DEVELOPMENT AND IMPLEMENTATION OF AN INTERACTIVE MULTI-MODALITY (IMM) FOR SELF-MANAGEMENT SUPPORT AMONG PATIENTS WITH TYPE 2 DIABETES IN BANGKOK, THAILAND

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นางสุวารี วงศ์โรจนานันท์

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรดุษฎีบัณฑิต
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Thesis Title	DEVELOPMENT AND IMPLEMENTATION OF AN INTERACTIVE MULTI-MODALITY (IMM) FOR SELF-MANAGEMENT SUPPORT AMONG PATIENTS WITH TYPE 2 DIABETES IN BANGKOK, THAILAND
By	Mrs. Suwaree Wongrochananan
Field of Study	Research for Health Development
Thesis Advisor	Associate Professor Wiroj Jiamjarasrangsi
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สุวารี วงศ์โรจนานันท์ : การพัฒนาและการใช้ ไอ เอ็ม เอ็ม เพื่อสนับสนุนการดูแลตนเองของผู้ป่วยเบาหวานชนิดที่ 2 ในกรุงเทพมหานคร ประเทศไทย. (DEVELOPMENT AND IMPLEMENTATION OF AN INTERACTIVE MULTI-MODALITY (IMM) FOR SELF-MANAGEMENT SUPPORT AMONG PATIENTS WITH TYPE 2 DIABETES IN BANGKOK, THAILAND) อ. ที่ปรึกษาวิทยานิพนธ์หลัก: รศ.ดร. นพ.วิโรจน์ เจียมจรัสรังษี, อ. ที่ปรึกษาวิทยานิพนธ์ร่วม : ผศ. ดร.อรัญญา ตุ้ยคำภีร์, 101 หน้า.

การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อพัฒนาเทคโนโลยีปฏิสัมพันธ์เพื่อการสนับสนุนการจัดการตนเองในผู้ป่วยเบาหวาน ชนิดที่ 2 ซึ่งประกอบด้วยการพัฒนาเว็บไซต์ ที่มีระบบการเชื่อมต่อกับการกระตุ้นเตือนผ่านอีเมล์และการส่งข้อความสั้นผ่านโทรศัพ์มือถือของผู้ป่วย และ เพื่อประเมินประสิทธิผลของเทคโนโลยีที่สนับสนุนการดูแลตนเองของผู้ป่วย โดยเปรียบเทียบค่าฮีโมโกลบินเอวันซี (HbA1c) และการวัดค่าเฉลี่ยคะแนนทางพฤติกรรม ได้แก่ คุณภาพชีวิต ความมั่นใจในการดูแลตนเอง และพฤติกรรมในการดูแลตนเอง ระหว่างกลุ่มทดลองและกลุ่มควบคุม ก่อนและหลังการใช้เทคโนโลยีปฏิสัมพันธ์ เป็นเวลา 3 เดือน ผลการพัฒนาเทคโนโลยีปฏิสัมพันธ์ ซึ่งมีเว็บไซต์เป็นองค์ประกอบหลัก ประกอบด้วยการทำงาน 4 ส่วนหลัก ได้แก่ การควบคุมตนเอง การเฝ้าระวังและการประเมินผลตนเอง การสนับสนุนทางสังคม และระบบการกระตุ้นเตือน นอกจากนี้ยังมีคลังความรู้เพื่อสนับสนุนผู้ป่วย จำแนกเป็น 4 หมวด ได้แก่ อาหาร การออกกำลังกาย อารมณ์ และการดูแลทั่วไป หลังจากครบ 3 เดือน จำนวนผู้ป่วยลดลง ในกลุ่มทดลองเหลือ จาก 74 คน เหลือ 55 คน ในกลุ่มควบคุม จาก 48 คนเหลือ 30 คน เมื่อประเมินผลลัพธ์ของการใช้เทคโนโลยีฯ พบว่าค่าเฉลี่ยของ HbA1c มีการเปลี่ยนแปลง โดยกลุ่มทดลองมีระดับลดลงจากเดิม ขณะที่กลุ่มควบคุมมีระดับสูงขึ้น และมีความแตกต่างอย่างมีนัยสำคัญทางสถิติ (p 0.001) ค่าเฉลี่ยของคุณภาพชีวิต ความมั่นใจในการดูแลตนเอง และการดูแลตนเองสูงขึ้นทั้งสองกลุ่ม แต่พบว่าการดูแลตนเองมีความแตกต่างอย่างมีนัยสำคัญทางสถิติ ($p < 0.05$) และ ความมั่นใจในการดูแลตนเองมีความสัมพันธ์ผกผันกับการเปลี่ยนแปลงของค่า HbA1c ($p < 0.05$) เทคโนโลยีปฏิสัมพันธ์เพื่อสนับการการดูแลตนเองในผู้ป่วยเบาหวานชนิดที่ 2 สามารถนำไปสู่ระบบการพัฒนาคุณภาพการบริการทางคลินิกได้ เมื่อพัฒนาระบบการทำงานให้สมบูรณ์มากยิ่งขึ้น และสามารถขยายผลสู่กลุ่มเสี่ยงต่อการเกิดโรคที่การดำเนินชีวิตได้ง่าย เช่น โรคอ้วน ความดันโลหิตสูง ไขมันในเลือดสูง

สาขาวิชา วิจัยเพื่อการพัฒนาสุขภาพ ลายมือชื่อนิสิต .....

ปีการศึกษา 2554 ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก .....

ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์ร่วม .....

508 77973 20 : MAJOR RESEARCH FOR HEALTH DEVELOPMENT
KEYWORDS : SELF MANAGEMENT/SELF CARE/ DIABETES/INTERNET

SUWAREE WONGROCHANANAN : DEVELOPMENT AND IMPLEMENTATION OF AN INTERACTIVE MULTI-MODALITY (IMM) FOR SELF-MANAGEMENT SUPPORT AMONG PATIENTS WITH TYPE 2 DIABETES IN BANGKOK, THAILAND. ADVISOR : ASSOC. PROF. WIROJ JIAMJARASRANGSI, M.D.,Ph.D., CO-ADVISOR : ASST. PROF. ARUNYA TUICOMEPEE, Ph.D., 101 pp.

The purpose of this study was to develop the interactive muti-modalities technology (IMM) including website, email, and SMS for self-management support and to evaluate the effects of IMM among patients with diabetes type 2 who lived in Bangkok after 3-month overtime. The 4 settings with 124 participants were subsequently allocated to the intervention group (n=74) and the control group (n=48). The IMM on the website consists of 4 main functions that were self-regulation, self-monitoring and assessment, social support, and reminder system—linked to email, SMS. After 3 months, the participants declined in both groups to 55 and 30 respectively. T-test, Chi-square test, and Multiple regression with correlation were used to examine means of HbA1c level and behavioral scores including diabetes quality of life (QoL), self-efficacy, and self-management. The findings revealed that were a significant difference in HbA1c between the intervention and the control group (p 0.001). HbA1c level decreased in the intervention group but it increased in the control group significantly ($p < 0.01$). Self-care score increased significantly between groups ($p < 0.05$) and within the intervention group ($p < 0.001$). The increasing self-efficacy score associated with decreasing HbA1c ($p < 0.05$). A further study will expand to a large population and deliver the technology to diabetes clinic. However, the IMM should be improved to be fully functionality. Importantly, the providing health professional should plan for the exclusive further system.

