Development of a Nurse-led Multidisciplinary Based Program to Improve Glycemic Control for People with Uncontrolled Diabetes Mellitus in a Community Hospital, Thailand

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Abstract: A multidisciplinary approach is strategy for glycemic control management for diabetes care, yet the type of health workforce at each level of the healthcare system is unequal. This participatory action research was designed in three phases and undertaken in a community hospital in Thailand. Phase 1 aimed at discovering the causes of uncontrolled blood glucose by two focus group discussions with healthcare providers and people with diabetes. In Phase 2, focus group discussion with stakeholders were undertaken to learn from the Phase 1 data to build a program for improving glycemic control among uncontrolled diabetes. Phase 3 aimed at implementing and evaluating the effectiveness of the developed program using a quasi-experimental design. Data from focus group discussions were analyzed by content analysis while the data before and after intervention were analyzed by percentages, mean, standard deviation, and paired t-test.

Four categories related to causes of uncontrolled glycemia: poor hypoglycemic drug adherence, high energy dietary consumption, limitation on physical activity, and vigorous stress in life event. The improving glycemic control program developed in Phase 2 was the Nurse-led Multidisciplinary Based Program for People with Uncontrolled Diabetes. The Program goal was a decreased fasting blood glucose and an A1C of >8% and no hospital admission with either a hypoglycemic or hyperglycemic crisis. Program outcomes included significantly lower A1C compared with baseline levels ($p<.01$), and no hospital admissions. This Program provides an avenue for nurses to manage glycemic control in diabetes within a cooperative program in the community hospital.

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Introduction

Globally, more than 400 million people live with diabetes mellitus (DM), a serious, chronic disease.[1] The International Diabetes Federation has predicted that the number of Thai people with diabetes will

increase from 6.4% in 2013 to 8.3% by 2035.[2] Changes in lifestyle towards urbanization, combined with rapid economic development, increased survival from communicable diseases, and genetic susceptibility, have led to rising numbers of diabetes case and is a major and growing health care problem in Thailand.[3,4]

The goal of diabetes care is that people with diabetes have on testing a A1C<7% and no acute and chronic complications.[5,6] When diabetes is not well managed, hypoglycemia, diabetic ketoacidosis and hyperosmolar coma complications could develop that threaten health and endanger life. People with diabetes who can manage their medication taking and behavioral life style well until they achieve an A1C <7% are defined as having controlled diabetes, while others having an A1C >7% have uncontrolled diabetes.[5,6]

The prevalence rate of controlled diabetes is one of the 11 criteria of non- communicable diseases (NCD) clinic of each hospital that should be reported online to the Health Disease Control (HDC) dashboard of the Ministry of Public Health (MOPH), Thailand.[7,8] In the HDC data during 2017-2019, it was found that the prevalence rate of controlled diabetes was lower than 50% in cumulative data of district, provincial and national levels. Bangrahum Hospital, a small community hospital in Phitsanulok province, Service area 2, MOPH developed a new plan to improve diabetes care by increasing the number of controlled diabetes rates in their responsible area.

Managing diabetes care by maintaining a A1C <7% is paramount. From previous research, it was found that the factors affecting A1C levels of people with diabetes had both client and health service aspects. In the client aspect, the factors associated with poor glycemic control of diabetes indicated by A1C values were insufficient physical activity[9], being overweight or obese[9], level of education[10] and regularity of follow up.[10] In the health service aspect, previous glycemic control interventions influenced the lowering A1C levels were diabetes self-management education (DSME)[11], self-monitoring of blood glucose (SMBG)[12], self-care management interventions[13], and multidisciplinary interventions managed by a nurse.[14] The above interventions reviewed showed diverse health providers such as physician, nurses, pharmacists, nutritionists, and physical therapists who address people with diabetes individually according to their own areas of expertise. Because diabetic conditions are very complicated, a uniform intervention approach based on a single profession has limitations.

Although diabetes guidelines are recommended, pharmacological and behavioral modification strategies using a multidisciplinary approach are key successes of management to control the A1C.[5] However, the number and type of health workforce at each level of the healthcare system is unequal.[15] A multidisciplinary approach to improve diabetes care in a small community hospital which does not employ a diabetes expert is a unique health service delivery that needs to be studied as there are insufficient health personnel resources.

