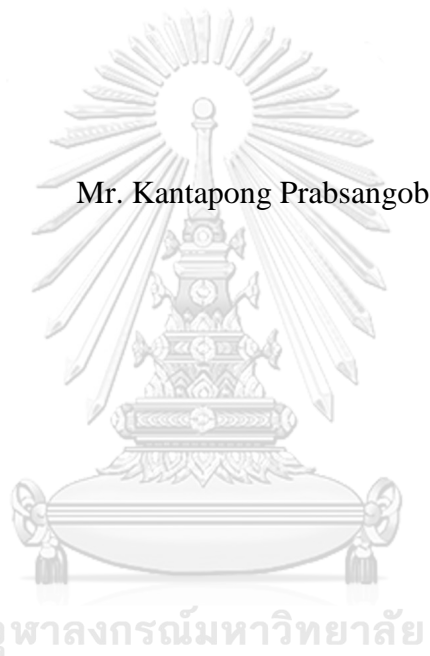Integrated Communicative Health Literary(ICHL) among Thai type 2
diabetic patients in SamutSongkram Province Thailand: a case study of CHL toward
diabetes type outcome

Mr. Kantapong Prabsangob

A Dissertation Submitted in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy Program in Public Health
College of Public Health Sciences
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ความแตกฉานด้านสุขภาพเชิงบูรณาการของการสื่อสารในหมู่ผู้ป่วยโรคเบาหวานชนิดที่2 ที่จังหวัด
สมุทรสงครามประเทศไทย: กรณีศึกษาเกี่ยวกับความแตกฉานด้านสุขภาพในการสื่อสารกับผลของ
โรคเบาหวานชนิดที่ 2

นายกันตพงษ์ ปราบสงบ

Thesis Title	Integrated Communicative Health Literary(ICHL) among Thai type 2 diabetic patients in SamutSongkram Province Thailand: a case study of CHL towarddiabetes type outcome
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Field of Study	Public Health
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กันตพงษ์ ปราบสงบ : ความแตกฉานด้านสุขภาพเชิงบูรณาการของการสื่อสารในหมู่ผู้ป่วยโรคเบาหวานชนิดที่2 ที่จังหวัดสมุทรสงครามประเทศไทย: กรณีศึกษาเกี่ยวกับความแตกฉานด้านสุขภาพในการสื่อสารกับผลของโรคเบาหวานชนิดที่ 2 (Integrated Communicative Health Literary(ICHL) among Thai type 2 diabetic patients in SamutSongkram Province Thailand: a case study of CHL towarddiabetes type outcome) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: รศ. ดร. รัตนา สำโรงทอง, อ.ที่ปรึกษาวิทยานิพนธ์ร่วม: รศ. ดร. จุลนี เทียนไทย, 175 หน้า.

กันตพงษ์ ปราบสงบ : ความแตกฉานด้านสุขภาพเชิงบูรณาการของการสื่อสารในหมู่ผู้ป่วยโรคเบาหวานชนิดที่ 2 ที่จังหวัด สมุทรสงคราม ประเทศไทย: กรณีศึกษาเกี่ยวกับความแตกฉานด้านสุขภาพในการสื่อสารกับผลของโรคเบาหวานชนิดที่ 2 (INTEGRATED COMMUNICATIVE HEALTH LITERACY (CHL) AMONG THAI TYPE 2 DIABETIC PATIENTS IN SAMUT SONGKRAM PROVINCE THAILAND: A CASE STUDY OF CHL TOWARD DIABETES TYPE 2 OUTCOME) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: รศ. ดร. รัตนา สำโรงทอง, อ. ที่ปรึกษาวิทยานิพนธ์ร่วม รศ. ดร. จุลนี เทียนไทย, 150 หน้า.

การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อพัฒนา และประเมินโปรแกรมความแตกฉานด้านสุขภาพเชิงบูรณาการของการสื่อสาร (โปรแกรมไอซีเอชเอล) ในผู้ป่วยโรคเบาหวานชนิดที่ไม่พึ่งอินซูลิน อำเภอบางคนที จังหวัดสมุทรสงคราม ประเทศไทย การศึกษาวิจัย แบ่งเป็น 4 ระยะ ระยะ ที่ 1-2 เป็นการศึกษาภาคตัดขวางเชิงปริมาณ (n =415) เพื่อประเมินความแตกฉานด้านสุขภาพของผู้ป่วยเบาหวานที่มีอายุ 50- 80 ปี และการวิจัยเชิงคุณภาพ (n =14) เพื่อบรรยายการรับรู้ เรื่องการส่งเสริมความแตกฉานด้านสุขภาพของผู้ป่วยเบาหวานที่มีอายุ 50- 80 ปี และผู้ให้บริการ ระยะที่ 3 เป็นการพัฒนา และดำเนินกิจกรรมแทรกแซงโปรแกรมความแตกฉานด้านสุขภาพเชิงบูรณาการของการสื่อสาร และระยะที่ 4 ประเมินผลของโปรแกรม ผลการศึกษาภาคตัดขวาง พบว่า ผู้ป่วยโรคเบาหวาน มีความแตกฉานด้านสุขภาพอยู่ในระดับปานกลาง สำหรับ ประเมินผลของโปรแกรม เป็นการศึกษากึ่งทดลอง โดยกลุ่มตัวอย่าง ใน 2 พื้นที่ ได้คัดเลือกแบบเจาะจง จำนวน 70 คน โดยแบ่งออกเป็น 2 กลุ่ม กลุ่มละ 35 คน กลุ่มทดลองได้รับโปรแกรมไอซีเอชเอล กลุ่มควบคุมได้รับโปรแกรมการการส่งเสริมความแตกฉานด้านสุขภาพทั่วไป แบบสอบถามถูกใช้เพื่อประเมินลักษณะทางประชากรศาสตร์และ พฤติกรรมการดูแลตนเอง แบบประเมินความแตกฉานด้านสุขภาพ 3 ระดับ ออกแบบโดย อิซิกาว่า ถูกใช้เพื่อประเมินระดับความแตกฉานด้านสุขภาพ ข้อมูลเกี่ยวกับระดับน้ำตาลสะสมในเลือดนำมาจากข้อมูลผู้ป่วยของโรงพยาบาล การวัดข้อมูลทำจำนวน 3 ครั้ง ได้แก่ ก่อนการใช้โปรแกรม หลังการใช้โปรแกรม 3 เดือน และ หลังการใช้โปรแกรม 6 เดือนข้อมูลถูกวิเคราะห์โดยการใช้ สถิติเชิงพรรณา ไซสแคว์ ทีเทส และ repeated ANOVA การค้นพบแสดงให้เห็นว่า ความแตกฉานด้านสุขภาพ พฤติกรรมการดูแลตนเอง และระดับน้ำตาลสะสมในเลือด ของผู้ป่วยที่เข้าร่วมโปรแกรมดีขึ้นอย่างมีนัยสำคัญ (p value< 0.05) หากแต่ไม่ยั่งยืนถึง 6 เดือน สรุปการศึกษาได้ว่า โปรแกรมความแตกฉานด้านสุขภาพเชิงบูรณาการของการสื่อสาร สามารถช่วยทำให้ผู้ป่วยโรคเบาหวาน ควบคุมระดับน้ำตาลในเลือด เพิ่มความแตกฉานด้านสุขภาพ และ ส่งเสริมการดูแลตนเองเพื่อควบคุมระดับน้ำตาลในเลือด

สาขาวิชา สาธารณสุขศาสตร์	ลายมือชื่อนิสิต _____
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This multi –phasing study aimed to develop and evaluate an integrated communicative health literacy program (ICHL Program) for type 2 diabetic patients in Bangkonthee district, Samut Songkram province, Thailand. The study divided into four phases. Phase 1-2 : Cross sectional study was conducted using quantitative (n =415) and qualitative study (n =14) which aimed to assess the level of health literacy of the DM patients aged 50-80 years old and describing providers' and patients' perception towards promoting health literacy. Phase 3: Developing and implementing ICHL (based on the findings of cross-sectional study). Phase 4: Evaluating the effect of the ICHL. The cross-sectional study shown that the participants has moderate level of health literacy. The quasi experimental study was employed to evaluate the effect of the ICHL. 70 diabetes patients aged between 50 and 80 years, living in a rural Thai community was purposively selected and divided into two groups of 35 patients. Then, they were selected to be an intervention groups receiving the ICHL program and a control group receiving a regular health literacy promotion program. A questionnaire was used to assess socio-demographic characteristics, and self-care behavior. The 3-level Health Literacy Scale developed by Ishikawa was used to assess health literacy level. Patients' blood sugars (HbA1c) were retrieved from hospital patient health records. The measurements of dependent variables were conducted three times: at baseline, after the intervention (three months), and during six months follow up. Descriptive statistic, Chi square, t-test, and repeated-measure ANOVA were used for data analysis. The finding showed the significant improvement in health literacy, self-care behavior, and HbA1c after 3 month participation in the program (p-value <0.05), but not sustainable through 6 month participation. It was concluded that the Integrated Communicative Health Literacy program could enable diabetic patients to control their blood sugar, increase health literacy and enhance their self-care behavior to control their blood sugar.

Field of Study: Public Health

Academic Year: 2017

Student's Signature _____

Advisor's Signature _____

Co-Advisor's Signature _____

ACKNOWLEDGEMENTS

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จุฬาลงกรณ์มหาวิทยาลัย

CHULALONGKORN UNIVERSITY

CHAPTER I
INTRODUCTION

1.1 Background and Rationale

Diabetes mellitus or diabetes is one of chronic diseases and causes death to numbers of patients around the world. In 2013, an approximately 382 million people are estimated to have diabetes and 316 million people are living with impaired glucose tolerance (International Diabetes Federation, 2012). The number of people with diabetes is increasing in every country. Consequently, It has been projected that there will be 592 million people diagnosed with diabetes globally in 2035. Moreover, the overwhelming burden of the disease continues to be shouldered by low and middle income countries. Socially and economically disadvantaged people in every country carry the greatest burden of diabetes and are often the most affected financially. By the end of 2013, diabetes will have caused 5.1 million deaths and cost USD 548 billion in healthcare spending (International Diabetes Federation, 2012).
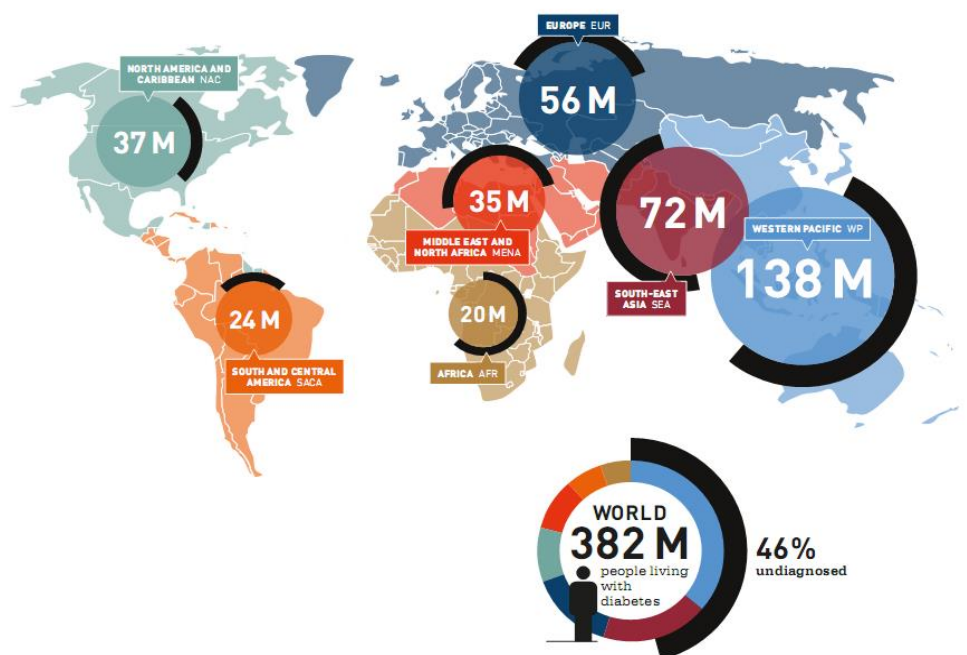
Figure 1. 1 *Number of people with diabetes by International Diabetes Federation (2012).*
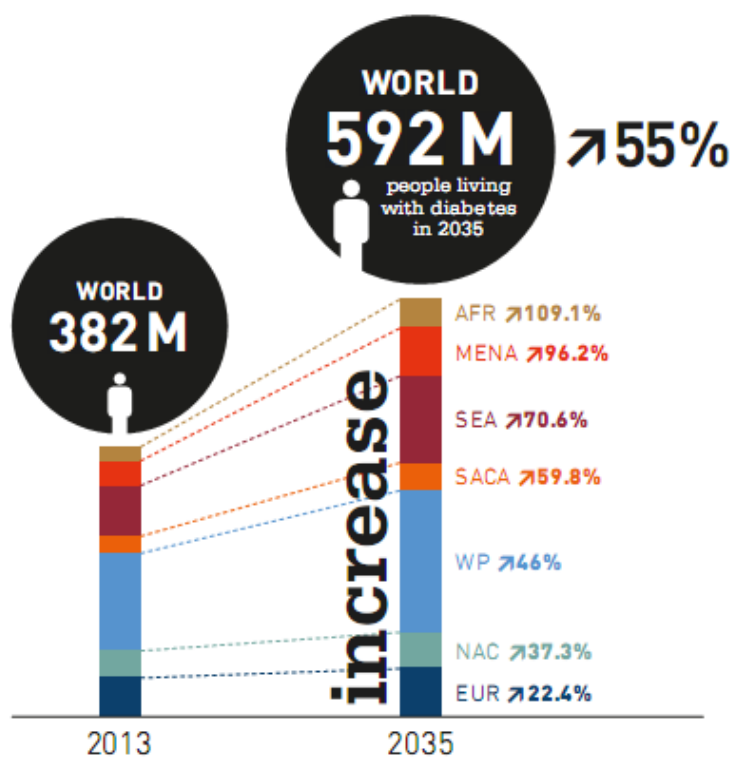
Figure 1. 2 *The estimated number of world people living with diabetes in 2035 (International Diabetes Federation, 2012)*

For Thailand, according to Ministry of Public Health (Thailand), Chronic Disease Surveillance Report of 2010, there were 888,580 diabetic patients in Thailand. The ratio of diabetic illness from the report was 1,395 patients per 100,000 populations. This made it ranked as the second top of non-communicable diseases, of which the first top belonged to high blood pressure.

Diabetes is due to abnormal insulin production or the effect of insulin that has an impact on high blood sugar or glucose level. According to pathology, diabetes can be classified into four types; type I, type II, gestational diabetes (found during pregnancy), and other types (American Diabetes Association, 2010). Type II diabetes mellitus is caused by the combination of abnormal insulin secretion of beta cells and the effect of insulin resistance. A person with diabetes may have either result from those mentioned causes greater than one another. Despite diabetes is a chronic disease, it is treatable through dietary control, physical exercises, and oral medicine. The patients who have long term diabetes, their beta cells may gradually be destructed and fail to control the blood sugar or glucose level. Insulin medication, such as insulin injection, is needed to help control the glucose level instead of the cells' production itself.

Type II diabetes is mostly found in people aged over 40 years. Risk factors of this type are older age, overweight, lack of physical exercises, and genetics (Deerojanawong & Poowilai, 2003). The patients with long term diabetes and poor blood sugar control will easily develop complications that cause illness and death. Complications in diabetic patients may be found when the persons are first diagnosed of diabetes. Those people may have diabetes without any symptoms. The goal of treatment in diabetes is to control blood sugar to normal or close to normal level as much as possible (Khovidhunkit, 2006).   So fasting blood glucose level after 8-12 hours must be 90-130 mg/dl, or the level of hemoglobin A1c (HbA$_{1c}$) is less than 7% (American Diabetes Association, 2010). HbA$_{1c}$ level can be measured by Hemoglobin A1c test. It can determine the average of blood sugar that permanently attach to red blood cells during the past 2-3 months. HbA1c does not only help to monitor the glucose level, but also to determine other risk factors to develop complications in diabetes.

Nowadays there are various methods on blood screening tests for diabetes and/or for monitor in diabetes. The most common method in Thailand is to measure fasting glucose level. The patients are required to fast for 8-12 hours period, and pricked a fingertip with a lancet to test blood sugar level. However, the result from the test shows only glucose level at that moment, it cannot determine the blood sugar level in previous days. Sometimes the result on blood test, as shown the outstanding level, disagrees with poor dietary control of the patients during the past months. Based on the interview of doctors and patients, for example, some patients did not take doctors' recommendation seriously and this often caused high blood sugar level in the patients. Some patients even had their own way to get rid of doctors' complain in sugar control. They managed to control their diet only 5-7 days before doctors' appointment for fingertip prick test which was done once every month. As the result, the blood sugar level showed as normal level. It was faulty and led to misinterpretation in diabetic care and treatment of doctors. The truth would be revealed when the sugar level exceeded normal level leading to complications. The doctors finally learned how their patients behaved that caused unreliable result in blood sugar test.

The other methods on blood screening test for glucose level is glycated hemoglobin or glycosylated hemoglobin test (HbA_{1c} test). HbA_{1c} test is performed by inserting a needle into a blood vessel without fasting. The blood sugar result can determine an average blood sugar level of the patients over the previous 2-3 months. When comparing to a fingertip prick test, HbA_{1c} test is more accurate. The patients cannot trick on their previous dietary control. However, HbA_{1c} test is more expensive than a fingertip prick test. It costs approximately 300 baht and about 50 baht for HbA1c and a fingertip prick tests respectively. Due to the cost of performing blood screening test, most public health centers in Thailand provide HbA_{1c} test to the patients sole 1-2 times a year or when it is necessary. In fact, HbA_{1c} is preferable for accurate blood sugar result. Public health centers seem to face with unreliable blood sugar result from a fingertip prick test, and limitation of providing HbA_{1c} test. As the consequence, this often leads to error in interpretation in blood result to monitor and care for the patients. It may one of the causes of ineffective care in diabetes

Diabetes is a chronic disease. The patients must see their doctors regularly for health checkup, picking up some medicine, and taking doctors' advice. While

examining, the patients must inform symptoms and health problems related to their diabetic illness. The doctor will provide recommendation of how to take better care of themselves, and how to control blood sugar to normal level; prescribe medicine; and explain how to take medicine correctly. In order to make patients understand and follow doctors' advice correctly, communication between patients and doctors must be effective. The important components to improve mutual and better understanding are language usage in communication and point of views on the topic discussing. Both patients and doctors must understand what the other try to communicate and what the other perceive on the subject they are discussing. When the patients do not understand health information or have low health literacy, they will not follow doctors' direction. Low health literacy and abandoning doctors' advice or direction are obstacles prevent them from good health.

Health Literacy or skills in health was first recognized in the United States of America where people from different ethnicities with different languages and cultures live together. Some patients have problem with using English as a second language to communicate with health providers. They seldom understand health information or how to take better health care. According to the study in the patients with diabetes, the patients with low health literacy were likely to have care less in their health. They had high blood sugar level, were often admitted in a hospital, and had more complications in diabetes (Gazmararian et al., 1999; Hoc, 1999; Schillinger et al., 2002; Williams et al., 1998). It was costly to diabetic treatment. Health literacy; therefore, drew more interesting in the United States. Keawdumnern and Treepechurai (2011) referred the data of year 1998 from Health system research Institute that, World Health Organization defined health literacy as "cognitive and social skills that determine an individual's motivation and ability to access, understand, and use the health information to promote and always maintain good health for oneself. World Health Organization defined health literacy as "cognitive and social skills that determine an individual's motivation and ability to access, understand, and use the health information to promote and always maintain good health for oneself. Later on Health organizations and researchers defined health literacy as can be summarized as the ability of a person to obtain health information from different media channels, and to understand and

recognize the obtained health information until utilizing the information as to promote and always maintain one's good health.

Nutbeam (2000, 2008) has classified health literacy into 3 categories: (1) functional health literacy is the ability to understand basic health information; (2) interactive or communicative health literacy is the ability to understand basic health information and to communicate for information exchange with others; (3) critical health literacy refers to the ability to analyze the obtained health information for decision making in health care.   According to previous studies, the patients with diabetes who had low functional health literacy are likely to fail to control blood glucose level (Schillinger et al., 2002). This may result from lack of understanding in health information recommended by health care providers. Increasing high health literacy level in the patients may help them understand what doctors recommend, and be able to control their blood sugar level better.

Measuring health literacy level in the patients can be done through different methods--each of them has different ways of usage and objectives. The previous researches of measurement in health literacy related to blood sugar level (HbA_{1c}) of the patients, the researches common used TOFHLA, s-TOFHLA, REALM or REALM-M (Sayah et al., 2013). These methods have the same goals are to measure ability in reading, pronunciation, vocabularies related to health care and treatment, filling words in the blank, and calculating the given numbers related to health information. These can measure only the level of functional health literacy. The intervention to increase health literacy among the patients is thus formed as health education or media development models. For instance, using pictures for wordings, and using special marks for medicines will help patients to understand health information better. It is a top-down approach of which the intervention is done by researcher team and experts from different fields. The weakness of conducting an intervention to this approach is less participation of patients. It also somehow drops the content of health literacy which makes it far to reach Nutbeam's definition. According to Nutbeam, health literacy is to focus on patients' understanding in health information; patients' ability to access sources of information and knowledge; and patients' ability to analyze the obtained information for proper utilization.   This will occur when all stakeholders, who involve in patients

care and treatment, cooperate and brainstorm their ideas flowing freely by viewing patients as the centers.

Nutbeam's idea influenced Professor Ishikawa (Ishikawa et al., 2008a), who pays much interest in communication between doctors and patients and health information obtained from various sources of patients, to develop a new instrument to measure the level of health literacy. That is Communicative Health Literacy (officially approved by Japanese researchers). It is designed into questionnaire that complies of 14 questions. Those questions are categorized into 3 areas which can determine the level of understanding in the content of health information; the capacity of utilizing in communicative channels to obtain information; and the utilization of obtained information for decision making. Patients will score 1-4 throughout 14 questions. This questionnaire was used to find the relationships between communicative health literacy and HbA_{1c} level in the patients with diabetes. In addition, Assistant Professor Dr. Wantana Maneesriwongkul a researcher from faculty of medicine, Mahidol University applied that questionnaire to the research on the people living with HIV in northern and northeastern Thailand with about 400 sample population (Chananya. et al., 2014). From examining this wide use in patients, it is possible to apply that instrument or questionnaire to diabetic patients in Thailand. It can also be as a guideline to conduct the intervention to rise higher health literacy of Thai diabetic patients. As the result, this can help the patients keep blood sugar level as close to normal ($HbA_{1c} < 7\%$).

Although some of the patients with diabetes understand and recognize health information and doctor's recommendation well, they deny to follow doctors' advice. That because of their thought and point of view towards their diabetes differs from the doctors'. According to Kleinman (1988), he explained that medical staff always viewed patients' illness as a disease. It was important to focus on curing a disease through medication. In contrast, patients viewed their illness as incapability to perform their normal activity. That had an impact on behavior change and social role. Since both doctors and patients had different views on patients' illness, there was a gap between doctors and patients in understanding health care plan or treatment. As the consequence, it causes delay in care and treatment; lack of patients' cooperation;

dissatisfaction in care and treatment; error diagnosis; and inappropriate treatment (Germanin, 1982).

The patients with diabetes have their own belief and attitude on their sickness differently. This leads to individuals' practice in self-care distinguishingly. At the same time, each doctor provides treatment differently based on one's belief and attitude towards the patients' illness. In some cases, both doctors and patients have conflict due to their belief and attitude is unlike. They will not cooperate in controlling blood sugar level or better health care. Some patients rarely provide the information on their health problem and their eating behavior when seeing their doctors. They are not only afraid that the doctors may reject their behavior, but they also refuse to follow the doctors' recommendation as they feel that it is too difficult to practice. In some cases according to the interview, the patients did not take medicine as doctors directed. They took herbal medicine or holy water from traditional healer they believe instead. On the other hand, the doctors were likely not to find out nor understand the patients' belief and attitude related to diabetes and self-care. They even do not try to adjust their advice and treatment to each patient properly. The differences point of view from both patients and doctors have affected on promoting good health in patients which both definitely join the same goal. Here are some examples that prevent them from good health: The patients are dissatisfied in receiving the treatment; Both patients and doctors have less motivation in cooperating in health care: They misunderstand each other as they fail to communicate. It is necessary for both patients with diabetes and doctors to understand each other's views in order to have effective communication that will lead to counseling of Motivational Interviewing (MI). MI will enable the patients to realize their problem and be ready to practice to resolve the problem. If the patients can change their behavior their health will be improved as the result.

Explanatory Models (Ems) from medical anthropology invented by professor Kleinman (1988) can help seeking for both patients and doctors' views. EMs can explain how the patients perceive the cause of diabetes such as what causes their diabetes; when it occurs; what their symptoms are; how it affects their daily lifestyle; and how to treat their illness. These perspectives are related to the patients' life in term of culture, social environment, economics, politics, and environment. It is an asymptomatic (a bottom-up approach). It can help to learn the doctors' view towards

diabetes of the patients, too. Ems thus can suggest whether both patients and doctors' views are similar or different. Moreover, the information from EMs will enable to find the appropriate way of making both patients and doctors to have better understanding and communication. Extreme point of views from both patients and doctors may sometimes discovered, that are difficult to make both of them work together. At least the information from EMs can somehow help both of them to negotiate, and adjust themselves to work together as much as possible. This can result in fulfilling the gap between the patients and doctors in different ways of thinking while assisting better cooperation in health care towards the patients' illness.

Health Literacy and Explanatory Models as mentioned above are important for effective communication between the patients with diabetes and doctors. This may help controlling blood sugar level in the patients. In providing care in diabetic patients; anyhow, there are more involved people besides the patients and doctors. The involved people are relatives, nurses, public health staff, health informative staff, community leaders, and leaders of religions. They have important role in promoting better understanding and knowledge in diabetes to the patients. They also may have an influence on communication between the patients and doctors, and the patients' behavior. In order to make those involved people working together effectively, brainstorming and cooperative guideline are required through systematic working process and the process of Formative Research of Dr. Mark Nichter. Formative Research process is a bottom-up approach, and common used in anthropology to seek for community participation intervention. All stakeholders must share their idea towards community's mutual interest. Formative Research process will start with:

1) Brainstorm to find problems and obstacles on communication between patients and doctors based on the information received from the research in Communicative Health Literacy and Explanatory Models. The obtained information is as primary source to seek for mutual direction or guideline to resolve problem together.

2) Try out as in the guideline mentioned for a period of time. Keep revising and developing the guideline together until reach the final and appropriate method.

3) Implement the intervention for the people with diabetes in the community. This intervention in which all stakeholders participate is expected to help improving better communication between patients and doctors. It can be determined by high level

of communicative health literacy. As expected, this may have an impact on blood sugar level which is indicated in lower HbA_{1c}.

This study, Bang Khonthi district, Samut Songkram Province was purposive selected due to there is increasing of un- controlled DM patients. Samut Songkram Province   is situated in southern central Thailand. It is a small town with 200,000 population. Samut Songkram Province is composed of three districts; Samut, Amphawa, and Bang Khonthi. This province is very important economics area of the central part where most residents produce palm sugar as a household industry. During the past decades, lifestyle of the people in Samut Songkram has changed tremendously from simple life to complex life. They used to work in their own land; consume the product they grew; and sell the extra they had left. They have become to live in semi-industry society that focuses on increasing product to industrial plants. Therefore, more labors are hired and rapid work is needed to increase the productivity in the province. Competition in the market is very tense. The more those labors increase the output, they more they get paid. Keeping themselves refreshing throughout their work shift is an excuse to make long for sweeten and energized drinks. Their lifestyle become in rush and causes them neglect their health. Lots of them like others spend their spare time on eating. They love party, especially Chinese feast that often serves fatty food. Neglect in self-care and consumption unhealthy food may somehow lead to the increasing numbers of diabetic patients in Samut Songkram yearly.