Field of Study : Research for Health Development ..... Student's Signature .....

Advisor's Signature .....

Academic Year : 2011 ..... Co-advisor's Signature .....

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CHAPTER I
INTRODUCTON

Background and Rationale

Diabetes is a worldwide burden; its prevalence is expected to rise to 366 million by 2030 and 60% of cases are in Asia (1). Most cases (90%) are type 2 diabetes mellitus (2). In Thailand, type 2 diabetes is also a major health concern. Data from a 5-year follow-up study indicated that coronary heart disease was one of the leading causes of death among Thai patients with diabetes (3). The incidence of diabetes did not significantly differ between genders however geographically it was higher in urban than rural areas (4, 5) and the highest prevalence (12.45 %) was among Thai people who lived in Bangkok(6). Furthermore, the reports of National examination Health Survey revealed trend of prevalence increase over time For example, there were 4.4% in 1996-1997, 6.7 % in 2003-2004, and 6.9% in 2008-2009 (4, 5). The recent national survey reported impaired fasting blood sugar at 10.7% (11.8% in men and 9.5% in women)(5).

A diabetic care must be principally managed by patient themselves on a day-to-day basis as common practice(7, 8); however, diabetes self-management is complex and patients require additional support apart from clinician visit(9-11). However, health care providers face significant barriers to provide such services which aimed at achieving health-related behavior change. These barriers include lack of time, knowledge, and skills(12-14).

During 1990s, information technology has developed rapidly including the rising of internet (15). Since then the Interactive Behavior Change Technology (IBCT) has been introduced to support diabetic self-management. It includes various mediums such as an internet, CD-ROMs and DVDs, an automated telephone or an interactive voice recognition (IVR), personal digital assistants (PDAs) or other handheld devices (15, 16).

IBCT assists both patients and health care providers in monitoring changes in health and self-care needs. It also supports patients' efforts to make behavior changes by promoting health and effective self-care, and

moreover it enhances communication between patients and potential supporters for their disease management. IBCT increases patients' access to the types of services available from their health care team (17). Conceptually, the IBCT has distinct advantages for program delivery because it combines the essential characteristics of media forms; for example, dissemination of written material, video or photographic materials, and direct communication and social support via e-mail, bulletin boards, or chat rooms (17, 18). Additionally, health providers indicated that the health care delivery system is needed to improve for self-behavioral changes in patients with diabetes(19). Therefore, reforms improving the affordability, accessibility, and efficiency of care are of importance.

There were several reasons to consider these modalities in this study. To begin with website that has great convenience (for those with access), but it has difficulty retaining users to follow up. In this point, IVR program can be useful as it appears to be successful at reaching and engaging a high percentage of participants, especially lower literacy populations. However, IVR program places major limits on the complexity of issues that can be addressed and is limited to a single auditory modality (20). Therefore, Short Message Service (SMS), an auto-text messaging component of web, was used as IVR. Also, email was added to be reminder for enhancing and sustaining self-management. Strengths and limitations of the modalities were shown on each of the 5A's framework (assess, advise, agree, assist, and arrange follow-up) in Table 1 (16) , which were considered to select each IBCT modality into this study.

In Thailand, there are already some forms of IBCT for diabetic care. There are websites posting diabetic knowledge (e.g., www.dcfl.in.th, www.thaide.org, www.diabassocthai.org); however, there is no empirical study suggesting the use of the interactive devices to facilitate the patient's behavioral change and allow accessible, efficient, and exchange information between health providers and patients directly. Therefore, this study aimed to develop the interactive multi-modalities (IMM) which incorporated into IBCT to facilitate self-care management in diabetic patients. IMM consisted of website, email, and SMS. In response to choice of selected modalities in this study, website has great potential in terms of its convenience (for those

with access to the internet), however it has difficulty retaining users for follow up(16). To minimize loss of follow up, emails are added to be reminders for enhancing and sustaining self-management. In addition, SMS is included to strengthen the reminder.

Table 1 Strengths and limitations of various IBCTs on each 5A's dimension

IBCT modality	Assess	Advise	Agree	Assist	Arrange
Purpose	Obtain data on behaviors and preferences	Recommend changes tied to patient lab results and values	Set goals collaboratively with patient	Identify barriers and develop action plan	Provide follow-up support and resources
•Internet					
-Email	Weak	Moderate	Moderate	Moderate	Strong
-Website	*Strong*	Strong	Strong	Strong	Weak-moderate
•CD-ROM	*Strong*	Strong	Strong	Strong	Weak
•PDA	Moderate	Weak	Moderate	Weak	Weak-Moderate
•Tailored-Print	Moderate	Strong	Moderate	Moderate	Strong
•IVR (phone)	Strong	Moderate	Moderate	Moderate	Strong

Note: CD-ROM, compact disk-read-only memory; PDA, personal digital assistant.

In sum, this study is conducted to investigate the effectiveness of IBCT for self-management support among patients with type 2 diabetes in Bangkok. The study comprised of two-phases , the first phase was to develop a web-based IMM based on self-regulation theory (21) and the second phase was to evaluate the effects of IMM used with diabetics patients. This study is an experimental study. Diabetes patients were randomly selected into either intervention or control group. Diabetics in intervention group were invited to use IMM to manage their self-management support and patients in control group managed their diseases through conventional routines. To evaluate the impact of IMM on diabetes, biological marker as primary outcome (HbA1c), and questionnaire scores as secondary outcomes (self-management behaviors related to diabetes, e.g. self-care activity, self-efficacy, and Quality of life) were assessed at baseline and 3-month follow up.

Research Questions

The main research questions of this study was : Would the patients in the intervention group (with IMM) have better 4 parameters (1) Glycaemic control (HbA1c), (2) Self-management behaviors (e.g. diet, physical activity, medication), (3) Self-efficacy and (4) Diabetes quality of life?

Research Objectives

General objective:

The purpose of this study was to develop IMM for diabetic patients and to evaluate the effectiveness of IMM for diabetic self-management support.

Specific objectives:

1. To develop the IMM (website, email, SMS)
2. To test the functions of the IMM in diabetic self care management
3. To compare (at baseline and 3-month follow up) between the patients in the intervention (IMM users) and the control group (through normal routine care) on the following parameters:
    - 3.1 HbA1c
    - 3.2 Self-management behavior
    - 3.3 Self-efficacy
    - 3.4 Diabetes Quality of Life
    - 3.5 Qualitative data of self-management behavior

Research Hypothesis

The study hypothesizes that the HbA1c and self-management of the patients with type 2 diabetes with the IMM intervention would be better than their baseline assessment and than those of the patients who received conventional care (control group). Parameters include:

1. Glycaemic control (HbA1c)
2. Self-care activity
3. self-efficacy
4. Quality of life

Scope of the study

Although many diabetics also have other chronic diseases, this study was confined to diabetic self-management.

Limitation of the study

This study focused on patients with type 2 diabetes in Bangkok, the city with its highest urbanization in Thailand. Thus an extrapolation of any applications of the study findings should be done with cautions particularly in the rural settings.