Literature review and Conceptual Framework

The differing multidisciplinary approaches in the literature reviewed varied in the makeup of specialists participating, hospitals and healthcare levels, and outcomes measured. However, the nurse is still the central person of a multidisciplinary team for diabetes care with complicated problems.[16] Existing nursing research below proposes a nurse-led multidisciplinary team to be effective in the glycemic control of uncontrolled diabetes. A previous study found that a nurse-led DSME Program showed significant improvement in A1C levels among Iranian adults.[17] After receiving nurse case management, patients with DM in a primary care cluster had significant lower average blood glucose level than before intervention.[18] After three months follow up, people with type 2 diabetes (T2D) who visited at a university hospital had significantly improved A1C.[19] In another study the A1C levels at 6 months of people who attended a health services dropped significantly in response to a multidisciplinary intervention managed by a nurse and remained low in the last half year of

follow up.[14] A group of patients with diabetes who received medication education intervention, a group counseling session and individual follow-up telephone counseling by physician and nurse in a general hospital had significantly lower A1C than the comparison group.[20] Patients with diabetes who received Multidisciplinary Team-Based Education at a university hospital showed an improvement in A1C level.[21] Five of 11 studies in a systematic review of diabetes nurse case management had positive effects on patients by reducing A1C compared to standard care,[22] although, there are some nursing interventions which did not significantly lower A1C levels. Another study found that the advanced practice nurse-led diabetes support group members had no significantly lower A1C in T2D in a tertiary care hospital.[23] During the two-year follow up, an intervention group who received DSME by multidisciplinary team of a tertiary medical center had similar mean differences in A1C reduction to the control group.[24]

All of these studies showed multidisciplinary approaches using different personnel at different healthcare levels but there was no previous research in a small community hospital which has no diabetes expert working there. Yet, health providers in small community hospitals must provide suitable diabetes care to improve glycemic control and also show the overall potential in diabetes management by presenting prevalence rates showing the control of DM in the HDC dashboard in Thailand. The literature reviewed is synthesized into a conceptual framework in Figure 1.

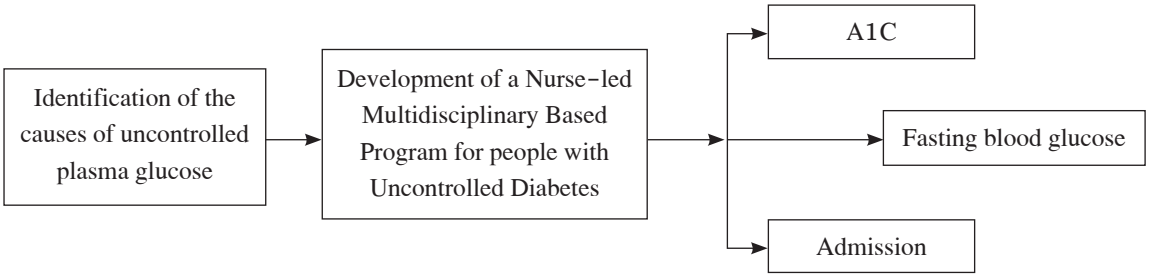

Figure 1 Conceptual framework of this study

Study objectives

The objectives of this study in a small Thai community hospital were to (a) understand the causes of uncontrolled plasma glucose among individuals with diabetes, (b) develop a program for improving glycemic control among people with uncontrolled diabetes using a multidisciplinary approach, and (c) implement and evaluate the effectiveness of the developed program.

Method

Study Design

This participatory action research (PAR) was designed in three phases. Phase 1 aimed at discovering the causes of uncontrolled blood glucose by 2 focus group discussions (FGDs)with healthcare providers and people with diabetes. In Phase 2, stakeholders of FGD were gathered to learn from the Phase 1 data with the objective of using that data to build a program for improving glycemic control among uncontrolled diabetes. Phase 3 aimed at implementing and evaluating the effectiveness of the developed program by using a quasi-experimental design. In PAR, qualitative and quantitative methods can be used. People were engaged in such a study to improve health may help to frame the research question(s), plan the processes, collect the data, decide on actions to be taken, and are often involved in implementing these, as well as taking part in the project evaluation.[25(p1)] This current PAR process used qualitative: 2 FGDs in Phase 1 and a FGD in Phase 2 and quantitative approaches: implementation and evaluation in Phase 3 of study.