In 2012, there were 2,597 patients with diabetes and 4,143 patients with high blood pressure and diabetes receiving care and treatment in the system of public health centers in Samut Songkram.

There were 80,969 people aged over 35 who were undiagnosed of diabetes and high blood pressure. 73,526 people or 90.9% received verbal screening. From all undiagnosed people, 15,526 people or 21.1% of them were at risk and had blood sugar test for diabetes. There were 8,548 people with blood glucose level < 100 mg/dl; 6,147 people had 100-125; and 831 showed ≥ 126 mg/dl (the doctors diagnosed 279 new cases).

According to Samut Songkram NCD report, 5,238 cases that were already in care and monitor at public health centers of Samut Songkram, 3,790 patients or 72.35%

received HbA1c test; 1,837 or 48.5% could control blood sugar level well (HbA1c < 7%).

During the year 2008-2012, numbers of people in Samut Songkram diagnosed with diabetes has increased from 2,732 to 3,463 per 100,000 population. There were more people receiving diabetic treatment from public health centers from 1,136 patients to 1,300 per 100,000 population during 2010-2012. In fact, the raising numbers of the patients visiting doctors daily is greater than the number of health providers. The doctors have limited time to discuss on health with each patient that causes ineffective care. Most diabetic patients of Samut Songkram are also elderly with low education that cause communication problem. Presently, lot of elders are neglected at home since their children and relatives have to work far from where they live. They rarely have someone to take care of them or accompany them to visit a doctor. Though the residents' lifestyle has changed, many of them still live in their houses built on their land as in the past. Each house is settled individually far from others. Bus routes are not many and that take so long to make one round. A few buses running through villages inconvenience the patients to commute to see a doctor. When they come to see a doctor, they cannot wait for so long as they have to be hurry to catch a bus back home otherwise they might miss it. Based on those mentioned factors, the impact on public health of Samut Songkram Province can be summarized into three areas-- unacceptable ratio of the doctors to the patients; communication problem due to age group and low education of the patients; and commuting of the patients.

Bang Khonthi district comprises 13 sub-districts with 32,975 total population or 17% of the province population. There were 1,477 people or 4.48 % of the district population had diabetes. As calculated to compare per 100,000 population, it was 4,479. The proportion of people with diabetes per 100,000 population of Samut Songkram province and Bang Khonthi district showed 3,463 and 4,479 respectively. These determined a greater average number of diabetes in the district than in the province. In Bang Khonthi district, there are 13 sub-district health promotion hospitals. Only three of those; Jormploug, Bang Prom, and Bang Yeerong sub-districts health promotion hospitals, are primary care center. In this study, Jormploug sub-districts was selected as the intervention areas meanwhile, Bang Prom and Bang Yeerong sub-districts were selected as control areas. Each center serves three to five sub-district

health promotion hospitals. Napalai Hospital has also set up teams of doctors, nurses, and pharmacists to each center once every month since 2011.

Jormploug sub-district health promotion hospital provides care and treatment to the patients via doctor's appointment and medication. The patients will be scheduled to pick up their medicine and have blood sugar test monthly. If the glucose level exceeds the acceptable level, the patients will be scheduled to see a doctor on the next day. When seeing a doctor, a nurse will first screen the patients' health through an interview. She will note important information or problem found in the patients' history file, and give some advice at the same time. The assisting of a nurse on this process helps a doctor in rapid examination. A doctor will have only a few minutes to discuss with the patients because numbers of patients are waiting in line.

In order to make the patients with diabetes obtain more health information and knowledge on basic health care is to raise the level of health literacy to functional throughout the process of health care system as mentioned above. This system; however, is not effectively enough to reach communicative and critical health literacy levels. It only provides information and knowledge on basic health care--just to care for oneself. Higher health literacy as communicative and critical levels requires patients' motivation. That will drive them to search for more health information and analyze the obtained information for individuals' utilization in good health. Thus doctors and nurses must come with some strategies to provide the consultation as Motivational Interviewing which will occur when those care provides understand what patients perceive on patients' own health indeed. If this idea is in practice, it is believe that the patients will be willing to take better care of themselves. Furthermore, their motivation will drive them to seek for more health information from various sources and analyze whether the information is good for them or not when they want to have good health. This kind of behavior determines higher level of health literacy to communicative and critical health literacy. It will be possible to influence health improvement among the patients. As the result, the blood glucose will maintain in outstanding level.

1.2 Research Questions

      1.2.1 What are the socio-demographic characteristics among Diabetes Mellitus Type II patients in Bang Khonthi District, Samut Songkram Province, Thailand?

      1.2.2 What are the levels of Health Literary (HL: the motivation and ability of individuals to gain access, to understand and use information in ways which promote and maintain good health, measured by Ishikawa's 3-level Health Literacy scale), the level of self-care behavior (There were four dimensions of self-care behavior including physical dimension, prevented complication dimension, treatment dimension, and psychosocial dimension), and blood sugar among Diabetes Mellitus Type II patients in Bang Khonthi District before intervention?

      1.2.3 What is the relationship between socio-demographic data, physical condition, oral communication capacity, social support, communicative health literacy, and self-care behavior among Diabetes Mellitus Type II patients in Bang Khonthi District?

      1.2.4 What are Diabetes Mellitus Type II patients' perception of promoting health literacy at sub-district health promotion hospitals in Bang Khonthi district?

      1.2.5 What are health care providers' perception of promoting health literacy at sub-district health promotion hospitals in Bang Khonthi district?

      1.2.6 What is a community participation intervention, that improves health literacy, self-care behavior, and blood sugar of Diabetes Mellitus Type II patients in sub-district health promotion hospitals in Bang Khonthi district?

      1.2.7 What is the effect of the community participation intervention on health literacy, self-care behavior, and blood sugar of Diabetes Mellitus Type II patients in sub-district health promotion hospitals in Bang Khonthi district?

1.3 Research's objectives

1.3.1 General objective

      To develop an integrated communicative health literacy program (ICHL program) for promoting health literacy, self-care behavior, and diabetes outcome among type-2 diabetic patient in Bang Khonthi district Samut Songkram province, Thailand.

1.3.2 Specific objective

1) To describe the socio-demographic characteristics among Diabetes Mellitus Type II patients in Bang Khonthi District, Samut Songkram Province, Thailand.

2) To find out the levels of Health Literary (HL measured by Ishikawa's 3-level Health Literacy scale), levels of self-care behavior and blood sugar among Diabetes Mellitus Type II patients in Bang Khonthi District, Samut Songkram Province, Thailand.

3) To determine the relationship between socio-demographic data, physical condition, oral communication capacity, social support, communicative health literacy, and self-care behavior among Diabetes Mellitus Type II patients in Bang Khonthi District.

4) To elicit Diabetes Mellitus Type II patients' perception of promoting health literacy at sub-district health promotion hospitals in Bang Khonthi district.

5) To elicit health care providers' perception of promoting health literacy at sub-district health promotion hospitals in Bang Khonthi district.

6) To develop an integrated communicative health literacy program (ICHL program), that helps improve health literacy, self-care behavior, and blood sugar of Diabetes Mellitus Type II patients in sub-district health promotion hospitals in Bang Khonthi district.

7) To evaluate the effect of the integrated communicative health literacy program (ICHL program) on health literacy, self-care behavior, and blood sugar of Diabetes Mellitus Type II patients in sub-district health promotion hospitals in Bang Khonthi district.

1.4 Hypotheses

1) The mean clinical parameters (HbA1c) between type-2 diabetic patients in the intervention group and the control group are different after applying the ICHL program.

2) The mean health literacy score between type-2 diabetic patients in the intervention group and the control group are different after applying the ICHL program.

3) The mean self-care behavior score between type-2 diabetic patients in the intervention group and the control group are different after applying the ICHL program.

1.5 Conceptual framework
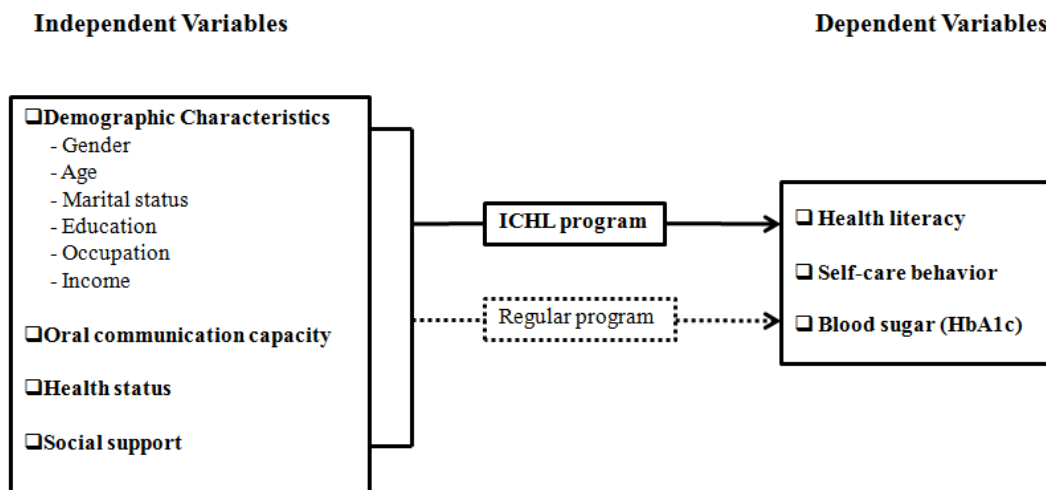
Figure 1. 3 *Conceptual frameworks*

1.6 Operational definitions

1. Age –age of the participants in this research

2. Gender –gender of the participants in this research

3. Income –an average of monthly household income of the participants in this research

4. Education –the highest education level of the participants in this research

5. Oral communication capacity –the ability in specking with a doctor to ask a question regarding health condition

6. Health status –the duration of diabetes and a number of complication that diabetic patients have

7. Social support - the perception and actuality that one is cared for, has assistance available from other people, and that one is part of a supportive <u>social network</u>.

8. Self-care behaviors – four dimension of an action taken by a person to maintain, attain, or regain good health and to prevent illness, including physical dimension, prevented complication dimension, treatment dimension, and psychosocial dimension

9. Health Literacy – the ability of the participants in understanding health information, searching for health information from different sources, and analyze and make a decision, based on the knowledge they obtained, for their own use in health care, measured by the 3- level Health Literacy Scale developed by Professor Ishikawa

10. Diabetes –the disease is due to abnormal insulin production or the effect of insulin that cause high blood sugar level. The diagnosis will be done at least two times and the result shows >126 mg/dl before meal, or HbA1c >6.5% according to ADA.

11. Type II diabetes mellitus –Type II results from insulin resistance and insulin deficiency this mostly found in the people aged over 30 years with overweight and have a family history of diabetes

12. Patient –the patient who has type II diabetes mellitus

13. HbA_{1c} – it is a measurement method of average sugar in the patients with diabetes during the past three months. Due to blood glucose attached to hemoglobin in red blood cell, it will attach to red blood cell for approximately 3 moths. If the blood sugar level is high, HbA1c will rise. The patients with well control, HbA1c shows <7%.

1.7. Significance of the study:

This study will:

1.6.1 Determine the direction to raise health literacy by utilizing a bottom-up approach.

1.6.2 Provide a knowledge that helps decrease HbA_{1c} in the diabetic patients.

1.6.3 Fulfill the gap between the doctors and patients' perspectives on diabetes control.

1.6.4. Provide some recommendations to the public health centers of Samut Songkram province that may help to improve care and treatment in diabetic patients.

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CHAPTER II
LITERATURE REVIEW

2.1 Diabetes

Diabetes is non-contagious diseases. It is a status in which the patient's body cannot perform functionally in controlling the blood glucose level. It is often that patients have an unusually high blood glucose level. In a normal person when taking no food, the liver commonly produces sugar in order to feed the brain and other organs. After taking food, the carbohydrates are digested into glucose and transmitted into the blood flow. Higher levels of glucose will stimulate the body into bringing this glucose for use within the body in order to reduce the glucose level. Contrarily, in the case of d*iabetic patients, the body cannot effectively reduce the blood glucose to normal levels within a normal length of time, resulting in high blood sugar until it is in the kidney and mixed in urine. This is how diabetes* is caused. Unusually high level of blood glucose can easily cause a *capillary* blockage. These capillaries are very important in feeding and hence the functionality of kidneys, eyes and skin. Capillary blockage can therefore affect or harm the function of these organs and lead to other effects such as kidney failure due to bad functionality, broken *blood vessels* in the *eyes* leading to blindness, and slower skin wound recovery leading to higher vulnerability to bacteria and infection (World Health Organization, 2013b).

Nowadays, diabetes is causing a high rate of death around the world. The forecast of the World Health Organization (World Health Organization, 2013a) reported that in the year 2025, the world's population living with diabetes will be approximately 300 million. According to World Health Report (World Health Organization, 2012), one in ten adults populations has diabetes.

For Thailand, the 4th Thai Population Health Survey gathered from physical check- up during 2008- 2009 found that diabetes occurred in 6.9 percent among young Thai from 15 years old or. One- third of these were those

who had never been diagnosed as having diabetes before and those who were diagnosed as having diabetes but had received no treatment, making 3.3 percent. According to the Non Communicable Disease Watch by the Health Systems Research Institute (1998), there were 888,580 people living with diabetes, making an illness rate of 1,394.91 people per hundred thousand people. The number of people living with diabetes was the second highest following that of high blood pressure. The report of Health System Research Institute (1998) found that in the developed countries such as United States of America, Australia and New Zealand, approximately 50- 70 percent of people living with diabetes could control the blood glucose to an appropriate level. Those who cannot were found to show some further symptoms or conditions that give a sign of more severe illness. Based on the Bureau of Policy and Strategy, the Ministry of Public Health in 2008, there was a continually increasing rate of diabetic patients admitted to receive treatment at hospitals during 1998- 2008. It was also found that the rate increased from 175.7 to 675.7 people per hundred thousand people in 2008. If diabetic patients do not receive appropriate and correct treatment, they will suffer from many other illnesses both acute and chronic, from body system malfunctions, which can lead to disability or premature death. These are the threats to the patients, the household economic of the patients and their families, including to the nation.

2.1.1 Diabetes in Medical Context

2.1.1.1 The Balance of Body Energies

Humans are creatures which always use energy. Most energies are derived from food intake. After the taken food is digested into small components in stomach and intestine, it is turned into smaller substances or nutrients and absorbed into the blood stream. The important nutrients include protein, fatty acid and glucose (Khovidhunkit, 2006). Naturally humans do not eat day long and therefore do not always receive energies directly from food. Part of the energies are from the energies unused, produced from the food intake earlier. These are, for example, glycogen stored in liver, triglyceride stored in adipose cell and protein in muscles. The energies from these sources are brought into use when the body lacks food. Excess energies will be stored again once humans take food.

2.1.1.2 The Balance of Blood Glucose

Glycogen is made and stored primarily in the cells of the muscles, where 400 grams of glycogen can be found. Liver cells are another area that easily makes and stores glycogen, for 80 grams (Khovidhunkit, 2006). The amount of glycogen is controlled by two important hormones which are insulin and glucagon. These two hormones are produced by the cells of the pancreas. Insulin helps in storing glucose within the cells before turning it into glycogen within muscles and liver. Glucagon helps dissolve glycogen at the liver in order to change to glucose to be transmitted into the blood flow. In general, in normal people body, the blood glucose remains balanced between 70- 120 mg / dl/both after meal and on fasting (Khovidhunkit, 2006). After taking carbohydrates, the body absorbs the glucose from the alimentary canal into the blood flow to feed the brain and other organs for further use. This absorbed glucose is normally excessive beyond the body's needs. High amount of sugar in the blood flow will stimulate the pancreas to release insulin. This insulin helps in absorbing the excessive glucose from the blood into other organ cells, where muscle cells contain the highest amount of glucose or 80- 95percent (Khovidhunkit, 2006). Conversely, when the body lacks food, glucagon is released by the stimulation in the pancreas, making the stored glycogen at the liver and other organs to dissolve into glucose that transmits into the blood flow for further use.

2.1.1.3 How is diabetes developed?

Diabetes is caused from an insulin deficiency or insulin resistance. This means that the pancreas produces less insulin than normal. The cause is from damage of the cells of pancreas or lower ability in producing insulin. This will result in less effective functionality of the body in transporting the excessive glucose into the body cells, or lower efficiency of insulin in transmitting glucose into the body cells, despite the high amount of insulin produced at the pancreas. These affect higher blood glucose level.

2.1.1.4 Types of Diabetes

Diabetes can be categorized into 4 types based *on the pathophysiology of diabetes (American Diabetes Association, 2010), as follows:*

(1)   Type- 1 Diabetes: caused by a damage of beta cells at the pancreas until the pancreas cannot produce insulin, resulting in lack of insulin in the body. Normally this happens to those who are younger than 20 years old. Patients usually are quite thin, in need of insulin injection. In Thailand, patients in this group are found lesser than 5 percent of all population with diabetes (Nitiyanant et al., 2001).

(2)   Type- 2 Diabetes: caused by an insulin resistance and insulin deficiency. Normally this happens to those who are above 30 years old. Patients in this group are fat, with family history of diabetes (Deerojanawong & Poowilai, 2003).

(3)   Diabetes during pregnancy: found as the first time in woman having pregnancy. Patients have no history of diabetes, but diabetes is rather caused from the change of body hormones during pregnancy. This causes an insulin resistance and the treatment can be done by giving insulin. Normally diabetes will disappear after pregnancy, however, patients can have chance to develop the type- 2 diabetes when they are older.

(4)   Diabetes caused from other reasons such as genetic disorder, pancreas disease, *endocrine diseases*, drug and chemical effects.

2.1.1.5 Diagnosis of Diabetes

During the past decades diagnosis of diabetes had relied on measuring the level of blood glucose, either fasting plasma glucose (FPG) or oral glucose tolerance test (OGTT) after 2 hours taking oral glucose. Nowadays, hemoglobin A1c and HbA1c are also tested (American Diabetes Association, 2010), which is able to evaluate whether a person has diabetes, without fasting. By this way, a relationship of diabetes and other complications can be shown. In order to diagnose a person to check diabetes, the person's blood is tested. If the person has diabetes, the results of the blood glucose level belong to any of the following criteria:

(1) The blood glucose level higher than 200 mg/dl without fasting; or

(2) With at least 2 times check of fasting plasma glucose (FPG), the blood glucose level from 126 mg/dl; or

(3) With the check of oral glucose tolerance test (OGTT) after 2 hours taking oral glucose, the blood glucose level from 200 mg/dl; or

(4) Having the level of HbA1c test from 6.5 percent based on ADA (ADA, 2012).

2.1.1.6 Diagnosis of HbA1c

HbA1c is to measure an average accumulated rate of blood glucose level in diabetes patients back to the previous 3 months. The test is based the previous 3 months is due to the reason that the blood glucose catches with the hemoglobin in red blood cell, which takes approximately 3 months. The patient with high blood glucose level will be found to have high level of HbA1c. Table 1 demonstrates a relationship of the HbA1c level and blood glucose level. Diabetic patients should be checked for the HbA1c level every 3 months or at least twice a year (American Diabetes Association, 2010). The benefit of HbA1c in treating diabetic patients is that HbA1c can be used in an explanation of effects from the current blood glucose condition, which is good as suggestions to be made for patients of the risk of having high HbA1c. Diabetic patients will be learned how to take care of themselves, which means to increase an effectiveness of diabetes treatments.

Table 2. 1 *The rate of A1C in comparison of mean plasma glucose (Gerber et al., 2005)*

A1C (%)	Mean plasma glucose	
	mg/dL	mmol/L
6	126	7.0
7	154	8.6
8	183	10.2
9	212	11.8
10	240	13.4
11	269	14.9
12	298	16.5

These estimates are based on ADAG data of ~2,700 glucose measurements over 3 months per A1C measurement in 507 adults with type 1, type 2, and no diabetes. The correlation between A1C and average glucose was 0.92 (ref. 67). A calculator for converting A1C results into eAG, in either mg/dL or mmol/L, is available at http://professional.diabetes.org/eAG.

2.1.1.7 Complications of Diabetes

Long living with diabetes and low control the balance of the blood glucose level can easily cause complications, which leads to the worse cases such as other illnesses and death. Complications can be found in diabetic patients from the first diagnosis, as patients may not aware of having diabetes due to no symptom. Diabetes can cause acute complications, for instance, diabetic Ketoacidosis, *Hyperosmolar Non- Ketotic Coma*, high blood glucose caused from infection, Hypoglycemia caused from drug use for treatment and chronic complications such as *diabetic retinopathy, kidney failure, peripheral nervous system diseases, stroke,* coronary *heart disease and* peripheral vascular disease. These diseases bring to the loss of lives, disabilities and money.

2.1.1.8 The Goal of Type- 2 Diabetes Treatment

The goal of type- 2 diabetes treatment is to control the blood glucose level to normal or close to normal level by controlling the blood glucose level after 8- 12 hours of fasting period (Khovidhunkit, 2006) to remain 130- 90 mg/dl; or to control the hemoglobin A1c [HbA1c] lower than 7 (American Diabetes Association, 2010) suggested that when the treatments of type- 2 diabetic patients start, the patients must

be provided with the knowledge of how to change their daily behavior. In the case of patients with medium high blood glucose level, strict changes of daily behavior may be able to help remain the blood glucose level to achieve the goal of treatment. In the case of patients with high blood glucose level with obvious symptoms or illnesses, provision of drug for blood glucose control must be made with the patients' changes of daily behavior. In Thailand, the Ministry of Public Health has set the practical guidelines for treatments of type- 2 diabetic patients as follows:

(1) Starting with changes of daily behavior within 1-3 months; if the result cannot achieve the goal of treatment, drug for reducing the blood glucose level should be provided;

(2) Provision of drugcan be made after the ineffective result of daily behavior changes, or can be made along with the changing of daily behavior, which depends on the blood glucose level. Provision of drug must be made with a consideration of patients' conditions: whether they have any strong resistance to drug action, or strong *insulin deficiency*. Furthermore, there should be an adjustment of the drug given every 1-2 months; secondary drug can be given if the primary cannot assist to achieve the treatment goal, and the treatment goal to be set must be the levels of the blood glucose and the HbA1c.

(3) If a failure to achieve the treatment goal appear after treating by giving the three types of drugs: the levels of the blood glucose and the HbA1c remain high, a treatment by insulin can be considered.

2.1.1.9 Evaluation of Blood Glucose Level Control in Type- 2 Diabetes

Blood glucose level control is a basis of diabetes treatment, the report from Diabetes Control and Complications Trails and U.K. Prospective Diabetes showed that better diabetes control correlates with a reduction of risk rate in diabetic complications in patients, particularly the complications in the following organs or systems: eye, kidney and foot. Treatment of diabetes today has many criteria in Glycemic Control, as shown in Table 2.2.

Table 2. 2 *The Treatment Goal of Glycemic Control in Diabetic Patients*

	ADA[(ADA,2007)] (and Thailand)	AACE[(AACE,2007)]	EASD[(Nathan et al,2007)]	IDF[(IDF,2005)]
FPG(mg/dl)	<130	<110	<110	<110
Peak postprandial PG(mg/dl)	<180	-	-	-
2hr postprandial PG (mg/dl)	-	<140	<135	<135
HbA$_{1c}$ (%)	<7.0	<6.5	<6.5	<6.5

ADA	-	American Diabetes Association
AACE	-	American Association of Clinical Endocrinologists
EASD	-	European Association for the Study of Diabetes
IDF	-	International Diabetes Federation
FPG	-	Fasting plasma glucose
PG	-	Plasma Glucose
HbA$_{1c}$	-	Hemoglobin A1c

In Thailand, blood tests to monitor the treatments of diabetic patient scan vary, but the most popular is 8- 12 hours fasting before capillary blood glucose test to check for the blood glucose level. The treatment goals of glycemic control follow the standard of American Diabetic Association (Khovidhunkit, 2006). Patients who receive this kind of treatment from public hospitals, in general, receive the treatment once a month. However, the result shows only the blood glucose level at the moment or the day of the test and the test cannot indicate the level during the previous days. This sometimes causes an irrelevancy between the result that shows the balance of the blood glucose control remaining in the criteria and the hidden fact in the previous days of bad balance of the blood glucose control. Based on the interview conducted by the author, it was found that some patients did not follow the instructions of doctors in doing a diet resulting in a regularly high level of the blood glucose. These patients do hide this behavior to the doctors and just behave strictly only 5-7 days before having the next

capillary blood glucose test. This causes a misunderstanding of doctors who treat these patients. Normally the patients are those who are in the working age, whose physical condition, especially muscles still remain good. This means that they can just spend around 5-7 days in exercising before having a test. This is contrarily to older patients, due to the physical limitation and lower ability of glucose use in the muscles.

Another type of blood test is HbA1c level test. The test is the Venipuncture at arm area without fasting. The resulted rate can indicate an average level of blood glucose during the past 2- 3 months, making the HbA1c level test giving more accurate result than the capillary blood glucose test during the 2-3 month-period. However, according to the interviews with the medical staff at district health promoting hospitals that take care of diabetic patients, it was found that the HbA1c level test costs higher, or around 300 Baht each time than the capillary blood glucose test which costs around 50 Baht. Thus, diabetic patients in most public hospitals normally receive HbA1c level test only once or twice a year or if necessary. The given results therefore cannot be used accurately in monitoring the blood glucose level control in diabetic patients, causing ineffective treatment in public hospitals

2.1.2 Diabetes in Social and Cultural Context

The past decades had revealed an annual increased number of people living with diabetes. Even though the world medication science has been progressed, an exact cause of diabetes still cannot be indicated precisely. What is known is only that the important direct factors that cause diabetes include food, living pattern and genes. There still are other factors that have a direct cause of diabetes such as social, cultural, economic, political and environmental factors. These factors have indirectly shaped the ways people in particular societies live and eat, and have altered their genes.

2.1.2.1 Changes of Way of Living

In the earlier time of human living, human had lived on hunting for flesh and vegetables in the nature. Later, social gathering of human grew up; making human learned the culture of cultivation such as feeding animals and growing crops. Human had learned to exchange foods left from their household consumption, until it was

developed as trading. Trading had been developed with the higher demands to produce more agricultural products.

At present, farmers utilize several technologies in order to increase their crops and to prevent them from natural damage such as insects. One of them is to use chemical. Chemical substances can be accumulated in vegetables and these vegetables are consumed by the public. This harms very much the human health. The study of van Koppen and Kaiser (2003) revealed that the level of insecticide substances accumulated in crops correlates with a reduction of insulin release in individuals who receive insecticide substances on a regular basis, which may later cause diabetes in those persons.

Number of agricultural crops is processed in factories. These factories are the source of income of many people. They moved from their rural hometowns to work in these factories mostly located in urbanized areas. This social shift has made urban areas become highly populated. The people, when settled in a new environment usually have to spend some times to adapt themselves to the new setting, and their ways of living have been getting changed. The changes of lifestyles have thus influenced changes in their body functionality system as well as mental system such as stress. Diabetes can be started from this fact.

During the past decades, human way of living has been greatly changed from simple living in natural environment to stressful living in urbanized environment. People make their living with struggles in order to earn living, while materialism consumption is hardly avoidable. Time for resting, exercising and taking care of their health is paid less importance. Fast food is the main food while enjoyment of regular social parties becomes normal activity. However, they do not recognize that this way of life is a promoter of having diabetes. Treatment of diabetes becomes more difficult to achieve its goal, due to one of the facts that people leave their elderly and children at home. Older diabetic patients who are left at alone home uncared well will face health problem due to the reason that no one takes them to hospital or take care of them in giving treatment drugs and controlling diets. These patients are in need of special care.