Operational definitions

Interactive multi-modality (IMM) is the interactive behavioral technologies including website, emails, and SMS that were tailored to individuals based on their specific informational needs regarding diabetic self-management.

Self-management behavior is self-care practice of patient with type 2 diabetes regarding diet, physical activity, medication, and self-monitoring of blood glucose (SMBG).

Self management support is encouragements to enhance the diabetic self-care through interactive multi-modality (IMM)—website, email, and SMS.

Self-regulation Theory is a theoretical statement that encourages diabetic to make an agreement on self-management behaviors. The theory focuses on adaptive process in which self-monitoring and self reinforcement and reliance on perceptual appraisal or feedback is used as a guide for behavior.

Glycosylated hemoglobin (*hemoglobin A1c, Hb_{1c} , Hb_{A1c},* or *A1C*; sometimes also *HgA1c*) is a form of hemoglobin used primarily to identify the average plasma glucose concentration over prolonged periods of time. The Hb_{A1c} level is proportional to average blood glucose concentration over the previous four weeks to three months. A high Hb_{A1c} represents poor glucose control. Patients at high risk of micro vascular complications may gain further benefits from reducing HbA1c below 7%. Therefore, HbA1c is used to

monitor blood sugar control in patients with more elevated levels, termed diabetes mellitus.

Self-efficacy is confidence of patients in diabetes self care that it can carry out their intended to self-management behaviors. The self-efficacy is assessed by a Thai version of questionnaire that is modified from Stanford education research center.

Quality of life is Diabetes Quality of Life (DQOL), the current health status of diabetics, which consists of two components: (1) treatment satisfaction and (2) treatment impact.

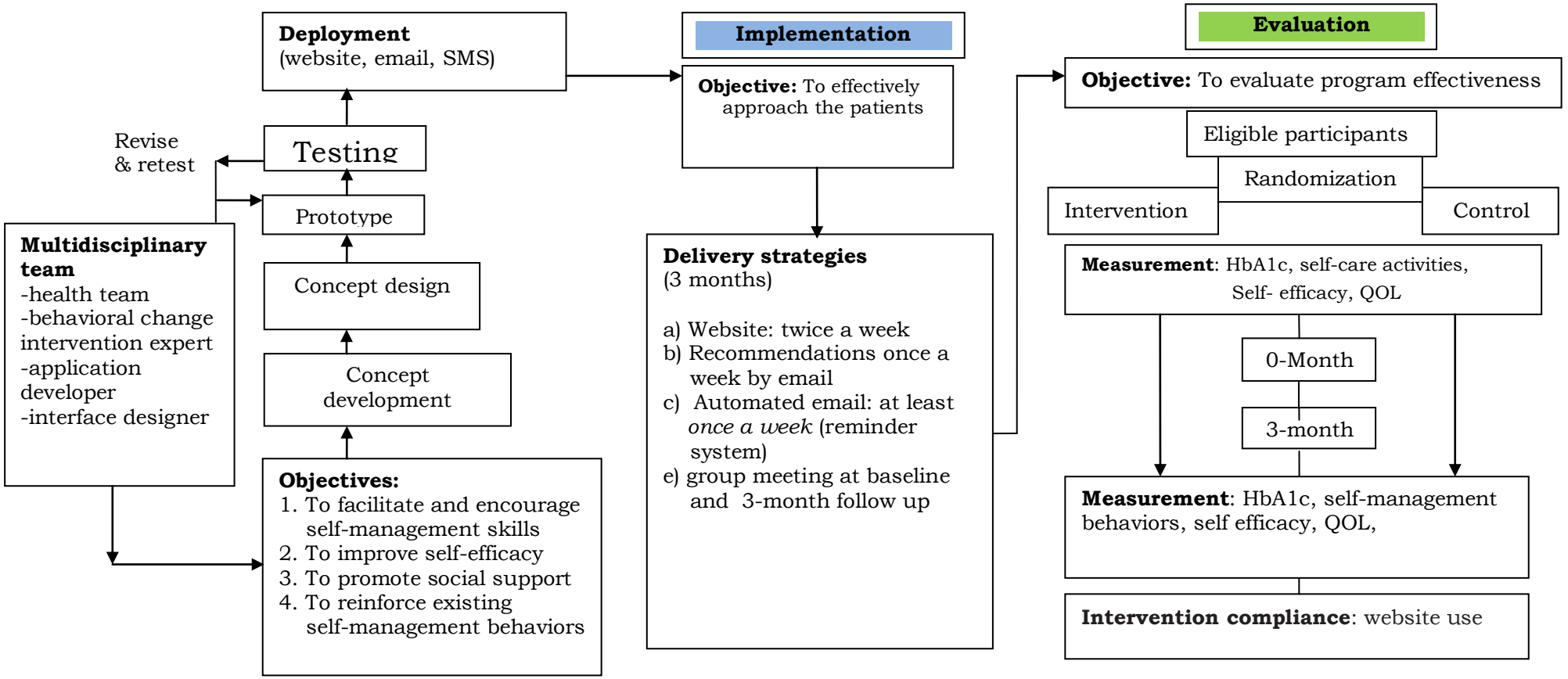


Figure 1 Research Conceptual Framework of Development and Implementation of an Interactive Multi-modality for Self-management Support among Patient with type 2 diabetes in Bangkok, Thailand

CHAPTER II
LITERATURE REVIEW

This intervention study focused on improving self-management among patients with type 2 diabetes who were residents in Bangkok, Thailand. In response to self-management support, behavioral theory, self-regulation theory, was incorporated with effective IMM (Interactive multi-modalities i.e., website, email, and SMS) to approach each patient. Additionally, the efficacy of the delivering IMM intervention was examined for self-management overtime. In order to understand these elements, the self-regulation theory and impact of IBCTs on type 2 diabetes were presented as follows:

Self-regulation Theory

Psychologists' interest in self-regulation has grown rapidly in recent years—two thirds of more than 2,700 publications containing the keyword "self-regulation" were published after 1990(22). A range of views differ in the various principles of self-regulation, they emphasize and the specific mechanism they propose, but nevertheless share two basic properties. A first common feature is to interpret self-regulation as a dynamic motivational system of setting goals, developing and acting strategies to achieve those goals, appraising progress, and revising goals and strategies accordingly. A second common characteristic is that self-regulation is also concerned with the management of emotional responses, which are seen as crucial elements of the motivational system, and that are conceived of as intricately linked with cognitive processes(22).

Self-regulation is conceptualized by Maes and Karoly(21) that self-regulation is commonly defined as "a systematic process of human behavior that involves setting of personal goals and steering behavior toward the achievement of established goals". Self-regulation can be defined as a goal-guidance process aimed at the attainment and maintenance of personal goals. Also, the mechanisms of self-regulation models are presented that there are main three phases, beginning with (a) goal selection, setting, and construal/representation, moving to (b) active goal pursuit, and then (c) goal attainment and maintenance or, when appropriate, goal disengagement. For

the development of interventions in chronic illness management and in health promotion can be used self-regulation theory for incorporation(21).