Participant Descriptions by Phase

Phase 1. Using a purposeful sampling technique, a group of participants' healthcare provider and a group of participants with diabetes were recruited. The 13 healthcare provider participants included one each of physician, pharmacist, physical therapist, and Thai traditional medical practitioner, 5 nurse practitioners (NPs) from the chronic disease clinic and 4 NPs from a sub-district health promotion hospital (SHPH), selected on their work experience in diabetes care for at least 1 year. Twelve participants with diabetes were selected based on the following inclusion criteria: diagnoses with diabetes in the previous 12 months, and history of receiving services from the SHPH, prior to receiving services from the community hospital.

Phase 2. In this phase, an FGD was undertaken with 13 stakeholders included one physician, pharmacist, physical therapist, Thai traditional medical practitioner, 2 NPs from chronic disease clinic, 2 NPs from SHPH and 5 participants with uncontrolled diabetes who did not participate in Phase 1.

Phase 3. Inclusion criteria included people who had an A1C>8% and had been sent from SHPH to the community hospital. They also had time to follow the activities of the program and read and write in Thai fluently. Forty participants with uncontrolled diabetes who did not participate in Phases 1 or 2 were selected to participate in this phase.

Data gathering and data analysis

Research Instruments

In Phase 1, two semi-structured FGD guidelines for health providers and the participants with diabetes were used to discover the causes of uncontrolled blood glucose from their perspectives. The open questions of the health provider guideline focused on professional knowledge and experiences of diabetes care, causes of uncontrolled blood glucose among diabetes, experiences in resolving diabetes care, overall satisfaction on diabetes care, and the model of expected diabetes care. The open questions for participants with diabetes' guideline related to causes of uncontrolled blood glucose, feelings/needs of attending the health service, their views of the diabetes care services, and model of expected diabetes care. The intentional use of two discussion groups, separating the participants with diabetes and health providers, provided the milieu for group members to talk more freely. A study on sample sizes of focus groups found that the first FGD generated 60% of code development and eventually reached saturation (with over 90%) at the 4th FGD. [26]

In Phase 2, the FGD guideline was composed of characteristics of expected multidisciplinary approach on diabetes care, and development of a suitable program for uncontrolled diabetes which included: (a) target group, (b) goals, (c) outpatient resources, (d) time, (e) care process interactions and (f) the outcome measures of the program.

In Phase 3, the developed program was the research intervention tool while clinical data record form included A1C, FBS, and number of admissions was the research collection tool.

In Phase 1, the researchers conducted two FGDs: health provider (FG1) and those with diabetes (FG2) in the studied hospital. Interviews were recorded digitally and written notes were taken by a researcher. Transcription of the recordings in Thai words, rereading the typed words and written notes and rewriting the transcription were undertaken. Descriptive content analysis; preparing, organizing, and reporting processes in accordance with the United States Agency for International Development[27] was used for content analysis.

In Phase 2, the researchers conducted FGDs involving health providers and participants with uncontrolled diabetes in a meeting room of the studied hospital. After reviewing the data from Phase 1, brainstorming of all participants in each part of program were audio-recorded and by writing notes while one participant wrote and rewrote the consensus results on the big chart in front of the meeting room to confirm the results. All data of this Phase were analyzed by content analysis.[27]

In Phase 3, 40 outpatients with uncontrolled DM were enrolled and participated in schedule of the developed Program during their out-patient department (OPD) visits every 4 months. Participants' A1C and FBS measure were collected before implementation of the program. All participants were encouraged to actively participate in the four care processes: 1) group health education on diabetes self-management, 2) medication adherence monitoring, 3) case management, and 4) consideration of the overall participants' outcome and treatment of the Program. At the end of the intervention, the participants' A1C, FBS and hospital admissions were collected. Outcome measures before and after intervention were analyzed using number, percentage, mean, standard deviation, and paired t-test.

Ethics Consideration

Ethics clearance for this research was obtained from the Naresuan University Ethics Committee for Research and Human Studies in Thailand (number COA No.240/2014, October 3, 2017). The researchers provided details of the study to participants prior to obtaining informed consent. Confidentiality was assured by code numbering all data and only the lead investigator was able to identify names with individual participant responses. The researchers obtained written consent and participants understood they could withdraw from the study at any time without penalty to assure protection of participant rights.