2.1.2.2 Influence of Thai Culture on Viewpoints towards and Managing of Diabetes

The study of Sowattanangoon et al. (2009) mentioned that the social and cultural values of Thai people had an influence on their viewpoints towards diabetes. The word "diabetes" in an understanding of Thai people is the disease that is explained by high level of blood sugar in the body until there is sugar in the urine. Thus, Thai patients try not to eat much carbohydrate and sweet hoping to reduce the blood sugar level. Many view that diabetes was the sin from the last life or this life, and could not escape from it. This belief has influenced these patients to manage their health quite well. However, control of diets is a harder action for many patients. It is especially in Thailand which is very prosperous in fruits. Yet, with the belief in Buddhism which teaches Thai people to live with sufficiency. The idiom "Eating to live, not living to eat" could explain the way of Thai people in releasing themselves from the sins of the last and present lives by reducing or removing meats in their meals and following vegetarian practices. These behaviors are good to the health condition of diabetic patients if they practice. Praying, practicing meditation, and following Buddhist ways can help diabetic patients remain calmer, less stressed and having a good reminder of what to do to take care of their health. These all assist in smoother and more effective management of diabetes treatment.

Conversely, Thai society respects seniority. Younger persons should respect older persons. In hospitals, there are young doctors and nurses who take care of diabetic patients who are much older. The way doctors and nurses tell the patients to follow their instructions strictly may cause dissatisfaction and reaction from these old patients who may feel disrespected. The study of Chanthapasa (2004) found that during treatment of diabetes, if doctors behave in the way that make old patients feel inferior, for example strictly commanding the patients to follow the instructions without allowing them to express any feelings or opinions, the doctors may not be able to receive sufficiently useful information from the patients; may not receive good participation from the patients; or the patients may decide to receive a treatment with a new doctor or at other hospitals. Some patients feel that they do not receive good respect from medical staff; some feel irritated and annoyed; some feel that they are not well cared by medical staff.

These influence them to change to new doctors, new hospitals or other alternative treatments such as herbal treatment or traditional treatment. This can cause the diabetic condition get worse.

2.2 Health Literacy

Since diabetes is a chronic disease, diabetic patients have to meet doctor regularly to receive drug prescription and suggestions in regards to blood glucose balance control. During each meeting, patients are asked to describe their symptoms and difficulties relevant to their diabetic condition. The doctor will give suggestions and drug prescription with instructions of drug use. In order to create an understanding among diabetic patients in how to behave correctly and appropriately suggested by the doctors, communication between doctors and diabetic patients must be effective. Both sides need to understand the communication messages made from each side. Both have to understand in the same way of what they are conversing. A factor that leads to misunderstanding of patients in doctors' messages is a shortage of health knowledge of patients, or in other words, they lack of health literacy. Health literacy is an ability of a person in receiving information relevant to health through different communication channels, and in understanding and remembering the content of the information enough for future use in taking care of health and promoting good health and well-being. Previous studies (Gazmararian et al., 1999; Hoc, 1999; Schillinger et al., 2002; Williams et al., 1998) revealed that diabetic patients with lower health literacy tend to have less ability to control blood glucose level as they do not understand about health-related suggestions given by their doctors, resulting in less appropriate behavior in taking good care of health. Thus, increasing diabetic patients' health literacy should be beneficial in assisting the patients to have higher level of understanding of health-related suggestions in terms of blood glucose control given by their doctors.

2.2.1 Definitions and Meanings of Health Literacy

The concept of health literacy first appeared in an academic journal of health education in 1974 (Mancuso, 2009), and had become popular in later years. Health literacy was defined in several approaches until it was defined by the World Health

Organization or WHO. In 1998, the campaigns to promote public health knowledge and development among citizens were created. After that, the word "health literacy" was appeared in a journal that denoted a crucial role of health education in pushing public policy concerning health, education and mass media. However, different explanations of health literacy within different aspects and viewpoints were made based on different academic experiences and attitudes. The definitions found in relevant studies and journals include the following:

2.2.1.1 World Health Organization (WHO, 1998) explained "health literacy represents the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good wealth". This definition was also explained by Health Systems Research Institute (Health System Research Institute, 1998).

2.2.1.2 The Ad Hoc Committee on Health Literacy for the Council on Scientific Affairs of the American Medical Association (1999) defined health literacy as "all skills which include skills of basic reading and calculation necessary for promoting and maintaining good health".

2.2.1.3 Keawdumnern and Treepechurai (2011) referred the data from The Center for Health Care Strategies Inc. in year 2000 that health literacy as "an ability in reading understanding and behaving after receiving health promotion information".

2.2.1.4 The US Healthy People (2010) declared and put into act in 2000 defined health literacy as "the level of ability of individuals in gathering, clarifying or making an understanding of basic information or service information which is necessary for making a decision in promoting health".

2.2.1.5 Keawdumnern and Treepechurai (2011) referred the data of Institute of Medicine (IOM) that health literacy was "a level of ability of individuals in receiving fundamental management service and knowledge of health necessary for an appropriate decision making". The institute explained that health literacy depends on a skill of individuals in confronting particular health condition, healthcare system, education system, social and cultural factors at home, at work and within community.

2.2.1.6 Nutbeam (2000, 2008) explained that health literacy was (1) "knowledge, understanding and social skills which determine individuals' ability in accessing, making an understanding and utilizing information for making good health, including developing knowledge and understanding in health context, changing attitudes and motivation for moving themselves to having more appropriate health behavior" (2000); (2) "capability of individuals in accessing, understanding, evaluating, utilizing and communicating health- related information at their own needs and requirements for health promotion and long- term well-being" (2008); and (3) "social skills and analysis which determine the motivation and ability of individuals in accessing, understanding and utilizing health- related information for health promotion and healthcare" (2009).

2.2.1.7 Zarcadoolas et al. (2005) defined health literacy as "the skill that influences individuals' ability in evaluating public health information for use as the guideline in reducing health risks and increasing quality of life".

2.2.1.8 Kickbusch (2008) stated that health literacy was ability in making a decision for health related aspects in daily life and in searching for useful information for self- healthcare.

2.2.1.9 Pleasant and Kuruvilla (2008) described health literacy as an ability in searching, making an understanding, analyzing and utilizing health- related information for appropriate health concerned decision making for good health and reduction of inequality of healthcare.

2.2.1.10 Health literacy was defined by Ishikawa et al. (Ishikawa et al., 2008a) as "an individual ability in accessing, understanding and utilizing health- related information for appropriate health concerned decision making".

The concept of health literacy is clarified from a classification of health literacy by Nutbeam (2000, 2008), the Faculty of Public Health Sciences and Community Medicine, University of Sydney, Australia. They wrote an article titled "Health literacy as a public health goal: a challenge for contemporary health education and

communication strategies into health 21ˢᵗ century". Health literacy in this article was classified into the following 3 levels:

(1) Functional health literacy refers to skills of listening, speaking, reading and writing necessary for making an understanding and practices of daily life. Kickbusch (2001) added that "it is ability in applying reading and numeric skills such as reading consent form, medical label, writing about healthcare, making an understanding of both written and oral information given by doctors, nurses or pharmacists, including behaving according to doctors' suggestions such as having pills, making an appointment".

(2) Communicative/ interactive health literacy refers to being literate in basic health, cognitive and social skills used in participating social activities and selecting updated information for improving health behavior.

(3) Critical health literacy refers to higher cognitive and social skills; ability to apply news and information based on analysis and comparison; ability to manage daily situations. This type of health literacy is shown through individuals' judgments and actions, participation in moving the society and politics they live in. This is a linkage between individual benefits and society, and public health.

2.2.2 Tools and Measures of Health Literacy

The literature reviews found that tools and measures of health literacy have been developed and presented in various research papers, yet have not been widely publicized. Most of them are for a measurement of characteristics of memory, calculation and media receptive evaluation. The classification of Don Nutbeam was used in developing tools and measures of health literacy (Nutbeam, 2000, 2008). Some widely used tools and measures are the following:

2.2.2.1 Rapid Estimate of Adults Literacy in Medicine: REALM was developed by Davis et al. was referred by Mancuso (2009). It is the tool for measuring ability to read and write of patients in primary care units, for educating health and

medicinal research units. The tool was designed for evaluation of reading for technical health terms, in order to check patients in memorizing necessary health- related terms. This can assist doctors in classifying patients based on different level of limited reading ability and in evaluating and improving media and words used.

Characteristics and Use Methods

The Rapid Estimate of Adults Literacy in Medicine or REALM consists of 125 words used in measuring. They are easy medicinal words, arrayed in 4 columns based on amount of syllabus and difficulty. The time spent in doing this measure is 3-5 minutes. Patients are asked to read all words out loud and score is given based on correction of words pronounced. The score is classified by level of education: lower than Prathom 3 level or junior primary school level, Prathom 4-6 level or senior primary school level, junior secondary school level, and higher than junior secondary school level.

***Table 2. 3** US High School Grade Equivalents of REALM Raw Scores*

Raw score	Grade range
0–18	Third grade and below (UK reading age 8–9 yr) Will not be able to read most low-literacy materials; will need repeated oral instructions
19–44	Fourth to sixth grade (UK reading age 9–12 yr) Will need low-literacy materials; may not be able to read prescription labels
45–60	Seventh to eighth grade (UK reading age 12–13 yr) Will struggle with most patient education materials; will not be offended by low-literacy materials
61–66	High school (UK reading age 16 yr) Will be able to read most patient education materials

2.2.2.2 *Shortened version of the Rapid Estimate of Adults Literacy in Medicine or S-REALM* (Mancuso, 2009)

Characteristics and Use Methods

The number of words was shortened to 66 words in this version of REALM in order to reduce the time spent in measuring. It was arrayed in 3 columns based on amount of syllabus and easiness and difficulty. The time spent is approximately 1-2 minutes. The classification remains the same as the REALM.

2.2.2.3 *Shortened version of the Rapid Estimate of Adults Literacy in Medicine or REALM-R*

Characteristics and Use Methods

The number of words was shortened to 8 words in REALM- R in order to reduce the time spent in measuring. In S-REALM, if a person receives 6 or lower than 6 scores, the person is considered having a risk in having lower health literacy.

2.2.2.4 *Medical Achievement Reading Test or MART* (Mancuso, 2009).

This measurement is similar to REALM in terms of evaluation of reading medicinal terms and vocabularies.

Characteristics and Use Methods

There are 42 words in MART. MART is designed to find reasons of why each individual cannot read relevant words or terms in prescription or educational health brochures. It was found that small letters printed on high glossy papers could have them read more difficultly, as they could not predict words they did not know. The time spent is approximately 3-5 minutes.

2.2.2.5 The Newest Vital Sign or NVS (Mancuso, 2009).

Characteristics and Use Methods

The tool is used for filtering patients in primary care unit, taking approximately 3-5 minutes. The 6 words brought from ice cream labels are used for evaluation. Patients may be asked to explain meanings and suggestions on practices based on received messages in the ice cream labels. This takes less time and usually gives precise results in testing individuals who have low reading and writing skills.

2.2.2.6 Test of Functional Health Literacy in Adults or TOFHLA used for measuring an ability of patients in reading statements or messages or phrases that contain numbers on printed publication given by healthcare units (Parker et al., 1995).

Characteristics and Use Methods

The test is divided into 2 parts: the part of reading test consisting of the content related to rights and responsibilities of patients and willingness of informing; and the part of numeric test consisting of the content related to details on prescription, blood glucose control, appointment and financial support. Statements used in testing reading and understanding of patients are laid out, giving blank spaces for filling 5- 7 missing words. Patients are asked to read a total of 50 statements and select words from the given choice of 4 words. This takes approximately 12 minutes. The part of numeric test has 17 statements, taking approximately 10 minutes. The whole test therefore takes 22 minutes approximately (Mancuso, 2009).

2.2.2.7 Test of Functional Health Literacy in Adults or TOFHLA was developed by Parker et al. (Parker et al., 1995), used for measuring only reading and understanding in order to reduce the time spent in gathering data.

Characteristics and Use Methods

Two parts of the test include reading test and understanding checking test in 36 items. The test takes approximately 7 minutes (Federman et al., 2009).

Table 2. 4 The abbreviated s-TOFHLA score and health literacy level (Schillinger et al., 2002)

S-TOFHLA score	Health literacy level
0 – 16	Inadequate
17 – 22	Marginal
23 - 36	Adequate

2.2.2.8 Health Literacy Screening Question: Set of Brief Screening Questions or SBSQ (Chew et al., 2004)

There are 16 easy questions which ask about, for instance, appointment papers and medical prescriptions. The Five Likert rating scales of frequency is used: every time, almost every time, occasionally/sometimes, almost never, never. The method is based on interview or self- administrated questionnaire.

2.2.2.9 National Assessment of Adult Literacy or NAAL is to measure ability in making an understanding of written messages found in daily life such as bus schedules, newspapers, editorials, and ability in utilizing medical papers with effectiveness such as drug labels, doctors' prescriptions, and consent forms.

Characteristics and Use Methods

Twenty- eight questions are selected for use from a total of 152 questions. The score ranges from 0- 500.

2.2.2.10 Literacy Assessment for Diabetes or LAD (Nath et al., 2001)

It is for evaluating reading medical terms or words related with diabetic treatments. It composes of 60 words with a difficulty level at Prathom three primary school, started from the least to the most difficult words (please see the attached paper**).

Characteristics and Use Methods

Sixty words are separated into 3 columns, each of which contains 20 words. The first column contains easier words than those in the third column. This test takes approximately 3 minutes. Patients are asked to read all words out loud and the score is

based on a correction of the pronunciation. The results of scores are classified into different score ranges which represent different levels of education. The score of 0-20 represents the knowledge of below Prathom four primary school level; 21- 40 represents the knowledge from Prathom five primary school level to junior secondary school level; and 41- 60 represents the knowledge of above junior secondary school level.

2.2.2.11 Three Brief Screening Questions (Chew et al., 2008)

It is to evaluate health literacy of patients by use of self- administrated questionnaire. The questionnaire contains 3 short questions: (1) how often do you face problems of learning about your health due to difficulty in reading?; (2) how much are you confident in filling medical papers by your own?; and (3) how often do you need helps from others in reading messages found at different places in hospitals".

Characteristics and Use Methods

Patients are asked to read or other people can read for them, which takes approximately 1- 2 minutes. Then, the patients answer to each question by rating from 0 which means never, to 4 which means regularly. Then, the scores from all 3 questions are collected. The score between 0- 12 indicates that the patients have high health literacy.

2.2.2.12 Three- Level Health Literacy Scale (Ishikawa et al., 2008b).

The test is used to measure functional, communicative and critical health literacy. It consists of 3 groups of questions based on different 3 levels of health literacy: basic health literacy composed of 5 questions; interactive health literacy composed of 5 questions; and reflective health literacy composed of 4 questions (please see the attached paper).

Characteristics and Use Methods

Patients are asked to read or other people can read for them. The patients answer to each question by rating from 1 which means never, to 4 which means

regularly. Then, the scores of each group of questions are collected and divided by numbers of questions. The score result will show between 1- 4. The higher score means that the patients have higher health literacy, except the score result of basic health literacy in which the higher score means that the patients have lower health literacy.

2.2.2.13 The Single Item Literacy Screeners or SILS (Morris et al., 2006).

The test utilizes a questionnaire with has only one question, to find out how much need or help patients will ask for in order to read texts labeled on health supporting equipment or materials. The question is "how often do you ask for help from others when you have to read instructions, manuals or short texts labeled on health supporting equipment or materials given by doctors or pharmacists?".

Characteristics and Use Methods

Patients are asked to read or other people can read for them. The patients answer to each question by rating from 1-5: 1 means never, 2 means rarely, 3 means sometimes, 4 means often, and 5 means regularly. The scores of higher than 2 indicate that the patients have a difficulty in reading texts labeled on health supporting equipment or materials.

2.2.2.14 The Diabetes Numeracy Test or DNT (Huizinga et al., 2008).

The test is used to measure numeracy skill which is used in self caring or self-treatment of diabetic patients. The test contains 43 questions, categorized in 5 groups of diabetic treatments. Among all questions, there are 8 questions concerning numbers.

Characteristics and Use Methods

Patients are asked to read or other people can read for them, which takes approximately 30 minutes. Each answer will only be marked as "right" or "wrong". Then, the right answers will be calculated in percentage between 0- 100. The higher percentage means the higher level of numeracy skill of the patients.

2.2.2.15 Wide Range Achievement Test or WRAT (Sayah et al., 2013)

The test is for measuring basic skills in reading, spelling and calculating. Patients are required to do the test on their own, which takes approximately 20- 30 minutes.

2.2.2.16 The Subjective Numeracy Scale or SNS (Sayah et al., 2013)

The test is for measuring ability in working with numbers, which contains 8 questions concerning numbers. Patients are asked to read or other people can read for them, and they rate from 1 which means poor, to 6 which means excellent.

2.2.3 Measuring Health Literacy in Diabetic Patients

The systematic literary study of Sayah et al. (2013) based on 56 papers in regards to health literacy in both educational documents and research papers during 1997- 2011, found that an only measurement used in testing health literacy particularly for diabetic patients was called Literacy Assessment in Diabetes (LAD) and another 8 general measurements included Rapid Estimate of Adult Literacy in Medicine (the original REALM and the revised form REALM-R), Test of Functional Health Literacy in Adults (TOFHLA and the shorter form s-TOFHLA), Newest Vital Sign (NVS), 3-0 brief Screening Questions (3-brief SQ), the 3-level health literacy scale (3-level HL Scale), and Single Item Literacy Screener (SILS). Furthermore, it was found that a special measurement for numeracy skill in diabetic patients was Diabetes Numeracy Test (DNT; 15-iten and 43-item versions) and another 2 general measurements were Wide Range Achievement Test (WRAT; the 3-item version WRAT-3 and the revised version WRAT-R) and the Subjective Numeracy Scale (SNS). The study also revealed that s-TOFHLA was the most selected measurement (26 papers), followed by the REALM (15 papers), 3- brief SQ (7 papers), TOFHLA (4 papers), 3- level HL Scale (3 papers), SILS (2 papers), LAD (2 papers), REALM-R (2 papers), NVS (1 paper), WRAT (4 papers), DNT (3 papers) and SNS (1 paper). Most of measurements mainly test reading and writing skills but do not cover other necessary skills such as oral communication, healthcare process survey, health concerned decision making and utilizing numeric information. Additionally, the research found that characteristics and

use methods affected the uses of measurement in terms of treatment and conducting research. The measurements that did not directly test health literacy including 3- brief SQ, 3- level HL Scale, and SILS were found to have the most benefits in utilizing both for treatment and conducting research.

For Thailand, based on the literature review, the finding revealed no use of measurements for diabetic patient research. The most appropriate measurement may be the 3- level Health Literacy Scale developed by Ishikawa et al. (2008b), since the content of the questions is not specific. Thus, when they are translated into Thai language, the translated content seems fit to the context of diabetic treatment of Thailand. Other popularly used measurements aboard include, for example, s-TOFHLA or REALM, which are not appropriate for diabetic patients in Thailand due to the questions not proper with diabetic treatment in Thailand.

2.2.4 Health Literacy Interventions among Persons with Diabetes

According to Boren (2009), there were four studies (Echeverry et al., 2005; Gerber et al., 2005; Rothman et al., 2004; Seligman et al., 2005) that tested a health literacy intervention in a sample of patients with diabetes (Table 5). Two of the studies were randomized controlled trials (Rothman et al., 2004; Seligman et al., 2005) and two were multicenter randomized controlled trials (Echeverry et al., 2005; Gerber et al., 2005). These interventions were diverse and included patient education, a low-literacy reminder card (Echeverry et al., 2005), computer multimedia that included audio/video sequences to communicate information, provide psychological support, and promote diabetes self-management skills without extensive text or complex navigation (Gerber et al, 2005), individually tailored disease management communication (Rothman et al., 2004), and notifying physicians of patients with limited health literacy with a reminder notice affixed to the patient's chart (Seligman et al., 2005).

The findings of the intervention studies were mixed. A low-literacy reminder card did not significantly improve any of the outcomes measured (Echeverry et al, 2005). Access to multimedia lessons resulted in an increase in perceived susceptibility to diabetes complications, particularly in subjects with lower health literacy; however,

there was relatively less use of the computer among participants with lower health literacy (Gerber et al, 2005). Patients with low literacy who received individually tailored communication were more likely to reach their HbA1c-level goal (Rothman et al, 2004). Physicians were more likely to use the recommended management strategies to improve communication if they were notified of their patients' limited health literacy; however, these physicians felt less satisfied and less effective regarding their visits, while patient self-efficacy remained unchanged (Seligman et al., 2005).

For Thailand, based on the literature review, there is not an intervention study in improving Health Literacy level among diabetic patients. Therefore, it would be a benefit for Thai people, when we conduct a research study with an intervention to find out an effective method that helps improve diabetic patients' Health Literacy and self-care.

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Table 2. 5 Health Literacy Interventions among Persons with Diabetes (Boren, 2009)

Study	Sample	Intervention and Control Groups	Results Reported
Echeverry et al (2005)	166 patients with diabetes hospitalized for cardiovascular disease, 55 years of age or older	I: Education and a low-literacy reminder card describing risk factors of cardiovascular disease. Instructions to discuss the risk factors described on the card with their primary care physician on their first appointment after discharge. C: No Intervention.	HbA1c (NS); blood pressure (NS); lipid levels (NS); aspirin use higher in control group (p = .001); angiotensin-converting enzyme inhibitor use higher in control group (p = .03)
Gerber et al (2005)	244 patients with diabetes	I: Use of computer multimedia that included audio/video sequences to communicate information, provided psychological support, and promoted diabetes self-management skills without extensive text or complex navigation. C: Standard of care only.	HbA1c (NS), weight (NS), blood pressure (NS), knowledge (NS), self-efficacy (NS), self-reported medical care (NS). Increase in perceived susceptibility to diabetes complications in the intervention group was greatest among subjects with lower health literacy. Time spent on the computer was greater for subjects with higher health literacy within the intervention group.

Rothman et al (2004)	217 patients aged 18 years or older with type 2 diabetes and poor glycemic control (HbA1c ≥ 8.0%)	I: All communication to patients was individualized and delivered to enhance comprehension among patients with low literacy. Patients received intensive disease management from a multidisciplinary team. C: Patients received an initial management session and continued with usual care.	Among patients with low literacy, intervention patients were more likely than control patients to achieve goal HbA1c levels (≤7.0%) (42% versus 15%, respectively; adjusted OR, 4.6; and 95% CI, 1.3 to 17.2; p =.02). Patients with higher literacy had similar odds of achieving goal HbA1c levels regardless of intervention status (24% versus 23%; adjusted OR, 1.0; and 95% CI, 0.4 to 2.5; p = .98)
Seligman et al (2005)	63 primary care physicians and 182 patients with diabetes and limited health literacy	I: Physicians were notified if their patients had limited health literacy skills. C: Physicians were not notified if their patients had low health literacy skills.	Intervention physicians were more likely than control physicians to use management strategies recommended for patients with limited health literacy (OR 3.2, p = .04). Intervention physicians felt less satisfied with their visits (81% versus 93%, p = .01). Intervention physicians felt less effective (38% versus 53%, p = .10). Intervention and control

			patients' postvisit self-efficacy scores were similar (12.6 versus 12.9, p = .60). And 64% of intervention physicians and 96% of patients felt health literacy screening was useful.
C, control; Cl, confidence interval; I , intervention; NS, not significant; OR, odd ratio			

2.2.5 Association of Health Literacy with Diabetes Outcomes

Paasche-Orlow and Wolf (2007) proposed the model that explained a relationship between limited health literacy and health outcome (Figure 3). The study unveiled a potential factor of limited health literacy included socioeconomics and social supports, culture, language, race/ethnicity, education, age, individual capacity and physical condition. Limited health literacy was found related with lower health condition. This was due to the reason that persons with limited health literacy could not understand the details or the information given by hospital staff. Difficulties in communication and interaction with doctor also occur. They do not know how to take care of themselves correctly at home. These cause worse health condition.
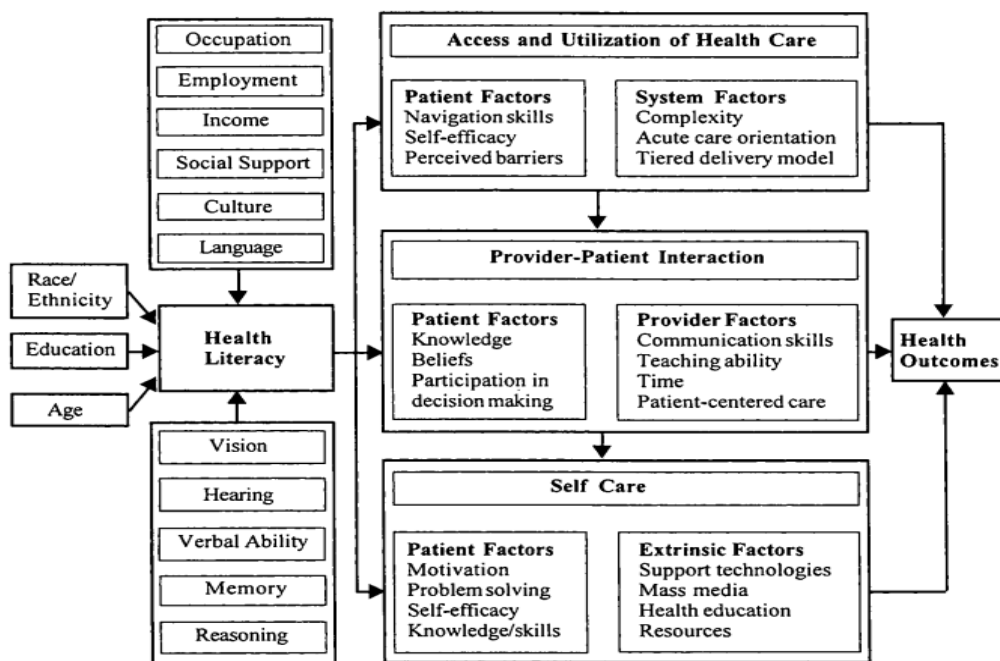
Figure 2. 1 Casual Pathways between Limited Health Literacy and Health Outcomes (Paasche-Orlow & Wolf, 2007)

Schillinger et al. (2002) found that inadequate health literacy in type- 2 diabetic patients correlated with failure in controlling blood glucose level. This was due to the fact that diabetic patients with lower health literacy often faced with a difficulty in reading drug labels, or in understanding blood glucose test result, doctor's prescriptions or other details received from hospitals. Even though how much effect of low health literacy is on diabetic treatment cannot be precise, several research papers

have at a certain length proved that low health literacy has an effect on controlling blood glucose level. Patients with low health literacy do often not know or remember the name of drugs and how to use (Williams et al., 1995) and do not know their health condition and how to deal with it (Kalichman & Rompa, 2000; Williams et al., 1998). Furthermore, there are several studies found that patients with low health literacy do not quite express their opinions on self healthcare, and usually depend on people in families, friends and hospital staff in making decision (Barragán et al., 2005; Collins et al., 2004; Mancuso & Rincon, 2006). In the worse case, patients with low health literacy were found to have a problem in memorizing and understanding medical information. This should be greatly concerned by healthcare service providers, as these patients cannot know how to gather or search for more information as they still do not understand or cannot remember the details received from hospitals, due to ineffective communication (Williams et al., 1998). Schillinger et al. (2004) found that when comparing a communication level between doctors and 2 types of patients: patients with adequate health literacy and patients with low health literacy, doctors did not usually explain about health condition and steps in treating to low health literacy group. Therefore, doctors, nurses and other healthcare service providers should try to adjust the ways of communication which facilitate an effectiveness and appropriateness to this type of patients so that the patients will be able to understand the messages and they can be persuaded to change to more appropriate behavior. Healthcare service providers should aware of how much their patients are ready to receive suggestions and willing to adjust their behavior. Knowing stages of behavior change assists healthcare service providers in selecting appropriate strategies in treating their patients.