1. Goal selection, Setting, and Construal / Representation

Goal selection has cognitive determinants including (a) risk perception, (b) outcome expectancies (or perceived benefits/rewards and perceived cost/punishment of the intended action, (c) social influence, and (d) perceived competence to carry out the intended behavior (e.g. self-efficacy expectations). In addition, illness representations, or common-sense definitions of health threats, are the schematic focus of Leventhal's self-regulation model. Representational content refers to five dimensions: (1) identity (2) time-line, i.e. the time it takes for the disease to develop as well as the duration of and recovery from the disease; (3) cause (4) consequences, and (5) cure or control, i.e. the perception of the degree to which a disease can be influenced or cured. The nature and the organization of representations guide actions that are directed at the perceived health threat. These actions are presumably embedded in "IF-THEN" rules for disease management. If the desired effect is not realized, the patient changes personal behavior. If the desired effect is realized, the patient reinforces the effect by continuing the behavior.

The content of representations defines the goals and reference values for the regulation process. Once goals and procedures for goal attainment are specified, action plans are generated to reach goals as determined or constrained by the representations and appraisals of procedural efficacy feedback. To set goals effectively, one needs to know how much one can accomplish; therefore, self-knowledge emerges as a key factor in setting goals.

2. Active goal pursuit and goal process cognition

A self-regulatory view on health behavior needs to strengthen a person's intention or commitment. Although planning is an important phase of the self-regulation process, other skills and strategies are necessary to

ensure active goal pursuit that implies both affective and cognitive processes.

In terms of regulatory cognitive processes, three kinds of mechanisms are distinguished: (a) feedback mechanisms, which involve monitoring and evaluation of progress towards a goal on the basis of knowledge of behavioral results, (b) feed forward mechanisms, which are outcome anticipations guided by personal capabilities and context expectancies, and (c) activation of control processes, which are involved in planning and action control to ensure continuation of progress despite competing goals and obstacles. Leading theories of self-regulation have tended to put different degrees of emphasis on these (and other) cognitive mechanisms. In general, three primary processes in self-regulation were clearly distinguished: (a) self-observation or self-monitoring (SM), (b) self reflection or self-evaluation (SE), and (c) self-reaction or self-reinforcement (SR).

3. Goal attainment, Maintenance, and Disengagement

Goal Attainment and Maintenance: The dominant models of health behavior change suggest that the psychological processes that guide the initiation versus the maintenance of behavior change do not differ. However, whereas initiation may be determined by expectations about future outcomes, the decision to maintain a healthful behavior is purported based on people's satisfaction with behavioral outcomes. As maintenance is a very important issue in disease management, more attention should be paid to the assessment of long-term self-regulation.

Goal disengagement is an essential aspect of self-regulation. Evidence exists that goal disengagement can be beneficial to psychological well-being, particularly if the original goal is unattainable and if disengagement from it ultimately leads to pursuing new goals with a greater likelihood of attainment.

Although several instruments measure goal attainment, no validated measures for assessing disengagement, especially the reasons why people disengage from the pursuit of health or disease management goals, or the

degree to which disengagement from these goals may be an adaptive response. Also, most self-regulation research does not focus sufficiently on maintenance issues.

Accordingly, several previous studies utilized the self-regulatory interventions that reflected the self regulation theory. This part illustrates some related studies using the models and their effects as follows:

A study in Netherlands by Huisman et al. in 2009 evaluated the efficacy of a self-regulation (SR) weight reduction intervention on weight, body mass index (BMI), glycosylated hemoglobin (HbA1c) (primary outcomes), exercise, nutrition and quality of life (secondary outcomes). The self-regulatory intervention (n=53) was compared to standard care with (n=38) and without a diabetes self-help manual (n=38). All three groups received the same standard care. Subjects were overweight (BMI>27) patients with type 2 diabetes, 52% female, mean age 58.14(S.D. = 8.86). There was no difference between the intervention and control groups at 3 or 6 months. However, results at 3 and 6 months revealed that patients with higher SR-skills scores had lower HbA1c levels than patients with lower scores. This apparent lack of effect might; however, partly be due to high attrition rates in all treatment groups(23).

In USA , a study in 2008 evaluated the efficacy of a hand-held computer (i.e., personal digital assistant [PDA]) for increasing moderate intensity or more vigorous (MOD+) physical activity levels over 8 weeks in mid-life and older adults relative to a standard information control arm. Data were collected in 2005 and analyzed in 2006 –2007. This community-based study consisted of 37 healthy, initially underactive adults aged 50 years and older who were randomized and completed the 8-week study (intervention=19, control=18). Self-regulatory behavioral strategies derived from social cognitive perspectives were utilized in the PDA program to motivate physical activity change. These strategies included daily and weekly individualized physical activity goal-setting, PDA-provided daily and weekly cumulative feedback on reported physical activity minutes using both text and graphic formats, and assessment of barriers and enablers associated with meeting one's physical activity goals. The results showed that

intervention participants reported significantly greater 8-week mean estimated caloric expenditure levels and minutes per week in MOD+ activity (p<0.04)(24).

In Germany, a RCT 6-month study in 2006 investigated the influence of psychological aspects on glycemic control in type 2 diabetic patients treated with diet alone or diet plus oral antidiabetic medication using meal-related self-monitoring of blood glucose (SMBG). These psychological aspects refer to the process of self-management including the tendency to structure situations and activate resources (self-perception), to accept options for action (self-reflection) and to believe in self-efficacy (self-regulation). Randomized two groups, one group (n = 113; mean age 58.7 years) used a blood glucose monitoring device, kept a blood glucose/eating diary and received standardized counseling focusing on self-perception, self-reflection and self-regulation. The other was a control group (n = 110; mean age 60.5 years) received non-standardized counseling on diet and lifestyle. The findings showed statistically significant endpoint differences between the SMBG and the control group were seen in glycemic control (p = 0.0086) and the well-being item 'depression' (p = 0.032). All aspects of counseling were influenced by SMBG with the extent of self-perception and self-reflection gradually increasing over time. This study identified processes (structuring the situation and activating resources, accepting options for action and believing in self-efficacy) which lead to a change in the metabolic profile(25).

In 2003, among patients with asthma, diabetes, and heart failure in the Netherlands, the patients do not succeed in integrating the required self-management behaviors into their lives, and fail to attain optimal disease control. Therefore, this study described the development of a theory-driven intervention to enhance self-management that would be appreciated and accepted by participants and providers. The program emphasized goal-setting and the planning of behavior based on self-regulation theory and proactive coping. In five 2 h group sessions, participants first decided upon their own goal and behaviors they wanted to change. Next, they wrote an action-plan to implement these behavioral intentions. Behavioral practices and self-monitoring took place between the sessions. Participants and nurse providers evaluated the intervention positively. Evaluations were unrelated

to patients' health at baseline, or to feelings of self-efficacy regarding self-management. But patients of older age, lower education, or no current employment responded best to the intervention(26).