Results

Phase 1. Causes of uncontrolled plasma glucose

Four categories emerged from the two FGDs (healthcare providers and people with diabetes) which were related to the causes of uncontrolled plasma glucose among people with diabetes: 1) poor hypoglycemic drug adherence, 2) high energy dietary consumption, 3) limitation of physical activity, and 4) vigorous stress from life events. The following lists the causes and participants' description consensus as follow:

1. Poor hypoglycemic drug adherence

Participants described various factors that influenced their ability to adhere to their prescribed diabetes medication. Participants described buying medications without provider oversight, missing medications that were schedule to be taken during follow up appointments, and misunderstandings about the importance of taking medications as prescribed to be the causes.

> *"Some patients bought hypoglycemic drugs from drug stores by themselves."*[#12F, FG1]

> *"When we went to visit elderly patients in their home, we found a lot of hypoglycemic drugs kept in the bag [from pharmacy]. This meant that the patient took medication irregularly".* [#7F, FG1]

> *"I do not take my medicine on time. It makes my blood glucose swing up and down quickly."* [#3F, FG2]

2. High energy dietary consumption

Participants described various factors that influenced their ability to adhere to their prescribed diabetic diets. They described eating high energy [high calorie] food, sweets and drink that was prepared for them, readily available or needed to sustain the hard physical work of farming. Some healthcare providers reported that people with DM followed their prescribed diet only when preceding a scheduled fasting blood glucose (FBG) test.

> *"In rural areas, people frequently eat a lot of high energy food, sweets and drink in village cultural ceremonies* (3-7 times/month)*."*[#10F, FG1]

> *"People with diabetes controlled their eating only 2 or 3 days before visiting the hospital for checking their FBG. However, their A1C, which is checked once a year, is more than 10%.* [#3M, FG1]

"I couldn't cook food by myself, so my daughter cooks every meal for me but I frequently have meals with curry and coconut milk." [#4M, FG2]

" I need high energy food for working hard in the rice field." [#7F, FG2]

"Although I ate only one fried egg, fried fish and chicken, my blood glucose was still up." [#9F, FG2]

"I eat a lot of fruits such as mango, jack fruit, and banana in season because they are grown in my backyard." [#12F, FG2]

3. Limitation on physical activity

Participants described various factors that influenced their ability to adhere to their prescribed exercise plans. They limited their physical activity due to being overweight, had difficulty in ambulating or believed that farm work was sufficient physical activity.

"Overweight limits exercise in some patients. Blood glucose control in this group is very difficult" [#1F, FG1]

"Almost all patients are farmers. They work on the farm every day. So they feel they have already exercised." [#13F, FG1]

"I had an eye problem 2 years ago. I use a walker every time I walk. What way can I exercise?" [#8M, FG2]

"I work in the farm for 4 hours every day. I have no need to exercise." [#10F, FG2]

4. Vigorous stress in life events

Participants described various stressful live events that influenced their ability to adhere to their plan of care for DM. They described house floods, sleep disruptions, economic crisis events, and other major health concerns.

"The houses of two patients were flooded. They couldn't sleep deeply for several days. We referred them to consult a psychologist." [#5F, FG1]

"One patient worked in Bangkok but the economic crisis fell. He left to work at home. He was worried about his decreased income. His FBS was very high every month." [#8F, FG1]

"After I had a stone in my gall bladder, I was stressed and had high glucose in my blood." [#5M, FG2]

"My left eye bleeds and can't see clearly. The physician is considering whether to apply laser for this problem or not. Does a laser shot to the eye hurt?" [#1M, FG2]

Phase 2. Development of a program for improving glycemic control

The developed program aimed at improving glycemic control among uncontrolled diabetes was called the Nurse-led Multidisciplinary based Program for People with Uncontrolled Diabetes (NMPUD or the Program). Multidisciplinary resources involved were (1) physician: consider overall participant's outcome, (2) pharmacist: taking of hypoglycemic agent monitoring, (3) Thai traditional practitioner: diet education, (4) physical therapist: exercise education, and (5) NP: case manager. Four months of Program care processes were 1) group health education on diabetes self-management, 2) medication adherence monitoring, 3) case management, and 4) considering overall participants' outcome and treatment. The Program plans were as follows:

1. The topics of group health education, including dietary practices, physical activity and exercise, home medication taking, SMBG practice, and stress management, were provided by the health team.