2.3 Stages of Behavior Change

Transtheoretical model or Stages of Behavior Change Model was used as a model in changing behavior effectively (Marks. et al., 2011). Many research papers (Johnson et al., 2008; Lam et al., 2006; Mason et al., 2008) referred to this theory as the stages of behavior change of a person, which consisted of 6 steps (Figure 4). The theory explains that individuals change their behavior in steps and across these steps,

the behavior changes forth and back until it remains stable. (Prochaska et al., 1992) explained that in order to change health behavior of an individual or a patient with efficiency and stability, changing should be in done with steps with a evaluation prior to each step to check whether a patient is ready to shift to further step, or has any likeliness to go back to the same behavior and how these occur.

An implementation of the stages of behavior change in curing drug addicted persons or patients with chronic diseases such as diabetic patients should be done with a concern that there are 6 steps of behavior change, each of which is appropriate for different patients with different behavior. In order to change the behavior of patients effectively, healthcare providers should select strategies that are appropriate with patients in each stage of behavior change (Chaipichtipan, 2013). The stages of behavior change are as follows:

2.3.1 Pre- contemplation stage: at this stage, patients ignore changing their behavior and have an attitude that this behavior does no harm to their health, and have a negative point of view towards the change rather than seeing benefits. Thus, healthcare service providers should survey first about their perception and give them feedback on their health condition, knowledge and right information.

2.3.2 Contemplation stage: at this stage, patients begin to doubt their current behavior, whether it is good or bad. They feel of conflict within, and that they may receive any effects from the current behavior. However, the feeling is not much enough to totally change the behavior, thus they just reduce a frequency of doing that behavior. Therefore, healthcare service providers should repeat negative effects from the current behavior the patients have and pros and cons of new behavior to the patients. The patients should be allowed to review freely with correct information. Healthcare service providers should encourage the positive side of new prospect behavior and emphasize on the patients-self responsibilities and willingness to accept any results after their decision.

2.3.3 Preparation: at this stage, patients perceive severe effects of a particular wrong behavior that they currently have, and recognize about these effects on their own.

They begin to feel they are interested in and would like to change the behavior. They start to find more information from different sources for their decision making and selecting right behavior they can opt to practice. Thus, healthcare service providers should offer appropriate alternatives or menu to them and let them select with freedom, with adequate knowledge necessary for their decision making. Suggestions about ways of treatment and obstacles they may face with during the adjustment can be also given.

2.3.4 Action stage: at this stage, patients start to take action by the ways they choose, but the action may not be regular during the first 6 months. The patients usually ask about solutions for problems during their adjustment. Healthcare service providers thus need to support the patients by showing their compliance, facilitate in getting rid of difficulties that cause unstable action, monitor the patients' understanding in techniques, and supporting the patients' confidence with empathy.

2.3.5 Maintenance stage: at this stage, patients remain constant in their action of change for at least 6 months. During this time, they are able to remain calm and balanced while practicing on their own selected ways. Healthcare service providers should give them advice about techniques in controlling themselves not to be back to the old behavior that harms their health condition, and in living with wellness and balance.

2.3.6 Relapse stage: at this stage, patients start to reverse to risky situation and may let themselves emotionally lost which may cause them back to the same behavior. Thus, healthcare service providers should create times where the patients can express about how they feel of having the same behavior and its effects, and coach them to learn how to accept the situation and self- efficacy and admire their affirmation.
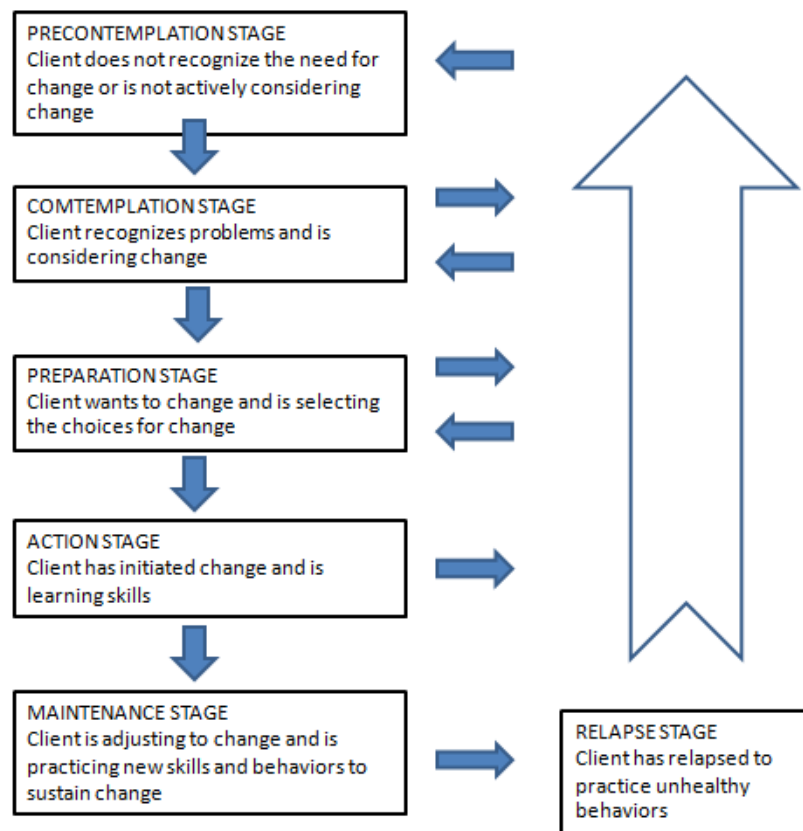
The Transtheoretical or Stages of Change Model by Prochaska and DiClemente

Figure 2. 2 *The Transtheoretical of Stages of Change Model (Marks. et al., 2011)*

In order to take care of diabetic patients, necessary and important factor is efficient communication between healthcare service providers and patients. Efficient communication can influence positive changes of behavior of the patients, in that it assists in changing from the behavior that harms the health condition, such as neglecting to control food and eating habit, no exercises and neglecting to take pills according to doctors' prescription, to positive behavior such as controlling food and eating habit, regular exercises and taking pills according to doctors' prescription. A communication model which can stimulate changes of behavior of patients is motivational interviewing.

2.4 Motivational interviewing

Motivational interviewing (MI) is a directive, client- center counselling style for eliciting behavior change by helping clients to explore and resolve ambivalence (Rollnick. & Miller., 1995). MI was developed during the late 1980 by William Miller

and Stephen Rollnick. Its outstanding characteristics is the way it shows respect and equality during an interview, where there is no superior shown above one another. By this way, patients will be fostered in making decision on their own and encouraged to use their ability in managing their daily life. The principle of motivational interviewing is the following (Rollnick. & Miller., 1995)

2.4.1 Express Empathy: expressing empathy without any argument and personal opinions and bias; the style of empathic communication is used from the beginning to the end of motivational interviewing.

2.4.2 Develop discrepancy: the fact that patients realize their current and desired health condition helps the patients to see differences between what they currently are and what they want to be, and points out what behavior they should concern. A goal of advisory is to help the patients go through the process of acceptance of the fact of why they should change their behavior in a positive way.

2.4.3 Roll with resistance: resistance refers to patients' current attitude and behavior that are opposite to what they should have been. This resistance is usually caused by healthcare service providers who try to confront in attempt to change the patients' behavior that harms the health condition, while the patients do not want or have no motivation to change the behavior. Therefore, healthcare service providers should let the patients to talk, and should listen them with care and understanding.

2.4.4 Support self- efficacy: this can make patients believe that they can change or adjust the behavior.

Effective diabetes controlling requires patients to have positive behavior concerning diet restrictions, medication treatment, regular medical consultations, exercise regimens, restricted alcohol consumption and smoking cessation (Clark & Hampson, 2001). Previous studies (Brug et al., 2007; Clark & Hampson, 2001; Dellasega et al., 2010; Jones et al., 2003; Smith et al., 1997; West et al., 2007) found that motivational interviewing for patients' counselling could help type- 2 diabetic patients in changing their behavior and resulted in good health outcome. The study of Smith et al. (1997) unveiled that individuals in the weight- control program with

motivational interviewing had greater group meeting attendance, completed more food diaries, monitored their blood glucose levels more often, and achieved better glucose control than those in weight- control program alone. The study of Brug et al. (2007) found that the mean HbA1c was significantly reduced in the motivation interviewing group compared to the control group at 12 and 24 months.

Some behavior of patients including greater group meeting attendance, completing more food diaries and monitoring their blood glucose levels more often should help them have more knowledge and understanding about health, which leads to having higher health literacy.

However, motivational interviewing process that produces good outcomes requires healthcare service providers to prepare well to have knowledge and understanding of patients' thoughts and points of view in meeting with a doctor. Not a few patients have understanding and remember health information and behavior changes suggested by doctors, but do not practice. This is an influence from the patients' personal attitudes or points of view about diabetes that are contrary to the doctors'. Kleinman (1988), in his writing, explained that most medical staff viewed that patients' illness was a disease, and relied on drugs in treating them, whereas patients viewed that their illness was what caused them not be able to do daily things as normal and made them change regular behavior and social roles. This creates a gap which obstructs a success in curing and treatment. Patients are not willing to cooperate; it cause dissatisfaction and wrong diagnosis, ending with the patients receiving inappropriate treatment (Germanin, 1982). In the case of diabetic patients, they have different attitudes and beliefs towards illness, which influence different ways they behave with their illness. Each doctor who is curing their patients also has different attitudes and beliefs that result in different ways of curing and giving suggestions to their patients. Sometimes, patients and their doctors have different attitudes and beliefs. During a meeting, there may be a conflict between them, which leads to a situation that patients do not follow a suggestion to control the blood glucose level. Some patients are not willing to give a doctor the details about their symptom and eating behavior, and to follow doctor's advice. This is due to the fact that they are afraid that the doctor may not accept their daily life behavior and suggestions made by doctors are believed

to be difficult to follow. For example, a patient does not take pills suggested in the prescription but take herbs or holy water instead, while a doctor does not try to make an understanding or explore why the patient believe that way in relation with diabetes, and to adjust the ways of giving suggestions and treating the patient. It is thus necessary that both patients and doctors have an understanding of the points of view of each other in order to adjust and work together in diabetic treatment. Explanatory Model of Illness created by Arthur Klienman is a technique used in exploring points of view of patients and doctors. What the technique explores include such as the following questions: from their points of view, what are the causes of diabetes?; when does it happen?; what are the symptoms?; how does it cause difficulties in daily life?; and how is it cured?. Adopting Explanatory Model of Illness facilitates an exploration of patients and doctors' different and similar points of view, which assists in making guidelines of making a more understanding and effective communication between patients and doctors.

2.5 Explanatory Model of Disease

Population of each culture groups have accumulated knowledge and beliefs about explanations of how diseases happen and how to cure them, which is called by Klienman "Explanatory Model of Illness or EM". The model is the process used in exploring causes or factors that explain certain beliefs and behavior, emphasizing that different races and nationalities give different meanings of illness and health. This is a result of different cultures. For instance, some Thai people may believe that diabetes was an outcome of what a person had done during the past life; many believe that to they can know whether a person has diabetes from the person's urine swarmed by ants. Moreover, patients' exploratory model of disease is meaningful as a reflection of their experience of illness and surrounding conditions. These give an explanation of what disease they have; why they are sick; how to prevent, control, or cure that illness; why some are sick and others are not (Clark., 1983). Exploratory Model of Disease has several functions.

The first function is that the model sets criteria in making a decision whether a person is sick. In some cultures, it is hard to accept an illness, while individuals cannot

make themselves to understand that particular state. For example in Thailand, despite the fact that some diabetic patients know the diagnosis outcome that indicate they have diabetes, they still do not believe of the scientific result due to the reason that they do not see any ants swarming their urine, or that they should not have diabetes as they do not eat sweet.

The second function is that the model indicates reasons why individuals are sick. In deeper analysis, the results may contribute to explanation of other related conditions or factors and ways to increase individuals' immunity against diseases and what decreases their immunity.

The third function is that the model explains 3 levels of causes of diseases: (1) immediate causes such as changes of syndrome, insulin resistance; (2) underlying causes such as eating foods with high sugar as regular habit, lack of exercises; (3) ultimate causes such as bad luck, karma, stress, insufficient exercises, food and etc. (Clark., 1983).

Explanatory Model of Illness broadly explains behavior of illness. Generally it explains about causes of illness aligned with unbalance of patients' living and nature and supernatural, and relationship between patients and surrounding society. This leads to actions of seeking how to cure illness based on local ways, folkways and professional ways of different races. Even though changes of economic, politics, society and culture may influence villagers to use modern healthcare service, they do not completely neglect traditional ways. This is a reason of mobility in Thailand between traditional and modern healthcare (Dussadee and Somsak, 1987, cited in Sumrongthong (1996)).

Klienman's Explanatory Model of Illness explained that there were 3 elements in medical system: (1) defining illnesses; (2) explaining causes of illnesses; and (3) process of treatment. These elements consist of theories about illnesses, symptoms, severity, types of illnesses and treatments. This can be stated that the model provides a systematic thinking that assist explanations of illnesses and determinants of healthcare service choices. Kalichman et al. (1999) explained that individuals construct different explanatory model of disease, especially between patients and healthcare

service providers under healthcare service system. This is due to the reason that healthcare service providers have clinical reality concept towards diseases, while general people have social reality concept towards the same thing. This results in different explanatory model of illness between both of them and influences decision making of patients in selecting placements of healthcare service. In a medical process, medical staff explains diseases by relating them with episode of illness and most treatments are dissected. This is because curing under the clinical reality concept requires medical staff to dissect contemplation and understanding about illness and treatments from social beliefs. The Explanatory Model of Illness consists of the following theories of illness:

(1) Etiology

(2) Time and Mode of Onset of Symptoms

(3) Pathophysiology

(4) The natural history and severity if the illness

(5) The appropriate treatments for the condition (Cohen et al., 1994). Explanatory Model of Illness will be the determinant in selecting healthcare service of patients.

Making a comprehension of the Explanatory Model of Illness of patients and doctors is very essential in discovering different points of view of both sides. It is especially for chronic patients such as diabetic patients. The study of Cohen et al. (1994) found that the Explanatory Model of Disease of diabetic patients and doctors who provide treatment for them was different. Diabetic patients viewed that diabetes caused them difficulties in participating in social activities and changes of daily life. Doctors who provide treatment to diabetic patients viewed that diabetes causes physical difficulties and harmed to their health condition. Moreover, it was found that diabetic patients and their doctors were similar in terms of demographic characteristics, despite of different explanatory model of disease. The Explanatory Model of Illness is broadly beneficial, yet still limited in diabetic treatment

particularly in Thailand. The review of literature found no implementation of Klienman's model with diabetic patients and doctors.

2.6 Medication system and Self Healthcare

Sumrongthong (1996) reported that Klienman and Glick Press defined medication system as the system related particularly with illness. Given this, medication system refers to the holistic approach of cultural, social and biological system that manages illness, by linking with beliefs of causes of illness, perception of symptoms, behavioral patterns, decision making in selecting placements for healthcare service, and evaluation of treatment. These elements have a systematic relationship. They explained that healthcare system consisted of 3 sectors: (1) popular sector which is the healthcare service provided by people outside the medication sector such as patients themselves, patients' family, patients' network and community; (2) professional sector which is the professional medication staff in medication system protected by law and professional certificate such as doctors, dentists, nurses, pharmacists, public health staff; and (3) folk sector which is the medication system provided by persons in particular ethnic groups, who have traditional wisdoms, beliefs and practices in curing and relieving symptoms of illnesses.

These 3 sectors of healthcare system have different characteristic called "social area", where decision making and healthcare behavior from meaning of illness, belief system, decision making in choosing ways of treatment are utterly different in terms of the concept, having illness and treatments. Yet these elements have an interaction (Sumrongthong, 1996). Klienman viewed that self-healthcare was a basic and a part of popular sector healthcare system, which is the largest system. The realm of illness and treatment in popular sector is considered to have the largest social area that consists of individuals, families, relatives and communities. Illnesses in this sector are primarily perceived, interpreted and diagnosed within folkway, not professional way. By the same time, various kinds of treatments can be noticed from family healthcare, such as leaving uncured, delaying to cure an illness, buying pills by themselves, curing with herbs, relying on rituals, to opting to receive healthcare service in modern medication. However, social area of self-healthcare is still in popular sector.

Klienman et al. (Sumrongthong, 1996) found that 70% - 90% of individuals' illnesses were managed in the popular sector.
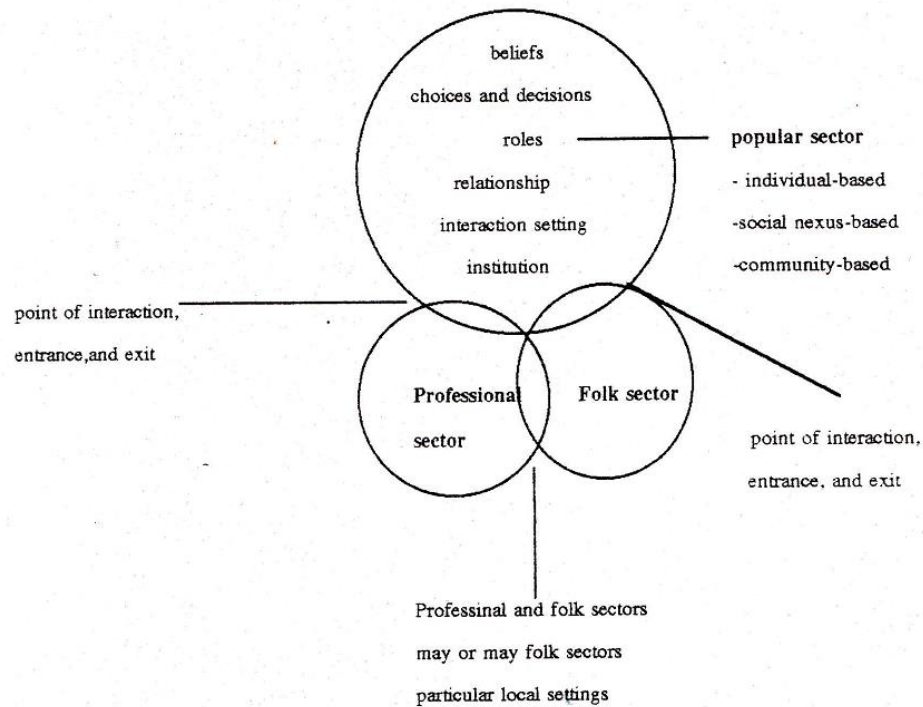
Figure 2. 3 Klienman's Local Healthcare System: Internal Structure (Sumrongthong, 1996)

For diabetes, once a family member has diabetes, healthcare in popular sector will be used such as uses of community network or help of relatives in cooking food that is appropriate for diabetic patients, giving an explanation of suggestions given by doctors, accompanying the patient to see the doctor. Professional sector is healthcare service in medical placements, where actions of treatment include ordering blood sample, adjustment of drugs used in curing diabetes, giving suggestions of self-healthcare and making appointments with doctors. For folk sector, diabetic patients have herbal drugs taken at home in order to reduce blood glucose level or use magic spells in hope of healing the spirit. Nowadays, all 3 systems have been harmoniously practiced.

2.7 Formative Research

From the review above, it can be concluded that both Health Literacy and Explanatory Model of Illness demonstrate an important role in enhancing more effective communication between diabetic patients and doctors and are likely to influence diabetic patients in controlling blood glucose level. Nevertheless, taking care of diabetic patients needs not only the patients themselves and the doctors, but also their relatives, nurses, medical staff at public health centers, information and technology staff, community leaders and leaders in religion unit. These people have an important role in building more knowledge and understanding about diabetes for diabetic patients, which can improve a communication between patients and doctors and stimulate patients in taking care of themselves. In order to create efficient cooperation between these people, it is necessary to have involvement of ideas from all groups and build a share path of practice within a systematic approach. Formative Research is a process that facilitates a gathering of ideas from all groups of people concerned directly and indirectly and developing an intervention with participation efforts of all. This contributes to sustainable solution.

2.7.1 Background of Formative Research

Formative research is a process of gathering data beneficial to a development of intervention program. The essence of formative research is suitability to society and culture. Formative research can be utilized in building an intervention suitable for geography and culture of specific areas. The root of this process was from an application of anthropology, social sciences, social marketing and psychological science.

Formative research applies both quantitative and qualitative methods in various techniques, which allow researchers to know participants and management of different measurements. In this process, researchers are required to have a comprehension of important elements of communities selected in their study, and of the target population concerning with problems of the studies (Higgins et al., 1996). This process is conducted before developing an intervention. In other words,

the process is made in order to gather the information of people and environmental factors necessary for intervention development (Gittelsohn et al., 1999). Formative research also helps build a good relationship between researchers and target samples (Gittelsohn et al., 1998; Gittelsohn et al., 1999; Kumanyika et al., 2003). It can be applied in all levels of behavioral interventions in clinics, schools, communities or with larger population (Gittelsohn et al., 1999; Higgins et al., 1996).

Health behavior is hard to change. Behavior is stimulated by many factors including personal, social, economic and cultural factors, and built environment factor. Understanding of these factors and process in developing effective intervention in various levels is the goal of formative research. Even though several previous studies indicated the results of formative research, there still have been many issues remaining unclear about formative research process. These include the following: (1) the data that can suggest how to build formative research goals, objectives and implementation plans is still inadequate; (2) a limitation of the most appropriate data analysis; and (3) ability of formative research in forecasting results of intervention. There have been many questions in regards to an implementation of formative research, for example at what extent an informative research is considered qualified?; what should be the most important questions?; how a reliability of data gathered from both concerned experts and local people should be measured?. It is still vague that the data from formative research can be used appropriately in developing an intervention.

The previous studies of formative research, it was found that the important techniques used in collecting data included direct observation, in-depth interviews, focus groups, structured and semi- structured surveys and pile sorts. A mixed approach of using these techniques produces many benefits. These benefits include covering all necessary data and self- data check (Ayala et al., 2001). Moreover, it helps in building an intervention framework that assists in making an understanding of differences and diversity of cultures and races of targeted audience (Kumanyika et al., 2003).

Formative research covers from small focus groups that spend a shorter period and those spending several years, to a variety of methods and steps (Gittelsohn et al., 1998). Several formative research studies applied with success a variety of techniques, for instance a formative research in a school- based obesity- preventions trial which used both unstructured and structured interviews, focus groups and direct observations in order to find out the key questions: which teaching methods and approaches were most effective in communicating with American Indian schoolchildren (Gittelsohn et al., 1998).

Standardization is one of the concerns in conducting formative research. Standardization is suitable for use in studies that the "one size fits all" approach can be applied for, but is not with intervention programs built for a diversity of population and areas. This is still in an argument in that formative research should develop a single standardized process for implementation or the flexible process that can be implemented in areas with different characteristics. Moreover, there should be a consideration upon how to encompass sub-audiences which are separated from targeted audiences.

2.7.2 Uses of Formative Research

Related papers of formative research mostly demonstrate uses of formative research for developing intervention strategies and materials and instruments. Some examples of uses of formative research include investigating social norms for making up messages , exploring key behaviors for intervention (Gittelsohn et al., 1998; Gittelsohn et al., 1999), evaluating level of knowledge and gap of knowledge used in specific studies, examining appropriate channels of communication (Cortes et al., 2001) and understanding of local health and illness concept (Cortes et al., 2001). These different uses of formative research point out that formative research can be an important strategy in developing effective health interventions.

Hahn and Inhorn (2009) reported the issue about implementation of formative research, the use for developing tools explained about the use of the seven- stages formative research process in order to build adolescent nicotine dependency survey.

In this process, in-depth interview and focus group techniques were utilized. Formative research was use in editing questions and building new questions in a questionnaire. Moreover, the report from Elder Health and Care in Chiapas, Mexico used formative research with the method involved a multistage participatory process to find out and define problems before building the intervention that were appropriate for the studied local areas.

The goal of formative research is to discover needs of the locals by utilizing a mixed- method techniques appropriate for particular local areas, with qualitative approach for an in-depth of understanding. By this, formative research process can be systematically operated and used at ease. The compositions and operation planning were established by Nichter (Hahn & Inhorn, 2009) as follows:

- Becoming informed about what people do, say, and think about an issue

- Identifying problems and obstacles from perspectives of stakeholders in personal, household, community and institutional contexts

- Generating intervention options via discussion with local participants invited to reflect on research findings

- Fostering critical assessment and problem solving among this inclusive group

- Investigating how best to implement interventions

- Introducing a process that monitors ongoing responses to interventions, enabling mid- course correction and stakeholder evaluation of the intervention process and outcome

- Evaluating process and outcome indicators of interventions. Evaluation entails being aware of how knowledge about issues and interventions is produced, disturbed, and represented among public, institutional, and political audiences.

The study of Cortes et al. (2001) titled "Formative research to inform intervention development for diabetes prevention in the republic of the Marshall Islands In" applied formative research in developing diabetes prevention home visit intervention, which assisted in solving the previous problem of unsuccessful intervention for diabetes prevention due to a lack of understanding in the local context. From this example, it can be stated that formative research may support in building intervention that can fix the problem of inefficient communication between diabetic patient and doctor that result a patient' failure in or inefficiency of controlling the blood glucose level.

2.8 Content Analysis

Content analysis is a research method for making replicable and valid inferences from data to their context, with the purpose of providing knowledge, new insights, a representation of facts and a practical guide to action Elo and Kyngäs (2008). The aim is to attain a condensed and broad description of the phenomenon, and the outcome of the analysis is concepts or categories describing the phenomenon.

Content analysis is extremely well-suited to analyze the multifaceted, sensitive phenomena characteristic of health care. An advantage of the method is that large volumes of textual data and different textual sources can be dealt with and used in corroborating evidence. Especially in nursing and health care research, content analysis has been an important way of providing evidence for a phenomenon where the qualitative approach used to be the only way to do this, particularly for sensitive topics. The disadvantage of content analysis relates to research questions that are ambiguous or too extensive. In addition, excessive interpretation on the part of the researcher poses a threat to successful content analysis. However, this applies to all qualitative methods of analysis.

2.9 The background of study site

Samut Songkram Province is situated in southern central Thailand. It is a small town with 200,000 population. Samut Songkram Province is composed of three districts; Samut, Amphawa, and Bangkhonthi. This province is very important

economics area of the central part where most residents produce palm sugar as a household industry. During the past decades, lifestyle of the people in Samut Songkram has changed tremendously from simple life to complex life. They used to work in their own land; consume the product they grew; and sell the extra they had left. They have become to live in semi-industry society that focuses on increasing product to industrial plants. Therefore, more labors are hired and rapid work is needed to increase the productivity in the province. Competition in the market is very tense. The more those labors increase the output, they more they get paid. Keeping themselves refreshing throughout their work shift is an excuse to make long for sweeten and energized drinks. Their lifestyle become in rush and causes them neglect their health. Lots of them like others spend their spare time on eating. They love party, especially Chinese feast that often serves fatty food. Neglect in self-care and consumption unhealthy food may somehow lead to the increasing numbers of diabetic patients in Samut Songkram yearly.

In 2012, the population of Samut Songkram was 194,086. There were around 6,800 diabetic patients or 3.5% of the population. There were 2,597 patients with diabetes only and 4,143 patients with high blood pressure and diabetes (the total of diabetic patients is 6,743) receiving care and treatment in the system of public health centers in Samut Songkram. The ratio of patients with diabetes to the population per 100,000 was 3,504.