Another study in England in 2002 was to explore the relationships among illness beliefs, diabetes self-management behaviors, psychological well-being, and blood-glucose control of adolescents with type 1 diabetes. It was hypothesized that the self-regulatory model (Leventhal et al.) would help identify beliefs that are central to adolescents' experiences of diabetes and its management. Thirty white adolescent outpatients, 16 males and 14 females, aged 13 to 19 years (M = 15.5, SD = 1.6) agreed to participate. Mean illness duration was 4.9 years (range 0.3 to 13.9, SD=3.6). Correlation and regression analyses indicated that illness beliefs were not related to self-management behaviors, but both were important contributors to psychological well-being (27).

Self-regulation concept applied to research conceptual framework

The self-regulation Theory was incorporated into this study. The main mechanisms of self-regulation models that are goal selection/setting, active goal pursuit, and goal attainment and maintenance were applied to the framework as guideline to deliver tailored skills, encourage the patient to set personal goal, find individual's barriers, plan to action, go on the plan, and maintenance self-behavior. All these are stimulated by himself/herself (internal stimuli) and essential intervention of IMM (external stimuli) for increasing patients' self efficacy, and then they have ability to behave on diabetic self-management regularly. Therefore, IMM intervention has features and options to support users to run on step by step. For example, once the patient log into the website individual will meet a tailored welcome message. Then the patient can choose to do lists that customize for each individual such as recipe for success. In addition, a set of goals, barriers, and strategies to reach achievement/act on plan is provided. In order to maintain improved behavior, bulletin board on webpage, SMS and email are used to link for encouragement. Consequently, health information can be exchanged between health care providers and patients through these

interactive devices. The ultimate aim of the IMM intervention is to change better behaviors on diabetes self-management.

Impact of IBCT on type 2 diabetes

In order to develop alternative novel technologies to support diabetes patients' effort at self-care, this study begins to present 2 components: 1) recent systematic reviews 2) brief previous studies which were performed in Europe, the United State and Korea.

1) Systematic Reviews

A review in USA by Azar and Gabbay in 2009 covered eighteen English literatures published in PubMed from January 1990 through October 2007. The goal of this review was not to perform a meta-analysis. Therefore, they included non-randomized controlled trials in the literature review, but excluded studies that did not specifically focus on web-based glucose upload followed by clinician feedback in the literature review. The authors concluded that type 2 diabetes patients who enrolled in the web-based diabetes self- management support seemed to do better than controls with significant differences in HbA1c. In contrast, such the intervention in type 1 diabetes showed no statistically significant difference among intervention and control patients(28).

The other review in UK, in 2008 Clark examined published systematic reviews of diabetes self-management education including community-based peer support groups and ongoing home telephone support. One part of the article referred to emerging health technologies—interactive software, automated telephone and internet-based system. Interactive software accessed on personal computer using CD-ROMs. It represents one strategy for delivering behavior change interventions efficiently and effectively in the context of busy primary care practices. Automated telephone systems can allow for frequent follow-up with patients who have difficulty accessing clinic-based services or who lack the computer supports necessary for more "high-tech" interventions. Internet-based intervention has the potential to reach great number of people with little extra cost, and users are willing to employ Internet-based diabetes education programs consistently. Such systems can enhance the educational experience by using audio and video

and are potentially available 24h per day. Internet-based also can allow patients to communicate with their clinicians, experts in self-care, or one another. At follow-up, both patients using the website and comparison-group patients improved in their self-reported physical activity levels. Intervention patients who used the system more frequently reported greater change in physical activity than those who used it less often. However, there were no significant differences between the two groups(29).

In addition, a narrative review of web-based interventions for managing type 2 diabetes published from 2000 to 2007 that utilized web sites, web portals, electronic medical records, videoconference, interactive voice response, and short messaging systems. The study found that the most effective systems linked medical management and self-management. The highest satisfaction of patients was they were able to tract blood glucose, receive electronic reminders, schedule physician visits, email their health care team, and interact with other diabetic patients. The study concluded that the cost of developing and maintaining comprehensive systems continues to be a challenge and an efficacy system was assessed (30).

While IBCT study on diabetic control intervention has not performed in Thailand. However, there was one recently systematic review in 2008 which aimed to summarize the best available evidence related to diabetic control interventions among persons with type 2 diabetes mellitus in Thailand. Its strategies were hand searching and electronic searching to find published and unpublished studies from 1997 to 2006. Fifty eight studies consisted of 7 randomized controlled trails, 48 quasi-experimental studies, and 3 action research regarding the interventions and effects on diabetic control among the diabetics. The review revealed 2 major types of diabetic control interventions including continuous self-management program and specific interventions. Most diabetic control interventions using continuous self-management program could reduce FBS and HbA1C. Even though those self-management programs were different in conceptual-bases and methods of intervention, they were similar in terms of contents, which included knowledge and practice regarding diabetic control. This study suggested that continuous self-management program can be used to control FBS and HbA1C among all patients with type 2 diabetes mellitus, while specific

interventions can be used appropriately with persons who have specific problems(31).

2) Previous Studies

This section summarizes related studies about utilization of IBCTs to support diabetes self-management. All of the selected studies were RCTs in type 2 diabetes and the follow-up periods ranged from one month to thirty months (32-51). However, only 25% of the studies had applied behavioral theories into the interventions (33-35, 38, 44). Approximately 60% of studies showed significant difference among intervention and control groups at the end of the trial (36, 37, 39-43, 45-48) .

Prevention or delay the progression of diabetes-related complications relies heavily on patient behavior modification; tight control of blood glucose and proper guidance from health care professionals are required. Therefore, the studies of IBCT in diabetes care had mainly focused on the improvement of glycaemic control. Furthermore, users' knowledge, social support, health behaviors, and self efficacy (a person's belief in their capacity to perform specific skills in a specific situation) and clinical outcomes were added into the process of studies.

The included studies involved different IBCTs with different characteristics including internet, email, IVR, mobile phone, SMS, print-based and PDA. The studies in the internet category used interactive web technology to enhance patient self-management by providing diabetes education and feedback of resulting data (33, 35, 37, 45, 47-51). Articles in the telephone used interactive, automated telephone calls (IVR)(36) , and mobile phone with SMS (32, 39-42) to enhance patient self-management through self-care education calls and feedback of self-monitored information to the provider. Interestingly, the studies in South Korea integrated internet and mobile phone with SMS into the interventions which contribute to the achievement for self-management support (37, 39-42). Articles in the computer-assisted integration of clinical information category consisted of computerized patient education and interventions that integrated electronic practice guidelines, reminder systems, and feedback of clinical data to enhance both self and clinical management(44, 46). In addition, one

feasibility study tried out PDA-based for dietary monitoring that it was acceptable among patients with type 2 diabetes(38).

The intervention effects were assessed by the change in biomarkers (e.g., HbA1c, 2-h post-prandial blood glucose, and lipids), dietary consumptions and physical activity. The enrolled patients were adult, stable diabetes patients, without serious co-morbidities. For example, the patients in the intervention group, with HbA1c ranging from 7%–8% in both groups, seemed to do better than control at baseline (37, 39-42, 45-47). Particularly, The long-term study showed the intervention group with a basal HbA1c ≥7% had markedly lower HbA1c level than in the control group during the first 3 months and maintained more stable levels throughout the 30-month follow up study; that was, baseline HbA1c was 7.7% in intervention patients, versus 7.5% in controls; at the end of follow up, the intervention group reached an HbA1c of 6.9% versus 7.5% for controls ($p = 0.009$). Furthermore, this study demonstrated a lower variability in blood glucoses and HbA1c in their intervention patients compared to controls. An HbA1c fluctuation index was significantly lower in the intervention group (43).