2. Medication adherence monitoring; the pharmacist checked the remaining medication of participants on each visit. If some participants were found to have a large amount of medications remaining, it meant that they had not taken the medicine as prescribed. Pharmacists wrote a small note in the participant's diabetes record for the NP and the physician review, and re-educated them on how to take the medication as prescribed.

3. NPs have a role in both direct and indirect case management care. They individually examined the participant's SMBG record and office FBS, reviewed participant's practices (nutrition, exercise and general care) and provided education or counseling as needed and considered as direct care. Indirect care included the designing of the topic of group health education and inviting health providers to share experiences in each topic, mobile phone call reminders of missed visits to set new follow-up appointments, and planning, implementing and evaluating the Program's services on schedule.

4. The physician considered the laboratory data, diet and exercise practices from the records of the NP and current treatment and medication notes from pharmacist and made decisions to continue or adjust medication.

Phase 3. Implementation and Evaluation of the Effectiveness of the Developed Program

At the time of each visit, the health care team started by providing group health education on diabetes self-management for 30-45 minutes/session, medication taking monitoring by the pharmacist, individual motivation of lifestyle changes by the NP, and consideration of the overall client's clinical outcomes by the physician. The NMPUD was well implemented according to the scheduled time but there were two participants who did not complete the activity and were withdrawn from the program. Therefore, Phase 3 had 38 participants.

Table 1 displays the FBS and A1C levels before the program intervention and four months following the intervention. The results showed A1C was significantly lower than the baseline levels ($p<.01$) while FBS was not significantly lower. **Table 2** displays pre and post intervention A1C levels and the percentage of the participants in each range. All (100%) participant A1C levels before the intervention were 8.1 or higher. Post intervention, A1C level ranges demonstrated greater variability and the number of participants with A1C levels of 8.1 and higher decreased. In addition, no participants were admitted into the hospital with signs and symptoms of hyperglycemic or hypoglycemic crisis during the intervention period.

Table 1 A1C and FBS among people with diabetes before and after intervention

Clinical laboratory	Mean	S.D.	Paired-t test	p-value
A1C				
Before intervention	9.789	1.238	3.420	.002
After intervention	8.521	1.983		
FBS				
Before intervention	194.69	68.133	1.587	.121
After intervention	180.42	52.024		

Table 2 Amount and percentage of A1C among people with uncontrolled diabetes before and after intervention

A1C (%) Ranges	Before intervention		After intervention	
	# Participants	Percentage	# Participants	Percentage
5.1-6.0	0	0	1	2.63
6.1-7.0	0	0	10	26.32
7.1-8.0	0	0	7	18.42
8.1-9.0	12	58.31	7	18.42
9.1-10.0	13	21.34	7	18.42
> 10.0	13	21.34	6	15.79
Total	38	100.00	38*	100.00

* No participant admitted in hospital with signs and symptoms of crisis hyperglycemia and hypoglycemia

Discussion

Phase 1: Causes of uncontrolled plasma glucose

People with diabetes were involved in one of the FGDs in this phase because they are able to understand their own causes which were beneficial to use as information for creating service programs that are expected to fix it. From Phase 1, it was found that the causes of uncontrolled plasma glucose were explained by the four themes below.

Poor hypoglycemic drug adherence

This research results found that buying medications without the healthcare provider's oversight, missing medications due to follow-up appointments that were not on time, and misunderstandings about the importance of taking medications were information of poor hypoglycemic drug adherence. In the diabetes care service, the doctor prescribed the amount of medication ordered to fit with the time of the next appointment. Taking medication by wrong route, dose and time affected the action of hypoglycemic agent to be higher or lower than expected. Missed doctor appointments was significantly associated with increased odds of poor glycemic control ($p<.05$).[28] Lack of understanding of the long-term benefits of treatment, and the complexity of the medication regimen influences poor medication adherence[29].