There were 80,969 people aged over 35 who were undiagnosed of diabetes and high blood pressure. From all undiagnosed people, 73,526 people or 90.9% received verbal screening. From all undiagnosed people, 15,526 people or 21.1% of them were at risk and had blood sugar test for diabetes. There were 8,548 people with blood glucose level < 100 mg/dl; 6,147 people had 100-125; and 831 showed ≤126 mg/dl)the doctors diagnosed 279 new cases).

According to 5,238 cases that were already in care and monitor at public health centers of Samut Songkram, 3,790 patients or 72.35% received HbA1c test. From all patient who received HbA_{1c} test, 1,837 or 48.5% could control blood sugar level well (HbA1c < 7%).

According to the diabetes statistics of Samut Songkram Provincial Public Health Office, the number of diabetic patients increased every year during 2008 to 2012. During the year 2008-2012, numbers of people in Samut Songkram diagnosed

with diabetes has increased around 27%--from 2,732 to 3,463 per 100,000 populations (Figure7). Most patients were elderly who had problem in caring their diabetes. Diabetes is then become a serious problem to public health of Samut Songkram province.
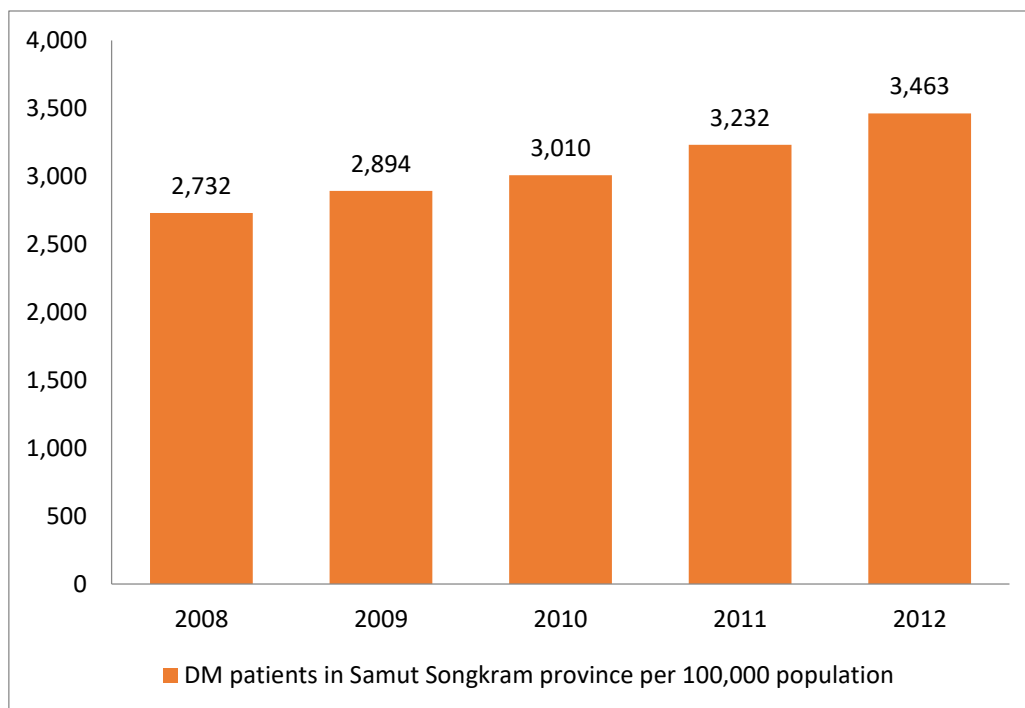
Figure 2. 4 *The number of diabetic patients in Samut Songkram province in 2008 to 2012*

There were more people receiving diabetic treatment from public health centers from 1,136 patients to 1,300 per 100,000 population during 2010-2012. In fact, the raising numbers of the patients visiting doctors daily is greater than the number of health providers. The doctors have limited time to discuss on health with each patient that causes ineffective care. Most diabetic patients of Samut Songkram are also elderly with low education that cause communication problem. Presently, lot of elders are neglected at home since their children and relatives have to work far from where they live. They rarely have someone to take care of them or accompany them to visit a doctor. Though the residents' lifestyle has changed, many of them still live in their houses built on their land as in the past. Each house is settled individually far from others. Bus routes are not many and that take so long to make one round. A few buses running through villages inconvenience the patients to commute to see a doctor. When

they come to see a doctor, they cannot wait for so long as they have to be hurry to catch a bus back home otherwise they might miss it. Based on those mentioned factors, the impact on public health of Samut Songkram Province can be summarized into three areas--unacceptable ratio of the doctors to the patients; communication problem due to age group and low education of the patients; and commuting of the patients.

Samut Songkram province consists of three districts which are Samut, Amphawa, and Bangkhonthi. Bangkhonthi district comprises 13 sub-districts with 32,975 total population or 17% of the province population. There were 1,477 people or 4.48 % of the district population had diabetes (Table 6). As calculated to compare per 100,000 population, it was 4,479. In addition, there were about 890 people aged 50 – 70 years in Bangkhonthi district had diabetes (Table 7).

The proportion of people with diabetes per 100,000 population of Samut Songkram province and Bangkhonthi district showed 3,463 and 4,479 respectively. These determined a greater average number of diabetes in the district than in the province. In Bangkhonthi district, there are 13 sub-district health promotion hospitals. Only three of those; Jormploug, Bang Prom, and Bang Yeerong sub-districts health promotion hospitals, are as Primary Care Center. Each center serves three to five sub-district health promotion hospitals. Napalai Hospital has also set up teams of doctors, nurses, and pharmacists to each center once every month since 2011.

Jormploug sub-district health promotion hospital provides care and treatment to the patients via doctor's appointment and medication. The patients will be scheduled to pick up their medicine and have blood sugar test monthly. If the glucose level exceeds the acceptable level, the patients will be scheduled to see a doctor on the next day. When seeing a doctor, a nurse will first screen the patients' health through an interview. She will note important information or problem found in the patients' history file, and give some advice at the same time. The assisting of a nurse on this process helps a doctor in rapid examination. A doctor will have only a few minutes to discuss with the patients because numbers of patients are waiting in line.

Table 2. 6 *Diabetic patient population in Bang Khonthi district, Samot Songkram province in 2012*

Health promotion hospital	Case
Bang Saka sub-district	69
Bang Yeerong sub-district	135
Rongheep sub-district	99
Bang konthi sub-district	67
Don Manora sub-district Moo 5	118
Don Manora sub-district Moo 6	51
Bang Prom sub-district	102
Bang Koong sub-district	86
Jormploug sub-district	140
Bang Nokkak sub-district	88
Yay Pang sub-district	57
Bang krabue sub-district	111
Ban Pramon sub-district	48
Kradangnga sub-district	306
Total	**1,477**

Table 2. 7 *Diabetic patient population aged 50 – 80 years in Bang Khonthi district, Samot Songkram province in 2012*

Health promotion hospital	Case
Bang Saka sub-district	42
Bang Yeerong sub-district	80
Rongheep sub-district	58
Bang konthi sub-district	39
Don Manora sub-district Moo 5	71
Don Manora sub-district Moo 6	31
Bang Prom sub-district	60
Bang Koong sub-district	54
Jormploug sub-district	90
Bang Nokkak sub-district	53
Yay Pang sub-district	35
Bang krabue sub-district	66
Ban Pramon sub-district	30
Kradangnga sub-district	181
Total	**890**

CHAPTER III
RESEARCH METHODOLOGY

This chapter explains the methods used to achieve the research objective and to answer the research question presented in chapter 1. This chapter includes

1. Study Area

2. Study Site

3. Study Design

3.1 Study Area:

The effect of Health Literacy on self-care behavior and diabetes outcomes of diabetic patients receiving services at sub-district health promotion hospitals, Bangkhonthi district, Samut Songkram province.

3.2 Study Site:

Bangkhonthi District, Samut Songkram Province.

Samut Songkram province consists of three districts which are Samut, Amphawa, and Bangkhonthi. Bangkhonthi district comprises 13 sub-districts and have 13 sub-district health promotion hospitals. However, only three of those; Jormploug, Bang Prom, and Bang Yeerong sub-districts health promotion hospitals, are as Primary Care Center. Each center serves three to five sub-district health promotion hospitals. As a Contracted Unit for Primary Care (CUP), Napalai Hospital has also set up teams of doctors, nurses, and pharmacists to each center once every month since 2011.

Bangkhonthi district is well represented on social environment, economics, lifestyles and subtle way of living of overall districts in Samut Songkram. Unlike

Amphawan and Samut districts, the majority of Bangkhonthi 's residents work in orchards, and maintain their rural lifestyle. Some parts of Amphawa district; however, are tourist attractions where they are well developed and affect to the residents' lifestyle. In fact, Amphawa's dwellers tend to have combination of urban and rural lifestyles. The differences in lifestyle hence exclude Amphawa from the study. This same reason applies to Samut district as well. Samut district is very diverse in term of areas and ways of life. There are municipal areas where most people run their life as urban society. Furthermore, industrial, fishing, and orchard zones can be easily found in Samut district. As of the result, these cause the differences in social environment, economics, lifestyles and ways of living. In summarize, a high number of diabetes and proper representative of overall districts of Samut Songkram, Bangkhonthi district will be selected as a study area. It may also be an important area in resolving diabetes problem of the province.

3.3 Study Design:

To address the research question, there were four phases of the study as

Phase 1: Health literacy , Self-care behavior and Blood sugar of DM patients in Bangkhonthi district, Samut Songkram province: A descriptive research.

Phase 2: DM patients and health care provider perception of promoting health literacy at sub-district health promotion hospitals in Bangkhonthi district : An qualitative research.

Phase 3: Developing and implementing an Integrated Communicative Health Literacy program to promote blood sugar control among type 2 diabetic patients in Bangkhonthi district: An action research approach

Phase 4: Evaluating the effectiveness of the Integrated Communicative Health Literacy program at a sub-district health promotion hospital, Bangkhonthi district : Quasi experimental research.

3.3.1 Phase 1: Health Literacy, Self-care behavior and Blood sugar of DM patients in Bangkhonthi district: A descriptive research.

In the first phase, descriptive research will be used. The researcher will study diabetic patients aged between 50 – 80 years, living in Bang Khonthi district.

Questionnaires will be used to collect diabetic patients' data including socio-demographics, oral communication capacity, social support, health literacy, self-care behavior, and blood sugar.

Participants: 415 diabetic patients aged between 50 – 80 years, live in Bang Khonthi district.

Eligibility Criteria:

Inclusion criteria:

- The patients who are diagnosed of having type II diabetes mellitus.

- The patients who are between 50-80 years old.

- The patients who live in Bangkhonthi district, Samut Sonkram province at least one year.

- The patients who are able to participate in the research study.

- The patients who are able to provide informed consent.

- Exclusion criteria:

- The patients who cannot speak Thai.

- The patients who have problem in perception and recognition.

- The patients who are not willing to participate in the research study.

In the first phase, 415 diabetic patients as samples will be retrieved from approximately 1,132 diabetic patients as population by satisfied random sampling. The sample size will be calculated by using Yamane's formula.

$$n = \frac{N}{1 + Ne^2}$$

where n = the sample size

N = the size of population

e = the error of 4 percentage points

$$n = \frac{1132}{1 + 1132\left(0.04^2\right)}$$

$$n = 403$$

By using Yamane's formula of sample size with an error 4% and with a confidence coefficient of 96%, the calculation from a population of 1,132 came up with 403 diabetic patients from Bang Khonthi district.To account for possible attrition, the number of subjects will be increased to 415. Because each sub-district in Bang Khonthi district has the different number of diabetic patients, therefore it will be planned to recruit diabetic patients from each sub-district according with sub-district's population.

Procedures

Find out socio-demographic data, physical condition, oral communication capacity, social support, communicative health literacy, and self-care behavior of diabetic patient who participate in the research by using the questionnaire which consists of 53 questions (see appendix 1) that cover:

- Socio-demographic data (6 items)

- Gender, age, mineral status, education, occupation, and income.

- Communication with a doctor (2 items)

- Social support (8 items)

- Health status (3 items)

- Duration of DM, complication, and blood sugar level were retrieved from patient's record.

- Health Literacy (14 items)

- Self-care behavior (20 items)

Data will be collected and analyzed to describe the characteristics of diabetic patients aged 50 – 80 years in Bang Konthi district and to find out the association between independent variables (including socio-demographics, communication with a doctor, social support, and health status) and dependent variables (including health literacy level and self-care behavior).

Data analysis

Health Literacy (HL) scores will be measured in two scale types including an interval scale and an ordinal scale (Ishikawa et al., 2008b).

For an interval scale, HL scores will have a rang 1 to 4 for each domain and have a rang 14 – 56 for a total score

For an ordinal scales, HL scores can be divided into 4 levels. The total score was calculated to be percentage which ranged from 25 to100 (Chananya. et al., 2014). Interpretations of the percentage score provided a measure of:

- poor health literacy (25.00 to 59.99);
- fair health literacy (60.00 to 69.99);
- good health literacy (70.00 to 79.99); and
- very good health literacy (80.00 to 100).
- Descriptive statistics including mean, standard deviation, frequency, and percentage will be used to describe the characteristic of the samples.
- Socio-demographic data
- Age, gender, duration of DM, and health status will be retrieved from patient's record.
- Gender, age, mineral status, education, occupation, and income were retrieved from a questionnaire.
- Communication with a doctor (ordinal data rang 1 – 3 and categorical data: yes/no)
- Social support (ordinal data rang 1 – 3 and categorical data: yes/no)
- Health Literacy (ordinal data and continuous data rang 1 - 4)
- Self-care behavior (ordinal data rang 1 – 5)

To find out the relationship between total HL score and subscale CHL score (continuous data) with socio-demographics, communication with a doctor, social support, and health status, t-test and One-Way Analysis of Variance were used.

To find out the association between total HL score and self-care behavior, Pearson's correlation coefficients were used.

3.3.2 Phase 2: DM patient and health care provider perception of promoting health literacy at sub-district health promotion hospitals in Bang Khonthi district : An qualitative research.

In the second phase, a qualitative research was used. The researcher focused to study all diabetic patients aged between 50-80 years, living in Bang Khonthi district,

and receiving services at sub-district health promotion hospitals for their diabetic treatment. The qualitative research method was employed, in-depth interviews were used to collect data about diabetic patients' and health care providers' perception of promoting health literacy at sub-district health promotion hospitals in Bang Khonthi district.

Participants: 14 participants including 4 diabetic patients, 2 caregivers, 1 doctor, 3 nurses, 3 public health officers, and 1 health literacy expert.

Eligibility Criteria: diabetic patients

Inclusion criteria:

- The patients who are diagnosed of having type II diabetes mellitus.

- The patients who are between 50-80 years old.

- The patients who live in Bang Khonthi district, Samut Sonkram province at least one year.

- The patients who visit a sub-district health promotion hospital in Bang Khonthi district for diabetic care

- The patients who are able to participate in the research study.

- The patients are able to provide informed consent.

- Exclusion criteria:

- The patients who cannot not speak Thai.

- The patients who have problem in perception and recognition.

- The patients who are not willing to participate in the research study.

- Eligibility Criteria: caregivers

Inclusion criteria:

- The caregivers who take care type 2 diabetic patients receiving service at a sub-district health promotion hospital in Bang Khonthi district, Samut Sonkram province at least one year.

- The caregivers who have ever taken the patient to visit a sub-district health promotion hospital in Bang Khonthi district for diabetic care.
- The caregivers who are able to participate in the research study.
- The caregivers are able to provide informed consent.
- Exclusion criteria:
- The caregivers who cannot not speak Thai.
- The caregivers who have problem in perception and recognition.
- The caregivers who are not willing to participate in the research study.
- Eligibility Criteria: health care providers

Inclusion criteria:

The health care providers who are doctors, nurses, or public health staffs.

The health care providers who currently take care or do a treatment for diabetic patients at a sub-district health promotion hospital in Bang Khonthi district.

The health care providers who are able to participate in the research study.

Exclusion criteria:

The health care providers who are not willing to participate in the research study.

Procedures

Qualitative study will be conducted to search for diabetic patients' and health care providers' perception of promoting health literacy at sub-district health promotion hospitals in Bang Khonthi district through an in-depth interview.

The guideline questions were used for an effective in-depth interview (see appendix A, B).

The interviewers have knowledge and experiences in an in-depth interview. The researcher and interviewers discussed on procedure method, and important information that the researcher was looking for such as the action of patients during the interviewing. During the interview, there was tape record. The researcher observed and recorded obtained information from the interview. In addition, an anthropological expert, who was as an advisor making some recommendations, closely advised during an in-depth interview data collection process in order to receive appropriate and accurate information.

Data were collected and analyzed by using content analysis to describe the perception of 4 diabetic patients, 2 caregivers, 1 doctor, 3 nurses, 3 public health officers, and 1 health literacy expert regarding promoting health literacy at sub-district health promotion hospitals in Bang Khonthi district.

Content analysis

In order to have accurate information, it is necessary to recheck the information back and forth. This study received two sources of information from an in-depth interview and record from observation during the research study. All obtained information from tape record was translated and written in Thai. When decoding the information or message from tape record, the researcher team carefully translated them in order to maintain the meaning as close as to original. The expert translator of specific languages such as a local language was required. The process of content analysis was started from listening to the tape record, read the decoding messages from the tape record for several times, jot down notes on the messages and write the theme for category purpose, to categorize the decoding messages from the interview according to the study objectives. The conclusion from tape record was compared to the information recorded via observation for accuracy.

3.3.3 Phase 3: Developing and implementing an Integrated Communicative Health Literacy program to promote blood sugar control among type 2 diabetic patients in Bangkhonthi district: An action research approch.

In the third phase, an intervention was created by using an action research approach.

Participants: DM patients, caregivers, doctors, nurses, public health officers, health promotion experts, and health literacy experts.

Procedures

Conduct action research to find out the possibility and the application to conduct intervention as these following processes:

Conduct a survey to determine stakeholders who are involved in taking care of the patients with diabetes

Hold a meeting for researcher team and stakeholders. The researcher team informed the level of health literacy toward self-care behavior; blood sugar control of the diabetic patients in the community; the result from an in-depth interview to seek for diabetic patients' and health care providers' perception of promoting health literacy at sub-district health promotion hospitals in Bang Khonthi district; and any possible factors that caused poor blood sugar control in the community.

Stakeholders utilized the obtained information from the researcher team and collaborated to solve the problem. All stakeholders were encouraged to give their opinions freely.

The solution in solving the problem from stakeholders was used as the first testing to an experimental group. The experimental group referred to 35 patients aged between 50-80 years who visited Jormploug sub-district health promotion hospital. The processes using self-help group technique were as the following;

The 35 patients were made 6 groups of 5 – 7 persons. Each group must compose of both patients who are able and unable to control blood sugar. There were at least two patients who are able to control blood sugar in each group.

Each group selected a leader of the group who had responsibility to encourage group members to continue participate in the program.

Each group selected time and place for a group meeting, based on the comfortableness of members who are not able to control blood sugar.

Each group conducted group activities once a week including blood sugar test (DTX), recoding unhealthy food eating, and sharing feelings, experiences and recommendations related to health information and managing diabetes.

After a four weeks experiment, stakeholders held the meeting again to acknowledge of the first assessment and discuss to revise or improve resolve method. Test the revised and improved resolve method with the experimental group and reevaluate. The process was as the following;

Each group conducted group activities twice a month including blood sugar test (DTX), recoding unhealthy food eating, and sharing feelings, experiences and recommendations, related to health information and managing diabetes.

Stakeholders arranged the meeting to acknowledge of the second assessment. Everyone was satisfied with the process. Finally, by using the self-help group technique, an integrated communicative health literacy program (ICHL Program) for type 2 diabetic patients in Bangkonthee district, Samut Songkram province, Thailand was developed and implement last for 3 months.

3.3.4 Phase 4: Evaluating the effectiveness of the Integrated Communicative Health Literacy program at a sub-district health promotion hospital, Bangkhonthi district: Quasi experimental research

In the fourth phase, a quasi-experimental research method will use an intervention created by using an action research approach. The sample of this study was 70 participants, aged 50 – 80 years, were divided into two groups including a group of 35 patients receiving services from Jormploug sub-district health promotion hospital and another group of 35 patients receiving services from Bang Prom and Bang Yeerong sub-district health promotion hospitals. Then, randomly selected one group as an intervention group and the rest was a control group. Finally, the patients from Jormploug sub-district health promotion hospital were selected as an intervention group.

Participants: 35 patients from Jormploug sub-district health promotion hospital for an intervention group and 35 patients from Bang Prom and Bang Yeerong sub-district health promotion hospitals for a control group.

Eligibility Criteria: Inclusion criteria :

The patients who are diagnosed of having type II diabetes mellitus.

- The patients who are between 50-80 years old.

- The patients who live in Bangkhonthi district, Samut Sonkram province at least one year.

- The patients who visit Jormploug or Bang Prom or Bang Yeerong sub-district health promotion hospital for diabetic care

- The patients who are able to participate in the research study.

- The patients are able to provide informed consent.

- Exclusion criteria:

- The patients who cannot not speak Thai.

- The patients who have problem in perception and recognition.
- The patients who are not willing to participate in the research study.

Sample size calculation

An appropriate sample size can be expected to detect the differences in primary outcomes between intervention and control groups with minimal errors. The sample size estimation for tests between two independent sample means is shown below (Sakpal, 2010).

The formula for calculating a sample size is

$$n = [2S^2 (Z\alpha + Z\beta)^2]/ D^2 = [2 (2.64)^2 (1.645 + 0.84)^2]/ (-1.82)^2$$

$$= 26, \text{ plus } 35\% \text{ dropout rate} = 35$$

Where

n	=	Sample size required in each group
Zα	=	Type I error; for 5%, this is 1.96 (two-tailed)
Zß	=	Type II error; for ß = 0.20 or Power = 80%, this is 0.84
S	=	Standard deviation = 2.64 (Mean difference in HbA1c from baseline to week 12)
D	=	Mean difference in HbA1c from baseline to week 12 = 2.64 (Wongsunopparat et al., 2008)

The sample size calculation was based on differences in HbA1c of an intervention group between baseline and 12 weeks (1.82) (Wongsunopparat et al., 2008).

The standard deviation of changes in HbA1c between baseline and 12 weeks was found to be 2.64. Based on the data, 26 participants per group were needed to detect this difference with alpha 0.05 two-sided and power of 0.80. We decided to make assumptions on two sides because the ICHL program could have both negative and positive effects when compared to the group that did not receive the intervention.

Procedures

The integrated communicative health literacy program (ICHL Program) was implemented with diabetic patients receiving health services from Jormploug sub-district health promotion hospital for diabetic treatment. For a control group, a regular

health literacy promotion was implemented. The baseline of the patients both in control and intervention areas were assessed before the intervention. Then data from the assessment after three and six months of both intervention and control group were compared. The processes were as the following:

Apply ICHL Program to the intervention group that was defined as those 35 patients who received health services from Jormploug sub-district health promotion hospital for diabetic care.

Apply a regular health literacy promotion to the control group: 35 patients who received health services from Bang Prom and Bang Yeerong sub-district health promotion hospitals.

Before the intervention, there was a measurement on health literacy level, self-care behavior and HbA1c level of those patients as baseline data.

After 3 and 6 months of intervention, measured health literacy level, self-care behavior and HbA1c level of those intervention and control groups.

Analyze the information from the test.

Data analysis

This study used the Statistical Package for the Social Sciences (version 16.0; SPSS, Inc., Chicago, IL) for the analysis of all data. Before selecting the most appropriate statistical tests, the chi-square and t-test were used to compare the distribution of variables (health literacy level, self-care behavior and HbA1c) between the intervention and the control groups.

Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to describe the participants' general characteristics, such as gender, marital status, education, and occupation.

Chi-square and independent t-tests were used to compare the differences in participants' general characteristics between the intervention and control groups.

A repeated-measure ANOVA was performed to evaluate the effects of the intervention when data did not violate the parametric assumptions. We compared health literacy level, self-care behavior and HbA1c between the intervention and the control groups at baseline, after intervention at Month 3, and as a follow-up at Month 6. We also used the Bonferroni correction to compare the differences between the two groups

over time. The mean differences between the intervention and control groups were calculated with 95% confidence intervals. Analyses were adjusted for possible confounders, and the effect of modification was investigated using interaction terms between intervention groups and time. All confirmatory statistical tests had p values of less than 0.05.

For the in-depth interviews, a form of a triangulation approach was used to understand people's behaviors with various interpretations from different disciplines bringing a variety of perspectives to the analysis (Shih, 1998). We believe that the use of triangulation during the follow-up period confirmed the strengths and weaknesses of the ICHL program.

3.4 Ethical considerations

Ethical approval was attained from the Chulalongkorn University Institutional Review Board on human rights prior to commencing the study. The medical records for each patient were accessed with the agreement of the Director of sub-district health promotion hospitals in Bang Khonthi district, Samut Songkram province. The participants completed consent forms before the program began. Furthermore, all participants received information about the research program, and the consent form specified that participants could withdraw at any time with no implications for the provision of healthcare services to them in the hospital. The confidentiality of the patients and healthcare personnel was respected.

CHAPTER IV
RESULTS

This study aimed to develop an Integrated Communicative Health Literacy program to promote blood sugar control among type 2 diabetic patients in Bangkhonthi district Samut Songkram province and determine the effectiveness of the program. To address the research objectives, there were four phases of the study as follows:

Phase 1: Health literacy, Self-care behavior and Blood sugar of DM patients in Bangkhonthi district, Samut Songkram province: A descriptive research.

Phase 2: DM patients and health care provider perception of promoting health literacy at sub-district health promotion hospitals in Bangkhonthi district : An qualitative research.

Phase 3: Developing and implementing an Integrated Communicative Health Literacy program to promote blood sugar control among type 2 diabetic patients in Bangkhonthi district: An action research approach

Phase 4: Evaluating the effectiveness of the Integrated Communicative Health Literacy program at a sub-district health promotion hospital, Bangkhonthi district: A quasi experimental research.

4.1 Phase 1: Health literacy, Self-care behavior and Blood sugar of DM patients in Bangkhonthi district, Samut Songkram province: A descriptive research.

4.1.1 Characteristic of the participants

Table 4-1 describes characteristics of 415 participants .Most of them were female (66.50 %). Most of them were 60 to 69 years old and their mean age was 64.11±8.1 years old. Most of them were married (68.00%), completed elementary education (71.30%), were agriculture (29.20%), and had monthly income less than 5,001 Baht (65.00%). Regarding communication with a doctor, most of them often talked to a doctor about their health. Mostly, the courses that made participants felt

uncomfortable to speak to a doctor during a visit were that they felt tire and wanted to rest (18.02%) and they hurried to go home (18.02 %).