Some studies not only looked into fasting blood glucose, but also examined the 2-h post-prandial blood glucose (2-hour post meal glucose—2HPMG) which is increasingly recognized as a major contributor of the cardiovascular risk related to diabetes. For instance, in three studies, there were improvements of 2 h post-prandial blood glucose in the intervention group (37, 39-42). Another study demonstrated that self-efficacy was a moderator in a behavioral intervention for diabetes self-care; therefore, initial level of self-efficacy provides relevant information for tailoring such interventions(35).

A pilot study of an internet-based virtual clinic was assessed the feasibility, acceptability, and effectiveness that was designed to facilitate self-management in patients who used insulin pumps for self-management. The results revealed easy virtual clinic easy to use and positively rated its design. Key value supports were peer and the discussion board. HbA1c, quality of life, and self-efficacy were not significant improvements between the pre- and post-test results. Interestingly, self-efficacy, patients' confidence in

their ability to perform self-care tasks, was found to be significantly reduced from baseline to follow up (52).

An recent study by Nijiland et al. (53) reported that the patients felt more closely monitored by their nurse and encouraged for self-management when used the interactive web application with the DiabetesCoach including online monitoring, personal data, and patient-nurse email contact. However, the study found that 65% of patients lacked to access the internet, 32 % of the enrollees did not continue using the web. Also, barriers to long-term use were poor user-friendliness of the web due to the absence of "push" factors or reminders and selection of the "wrong" users; the well-regulated patients were not the ones who could benefit the most from system use because of a ceiling effect. Patients with a greater need for care seemed to be more engaged in long-term use; highly active users were significantly more often medication users than low/inactive users (P = .005) and had a longer diabetes duration (P = .03).

An effects of an online diabetes self-management program was verified by 3-group randomized control trial that were received the program, the program with e-mail reinforcement, and usual care. HbA1c, patient activation, and self-efficacy were improved in program group at 6 months. ($p<0.05$). At 18 months, self-efficacy and patient activation were improved for program group. However, participants in reinforcement group showed no improvement. The program was acceptable for patients with type 2 diabetes and have beneficial effects in reducing HbA1c (54).

Additionally, an engagement in internet programs was studies that participants in two groups who received website alone and website plus human support with phone calls and group meeting. The results found that were no significant difference between website only and website plus over 4 months. Seventy-five % of total participants entered self-monitoring data at least once per week. Exercise action plan pages were visited more often than medication taking and healthy eating pages (mean of 4.3 visits vs 2.8 and 2.0 respectively, $P < .001$). There were few significant associations between patient characteristics and summary website engagement variables. In addition, main factors, ethnicity, baseline computer use, age, health literacy,

and education were not associated with website use. Importantly, self-monitoring, was most consistently related to improvement in healthy eating and reduction of dietary fat. There was also a significant correlation between self-monitoring and improvement in exercise but not with medication taking(55).

Recently, another study of Glasgow et al. (56) reported 12-month results of an Internet-based diabetes self-management program, with and without additional support, compared to enhanced usual care in a 3-arm practical randomized trial. All conditions improved moderately on biological and psychosocial outcomes. Latinos, lower literacy, and higher cardiovascular disease risk patients improved as much as other participants. Internet conditions improved health behaviors significantly vs. usual care over the 12-month period (d for effect size = .09–.16). The magnitude of effects was small; therefore, different or more intensive approaches were necessary to support long-term outcomes. The suggestion for this study was to integrate an internet intervention into primary care for maintenance of patients' self-management.

CHAPTER III
METHODS

The present study comprised two main phases. The first phase was a development of the interactive modalities which included an interactive website, email, and SMS. The second phase was an implementation and evaluation of the above described intervention. A detail description of these phases is as follows:

PHASE I: DEVELOPMENT OF INTERACTIVE MODALITIES

The objective of this phase was to develop a web-based instrument for diabetic patients. The instrument aims to encourage diabetic self-management skills, to improve self-efficacy, to promote social support and to reinforce existing behavioral self-management of the patients. The constructive concept for development of the interactive modality is illustrated in Figure 2.