High energy dietary consumption

Participants often ate high energy [high calorie] food, and followed their prescribed diet only when preceding a scheduled FBG test. The responses of participants were deceptive behaviors in an attempt to lower blood glucose levels only on the day of collection but had no benefit for overall glycemic control. The Thai culture of food consumption is traditionally eating rice, beef, pork or chicken curry with coconut milk for the main dish and followed by sweets. Various ingredients of Thai curry and desserts such as coconut, flour, and milk are high energy substances while fruits such as mango, durian and grapes have a high glycemic index.[30] Hyperglycemia can be considered a consequence of the energy imbalance, that is, energy intake is greater than energy spent during a certain period.[31]

Limitation on physical activities

The limitation of physical activities due to being overweight and difficulty in ambulating were causes of poorly controlled diabetes. During exercises, glycogen in the muscle of a person converts to glucose for providing energy. On the contrary, if the person does not exercise, converting glucose to energy is reduced, causing high blood glucose.[5] Multivariate analysis shows inadequate physical activity is significantly associated with increased A1C.[32] However, medium physical activity can reduce poor glycemic control more than low and high physical activity.[33] Weight loss defined as a sustained reduction of 5% of initial body weight, has been shown to improve glycemic control in some overweight and obese people with T2D.[34]

Vigorous stress in life events

This research found that the house floods, economic crises, and sleep disruptions were stressful live events that interrupted participants' adherence to their diabetes care plan. High levels stress due to life events is significantly linked to variability in A1C levels, and behaviors related to dietary and exercise choices.[35] Addressing the psychosocial needs of the people with diabetes helps to overcome the psychological barriers associated with adherence and self-care, while achieving long-term benefits in terms of better health outcomes and glycemic control.[36]

Therefore, understanding the causes of uncontrolled blood glucose among people with diabetes allows healthcare providers to formulate strategies focusing on the improvement in diabetes care outcomes.

Phase 2: Development of the NMPUD

The NMPUD, aiming at improving glycemic control in uncontrolled diabetes included four activities as described above, were approved by discussion of providers and people with uncontrolled diabetes. Involving health providers who have specialized knowledge and had diabetes care experience in the

FGDs were useful for the development of an effective and practical program. And the reason for inviting people with uncontrolled diabetes who had direct experiences is for them to share their opinions and consider the activities for the feasibility of the final program option. Previous research suggests that if an intervention is informed by the knowledge and experience of each team member but also through the process of co-designing, then each of the members develops greater ownership and engagement in the implementation of the activity.[37,38]

The logic for choosing a multidisciplinary intervention, managed by an NP, was helping people with uncontrolled diabetes to stay within normal blood glucose limits which is a goal of health care providers. A number of studies support that a multidisciplinary intervention managed by nurses has better outcomes in uncontrolled diabetes.[14, 17-22]

The group health education on diabetes self-management was the first sound adjustment of NMPUD because of the short time for each diabetes educator to transfer knowledge and skills to the client for self-care practices. Studies have demonstrated the DSME to be a well-accepted application in achieving the goals of diabetes treatment. [11,17,21] The purpose of selecting medication adherence monitoring as one of the care process of NMPUD was that this was identified as the main cause of poor glycemic control (Phase 1 data) resulting from poor drug adherence. A study's findings supported that pharmacists are in a unique position to improve medication adherence through the use of medication reviews.[29] The reason for designing consideration on overall clinical outcomes and treatment involved in NMPUD was that patients believe that physicians are knowledgeable and are the core people to help them control their blood glucose by prescribing medications. They need physicians to take more time to assess their condition, prescribe the drug(s), and provide health education. Therefore, NMPUD was designed by sharing among stakeholders to develop ownership and engagement.

Phase 3: The Effectiveness of the Program

Outcomes of our Program included significantly decreased A1C levels of uncontrolled diabetes and no reported hospital admissions of participants for hypoglycemic or hyperglycemic crises events during the study period. The reason for this significant decrease of A1C levels in only 4 months were SMBG, medication taking monitoring, and case management explained in detail as follows:

1. SMBG recording helped participants identify their current blood glucose (BG) and adjusted their appropriate diet and physical activities day to day. Consequently, the success in reducing BG of participants motivated other participants to follow the SMBG intervention. Previous research suggested that integrating SMBG resulted in diabetes management that was a benefit tool for guiding diet consumption, physical activity, preventing hyperglycemia, and adjusting medications.[12] This current study found that SMBG significantly improved glycemic control among participants with uncontrolled diabetes whose baseline A1C was >8%.