Table 4. 1 *Characteristic of the participants receiving health service at sub-district health promotion hospitals in Bang Khonthi district Samut Songkram province*

Characteristic	Number	Percentage (%)
1. Gender		
Male	139	33.50
Female	276	66.50
Total	415	100.00
2. Average age		
Average 64.11 years (S.D. = 8.1)		
Minimum 50.00 years		
Maximum 80.00 years		
3. Age rage		
50 – 59 years	148	35.70
60 – 69 years	175	42.20
70 – 80 years	92	22.10
Total	415	100.00
4. Marital status		
Single	28	6.80
Married	282	68.00
Widowed	65	15.50
Divorced	12	2.90
Separated	28	6.80
Total	415	100
5. Education background		
Lower than primary school	36	8.70
Primary school	296	71.30
Secondary/Vocational school	64	15.40
Bachelor degree and above	19	4.60
Total	415	100.00

Table 4-1 (continue)

Characteristic	Number	Percentage (%)
6. Occupation		
Agriculture	121	29.20
General employee	99	23.90
Commercial group/private sector	62	14.90
Government sector officer/ State enterprise officer	6	1.50
Retirement	13	3.10
Housewives/housekeeper/no work	114	27.40
Total	415	100.0
7. Average monthly income		
Less than 5,001 baht	164	39.51
5,001 – 10,000 baht	139	33.49
10,001 – 15,000 baht	80	19.30
15,001 – 20,000 baht	16	3.85
More than 20,000 baht	16	3.85
Total	415	100.00
8. Speak to a doctor during a visit		
Never	24	5.78
Seldom	38	9.16
Sometime	173	41.68
Often	180	43.38
Total	415	100.00
9. Causes make participants feel uncomfortable to talk to a doctor (select 1 choice or more)		
9.1. They feel tire and want to rest.	155	18.02
9.2. They are hurry to go home.	155	18.02
9.3. They are hurry to go to somewhere.	127	14.77
9.4. They do not understand what a doctor talk with you.	86	10.00
9.5. A doctor is not friendly to them.	33	3.84
9.6. A doctor does not talk or ask any question to them.	90	10.47
9.7. A doctor hurries to do treatment till he does not have time to talk with them.	145	16.86

Table 4-1 (continue)

Characteristic	Number	Percentage (%)
9. Causes make participants feel uncomfortable to talk to a doctor		
9.8. In an examination room, there is another person beside them and a doctor	51	5.93
9.9. The environment in an examination room is bad such as loud, chaotic	18	2.09
	860	100.00

Table 4-2 describes social support of participants. The overall mean of social support was 2.98±0.64. The social support that "their family encourages them about their diabetes control" had the highest mean score (mean = 3.22, S.D. = ±0.85), while "their friend is interested to listen to them when they talk about their diabetes" had the lowest mean score (mean = 2.86, S.D. = ±0.84). Most of the participants had descendants help take care of their diabetes (27.04 %) and had doctors treat their diabetes (37.43 %).

Table 4. 2 Social support

Social support	Mean ($\bar{x}$)	S.D.
Family and friend support		
1. Their family encourages them about their diabetes control.	3.22	0.85
2. Their friend encourages them about their diabetes control.	2.98	0.80
3. Talking about their diabetes to their family	2.94	0.90
4. Their family is interested to listen to them when they talk about their diabetes	3.18	0.80
5. Talking about their diabetes to their friend	2.71	0.87
6. Their friend is interested to listen to them when they talk about their diabetes	2.86	0.84
Total	2.98	0.64

Table 4-2 (continue)

Social support	Number	Percentage %
Persons who help take care of diabetes		
Spouse	278	25.84
Descendants	291	27.04
Friend	59	5.48
Relative	161	14.96
Paid helper	12	1.12
Health volunteer	257	23.88
Others	18	1.67
	1076	100.00
Persons who treat diabetes		
Doctor	414	37.43
Nurse	258	23.33
Public health official	411	37.16
Others	23	2.08
	1106	100.00

Table 4-3 describes the level of social support of participants determined by
mean scores of social support. The level of social support composed of 3 levels: low
social support (rang from 1.00 to 2.00), moderate social support (rang from 2.01 to
3.00), and high social support (rang from 3.01 to 4.00). Most of participants had
medium social support (46.50%) followed by high social support (43.13 %), and low
social support (10.37 %), respectively.

Table 4. 3 Level of social support

Level of social support	Number of participants	Percentage (%)
Low	43	10.37
Moderate	193	46.50
High	179	43.13
Total	**415**	**100**

Table 4-4 describes health condition of participants from patient record. Most
of their duration of diabetes was 5 to 9 years (39.80 %). Most of them had a diabetes

complication (80.25 %). Among participants who had the complication, most of them had one complication (46.52%) and hypertension was the most complication (66.85 %). Most of their blood sugar (DTX) was 126 to 154 ml/dl (51.45 %).

Table 4. 4 Health condition from patient record

Health condition	Number	Percentage %
Duration of diabetes		
Less than 5 years	105	25.20
5 – 9 years	165	39.80
10 years and more	145	35.00
Total	**415**	**100**
Having a complication		
No	82	19.75
Yes	331	80.25
Total	**415**	**100.0**

Table 4-4 (continue)

Health condition	Number	Percentage %
Number of complication		
1 complication	167	46.52
2 complications	148	41.23
3 complications	40	11.14
5 complications	4	1.11
	359	**100.00**
Type of complication		
Heart disease	35	9.75
Hypertension	240	66.85
Kidney disease	7	1.95
Chronic wound	10	2.79
Eye disease	24	6.69
Numbness in the finger and feet	37	10.31
Others	6	1.67
	359	**100**
Blood sugar (DTX)		
Less than 126 ml/dl	125	30.10
126 – 154 ml/dl	214	51.45
155 – 182 ml/dl	60	14.56
More than 182 ml/dl	16	3.89
Total	**415**	**100.0**

4.1.2 Health literacy among type 2 diabetic patients receiving health services at sub-district health promotion hospitals in Bang Khonthi district.

The respondents had moderate overall health literacy)mean = 2.68, S.D. = ±0.64) and a mean full score was 36.89 (S.D. =±7.118). Upon consideration as an aspect basis, the mean score of functional health literacy was 3.11 (S.D. =±0.86), the interactive health literacy was 2.32 (S.D. =0.86), and the critical health literacy was 2.61(S.D. =±0.96), as shown in Table 4-5.

Table 4. 5 *Health literacy among type 2 diabetic patients receiving health services at sub-district health promotion hospitals in Bang Khonthi district*

Health literacy	Mean ($\bar{x}$)	S.D.	Translation
Functional Health Literacy	**3.1107**	**0.86895**	
1) They have found that the print was too small to read	2.9223	1.15206	
2) They have found characters and words that They did not know	3.0777	1.02603	
3) They have found that the content was too difficult	3.2039	1.02287	
4) They have need a long time to read and understand them	3.0971	1.05268	
5) They have need someone to help them read them	3.2524	0.99724	
Interactive Health Literacy	**2.3282**	**0.86856**	
1) They have collected information from various sources	2.2816	0.98436	
2) They have extracted the information they wanted	2.1553	0.93680	
3) They have understood the obtained information	2.4369	1.06338	
4) They have communicated their thoughts about their illness to someone	2.3301	1.06078	
5) They have applied the obtained information to their daily life	2.4369	1.10852	
Critical Health Literacy	**2.6141**	**0.96810**	
1) They have considered whether the information was applicable to their situation	2.6505	0.96719	
2) They have considered the credibility of the information	2.5728	1.14277	
3) They have checked whether the information was valid and reliable	2.6019	1.08772	
4) They have collected information to make health-related decisions	2.6311	1.12886	
Total (range 1 – 4)	**2.6847**	**0.64637**	**Moderate**
Total full score (rang 14 – 56)	**36.89**	**7.118**	

4.1.3 Self-care behavior among type 2 diabetic patients receiving health services at sub-district health promotion hospitals in Bang Khonthi district.

In the average, the respondents had fair overall self-care behavior (Mean = 68.50, S.D. = ±8.42). Most of them had good overall self-care behavior (39.8%), as shown in Table 4-6.

Table 4. 6 *Overall self-care behavior among type 2 diabetic patients*

Self-care behavior	Number	Percentage
Very good (80.00 – 100)	36	8.7
Good (70.00 – 79.99)	165	39.8
Fair (60.00 – 69.99)	150	36.1
Poor (20.00 – 59.99)	64	15.4
Minimum score = 46, Maximum score = 88		
Mean = 68.50, S.D. = 8.42		
Total	415	**100.0**

. The respondents had the mean score of overall self-care behavior equal 4.00 (S.D. = ±0.334). Upon consideration as an aspect basis, the mean score of treatment dimension was highest (Mean = 4.34, S.D. = ±0.400) followed by physical dimension (Mean = 4.00, S.D. = ±0.711), prevented complication dimension (Mean = 3.89, S.D. = 0.53), and psychosocial dimension (Mean = 3.75, S.D. = ±0.72) respectively, as shown in Table 4-6

Table 4. 7 Mean and standard deviation of self-care behavior among type 2 diabetic patients

Self-care behavior	Mean ($\bar{x}$)	S.D.
1. Physical dimension	4.00	0.711
2. Prevented complication dimension	3.89	0.531
3. Treatment dimension	4.36	0.400
4. Psychosocial dimension	3.75	0.721
Total	**4.00**	**0.334**

4.1.4 Relationships of socio-demographic data, physical condition, oral communication capacity, social support, health literacy.

4.1.4.1 Relationship of gender and health literacy

Independent t-test analysis showed that participants with different gender had no different health literacy mean score, as shown in Table 4-8.

Table 4. 8 *Relationship of gender and health literacy analyzed by independent t-test*

Gender	Number	Mean	S.D.	t	p-value
Male	139	37.04	7.00	0.321	0.755
Female	276	36.81	7.18		

4.1.4.2 Relationship of age and health literacy

One-way ANOVA analysis showed that participants with different age had significantly different health literacy mean score ($p < 0.05$), as shown in Table 4-9.

Table 4. 9 *Relationship of age and health literacy analyzed by One-way ANOVA*

Age (years)	Number	Mean	S.D.	F	p-value
50 – 59	148	37.95	6.21	8.875	0.011[*]
60 – 69	175	36.80	7.89		
70 - 80	92	35.36	7.37		

*Difference is significant at the 0.05 level

4.1.4.3 Relationship of marital status and health literacy

One-way ANOVA analysis showed that participants with different marital status had significantly different health literacy mean score ($p < 0.01$), as shown in Table 4-10.

Table 4. 10 *Relationship of marital status and health literacy analyzed by One-way ANOVA*

Marital status	Number	Mean	S.D.	F	p-value
Single	28	36.12	6.29	5.235	0.000[**]
Married	282	39.62	6.41		
Widowed	65	29.82	7.24		
Divorced	12	33.88	7.38		
Separated	28	36.54	5.35		

**Difference is significant at the 0.01 level

4.1.4.4 Relationship of education background and health literacy

One-way ANOVA analysis showed that participants with different education background had significantly different health literacy mean score (p<0.01), as shown in Table 4-11.

Table 4. 11 Relationship of education background and health literacy analyzed by One-way ANOVA

Education background	Number	Mean	S.D.	F	p-value
Lower than primary school	36	24.75	6.22	41.80	0.**00
Primary school	296	37.61	7.04		
Secondary/Vocational school	64	39.44	6.02		
Bachelor degree and above	19	40.12	7.11		

**Difference is significant at the 0.01 level

4.1.4.5 Relationship of occupation and health literacy

One-way ANOVA analysis showed that participants with different occupation had no different health literacy mean score as shown in Table 4-12.

Table 4. 12 Relationship of occupation and health literacy analyzed by One-way ANOVA

Occupation	Number	Mean	S.D.	F	p-value
Agriculture	121	37.32	7.56	0.919	0.492
General employee	99	36.60	7.76		
Commercial group/private sector	62	34.75	11.35		
Government sector officer/ State enterprise officer	6	43.50	10.60		
Retirement	13	35.57	5.33		
Housewives/housekeeper/no work	114	36.29	6.55		

4.1.4.6 Relationship of income and health literacy

One-way ANOVA analysis showed that participants with different average monthly income had no different health literacy mean score, as shown in Table 4-13.

Table 4. 13 *Relationship of income and health literacy analyzed by One-way ANOVA*

Monthly income	Number	Mean	S.D.	F	p-value
Less than 5,001 baht	164	36.24	7.36	0.589	0.670
5,001 – 10,000 baht	139	37.35	7.80		
10,001 – 15,000 baht	80	37.22	5.74		
15,001 – 20,000 baht	16	36.87	5.65		
More than 20,000 baht	16	37.75	5.92		

4.1.4.7 Relationship of oral communication capacity and health literacy

One-way ANOVA analysis showed that participants with different speaking to a doctor during a visit had significantly different health literacy mean score ($p<0.05$), as shown in Table 4-14.

Table 4. 14 *Relationship of oral communication capacity and health literacy analyzed by One-way ANOVA*

Speak to a doctor during a visit	Number	Mean	S.D.	F	p-value
Never	24	33.45	7.71	3.46	0.*016
Seldom	38	36.60	6.64		
Sometime	173	36.36	6.62		
Often	180	37.90	7.11		

*Difference is significant at the 0.05 level

4.1.4.8 Relationship of health status and health literacy

Independent t-test analysis showed that participants with different health status had no different health literacy mean score, as shown in Table 4-15.

Table 4. 15 *Relationship of health status and health literacy analyzed by independent t-test*

Complication	Number	Mean	S.D.	t	p-value
Do not have any	82	36.75	6.98	-0.277	0.782
Have at least one	331	36.99	7.07		

4.1.4.9 Relationship of social support and health literacy

One-way ANOVA analysis showed that participants with different level of social support had significantly different health literacy mean score (p<0.01), as shown in Table 4-16.

Table 4. 16 *Relationship of social support and health literacy analyzed by One-way ANOVA*

Level of social support	Number	Mean	S.D.	F	p-value
Low	43	33.09	7.60	17.72	0.000*
Medium	193	35.77	6.85		
High	179	39.00	6.65		

**Difference is significant at the 0.01 level

4.1.5 Relationships of health literacy, self-care behavior, and blood sugar level among type 2 diabetic patients.

Pearson's correlation coefficient analysis shown that health literacy had significant positive relationship with self-care behavior (r = 0.09, Sig. = 0.047) but did not have significant relationship with blood sugar level (r= -0.023, Sig. = 0.638). In addition, self-care behavior had significant negative relationship with blood sugar level (r = -0.05, Sig. = 0.00), as shown in Table 4-17.

Table 4. 17 *Correlation between health literacy, self-care behavior, and blood sugar level among type 2 diabetic patients*

Variables	Mean, Standard deviation ($\bar{x}$, S.D.)	Self-care behavior r, Sig.	Blood sugar (DTX) r, Sig.
Health literacy	(36.89, 7.118)	0.09, 0.049*	-0.023, 0.638
Self-care behavior	(68.50, 8.425)	-	-0.50, 0.000**
Blood sugar (DTX)	(147.46, 41.915)	-	-

**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

4.2 Phase 2: DM patients and health care provider perception of promoting health literacy at sub-district health promotion hospitals in Bangkhonthi district : An qualitative research.

From a qualitative method, all participants expressed satisfaction with participating in an in-depth interview. They wanted to express their opinion regarding the health literacy situation. The following is the result of observation and content analysis, categorized by groups of participants.

Perspective of diabetes patients

Most patients receive health-related information from public health officials. The staffs will provide and distribute health knowledge documents to them. Every month, on the day the diabetes clinic is open, there will be staffs to lecture on health issues. For many patients, when they have a problem with insufficient understanding of health issues, they will consult health care providers. However, since most of them are elderly, they need help from relatives and friends who will take them to see a doctor and take their health information during the doctor visit. These friends and relatives will help take care of patients regarding food consumption and medication. Most patients do not have problems with receiving health-related information. However, the commonest problem is that, once they have received the health-related information, they do not care to read the document.

"Staffs at a hospital do many things to make me know how to do diabetes care. They gave me a lot of documents and pocket books and ask me to read them. I know they are good for me but I do want to read them because they are too many and are boring. They should do interesting thing better than reading books." (Patient S)

In addition, regarding whatever they know from the information they often think and make decisions by themselves without any help to consider. They do not like to talk to other diabetes patients about their diabetes.

"I do not like to talk about my diabetes to others because I think they are not interested to know about my diabetes. Sometime I talk about how I practice diabetes care to a doctor. He asks me to focus just on whatever he told me to do and do not try to do other things. I know it might not good for me but I just want to try something new" (Patient P)

Most patients want to have someone who is willing to listen to their problem and help them solve the problem.

"I know everyone is busy. I do not want to disturb them when I have a problem understanding health-related information because I will feel upset when they are not willing to help me. So, I try to do things on my own." (Patient N)

Perspective of caregivers

Most of the caregivers regularly receive health-related information and knowledge about diabetes care from health officials, physicians and nurses. Friends and relatives provide advice and assistance in the care of patients. However, many patients rarely follow their advice. They are ignorant towards the control of blood sugar and unhealthy eating habits. They like to do whatever they want without listening to others.

"My uncle is very pertinacious. I keep telling him do not do whatever the doctor prohibited, but he does not listen to me. He likes to do whatever he thinks is right." (Caregiver S)

Perspective of doctors

Although doctors do not have much time to talk to patients, whenever a patient has health problems, they are ready to help. However, most patients rarely ask the doctors questions regarding health problems. When the doctors ask them what the problem they have understanding health information is, most patients often said they do not have any problem. However, many patients usually like to do whatever is not recommended by the doctor. They still consume unhealthy things such as sweet food. Doctors do not know that patients do not understand or do not care to follow their recommendations.

"I am concerned that many elderly patients may have a problem understanding the health information that I gave to them. I keep asking them if they have any problem or concern about what I just said to them. Most of them often said they are fine and do not have any problem. However, when they go home many of them do not follow my recommendations." (Doctor Ch)

Perspective of nurses

Nurses will provide health-related information and knowledge about diabetes care. They often advise and warn patients when they did something that might have a negative effect on their health. However, there are some patients who are not interested in the health-related information. They do not care about their health problems. They also do not care to take care of their own health.

"I know some patients do not like me because I keep telling them to do this or not to do that. Since they are elderly, they might not like a young person like me giving them orders. They may feel frustrated when I blame them for the wrong things they did." (Nurse P)

Perspective of public health officials

Every month public health officials will visit diabetes patients at home in the area for which they are responsible, especially those who have problems taking care of themselves and need health providers to help them at home. Health-related information and knowledge about diabetes care are provided to patients and caregivers when they come to receive services at the hospital. The public health officials make a lot of effort to find out if there is anything that makes it difficult for the patients to perceive and understand the health information. From their experience, they found that many patients have a good understanding of diabetes, especially those who have had diabetes for a long time. However, even when they know what is bad for their health, they still do it.

"Many elderly patients know a lot about diabetes care because they have received health-related information and knowledge about diabetes care for many years. However, some patients still do whatever they know may have serious effects on their health such as eating a lot of sweet food." (Public health official R)

Perspective of health literacy experts

At hospitals, health providers often focus on educating diabetes patients. They think that diabetes patients with good knowledge will perform well in maintaining good health. In fact, in the definition of health, patients have to be motivated to perceive and understand health information and be encouraged to use this information to their

advantage. Even if the patients are knowledgeable, as long as there is no motivation, they will not practice good self-care behavior.

"For many patients who have good knowledge about diabetes care, they still do not practice good self-care behavior because they have no motivation to do it. Therefore, for promoting patients' health literacy, we have to know how to motivate them to access, understand, and use health-related information to improve their health." (Expert B)

4.3 Phase 3: Developing and implementing an Integrated Communicative Health Literacy program to promote blood sugar control among type 2 diabetic patients in Bangkhonthi district: An action research approach

4.3.1 Developing an Integrated Communicative Health Literacy program

The positive resources and support in individuals' social networks can improve their ability to acquire and understand medical information and to negotiate the health care system. Such social support and resources, when present, would be particularly important for those with low health literacy in facilitating the establishment of healthful attitude and behavior, increasing the use of preventive and routine physician visits, improving health status, and reducing the amount of costly, intensive emergency and hospital care.

From data analysis, above, researchers created a model of improving health literacy to promote blood sugar control, as shown in Figure 4-1.Then, the model was used to developed an Integrated Communicative Health Literacy program (ICHL program) to promote blood sugar control among type 2 diabetic patients in Bang Khonthi district.
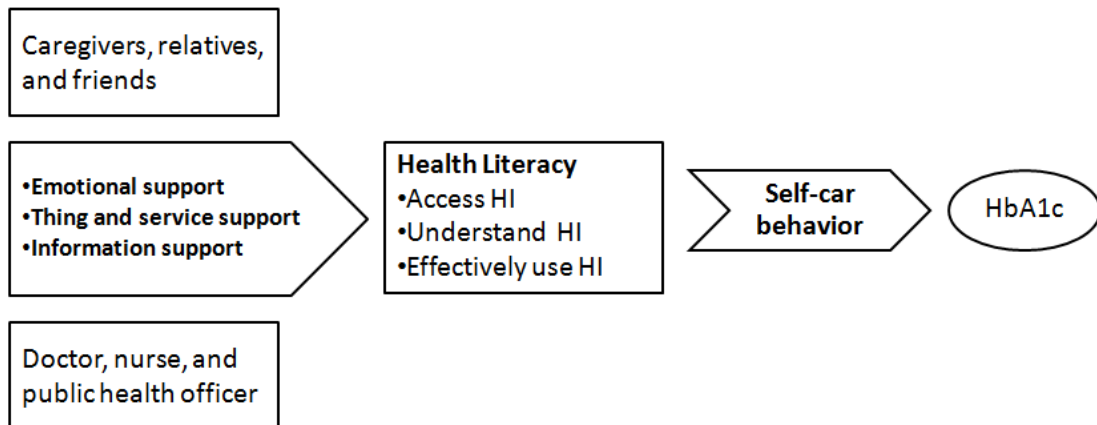
Figure 4. 1 Model of improving health literacy to promote blood sugar control
HI : Health Information

From the model, health literacy including ability to access health information, understand health information, and effectively use health information would be improved by getting social supports: emotional support, thing and service support, and information support. Caregivers, relatives, and friends of diabetic patients would mainly give emotional support to them followed by thing and service supports, and information supports respectively. On the other hand, doctors, nurses, and public health officers would mainly give information support to them followed by thing and service supports, and emotional supports respectively. The positive resources and support in individuals' social networks can improve their ability to acquire and understand medical information and to negotiate the health care system. Such social support and resources, when present, would be particularly important for those with low health literacy in facilitating the establishment of healthful attitude and behavior, increasing the use of preventive and routine physician visits, improving health status, and reducing the amount of costly, intensive emergency and hospital care. When diabetic patients have got social supports, they are motivated to find necessary health information, take an effort to learn and understand health information, and use health information effectively for their better health. This would make diabetic patients do better self-care behaviors. Consequently, they would be able to control their blood sugar (HbA1c) better.

4.3.2 Implementing an Integrated Communicative Health Literacy program

An Integrated Communicative Health Literacy program (ICHL program) was implemented by using self-help group techniques and action research approach. The action research approach involved 5-interactive stages: a) planning; b) action; c) observation; d) reflection; and, e) revising the plan. The researchers and participants worked collaboratively, throughout each of these stages.

a) Planning

During this stage, the researchers worked to build relationships with: participants; participants'family members; the sub-district administrator; village volunteers; and, doctors, nurses and public health officials at the community healthcare center. Relationship building was implemented via visits with each individual in his/her home or at a public place (i.e. healthcare center, sub-district office, weekend market, or local grocery store). In addition, the researchers joined participants in community activities (i.e. religious events, meeting party, and/or funeral ceremonies). Involving all of these individuals and attending community activities was necessary in order for the researchers to pay cultural respect, build trusting relationships within the community and alert members of the community about the formation of the Integrated Communicative Health Literacy program (ICHL program). Building respect and trusting relationships, and informing significant community members about the ICHL program, increased the likelihood of the researchers being able to access necessary information, conduct a self-help group and possibly obtain community services for the group.

The planning stage also involved the researchers working with the community health center nurses and public health officials to coordinate dates, times and location for the self-help group sessions. The dates and times for the sessions were planned on a two-week basis, with participant agreement. Each session was anticipated to take approximately two hours. In addition to establishing relationships within the community and arranging the logistics for the self-help sessions, the planning stage involved the creation of guidelines, by the researchers, for use during the self-help group sessions. The initial guidelines addressed evaluation of participants' perceptions about: health literacy, self-care abilities and quality of life; disadvantageous conditions that hindered participants' ability to access health related information and manage their

diabetes; and, things participants wanted to change in order to improve their individual disadvantageous conditions.

b) Action

Throughout the action research approach, the action stage was implemented with participants attending self-help group sessions. The overall foci of the self-help group sessions were to: (a) assess participants' abilities to access and understand health related information, and manage their diabetes; (b) ascertain difficulties participants encountered in regards to health related information and self-care of their diabetes; and, (c) determine what participants believed would improve their health literacy and healthcare situations. Group goals were set during the first session and refined, as needed, at the beginning of each subsequent session. To enhance ongoing participation, group sessions, lasting over a 6-month timeframe, met every other week on the same day, at the same time. A six month timeframe was selected because it was believed to be a sufficient period of time for noting change in participants' lifestyles. Group sessions were held in the community health center or any appropriate place selected by participants and lasted approximately two hours. Group activities included participants sharing their experiences, information and problem-solving techniques related to health literacy (i.e. access health related information, understand health related information, and effectively use health related information) and diabetes management (i.e. dietary control, medication adherence, foot care and exercise). Problem-solving related to health literacy and diabetes management was noted to be the most meaningful activity, for the participants during the group sessions. Throughout the group sessions, the researchers served as a group member, consultant and facilitator.

c) Observation

Like the action stage, the observation stage was implemented throughout the action research approach. The researchers participated as a group member during each group session, while simultaneously listening to the group discussions and observing participants' behavior. The researchers also wrote field notes and memos so as to be able to: retain the participants' actual comments; capture the group process; and, note how group members worked together. In addition, the researches tape-recorded the group sessions for further qualitative data analysis.

d) Reflection

This stage involved examination of how the self-help group sessions were benefiting the participants with respect to their health literacy and diabetes self-care abilities. Reflection was conducted at the end of every self-help group session. The participants discussed: how the sessions were conducted; what they had learned; changes they would make in regards to management of their diabetes; and, their perceptions about their health literacy. As part of the stage of reflection, the researchers assessed their health literacy by observing the way they access and use health related information, and assessed their diabetes self-care ability by examining each participant's monthly FBS level, obtained by the community health center nurses. The FBS levels were thought to reflect, in part, the participants' ability to self-manage their diabetes.

e) Revising

This stage also occurred throughout the action research approach. At the end of each group session, participants discussed the benefits they gained from the session. They also evaluated whether the goals of each session were achieved. In addition, the participants indicated whether the group structure and process needed to be revised. Revisions in the group structure and process were discussed within the session until all participants were in agreement about what should be done. This stage was important in moving the group activities forward in a positive and productive manner.

4.4 Phase 4: Evaluating the effectiveness of the Integrated Communicative Health Literacy program at a sub-district health promotion hospital, Bangkhonthi district : Quasi experimental research.

4.4.1 Baseline characteristics

The majority of the participants were female, aged 50-76 years old. Most participants were diagnosed with DM more than one year (ranged 1- 20 years) prior to interviewing. Most of them were not able to control their blood sugar (HbA1c > 7.0). When comparing both groups by using chi-square and independent t-test, there was no significant difference between the socio-demographic characteristics regarding gender, age, duration of DM, and blood sugar of intervention and control groups. Also, as noted

in Table 4-8, before applying the ICHL program, health literacy, self-care behavior, and HbA1c of intervention and control groups was not significantly different.

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Table 4. 18 *Characteristics, health literacy, self-care behavior, and HbA1c of the intervention and the control groups at baseline*

Variables	Intervention (n = 35)		Control (n = 35)		p-value
Gender: Female (n, %)	26	(74.28)	26	(74.28)	1.00[a]
Age (mean ± SD)	60.08	(8.8)	61.60	(6.42)	0.69[b]
Duration of diabetes (years) (mean ± SD)	9.02	(6.65)	7.20	(5.52)	0.21[b]
Health literacy (mean ± SD)	36.40	(8.98)	38.40	(9.69)	0.37[b]
Self-care behavior (mean ± SD)	68.60	(7.38)	66.65	(6.79)	0.25[b]
HbA1c (%)	7.41	(1.01)	7.74	(1.35)	0.25[b]

Significant at p-value < 0.05, (a) Chi-square, (b) = t-test

Table 4-18 describes baseline characteristics of the intervention group. There were 35 participants, most of whom (74.28%) were female, and their mean age was 60.08±8.8 years old. The mean duration of being diagnosed with diabetes was 9.02±6.6 years. The mean score of health literacy was 36.40±8.9. The mean score of self-care behavior was 68.60±7.3. The mean percentage of HbA1c was 7.41±1.0. Likewise, the 35 participants in the control group had similar characteristics at baseline. As such, it could be concluded that the participants in the intervention and control groups had similar characteristics at baseline.