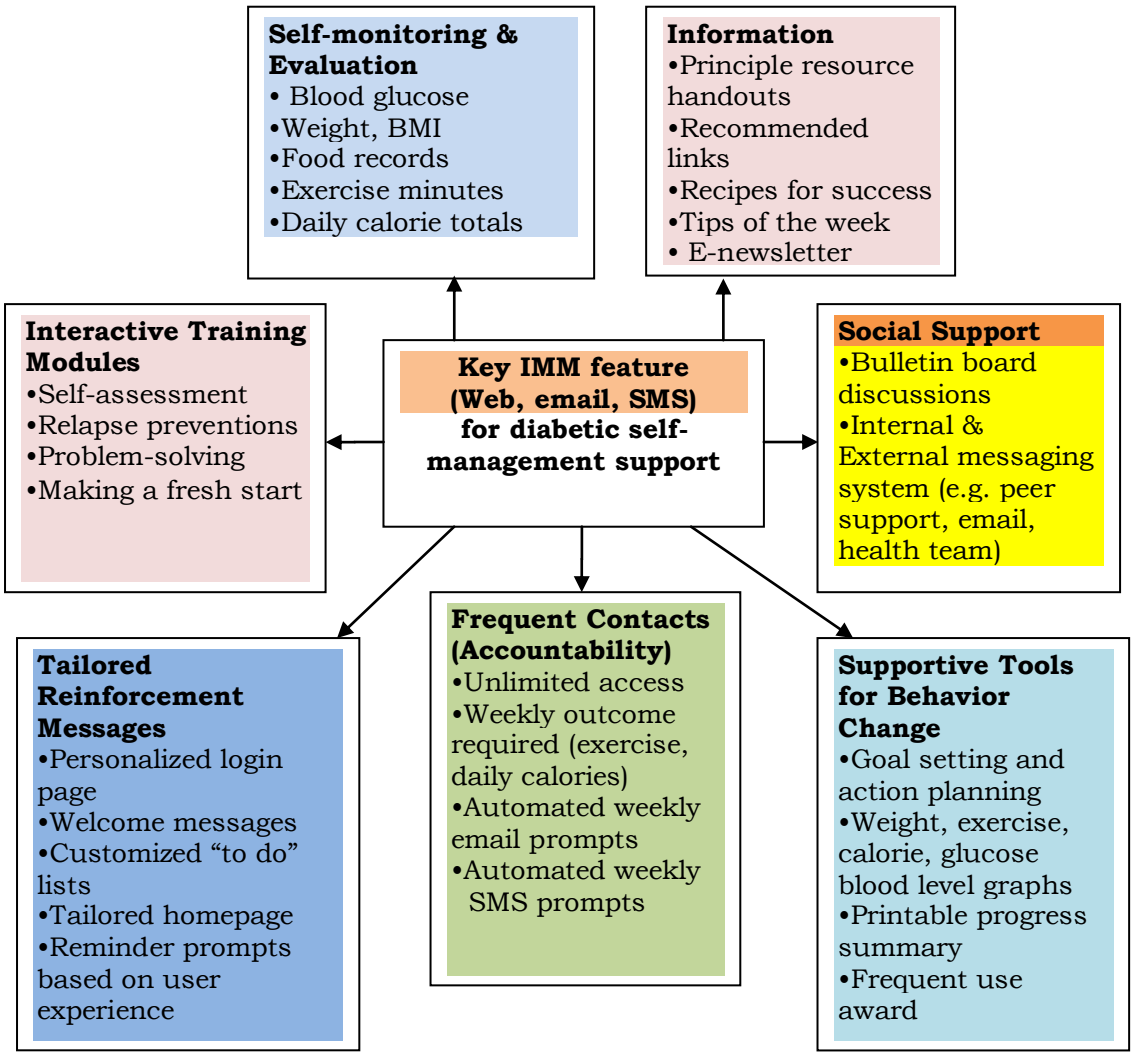


Figure 2 key interactive features for diabetic self- management support

Key concept

The concept of this instrument development was based on the use of a patient empowerment—patient-center approach as a vital strategy for improving self-management. Therefore, the core components of the web site consisted of the patient's goals, barriers, and strategies for a tailored solution—action plan. Furthermore, other features such as personalization information, communication, monitoring and videos were also included.

The content of this instrument was developed by the author as part of a health core team of Chulalongkorn Memorial Hospital. Once the contents were finalized, an architectural team of the National Electronic and Computer Technology of Thailand (NECTEC) was brought in to help creating the web-based interactive system. The contents included diabetic

knowledge resources for self-management in broad four categories, namely food and nutrition, exercise, emotion and general health care.

To enable monitoring progresses and evaluating patients' outcome, selected medical indicators were included in the system. Moreover, since psychological motivation was a crucial element, this study also has a team Health Promotion Center staff such as educators, nutritionists, a sport medicine official, nurses, a physician and a general coordinator to provide support to the users if needed.

Validation process

During the development of the website, external commentators – consisting of a software programmer, an expert on computer system management and other health providers – were invited to give their opinions/comments on its functions, features and content suitability.

Prior to implementation, the website was retested. Diabetic volunteers were invited to test its practicality step by step. Furthermore, six weeks after implementation, the users' satisfaction of the website survey was carried out.

PHASE II : IMPLEMENTATION AND EVALUATION

The aims of this phase were to effectively implement and to evaluate the effects of the intervention. Details of implementation process and evaluation process are described as follows:

Research design

Randomized Controlled Trial with pre- and post-test design was performed to evaluate the effectiveness of the IMM intervention.

Variables and Outcome assessment : An independent variable was the interactive modality intervention. Dependent variables were the outcomes that consisted of clinical data such as HbA1c and patients' behaviors. Participants in the intervention and control groups were measured by physical exam with laboratory test and by self-administered questionnaires at baseline and after 3-month overtime.

Primary outcome : The primary outcome measure was the difference in glycaemic control (HbA1c change) between intervention and control group. HbA1c was measured at baseline, and 3 months.

Secondary outcome : The secondary outcomes including diabetic self-care activity, self-efficacy, and quality of life were assessed by self-administered questionnaires.

Participants and settings

There were two main approaches to enroll participants into this study.

1. Advertisements were performed to recruit participants who were resident in Bangkok.

1.1 Press conference

Initially, the press conference was deployed to advertise a new health service at Chulalongkorn Memorial Hospital.

1.2 Prints, broadcast media and internet

Public announcements including newspapers, magazines, televisions, and internet (e.g., www.chulalongkornhospital.go.th, www.md.chula.ac.th, www.facebook.com and email forwardness) were also utilized as an open enrollment. Leaflets were also distributed to faculties of Chulalongkorn University. In addition, roll-ups were stood at diabetes and general clinic of Chulalongkorn Memorial Hospital.

An open email screening was addressed to recruit participants that started at the first setting, Chulalongkorn University (CU), where enrollees have been diabetic treated from various hospitals (private or government hospitals) in Bangkok. Some enrollees were officials or employees of faculties of Chulalongkorn University.

2. Direct Approach

Subsequently, Official letters and brochures were sent to any offices that were expected to provide internet for their own workers to further recruit participants. There were three responding offices that were Siam

Cement Group (SCG), Bank of Thailand (BOT) and Petroleum Authority of Thailand (PTT).

Cluster randomization

Consequently, the four government/state enterprise offices (CU, SCG, BOT and PTT) were voluntary settings of this study. These setting were randomized by cluster random sampling into intervention group and control group. Therefore, the volunteer diabetics were recruited from a group of patients with type 2 diabetes at the 4 settings. The participants of CU and BOT settings were the intervention group and those of SCG and PTT were the control group.

Eligibility criteria

Inclusion criteria : able to read and write Thai and having Internet access, aged 18 years or older, having been diagnosed as type 2 diabetes for at least 6 months (either insulin or non-insulin-treated) with current glycosylated hemoglobin(HbA1c) >7.0%, accessible via home or mobile telephone.

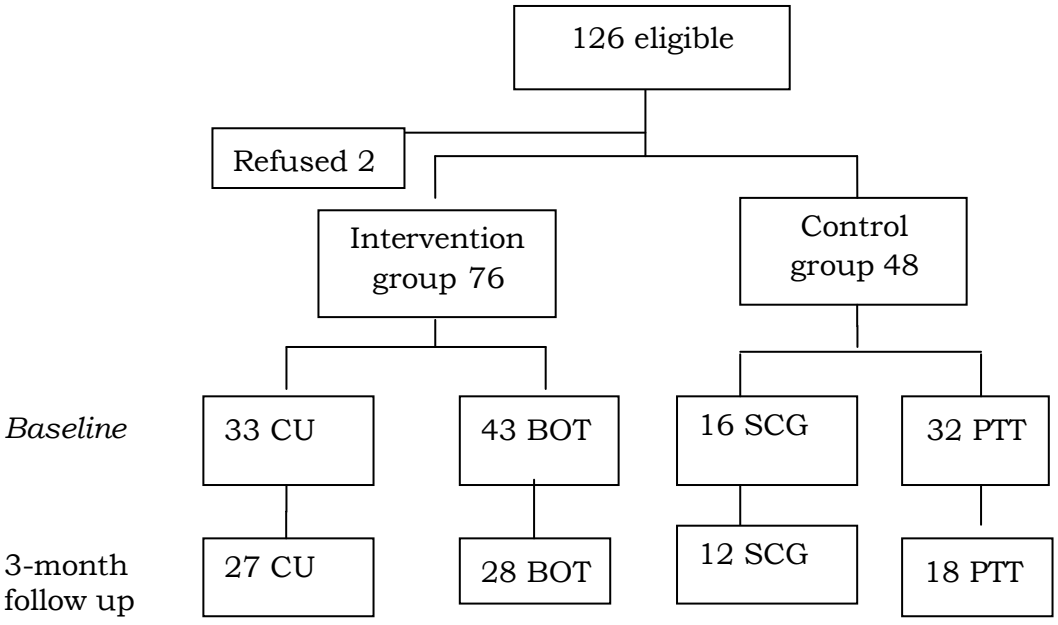
Exclusion criteria: having any significant diseases that may affect the outcome and compliance with this study; a heart condition, chest pain during periods of activity , taking any weight loss medication, being pregnant, expecting to be pregnant and/or lactating, major psychiatric diseases, not willing to participate.

