม่ต่อเนื่อง ถูกเลือกเข้าในกลุ่มทดลองจำนวน 39 ราย และกลุ่มเปรียบเทียบจำนวน 37 ราย กลุ่มทดลองได้กิจกรรมสุขศึกษาเรื่องยา 4 ครั้ง ประกอบด้วย การให้ข้อมูลความรู้สั้นๆ โดยแพทย์ และการให้การปรึกษาแบบกลุ่มโดยพยาบาล ในสัปดาห์ที่ 1 และสัปดาห์ที่ 3 และได้รับการปรึกษาติดตามทางโทรศัพท์รายบุคคล โดยพยาบาล ในสัปดาห์ที่ 6 และ สัปดาห์ที่ 9 ส่วนกลุ่มเปรียบเทียบได้รับบริการให้ความรู้ตามปกติของคลินิก ประเมินตัวแปรผลลัพธ์ ซึ่งได้แก่ ความรู้เกี่ยวกับการใช้ยา ความเชื่อเกี่ยวกับยา การใช้ยาอย่างต่อเนื่องและค่าระดับน้ำตาลในเลือดสะสม ในสัปดาห์ที่ 1 และ สัปดาห์ที่ 12 ของการศึกษา ผลการศึกษาพบว่ากลุ่มทดลองมีการเปลี่ยนแปลงค่าเฉลี่ยที่ดีกว่าของความรู้เกี่ยวกับการใช้ยา ความเชื่อเกี่ยวกับยา การใช้ยาอย่างต่อเนื่องเมื่อเทียบกับกลุ่มเปรียบเทียบ นอกจากนี้แล้วกลุ่มทดลองยังมีการลดลงของระดับน้ำตาลในเลือดสะสม (HbA1c) มากกว่ากลุ่มเปรียบเทียบ ผลที่พบแสดงความสำเร็จของกิจกรรมบูรณาการสุขศึกษาเรื่องยาพยาบาลซึ่งเป็นหนึ่งในทีมดูแลสุขภาพสามารถริเริ่มในงานบริการประจำของคลินิกเบาหวาน อย่างไรก็ตามยังจำเป็นต้องทดสอบต่อไปเพื่อยืนยันผลของกิจกรรมสุขศึกษานี้

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คำสำคัญ : เบาหวาน HbA1c การใช้ยาอย่างต่อเนื่อง ความเชื่อเกี่ยวกับยา โปรแกรมสุขศึกษาเรื่องยา ความรู้เกี่ยวกับการใช้ยา เบาหวานชนิดที่ 2

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