4.4.2 Health literacy and self-care behavior, and percentage of HbA1c at baseline, 3 month, and 6 month follow up

4.4.2.1 Health literacy

The average full score of health literacy (SD) at baseline, 3 month, and 6 month follow up in the intervention group were 36.68 (±8.39), 41.65 (±4.12), and 40.17 (±4.90), respectively. The average full score of health literacy (SD) at baseline, 3 month, and 6 month follow up in the control group were 38.54 (±9.35), 38.11 (±8.74), and 38.14 (±8.58), respectively. (Table 4-9)

4.4.2.2 Self-care behavior

The average full score of self-care behavior (SD) at baseline, 3 month, and 6 month follow up in the intervention group were 68.60 (±7.38), 72.82 (±6.45), and 71.85

(±6.82), respectively. The average full score of self-care behavior (SD) at baseline, 3 month, and 6 month follow up in the control group were 66.65 (±6.79), 66.62 (±6.75), and 66.45 (±6.87), respectively. (Table 4-19)

4.4.2.3 HbA1c

The average percentage of HbA1c (SD) at baseline, 3 month, and 6 month follow up in the intervention group were 7.41 (±1.01), 7.12 (±0.70), and 7.67 (±1.41), respectively. The average percentage of HbA1c (SD) at baseline, 3 month, and 6 month follow up in the control group were 7.74 (±1.35), 7.75 (0.91), and 8.26 (±1.38), respectively. (Table 4-19)

Table 4. 19 *Descriptive statistics of score of health literacy and self-care behavior, and percentage of HbA1c at baseline, 3 month, and 6 month follow up in the intervention and the control groups*

Variables	Baseline (n=70)	3 month (n=70)	6 month (n=70)
Full score of health literacy			
- Intervention: mean (SD)	36.68 (8.39)	41.65 (4.12)	40.17 (4.90)
- Control : mean (SD)	38.54 (9.35)	38.11 (8.74)	38.14 (8.58)
Full score of self-care behavior			
- Intervention: mean (SD)	68.60 (7.38)	72.82 (6.45)	71.85 (6.82)
- Control : mean (SD)	66.65 (6.79)	66.62 (6.75)	66.45 (6.87)
Percentage of HbA1c			
- Intervention: mean (SD)	7.41 (1.01)	7.12 (0.70)	7.67 (1.41)
- Control : mean (SD)	7.74 (1.35)	7.75 (0.91)	8.26 (1.38)

4.4.3 The differences of health literacy, self-care behavior, and HbA1c between the intervention and the control groups at baseline, 3 month, and 6 month follow up by Repeated measure ANOVA

4.4.3.1 Health literacy

There was a statistically significant difference between the intervention and the control groups (p<0.000). Among within subjects, there was a statistically significant difference between measurements (p<0.002). Interaction, there was a statistically significant difference between measurements of health literacy depending on group (p<0.000) (Table 4-20 and figure 4-2).

Table 4. 20 *Repeated measure ANOVA of Health Literacy among Diabetes Mellitus Type II patients between and within the intervention and the control group (n=70)*

Source of variation	SS	df	M S	F-test	p-value
Between subjects					
Intervention	317540.743	1	317540.743	1.948E3	0.000
Error	11082.114	68	162.972		
Within subjects					
Time	83.314	1	83.314	10.124	0.002
Intervention	132.114	1	132.114	16.055	0.000
Error	559.571	68	8.229		

SS: Sum of Squares

df: Degrees of freedom

MS: Mean Squares
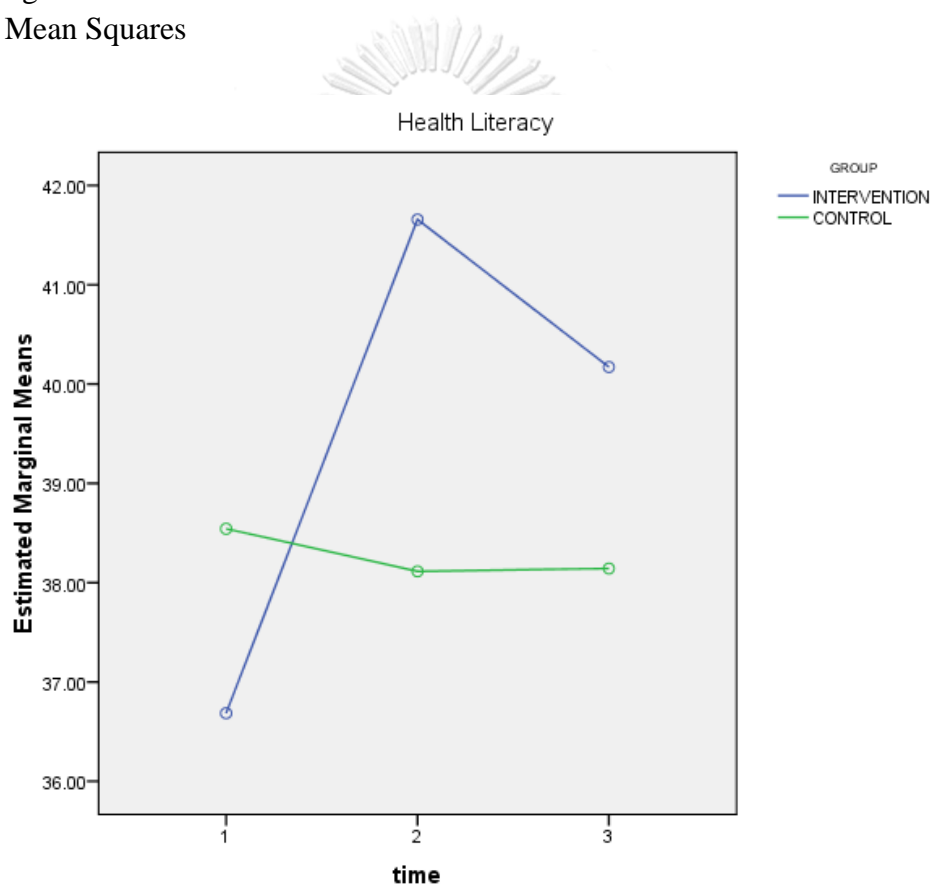
Figure 4. 2 Change overtime on Health Literacy among Diabetes Mellitus Type II patients between and within the intervention and the control group (n=70)

There were statistically significant differences in health literacy between intervention group and control group at 3 month (p = 0.034) (Table 4-21).

Table 4. 21 Pairwise comparisons of the different measurements of Health Literacy among Diabetes Mellitus Type II between the intervention and control groups (n=70)

time	(I) Group	(J) Group	Mean Difference (I-J)	S E	p-value	95% CI of mean Difference[a] Lower	Upper
Baseline	Experiment	Control	-1.857	2.125	0.385	-6.097	2.383
Month3	Experiment	Control	3.543[*]	1.634	0.034	0.283	6.803
Month6	Experiment	Control	2.029	1.672	0.229	-1.307	5.364

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

*. The mean difference is significant at the .05 level.

There were statistically significant differences in health literacy between baseline and three month (p= 0.000), baseline and 6 month follow up (p = 0.000), and 3 month and 6 month follow up (p = 0.000) in the intervention group. In contrast, there were no such statistically significant differences in health literacy of the control group measured at different times (Table 4-22).

Table 4. 22 *Pairwise comparisons of the different measurements of Health Literacy in the time of measurements among Diabetes Mellitus Type II in the intervention and control groups (n=70)*

Group	(I) time	(J) time	Mean Difference (I-J)	S E	p-value	95% CI of mean Difference[a] Lower	Upper
Experiment	Baseline	Month3	-4.971[*]	0.646	.000	-6.557	-3.385
	Baseline	Month6	-3.486*	0.686	.000	-5.169	-1.802
	Month3	Month6	1.486[*]	0.330	.000	1.802	5.169
Control	Baseline	Month3	0.429	0.646	1.000	-1.157	2.015
	Baseline	Month6	0.400	0.686	1.000	-1.283	2.083
	Month3	Month6	-0.029	0.330	1.000	-0.893	0.782

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

4.4.3.2 Self-care behavior

There was a statistically significant difference between the intervention and the control groups (p<0.000). Among within subjects, there was a statistically significant difference between measurements (p<0.000). Interaction, there was a statistically significant difference between measurements of self-care behavior depending on group (p<0.000) (Table 4-23 and figure 4-3).

Table 4. 23 *Repeated measure ANOVA of Self-Care Behavior among Diabetes Mellitus Type II patients between and within the intervention and the control group (n=70)*

Source of variation	SS	df	M S	F-test	p-value
Between subjects					
Intervention	995123.505	1	995123.505	7.422E3	0.000
Error	9117.276	68	134.078		
Within subjects					
Time	81.779	1	81.779	15.837	0.000
Intervention	104.579	1	104.579	20.252	0.000
Error	351.143	68	1.764		

SS: Sum of Squares
df: Degrees of freedom
MS: Mean Squares

Health Behavior
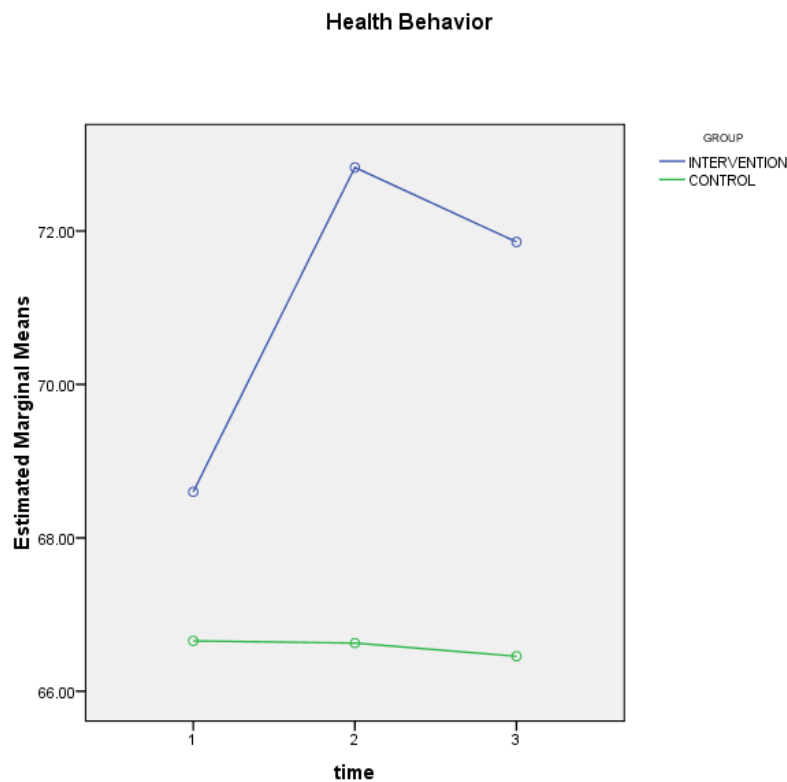
Figure 4. 3 *Change overtime on self-care Behavior among Diabetes Mellitus Type II patients between and within the intervention and the control group (n=70)*

There were statistically significant differences in self-care behavior between intervention group and control group at 3 month and 6 month follow up (p = 0.000 and p=0.002, respectively) (Table 4-24).

Table 4. 24 *Pairwise comparisons of the different measurements of Self-Care Behavior among Diabetes Mellitus Type II between the intervention and control groups (n=70)*

time	(I) Group	(J) Group	Mean Difference (I-J)	S E	p-value	95% CI of mean Difference[a]	
						Lower	Upper
Baseline	Experiment	Control	1.943	1.697	0.256	-1.444	5.330
Month3	Experiment	Control	6.200[*]	1.579	0.000	3.049	9.351
Month6	Experiment	Control	5.400*	1.638	0.002	-8.669	-2.131

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

*. The mean difference is significant at the .05 level.

There were statistically significant differences in self-care behavior between baseline and three month (p= 0.000), baseline and six month follow up (p = 0.000), and 3 month and 6 month follow up (p = 0.005) in the intervention group. In contrast, there were no such statistically significant differences in self-care behavior of the control group measured at different times (Table 4-25).

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Table 4. 25 *Pairwise comparisons of the different measurements of Self-Care Behavior in the time of measurements among Diabetes Mellitus Type II in the intervention and control groups (n=70)*

Group	(I) time	(J) time	Mean Difference (I-J)	S E	p-value	95% CI of mean Difference[a] Lower	Upper
Experiment	Baseline	Month3	-4.229[*]	0.461	.000	-5.359	-3.098
	Baseline	Month6	-3.257*	0.543	.000	-4.591	-1.924
	Month3	Month6	0.971[*]	0.294	.005	0.249	1.693
Control	Baseline	Month3	0.029	0.461	1.000	-1.102	1.159
	Baseline	Month6	0.200	0.543	1.000	-1.133	1.533
	Month3	Month6	0.171	0.294	1.000	-0.551	0.893

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

4.4.3.3 HbA1c

There was a statistically significant difference between the intervention and the control groups (p=0.000). Among within subjects, there was a statistically significant difference between measurements (p=0.002). Interaction, there was no statistically significant difference between measurements of self-care behavior depending on group (p=0.274) (Table 4-26 and figure 4-4).

Table 4. 26 *Repeated measure ANOVA of HbA1c among Diabetes Mellitus Type II patients between and within the intervention and the control group (n=70)*

| Source of variation	SS	df	M S	F-test	p-value
Between subjects					
Intervention	12329.537	1	12329.537	3.654E3	0.000
Error	229.426	68	3.375		
Within subjects					
Time	5.207	1	5.207	10.483	0.002
Intervention	0.605	1	0.605	1.217	0.274
Error	33.778	68	0.497		

SS: Sum of Squares

df: Degrees of freedom

MS: Mean Squares
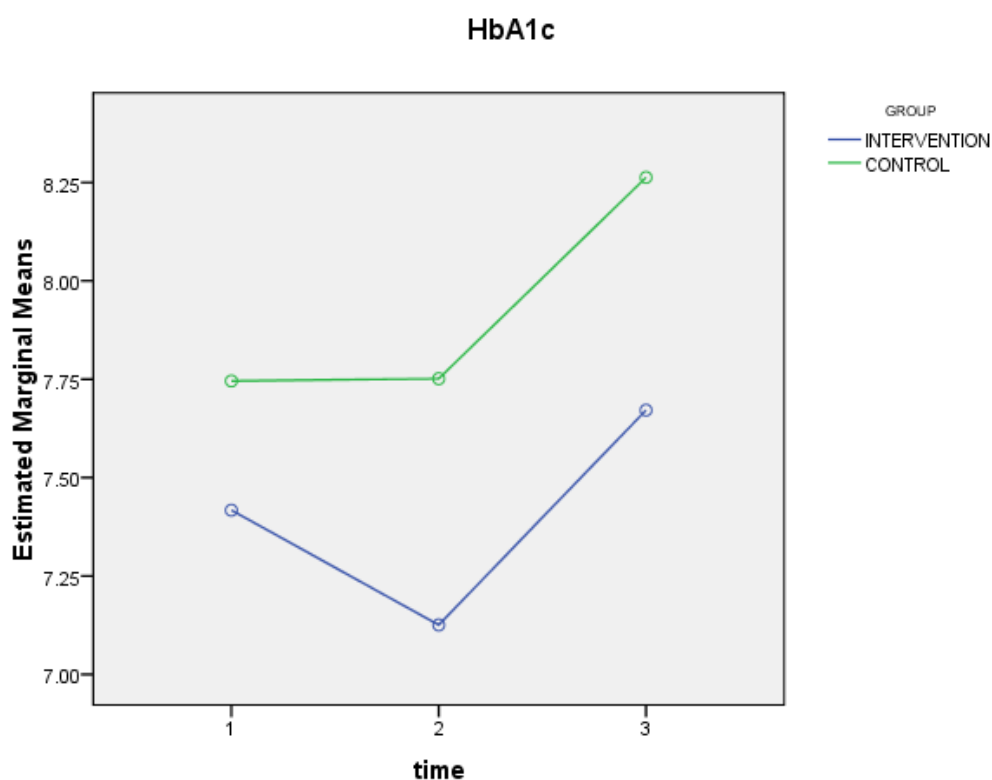
Figure 4. 4 *Change overtime on HbA1c among Diabetes Mellitus Type II patients between and within the intervention and the control group (n=70)*

There were statistically significant differences in self-care behavior between intervention group and control group at 3 month (p = 0.002) (Table 4-27).

Table 4. 27 *Pairwise comparisons of the different measurements of HbA1c among Diabetes Mellitus Type II between the intervention and control groups (n=70)*

time	(I) Group	(J) Group	Mean Difference (I-J)	S E	p-value	95% CI of mean Difference[a] Lower	Upper
Baseline	Experiment	Control	0.329	0.287	.256	-0.901	0.243
Month3	Experiment	Control	-0.626[*]	0.196	.002	-1.017	-0.235
Month6	Experiment	Control	-0.591	0.334	.081	-20.903	-6.983

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

*. The mean difference is significant at the .05 level.

There were statistically significant differences in HbA1c between baseline and 3 month (p= 0.002), and 3 month and 6 month follow up (p = 0.002) in the intervention group. In contrast, there were statistically significant differences in HbA1c between baseline and 6 month (p= 0.009), and 3 month and 6 month follow up (p = 0.005) in the control group measured at different times (Table 4-28).

Table 4. 28 *Pairwise comparisons of the different measurements of HbA1C in the time of measurements among Diabetes Mellitus Type II in the intervention and control groups (n=70)*

Group	(I) time	(J) time	Mean Difference (I-J)	S E	p-value	95% CI of mean Difference[a] Lower	Upper
Experiment	Baseline	Month3	0.291[*]	0.081	.002	0.092	0.491
	Baseline	Month6	-0.254	0.168	.408	-0.668	0.159
	Month3	Month6	-0.546[*]	0.155	.002	-0.927	-0.164
Control	Baseline	Month3	-0.006	0.081	1.000	-0.205	0.193
	Baseline	Month6	-0.517*	0.168	0.009	-0.931	-0.104
	Month3	Month6	-0.511*	0.155	0.005	-0.893	-0.130

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

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จุฬาลงกรณ์มหาวิทยาลัย

CHULALONGKORN UNIVERSITY

APPENDIX A

QUESTIONNAIRE (English)

This questionnaire comprise s of 4 parts as below:-

Part I   General characteristics (16 items)

Part II   History of illness and treatment (filled by staff)

Part III Health literacy (14 items)

Part IV   Self-care behavior (20 items)

+++

Please check ✓ in round brackets only one answer

(In case of elders probably filled by health staff/ family care-givers/researcher)

Part I General characteristics

1.1 Socio-demographic data

1.	Gender: __Male __Female
2.	Age _____ years
3.	Marital status ( ) 1. Single ( ) 2. Married ( ) 3. Widowed ( ) 4. Divorced/Separated
4.	Education ( ) 1. Never been in school ( ) 2. Primary school ( ) 3. Secondary school ( ) 4. Vocational school ( ) 5. Bachelor degree ( ) 6. Higher/others..............
5.	Occupation ( ) 1. Housewives/ housekeeper/no work/ retirement ( ) 2.Agriculture/ General employ ( ) 3. Commercial group/private sector ( ) 4. Private sector employee ( ) 5. Government sector officer/State enterprise officer
6.	Income ( ) Less than 5,000฿ ( ) 5,000฿ to 9,999฿ ( ) 10,000฿ to 14,999฿ ( ) 15,000฿ to 19,999฿

	( ) 20,000฿ to 29,999฿ ( ) 30,000฿ or more
	1.2 Communication with a doctor
7.	How often do you speak to a doctor regarding your health during a visit? ( ) Never ( ) Seldom ( ) Sometime ( ) Often *If your answer is "Never", please skip No. 8.
8.	During a doctor visit, do you think what make you feel uncomfortable to talk with a doctor? (You can select more than one choice) 1. ( ) You feel tire and want to rest. 2. ( ) You are hurry to go home. 3. ( ) You are hurry to go to somewhere. 4. ( ) You do not understand what a doctor talk with you. 5. ( ) A doctor is not friendly to you. 6. ( ) A doctor does not talk or ask any question to you. 7. ( ) A doctor is hurry to do treatment till he does not have time to talk with you. 8. ( ) In an examination room, there is another person beside you and a doctor. 9. ( ) The environment in an examination room is bad such as loud, chaotic
	1.3 Social support
9.	How does your family encourage you about your diabetes control? ( ) Never ( ) Seldom ( ) Sometime ( ) Often
10.	How does your friend encourage you about your diabetes control? ( ) Never ( ) Seldom ( ) Sometime ( ) Often
11.	How often do you talk about your diabetes to your family? ( ) Never ( ) Seldom ( ) Sometime ( ) Often
12.	How is your family interested to listen to you when you talk about your diabetes? ( ) Never ( ) Seldom ( ) Sometime ( ) Often
13	How often do you talk about your diabetes to your friend? ( ) Never ( ) Seldom ( ) Sometime ( ) Often
14.	How is your friend interested to listen to you when you talk about your diabetes? ( ) Never ( ) Sometime ( ) Often
15.	Who help you to take care of your diabetes? (You can select more than on choice) 1. ( ) Spouse 2. ( ) Descendants 3. ( ) Friend 4. ( ) Relative 5. ( ) Paid helper 6. ( ) Health volunteer

	7. ( ) Others_____
16	Who help you to treat your diabetes? (You can select more than on choice) 1. ( ) Doctor 2. ( ) Nurse 3. ( ) Public health officer 4. ( ) Others_____
Part II	**History of illness and treatment (filled by staff)**
1.	Blood sugar (DTX) in the last 3 months First month = _____ Second month = _____ Third month = _____
2.	Duration of diabetes _____ years
3.	Does a patient have a complication of diabetes? 1. ( ) No 2. ( ) Yes If "Yes", what kind of the complication does the patient have? (Can select more than one) 1. ( ) Heart disease 2. ( ) Hypertension 3. ( ) Kidney disease 4. ( ) Chronic wound 5. ( ) Eye disease 6. ( ) Numbness in the fingers and feet 7. ( ) Disability 8. ( ) Others_____

Health Literacy (CHL) (14 items)

In reading instructions or leaflets from hospitals/pharmacies, have you had following experiences during the past one year?

	Never	Rarely	Sometimes	Often
1) You have found that the print was too small to read				
2) You have found characters and words that you did not know				
3) You have found that the content was too difficult				
4) You have need a long time to read and understand them				
5) You have need someone to help you read them				

Since being diagnosed with diabetes, have you had following experiences in seeking the information related to diabetes (e.g. diagnosis, treatment, self-care issues, alternative therapy, etc.)?

	Never	Rarely	Sometimes	Often
6) You have collected information from various sources				
7) You have extracted the information you wanted				
8) You have understood the obtained information				
9) You have communicated your thoughts about your illness to someone				
10) You have applied the obtained information to your daily life				
11) You have considered whether the information was applicable to your situation				
12) You have considered the credibility of the information				
13) you have checked whether the information was valid and reliable				
14) You have collected information to make health-related decisions				

Part 2 Self-care behavior

Please check ✓ in a cell that show your best answer to each question

The following is a mean of a number

- 5 is mean that you do the activity frequently

- 4 is mean that you do the activity often

- 3 is mean that you do the activity sometime

-2 is mean that you do the activity rarely

-1 is mean that you never do the activity

Self-care behavior	Frequency of practice				
	5	4	3	2	1
Physical dimension 1. You eat so much food until you feel uncomfortable.					
2. You eat sweet fruit such as lychee, longan, rambutan					
3. You drink alcoholic beverages, such as beer, liquor					
4. You exercise regularly at least 16-20 minutes 3-4 times a week.					
5. You keep your body clean by bathing at least twice a day.					
Prevented complication dimension 6. You wear shoes that fit to your feet and are not too tight.					
7. You look at your feet to see wounds and abnormalities.					
8. When there are wounds, you let the wound heal itself.					
9. You have been examined by a physician or health officials at least once a year.					
10.When you have to travel, you have candy, biscuits or sugar to prevent unconsciousness because of hypoglycemia.					

Self-care behavior	Frequency of practice				
	5	4	3	2	1
Treatment dimension					
11. You go to the hospital or health center by appointment.					
12. You take medicine or injection according to the value prescribed by the doctor.					
13. You take the medicine or injection at the time prescribed by the doctor.					
14. You buy medicine or herb by your own without a prescription.					
15.You study or ask for advices from others about diabetes.					
Psychosocial dimension					
16. You feel discouraged and worry about the disease that you have till you are unable to sleep.					
17. You are relax by doing meditation, prayers, favorite hobbies or let oneself on.					
18. When you have problems, you always seek advice and suggestion from your family and friends.					
19. Your family and friends are interested in inquiring about your health and wellbeing.					
20. You go to various community traditions to meet with other people.					

QUESTIONNAIRE

(For month 3 and month 6)

Health Literacy (CHL) (14 items)

In reading instructions or leaflets from hospitals/pharmacies, have you had following experiences during the past one year?

	Never	Rarely	Sometimes	Often
1) You have found that the print was too small to read				
2) You have found characters and words that you did not know				
3) You have found that the content was too difficult				
4) You have need a long time to read and understand them				
5) You have need someone to help you read them				

Since being diagnosed with diabetes, have you had following experiences in seeking the information related to diabetes (e.g. diagnosis, treatment, self-care issues, alternative therapy, etc.)?

	Never	Rarely	Sometimes	Often
6) You have collected information from various sources				
7) You have extracted the information you wanted				
8) You have understood the obtained information				
9) You have communicated your thoughts about your illness to someone				
10) You have applied the obtained information to your daily life				
11) You have considered whether the information was applicable to your situation				
12) You have considered the credibility of the information				
13) you have checked whether the information was valid and reliable				
14) You have collected information to make health-related decisions				

Self-care behavior

Please check ✓ in a cell that show your best answer to each question

The following is a mean of a number

- 5 is mean that you do the activity frequently

- 4 is mean that you do the activity often

- 3 is mean that you do the activity sometime

- 2 is mean that you do the activity rarely

- 1 is mean that you never do the activity

Self-care behavior	Frequency of practice				
	5	4	3	2	1
Physical dimension 1. You eat so much food until you feel uncomfortable.					
2. You eat sweet fruit such as lychee, longan, rambutan					
3. You drink alcoholic beverages, such as beer, liquor					
4. You exercise regularly at least 16-20 minutes 3-4 times a week.					
5. You keep your body clean by bathing at least twice a day.					
Prevented complication dimension 6. You wear shoes that fit to your feet and are not too tight.					
7. You look at your feet to see wounds and abnormalities.					
8. When there are wounds, you let the wound heal itself.					
9. You have been examined by a physician or health officials at least once a year.					
10. When you have to travel, you have candy, biscuits or sugar to prevent unconsciousness because of hypoglycemia.					

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14. You buy medicine or herb by your own without a prescription.					
15. You study or ask for advices from others about diabetes.					
Psychosocial dimension					
16. You feel discouraged and worry about the disease that you have till you are unable to sleep.					
17. You are relax by doing meditation, prayers, favorite hobbies or let oneself on.					
18. When you have problems, you always seek advice and suggestion from your family and friends.					
19. Your family and friends are interested in inquiring about your health and wellbeing.					
20. You go to various community traditions to meet with other people.					

Blood sugar (filled by staff/researcher)

HbA1c = _____ Date of the blood test :_____

Guideline Question for in-depth interview

The following questions are used as a guideline question to elicit diabetic patients' and health care providers' perception of promoting health literacy at sub-district health promotion hospitals in Bangkhonthi district Samut Songkram province.