2. Medication taking of participants was monitored during their 2^{nd}-4^{th} visits and this helped them take hypoglycemic agents correctly and effectively. This study found that teaching about medication taking in a group health education class of NMPUD cannot help some older adults and those with low learning skills to understand and implement adherence correctly. This medication taking monitoring of each visit done by the pharmacist to ensure that all participants had received the full range of antidiabetic action. To ensure medication adherence, healthcare providers should communicate clearly on dosage, route and right method of drug administration by explaining and pointing at the drug's label at the same time[39].

3. Case management lead by an NP was a main key success of this Program. The American Nurses Association defines nurse case management as a "dynamic and collaborative approach to providing and coordinating healthcare services to a defined population. It is a participative process to identify and facilitate options

and services for meeting individuals' health needs, while decreasing fragmentation and duplication of care and enhancing quality, cost-effective clinical outcomes".[40(p11)] Regarding case management in our study, the NP reviewed the participants' SMBG records, planning, facilitation and advocacy for supporting uncontrolled diabetes' health needs via communication and available resources. In the case of participants with limitations or barriers regarding diet and exercise, the NP provided some alternative choices based on diabetes knowledge and the participant's context, persuaded them to try one, and evaluated their behavioral changes in the next visit. In the case where BG was deceased, the NP admired and motivated the participants' self-confidence and self-efficacy for their sustainable practice. Cooperation between the staff members, communication, consultation, and coordination on schedule of NMPUD that were managed by the NP also resulted in improved glycemic levels among participants with uncontrolled diabetes. Various studies have examined the role of the nurse in the multidisciplinary approach which found a positive outcome on glycemic control.[17-24] This study examined the utility of diabetes care management by the nurse in a multidisciplinary community hospital.

Limitations

The NMPUD schedule done on the time of OPD visits were undertaken on regular diabetes. Health providers and participants with diabetes allocated time to match the program schedule. Some health providers having urgent jobs on the day required them to act as health educators, causing them to have less time to prepare and not fully perform as well as planned. Some participants with diabetes also had urgent work on the day of hospital visit, causing lack of health education attention, medication monitoring, lifestyle determination and motivation. These situations needed an NP who had knowledge to solve and manage the emergent problem.

One important limitation regarding the causes uncontrolled BG was that data from 2FGDs in Phase 1 were not saturated, and this needs to be undertaken in another study.

NMPUD applied one group quasi-experimental design for testing effectiveness. This design lacked a control group and was a susceptible threat to internal validity such as history and maturation effects.

Conclusion

The overall result found showed that NMPUD was effective in lowering A1C and prevented hypoglycemic and hyperglycemic crisis episodes among people with uncontrolled diabetes. NMPUD is effective due to the design by FGD involving healthcare providers and client participants. Meanwhile, each of the members developed future ownership and willingness to engage in the implementation and evaluation activities. Medication taking monitoring and SMBG records indicated the outcome of actual practice and the success in reducing BG of participants motivated other participants to follow the SMBG intervention. More importantly, management of the NP who works on finding out interest providers, design collaborative care, and motivate lifestyle changes could decrease fragmentation and duplication of care among providers along with strengthening of NP role in diabetes care.

Implications for Nursing Practice and Research

Nurses in community hospitals/primary health care level could apply a nurse-led multidisciplinary approach to managing glycemic control for people with diabetes by increasing other outcomes such as diabetes self-management skill, medication adherence practice, diet practice, and exercise activity for to clarify the approaches' effects on behavioral modification.

The PAR process of NMPUD needed managers who were nurses in OPDs and NPs in community hospitals to learn and apply them for improving their competency and aim at glycemic control.

To obtain a complete data on the causes, FGDs should be conducted in 4-6 groups and to strengthen the program testing approach, a two-group pre-posttest

quasi-experimental design should be applied. Longitudinal studies are needed to evaluate the effectiveness of sustainable blood glucose control over time. Apart from that, multidisciplinary approaches in any group of hospitals (regional, general) and sub-groups of community hospitals aimed at lowering glycemic levels should be studied in greater detail.