A. Questions for diabetic patients
1) How do staffs at sub-district health promotion hospitals in Bangkhonthi district help you access, understand, and effectively use health related information for your diabetes care; and why they do like that?
2) How should staffs at sub-district health promotion hospitals in Bangkhonthi district do to help you access, understand, and effectively use health related information for your diabetes care; and why you do you want they to do like that?

B. Questions for caregivers
1) How do staffs at sub-district health promotion hospitals in Bangkhonthi district help you access, understand, and effectively use health related information for care of your diabetic patient; and why they do like that?
2) How do your diabetic patients do when you use the health related information for their diabetes care; and why they do like that?

C. Questions for health care providers
1) How do you help diabetic patients to access, understand, and effectively use health related information for their diabetes care; and why you do like that?
2) How do diabetic patients do when you provide knowledge and health related information for their diabetes care; and why they do like that?

D. Question for health literacy experts
1) How do staffs at sub-district health promotion hospitals in Bangkhonthi district help diabetic patients to access, understand, and effectively use health related information for their diabetes care; and why they do like that?
2) How do the staffs should do to help diabetic patients to access, understand, and effectively use health related information for their diabetes care; and why they should do like that?

APPENDIX B

QUESTIONNAIRE (Thai)

ส่วนที่ 1 ข้อมูลทั่วไป (16 ข้อ)

ส่วนที่ 2 ประวัติความเจ็บป่วยที่เกี่ยวข้องและการตรวจรักษา (สำหรับเจ้าหน้าที่บันทึก)

ส่วนที่ 3 ความแตกฉานด้านสุขภาพ (14 ข้อ)

ส่วนที่ 4 พฤติกรรมการดูแลตนเอง (20 ข้อ)

+++

คำชี้แจง โปรดทำเครื่องหมาย ✓ หรือกรอกข้อมูลลงในช่องว่างที่ตรงกับความเป็นจริง *(เจ้าหน้าที่*

หรืออาสาสมัครสาธารณสุขประจำหมู่บ้าน หรือญาติผู้ป่วยสามารถบันทึกแทน

ในกรณีที่ผู้ให้ข้อมูล ไม่สามารถกรอกข้อมูลเองได้)

ส่วนที่ 1 ข้อมูลทั่วไป

ตอนที่ 1.1 ลักษณะทางประชากรศาสตร์

ข้อที่	สถานภาพทั่วไปของผู้ตอบแบบสอบถาม	สำหรับผู้วิจัย

1. เพศ   SEX___

    1.☐ ชาย   2.☐ หญิง

2. อายุ .... ปี   AGE___

3. สถานภาพสมรสของท่านในปัจจุบัน   MAR____

    ( ) โสด   ( ) คู่

    ( ) หม้าย   ( ) หย่า

    ( ) แยกกันอยู่   ( ) อื่นๆ (โปรด

    ระบุ)..........................

4. สำเร็จการศึกษาสูงสุดระดับใด   EDU____

    ( ) ไม่ได้รับการศึกษา   ( ) ประถมศึกษา

    ( ) มัธยมศึกษา   ( ) อนุปริญญา / ปวส

    ( ) ปริญญาตรี   ( ) อื่นๆ (โปรด

    ระบุ)..........................

5. อาชีพ   OCC___

    ( ) เกษตรกรรม   ( ) รับจ้างทั่วไป

( ) ลูกจ้างเอกชนหรือรัฐบาล ( ) รับราชการหรือรัฐวิสาหกิจ

( ) ค้าขายหรือธุรกิจส่วนตัว ( ) ข้าราชการบำนาญ

( ) อื่นๆ (โปรดระบุ)............................

6. ช่วงรายได้ของท่านเฉลี่ยต่อเดือน INC____

( ) ต่ำกว่า 5,000 บาท ( ) 5,001 – 10,000 บาท (
) 10,001 – 15,000 บาท ( ) 15,001 – 20,000 บาท ( ) สูงกว่า
20,000 บาท

ตอนที่ 1.2 แบบสอบถามเกี่ยวกับการสื่อสารกับแพทย์

7. ในช่วงที่ท่านเข้าพบแพทย์ ท่านได้ซักถามปัญหาด้านสุขภาพและเรื่องโรคต่างๆ COM1__
กับแพทย์

1.❑ไม่เคยปฏิบัติ 2.❑ไม่ค่อยปฏิบัติบางครั้ง

3.❑ปฏิบัติบางครั้ง 4.❑ปฏิบัติเป็นประจำ

**ถ้าท่านไม่เคยพูดคุยกับแพทย์ในช่วงที่ท่านเข้าพบแพทย์ให้ข้ามข้อ 8

8. ในช่วงที่ท่านเข้าพบแพทย์ ท่านคิดว่าอะไรเป็นสาเหตุที่ทำให้ท่านรู้สึกไม่สบาย COM2__
ใจที่จะพูดคุยกับแพทย์ (ตอบได้มากกว่า 1 ข้อ)

1.❑ ท่านรู้สึกเหนื่อยออยากพักผ่อน

2.❑ ท่านต้องรีบกลับบ้าน

3.❑ท่านต้องรีบไปทำธุระที่อื่น

4.❑ท่านไม่ค่อยเข้าใจในสิ่งที่แพทย์พูดกับท่าน

5.❑แพทย์มีท่าทางที่ไม่ค่อยเป็นมิตรกับท่าน

6.❑แพทย์ไม่พูดคุยและซักถามท่าน

7.❑แพทย์ตรวจรักษาท่านอย่างเร่งรีบจนไม่มีเวลาให้ท่านพูดคุยและซักถาม

8.❑ ในห้องตรวจ นอกจากแพทย์แล้ว ยังมีบุคคลอื่นอยู่ด้วย

9.❑สภาพแวดล้อมในห้องตรวจไม่ค่อยดี เช่น เสียงดัง วุ่นวาย

ตอนที่ 1.3 แบบสอบถามเกี่ยวกับการสนับสนุนของสังคม

สำหรับผู้วิจัย

9. คนในครอบครัวของท่าน คอยให้กำลังท่าน ในการควบคุมเบาหวาน(ระดับ น้ำตาลในเลือด) เพียงใด — SSP1__

1. ❑ ไม่ให้กำลังใจเลย   2. ❑ ไม่ค่อยกำลังใจ

3. ❑ ให้กำลังใจบ้าง   4. ❑ให้กำลังใจมาก

10. เพื่อนของท่าน คอยให้กำลังท่าน ในการควบคุมเบาหวาน(ระดับน้ำตาลในเลือด) เพียงใด — SSP2__

1. ❑ ไม่ให้กำลังใจเลย   2. ❑ ไม่ค่อยกำลังใจ

3. ❑ ให้กำลังใจบ้าง   4. ❑ให้กำลังใจมาก

11. ท่านพูดเกี่ยวกับโรคเบาหวานของท่านกับคนในครอบครัว บ่อยเพียงใด

1. ❑ ไม่เคยพูด   2. ❑ ไม่ค่อยพูด   3. ❑ เคยพูดบ้าง   4. ❑เคยพูด บ่อย

12. คนในครอบครัวของท่าน สนใจที่จะรับฟังท่าน ในเวลาที่ท่านพูดเกี่ยวกับ โรคเบาหวานของท่าน เพียงใด — SSP3__

1. ❑ ไม่สนใจเลย   2. ❑ ไม่ค่อยสนใจ   3. ❑ สนใจบ้าง   4. ❑สนใจ มาก

13. ท่านพูดเกี่ยวกับโรคเบาหวานของท่านกับเพื่อนของท่าน บ่อยเพียงใด

1. ❑ ไม่เคยพูด   2. ❑ ไม่ค่อยพูด   3. ❑ เคยพูดบ้าง   4. ❑เคยพูด บ่อย

14. เพื่อนของท่าน สนใจที่จะรับฟังท่าน ในเวลาที่ท่านพูดเกี่ยวกับโรคเบาหวานของ ท่าน เพียงใด — SSP4__

1. ❑ ไม่สนใจเลย   2. ❑ ไม่ค่อยสนใจ   3. ❑ สนใจบ้าง   4. ❑สนใจ มาก

15. ใครบ้างที่ช่วยเหลือท่าน ในการดูแลอาการโรคเบาหวานของท่าน (ตอบได้ มากกว่า 1 ข้อ) — CARER

1. ❑สามี/กรรยา   2. ❑ลูกหลาน   3. ❑เพื่อน   4. ❑ญาติพี่น้อง

5. ❑คนที่ท่านจ้าง (เช่น ลูกจ้าง แม่บ้าน หรือพยาบาลที่ดูแลท่าน)

6.❑อาสาสมัครสาธารณสุขแระจำหมู่บ้าน (อสม.)

7. ❑อื่นๆ...........

16. ใครบ้างที่ช่วยเหลือท่าน ในการรักษาอาการโรคเบาหวานของท่าน (ตอบได้ มากกว่า 1 ข้อ) — TREAT

1. ❑แพทย์   2. ❑พยาบาล   3. ❑เจ้าหน้าที่สาธารณสุข   4. ❑อื่นๆ...........

ส่วนที่ 2 ประวัติความเจ็บป่วยที่เกี่ยวข้องและการตรวจรักษา (สำหรับเจ้าหน้าที่บันทึก)

1. ระดับน้ำตาลในเลือด(เจาะปลายนิ้ว, DTX) เฉลี่ย 3 เดือนย้อนหลัง   DTX___

    เดือนที่ 1 = _____

    เดือนที่ 2 = _____

    เดือนที่ 3 = _____

2. ระยะเวลาที่เป็นโรคเบาหวาน_____ปี   DUR___

3. ภาวะแทรกซ้อนที่เกิดจากโรคเบาหวาน   COMP1____

    1.❏ไม่มี   COMP2____

    2.❏มี โปรดระบุ (ตอบได้มากกว่า 1 ข้อ)

        1.❏หัวใจ   2.❏ ความดันโลหิตสูง   3. ❏ โรคไต

    4.❏แผลเรื้อรัง   5.❏ โรคตา   6.❏ ชาปลายมือปลายเท้า

        7.❏แผลที่เท้า   8.❏ อื่นๆ (โปรดระบุ).....................

ส่วนที่ 3 ความแตกฉานด้านสุขภาพ

ในการอ่านฉลากยาหรือเอกสารเกี่ยวกับโรคเบาหวาน คุณเคยพบปัญหาเหล่านี้

คำถาม	ไม่เคย	นานๆครั้ง	บางครั้ง	บ่อยๆ
1.ตัวหนังสือในเอกสารมีขนาดเล็กเกินไป				
2.พบตัวหนังสือหรือคำที่ไม่รู้ความหมายหรือไม่เข้าใจ				
3.เนื้อหาของเอกสารยากเกินไป				
4.ต้องใช้เวลานานในการอ่านและเข้าใจเอกสาร				
5.ต้องการคนช่วยในการอ่านเอกสาร				

ตั้งแต่รู้ว่าคุณเป็นโรคเบาหวาน คุณได้มีการค้นหาข้อมูลเกี่ยวกับโรคเบาหวานอย่างไร

คำถาม	ไม่เคย	นานๆครั้ง	บางครั้ง	บ่อยๆ
6.มีการข้อหาข้อมูลจากแหล่งต่างๆ				
7.มีการคัดเลือกข้อมูลที่ท่านต้องการ				
8.มีความเข้าใจในข้อมูลที่ท่านเลือก				
9.มีการแลกเปลี่ยนข้อมูลที่ท่านมีกับคนอื่น				
10.นำข้อมูลที่ค้นหาได้ไปใช้ในชีวิตประจำวัน				

หลังจากที่ท่านได้รับข้อมูลด้านสุขภาพ ก่อนที่ท่านจะนำข้อมูลไปใช้ ท่านได้ทำดังต่อไปนี้

คำถาม	ไม่เคย	นานๆครั้ง	บางครั้ง	บ่อยๆ
11.พิจารณาว่าข้อมูลที่ได้รับเหมาะสมที่จะนำมาใช้กับอาการเจ็บป่วยของท่าน				
12.พิจารณาว่าข้อมูลที่ได้มีความน่าเชื่อถือเพียงไร				
13.มีการตรวจสอบว่าข้อมูลมีความถูกต้องหรือไม่				
14.มีการคิดทบทวนก่อนการตัดสินใจที่จะนำข้อมูลที่ได้รับไปใช้				

ส่วนที่ 4 พฤติกรรมการดูแลตนเอง

คำชี้แจง โปรดทำเครื่องหมาย √ ลงในช่องว่างที่ตรงกับการปฏิบัติตนของท่านมากที่สุด โดยถือเกณฑ์การปฏิบัติ ดังนี้

- 5 หมายถึง กิจกรรมในข้อความนั้นท่านได้ทำเป็นประจำเสมอ

- 4 หมายถึง กิจกรรมในข้อความนั้นท่านได้ทำบ่อย

- 3 หมายถึง กิจกรรมในข้อความนั้นท่านได้ทำบางครั้ง

-2 หมายถึง กิจกรรมในข้อความนั้นท่านได้ทำนานๆครั้ง

-1 หมายถึง กิจกรรมในข้อความนั้นท่านไม่ได้ทำเลย

พฤติกรรมการดูแลตนเอง	ระดับการปฏิบัติ				
	5	4	3	2	1
การดูแลด้านร่างกาย					
1. ท่านรับประทานอาหารจนอิ่มมากจนรู้สึกอึดอัด					
2. ท่านรับประทานผลไม้ที่มีรสหวาน เช่น ลิ้นจี่ ลองกอง เงาะ					
3. ท่านดื่มเครื่องดื่มที่มีแอลกอฮอล์ เช่น เบียร์ เหล้า					
4. ท่านออกกำลังกายสม่ำเสมออย่างน้อยวันละ16-20 นาที สัปดาห์ละ 3-4 ครั้ง					
5. ท่านรักษาความสะอาดของร่างกายโดยการอาบน้ำ อย่างน้อยวันละ 2 ครั้ง					
ด้านการป้องกันภาวะแทรกซ้อน					
6. ท่านสวมรองเท้าที่มีขนาดพอดีกับเท้า ไม่บีบรัด จนเกินไป					
7. ท่านตรวจดูเท้าของท่านเพื่อดูบาดแผลและสิ่งผิดปกติ					
8. เมื่อมีบาดแผล ท่านปล่อยให้แผลหายเอง					
9. ท่านได้รับการตรวจร่างกายจากแพทย์ หรือเจ้าหน้าที่ สาธารณสุขอย่างน้อยปีละ 1 ครั้ง					
10. เมื่อท่านต้องเดินทางท่านมีท๊อฟฟี่ ขนมปังกรอบ หรือ น้ำตาล ติดตัวไว้เพื่อป้องกันการหมดสติ จากภาวะ น้ำตาลในเลือดต่ำเกินไป					

พฤติกรรมการดูแลตนเอง	ระดับการปฏิบัติ				
	5	4	3	2	1
ด้านการดูแลรักษา					
11. ท่านไปรับการตรวจรักษาที่โรงพยาบาล หรือสถานี อนามัยตามนัด					
12.ท่านรับประทานยา หรือฉีดยาตามขนาดที่แพทย์กำหนด					
13.ท่านรับประทานยา หรือฉีดยา ตรงตามเวลาที่แพทย์ กำหนด					
14. ท่านหาซื้อยาหรือสมุนไพรต่างๆมารับประทานเอง					
15.ท่านได้ศึกษาหาความรู้ หรือขอคำแนะนำจากผู้อื่น เกี่ยวกับโรคเบาหวาน					
ด้านการดูแลจิตใจ อารมณ์ และสังคม					
16. ท่านรู้สึกท้อแท้ และวิตกกังวลเกี่ยวกับโรคที่ท่านเป็น จนนอนไม่หลับ					
17. ท่านผ่อนคลายความเครียดโดยการทำสมาธิ ไหว้พระ สวดมนต์ ทำงานอดิเรกที่ชอบ หรือวางเฉยตามหลัก ธรรมะ					
18. เมื่อท่านมีปัญหาท่านไปขอคำแนะนำและคำปรึกษา จากครอบครัวและเพื่อนของท่านเสมอ					
19. ครอบครัวและเพื่อนของท่านสนใจที่จะสอบถามเรื่อง สุขภาพและความเป็นอยู่ของท่าน					
20. ท่านไปร่วมงานประเพณีต่างๆของชุมชนเพื่อพบปะ พูดคุยกับคนอื่นๆ					

แบบสอบถาม

(สำหรับการติดตามข้อมูล เดือนที่ 3 และเดือนที่ 6)

ส่วนที่ 1 ความแตกฉานด้านสุขภาพ

ในการอ่านฉลากยาหรือเอกสารเกี่ยวกับโรคเบาหวาน คุณเคยพบปัญหาเหล่านี้

คำถาม	ไม่เคย	นานๆครั้ง	บางครั้ง	บ่อยๆ
1.ตัวหนังสือในเอกสารมีขนาดเล็กเกินไป				
2.พบตัวหนังสือหรือคำที่ไม่รู้ความหมาย หรือไม่เข้าใจ				
3.เนื้อหาของเอกสารยากเกินไป				
4.ต้องใช้เวลานานในการอ่านและเข้าใจเอกสาร				
5.ต้องการคนช่วยในการอ่านเอกสาร				

ตั้งแต่รู้ว่าคุณเป็นโรคเบาหวาน คุณได้มีการค้นหาข้อมูลเกี่ยวกับโรคเบาหวานอย่างไร

คำถาม	ไม่เคย	นานๆครั้ง	บางครั้ง	บ่อยๆ
6.มีการข้อหาข้อมูลจากแหล่งต่างๆ				
7.มีการคัดเลือกข้อมูลที่ท่านต้องการ				
8.มีความเข้าใจในข้อมูลที่ท่านเลือก				
9.มีการแลกเปลี่ยนข้อมูลที่ท่านมีกับคนอื่น				
10.นำข้อมูลที่ค้นหาได้ไปใช้ในชีวิตประจำวัน				

หลังจากที่ท่านได้รับข้อมูลด้านสุขภาพ ก่อนที่ท่านจะนำข้อมูลไปใช้ ท่านได้ทำดังต่อไปนี้

คำถาม	ไม่เคย	นานๆครั้ง	บางครั้ง	บ่อยๆ
11.พิจารณาว่าข้อมูลที่ได้รับเหมาะสมที่จะ นำมาใช้กับอาการเจ็บป่วยของท่าน				
12.พิจารณาว่าข้อมูลที่ได้มีความน่าเชื่อถือ เพียงไร				
13.มีการตรวจสอบว่าข้อมูลมีความถูกต้อง หรือไม่				
14.มีการคิดทบทวนก่อนการตัดสินใจที่จะนำ ข้อมูลที่ได้รับไปใช้				

ส่วนที่ 2 พฤติกรรมการดูแลตนเอง

คำชี้แจง โปรดทำเครื่องหมาย √ ลงในช่องว่างที่ตรงกับการปฏิบัติตนของท่านมากที่สุด โดยถือเกณฑ์การปฏิบัติ ดังนี้

- 5 หมายถึง กิจกรรมในข้อความนั้นท่านได้ทำเป็นประจำเสมอ

- 4 หมายถึง กิจกรรมในข้อความนั้นท่านได้ทำบ่อย

- 3 หมายถึง กิจกรรมในข้อความนั้นท่านได้ทำบางครั้ง

-2 หมายถึง กิจกรรมในข้อความนั้นท่านได้ทำนานๆครั้ง

-1 หมายถึง กิจกรรมในข้อความนั้นท่านไม่ได้ทำเลย

พฤติกรรมการดูแลตนเอง	ระดับการปฏิบัติ				
	5	4	3	2	1
การดูแลด้านร่างกาย					
1. ท่านรับประทานอาหารจนอิ่มมากจนรู้สึกอึดอัด					
2. ท่านรับประทานผลไม้ที่มีรสหวาน เช่น ลิ้นจี่ ลองกอง เงาะ					
3. ท่านดื่มเครื่องดื่มที่มีแอลกอฮอล์ เช่น เบียร์ เหล้า					
4. ท่านออกกำลังกายสม่ำเสมออย่างน้อยวันละ16-20 นาที สัปดาห์ละ 3-4 ครั้ง					
5. ท่านรักษาความสะอาดของร่างกายโดยการอาบน้ำ อย่างน้อยวันละ 2 ครั้ง					
ด้านการป้องกันภาวะแทรกซ้อน					
6. ท่านสวมรองเท้าที่มีขนาดพอดีกับเท้า ไม่บีบรัด จนเกินไป					
7. ท่านตรวจดูเท้าของท่านเพื่อดูบาดแผลและสิ่ง ผิดปกติ					
8. เมื่อมีบาดแผล ท่านปล่อยให้แผลหายเอง					
9. ท่านได้รับการตรวจร่างกายจากแพทย์ หรือ เจ้าหน้าที่สาธารณสุขอย่างน้อยปีละ 1 ครั้ง					
10. เมื่อท่านต้องเดินทางท่านมีท๊อฟฟี่ ขนมปังกรอบ หรือน้ำตาล ติดตัวไว้เพื่อป้องกันการหมดสติ จากภาวะน้ำตาลในเลือดต่ำเกินไป					

พฤติกรรมการดูแลตนเอง	ระดับการปฏิบัติ				
	5	4	3	2	1
ด้านการดูแลรักษา					
11. ท่านไปรับการตรวจรักษาที่โรงพยาบาล หรือ สถานีอนามัยตามนัด					
12.ท่านรับประทานยา หรือฉีดยาตามขนาดที่แพทย์ กำหนด					
13.ท่านรับประทานยา หรือฉีดยา ตรงตามเวลาที่ แพทย์กำหนด					
14. ท่านหาซื้อยาหรือสมุนไพรต่างๆมารับประทาน เอง					
15.ท่านได้ศึกษาหาความรู้หรือขอคำแนะนำจากผู้อื่น เกี่ยวกับโรคเบาหวาน					
ด้านการดูแลจิตใจ อารมณ์ และสังคม					
16. ท่านรู้สึกท้อแท้ และวิตกกังวลเกี่ยวกับโรคที่ท่าน เป็น จนนอนไม่หลับ					
17. ท่านผ่อนคลายความเครียดโดยการทำสมาธิ ไหว้ พระ สวดมนต์ ทำงานอดิเรกที่ชอบ หรือวางเฉยตาม หลักธรรมะ					
18. เมื่อท่านมีปัญหาท่านไปขอคำแนะนำและ คำปรึกษาจากครอบครัวและเพื่อนของท่านเสมอ					
19. ครอบครัวและเพื่อนของท่านสนใจที่จะสอบถาม เรื่องสุขภาพและความเป็นอยู่ของท่าน					
20. ท่านไปร่วมงานประเพณีต่างๆของชุมชนเพื่อ พบปะพูดคุยกับคนอื่นๆ					

ส่วนที่ 3 ระดับน้ำตาลสะสมในเลือด (HbA1c) (สำหรับเจ้าหน้าที่/นักวิจัยบันทึก)

HbA1c = _____ ตรวจเมื่อ วันที่ _____เดือน_____พ.ศ. _____

คำถามนำสำหรับการสัมภาษณ์เชิงลึก

คำถามต่อไปนี้ ใช้เพื่อเป็นคำถามนำในการสอบถามความคิดเห็นของผู้ป่วยโรคเบาหวานกับผู้ดูแลรักษา เกี่ยวกับการส่งเสริมความแตกฉานด้านสุขภาพในโรงพยาบาลส่งเสริมสุขภาพตำบล ใน อำเภอบางคนที จังหวัด สมุทรสงคราม

ก. คำถามสำหรับผู้ป่วยโรคเบาหวาน
1) เจ้าหน้าที่ในโรงพยาบาลส่งเสริมสุขภาพตำบล ใน อำเภอบางคนที ทำอย่างไรในการช่วยทำ ให้ท่านสามารถเข้าถึง เข้าใจ และ นำข้อมูลสุขภาพ ไปใช้อย่างมีประสิทธิภาพเพื่อการดูแล เบาหวานของท่าน และ ทำไมเจ้าหน้าที่ถึงทำอย่างนั้น?
2) เจ้าหน้าที่ในโรงพยาบาลส่งเสริมสุขภาพตำบล ใน อำเภอบางคนที ควรทำอย่างไรในการ ช่วยทำให้ท่านสามารถเข้าถึง เข้าใจ และ นำข้อมูลสุขภาพ ไปใช้อย่างมีประสิทธิภาพเพื่อ การดูแลเบาหวานของท่าน และ ทำไมเจ้าหน้าที่ถึงควรทำอย่างนั้น?

ข. คำถามสำหรับผู้ดูแลผู้ป่วยโรคเบาหวาน
1) เจ้าหน้าที่ในโรงพยาบาลส่งเสริมสุขภาพตำบล ใน อำเภอบางคนที ทำอย่างไรในการช่วยทำ ให้ท่านสามารถเข้าถึง เข้าใจ และ นำข้อมูลสุขภาพ ไปใช้อย่างมีประสิทธิภาพเพื่อการดูแล เบาหวานของผู้ป่วยโรคเบาหวานที่ท่านดูแล และ ทำไมเจ้าหน้าที่ถึงทำอย่างนั้น?
2) เจ้าหน้าที่ในโรงพยาบาลส่งเสริมสุขภาพตำบล ใน อำเภอบางคนที ควรทำอย่างไรในการ ช่วยทำให้ท่านสามารถเข้าถึง เข้าใจ และ นำข้อมูลสุขภาพ ไปใช้อย่างมีประสิทธิภาพเพื่อ การดูแลเบาหวานของผู้ป่วยโรคเบาหวานที่ท่านดูแล และ ทำไมเจ้าหน้าที่ถึงควรทำอย่าง นั้น?
3) ผู้ป่วยโรคเบาหวานของท่านทำอย่างไรในขณะที่ท่านใช้ข้อมูลสุขภาพในการดูแลเบาหวาน ของเขา และ ทำไมเขาจึงทำอย่างนั้น?

ค. คำถามสำหรับผู้ให้การดูแลและรักษาผู้ป่วยโรคเบาหวาน
1) ท่านทำอย่างไรในการช่วยทำให้ผู้ป่วยโรคเบาหวาน สามารถเข้าถึง เข้าใจ และ นำข้อมูล สุขภาพ ไปใช้อย่างมีประสิทธิภาพเพื่อการดูแลเบาหวานของเขา และ ทำไมท่านถึงทำอย่าง นั้น?
2) ผู้ป่วยโรคเบาหวานทำอย่างไรในขณะที่ท่านให้ความรู้และข้อมูลสุขภาพเพื่อการดูแล เบาหวานของเขา และ ทำไมเขาจึงทำอย่างนั้น?

ง. คำถามสำหรับผู้เชี่ยวชาญทางด้านความแตกฉานด้านสุขภาพ

1) เจ้าหน้าที่ในโรงพยาบาลส่งเสริมสุขภาพตำบล ทำอย่างไรในการช่วยทำให้ผู้ป่วย
   โรคเบาหวานสามารถเข้าถึง เข้าใจ และ นำข้อมูลสุขภาพ ไปใช้อย่างมีประสิทธิภาพเพื่อการ
   ดูแลเบาหวานของผู้ป่วยโรคเบาหวาน และ ทำไมเจ้าหน้าที่ถึงทำอย่างนั้น?

2) เจ้าหน้าที่ในโรงพยาบาลส่งเสริมสุขภาพตำบล ควรทำอย่างไรในการช่วยทำให้ผู้ป่วย
   โรคเบาหวานสามารถเข้าถึง เข้าใจ และ นำข้อมูลสุขภาพ ไปใช้อย่างมีประสิทธิภาพเพื่อการ
   ดูแลเบาหวานของผู้ป่วยโรคเบาหวาน และ ทำไมเจ้าหน้าที่ถึงควรทำอย่างนั้น?

APPENDIX C

Activity Photo

VITA

Kantapong Prabsangob

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