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การพัฒนาโปรแกรมการพยาบาลแบบการดูแลโดยสหวิชาชีพเพื่อปรับปรุงการควบคุมระดับน้ำตาลในเลือด สำหรับผู้ป่วยโรคเบาหวานที่ควบคุมไม่ได้ในโรงพยาบาลชุมชน ประเทศไทย

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บทคัดย่อ: การดูแลแบบสหวิทยาการเป็นกลยุทธ์ที่ใช้ในการจัดการดูแลผู้ป่วยเบาหวานเพื่อการควบคุมระดับน้ำตาลในเลือด แต่ประเภทของบุคลกรทางสุขภาพในแต่ละระดับบริการสุขภาพไม่เท่ากัน งานวิจัยเชิงปฏิบัติการแบบมีส่วนร่วมนี้ ดำเนินการที่โรงพยาบาลชุมชนแห่งหนึ่งในประเทศไทย ประกอบด้วย 3 ขั้นตอน ขั้นตอนที่ 1 : ศึกษาสาเหตุของการควบคุมระดับน้ำตาลในเลือดไม่ได้ของผู้ป่วยเบาหวาน ใช้วิธีการสนทนากลุ่ม จำนวน 2 ครั้ง ขั้นตอนที่ 2 : สร้างโปรแกรมการควบคุมระดับน้ำตาลในเลือดสำหรับผู้ป่วยเบาหวานที่ควบคุมไม่ได้โดยผู้มีส่วนเกี่ยวข้องศึกษาข้อมูลจากขั้นตอนที่ 1 ก่อนการสนทนากลุ่ม ขั้นตอนที่ 3: ดำเนินการและประเมินประสิทธิผลของโปรแกรมที่สร้างขึ้นโดยใช้การวิจัยกึ่งทดลองแบบ 1 กลุ่ม ข้อมูลจากการสนทนากลุ่มใช้การวิเคราะห์เนื้อหา ส่วนข้อมูลก่อนและหลังการทดลองใช้การวิเคราะห์ เปอร์เซ็นค่าเฉลี่ย ส่วนเบี่ยงเบนมาตรฐาน และทดสอบความแตกต่างด้วย paired t-test

ผลการสนทนากลุ่ม พบว่า ความไม่ร่วมมือในการใช้ยา การรับประทานอาหารพลังงานสูง ข้อจำกัดในการทำกิจกรรมทางกาย และภาวะเครียดอย่างรุนแรงจากการดำรงชีวิต เป็นสาเหตุ 4 ประการที่ทำให้ผู้ป่วยเบาหวานไม่สามารถควบคุมระดับน้ำตาลในเลือดให้อยู่ในระดับเป้าหมาย โปรแกรมที่พัฒนาในขั้นตอนที่ 2 คือ โปรแกรมการควบคุมระดับน้ำตาลในเลือดแบบสหวิทยาการที่มีพยาบาลเป็นผู้บริหารจัดการ มีเป้าหมายเพื่อให้ผู้ป่วยเบาหวานที่มีระดับเอวันซีมากกว่าร้อยละ 8 มีระดับเอวันซีลดลงและไม่เข้านอนรักษาในโรงพยาบาลด้วยภาวะน้ำตาลในเลือดต่ำและภาวะน้ำตาลในเลือดสูงอย่างวิกฤต ผลการทดลองพบว่า ระดับเอวันซีของกลุ่มทดลองหลังการทดลองต่ำกว่าก่อนการทดลองอย่างมีนัยสำคัญทางสถิติ ($p<.01$) และไม่พบการนอนรักษาในโรงพยาบาล ผลการวิจัยนี้เป็นแนวทางให้พยาบาลวิชาชีพนำไปใช้ในการจัดการโปรแกรมควบคุมระดับน้ำตาลในเลือดโดยการประสานความร่วมมือของทีมผู้ให้บริการสุขภาพที่มีอยู่ในโรงพยาบาลชุมชน

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คำสำคัญ: ผู้ป่วยเบาหวานที่ควบคุมระดับน้ำตาลในเลือดไม่ได้ การควบคุมระดับน้ำตาลในเลือด พยาบาล สหวิทยาการ การวิจัยเชิงปฏิบัติการแบบมีส่วนร่วม

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