Sample size estimation

Sample size was estimated using formula proposed by Jacob Cohen's in his classic book *Statistical power analysis for the behavioral sciences* (1977, Academic Press). As there is no data on the effectiveness of an interactive web-based program from the Thai population as such thus value was obtained from a previous study in South Korea (57). The study investigated the effectiveness of an educational intervention via cellular phone and the Internet and the finding showed that a mean difference in HbA1c between intervention and control group was 1.08 %. This present

study, the author proposed to use the large effect size (≥ 0.40) to estimate sample size from Cohen's table with α 0.05 and power 0.80 for each group(58). Twenty six samples were required per group. With a possible dropout rate of 20% the total participants needed in each group was 32.

The initial participants consisted of 126 diabetics who were receiving medical treatment from several government or private hospitals or health unit of their offices. Of the 126 diabetics, 43 (34.12%) dropped out during the course of the study. The reasons from some non-participants were, for example, inconvenient internet use /visit, and request for specialist physicians. The remaining 83 diabetics were followed through the 3-month course.



Note: CU : Chulalongkorn University, BOT : Bank of Thailand,
SCG : Siam Cement Group, PTT: Petroleum Authority of Thailand

Figure 3 Flow chart of participants' enrollment

Outcome measures

A public website (http://www.google.co.th/) was utilized to collect data in order to enhance privacy and allow freedom to answer personal questions. The application (googledoc) was the best for self-assessment. A set of questionnaire asked about socio-demographic characteristics, self-care activity (nutrition, physical activity, medication, self-monitoring complication), self-efficacy and Quality of Life. In addition, clinical data was collected at the same time (at baseline and 3 months).

Evaluation of the effect of IMM was assessed through both primary and secondary outcome. Indices included biological indicators specifically to diabetes and data derived from questionnaire assessments. Details are described as follows.

1. Primary outcome: HbA1c

HbA1c, one indicator related to diabetes, was used as primary outcome. The measurement of HbA1c, and lipids from participants' blood samples were conducted at the biomedical laboratory of the King Chulalongkorn Memorial Hospital of the Thai Red Cross, Bangkok.

2. Secondary outcome: A self-report questionnaire

A set of self-administrative questionnaire was used to collect data on demographic characteristics and to assess participants' behavior at baseline and month 3.

The questionnaires for secondary outcome measurement included self-care activity, self-efficacy, and quality of life. Describing the questionnaires as follows:

a) Diabetes Self-care activities (Appendix A)

A Thai version of the Summary of Diabetes Self-Care Activities Measure (SDSCA) was used in this study(50). The Thai SDSCA consisted of

5 components: diet, items 1-7; exercise, items 8-9; self-monitoring, items 10-12; foot care, items 13-17; and medication-taking, items 18-19. The average inter-item correlation scores within components was high (mean (*r)* = .43, SD = 0.21). The two weeks test – retest reliability of SDSCA was 0.89. The score assessed each component separately and combined scores across components. The total score was 133 points. A higher score indicated greater diabetes self-care activities. In this study, the scale of SDSCA demonstrated reliability with Conbrach's alpha was 0.73.

b) Diabetes self-efficacy (Appendix B)

The Diabetes self-efficacy instrument was modified from that of the Stanford education research center that Cronbach's alpha was 0.83 (59). Self-efficacy beliefs were assessed with the Confidence in Diabetes Self Care. This is an 11-item questionnaire, measuring the 10-level of confidence a diabetes patient has in performing self-care activities. It was measured at baseline and 3-month follow-up. In this study, the Conbrach's alpha was 0.83.

c) Diabetes Quality of Life (DQOL) (Appendix C)

The DQOL was performed among patients with type 2 diabetes in Thailand (50). This DQOL process was the same as that used for the SDSCA measure. Internal consistency of the two components, treatment satisfaction and treatment impact components, and total score were investigated in thirty patients with type 2 diabetes mellitus. Cronbach's alpha coefficient was 0.77 and 0.86 in treatment satisfaction and treatment impact components, respectively, and the total Cronbach's alpha was 0.87. In this study, the Conbach's alpha was 0.89

3. Pedometer was used for assessing physical activity of all participants in both groups at 0 and 3-month.

4. Using open questionnaire for diabetic self-management that was approved content validity by two diabetic and behavioral experts to carry out research. Focus group method was also performed to collect qualitative data of diabetic self-management at meeting time. (Appendix D)

Procedure

1. Preparation

For feasibility purpose, a management system was established at the King Chulalongkorn Memorial Hospital of the Thai Red Cross, Bangkok. The system including hardware, software, and people-ware was set to process during the period of this study.

2. Pre-test

At month 0, a prior intervention, the participants of both groups were assigned to complete a set of the on-line questionnaires that included self-care activity, self-efficacy, and quality of life. A prior answer, a confidential user name was sent to each patient but a login password was given to each participant in the intervention group only.

All participants were invited to measure their HbA1c, LDL, HDL, triglycerides, blood pressure, and BMI. They were also asked to provide information on their self-care activities, self-efficacy, and QOL via the structured questionnaires.

3. Implementation

3.1 Intervention group

Participants were invited via email for physical examination and meeting on diabetes self-management at month 0 and month 3 after. During three month study, the participants received knowledge of diabetes self-management every week.

1. E-coach for self-management support

IMM system provided diabetes knowledge, communication, and social support via the website as e-coach that suggested a tailored strategy for each patient throughout the intervention period. The interactive modalities provided tips for overcoming barriers and reaching their goals. In fact, the participants and health providers can up-load and down-load graphical feedback or feed-forward of patterns of blood glucose level. In addition, auto-email and SMS were sent to remind participants who did not continuing access the website and also warn to act as one plan.

2. Risk perception and the health problem representation

In the intervention group, after the participants logged on to the application page of the website, they were asked to record their lifestyles, detailed information such as changes in diet or exercise, hypoglycemic events, and other factors that might influence the blood glucose level in the memo box.

3. Encouraging the individual to set personal goals

Based on the identification of barriers, the participants in the intervention group set personal goals which were linked to the encouraging recommendation with a specific guidance for tailored goal setting such as weight loss goal, activity goal, and dietary counting etc. Strategies were prescribed to address barriers. A 'More Information' icon was created for each strategy. At this step, participants chose whatever suitable for their individual goals.

4. Building an action plan

After the patients reviewed their barriers and strategies, they were assisted to gain the target by asking when, where, how, and how long they will act in relation to the goal.

5. Social support

The social communication and peer support was created on bulletin board as behavioral motivation. The patients were asked to report their calorie counting and physical activities on the web page.

6. Monitoring and evaluation

The program administrator logged on to the system and sent appropriate recommendations (based on the patients' profile) to each patient in the intervention group every 2 weeks. Any additional specific problems about self-management or lifestyle changes were referred to the educators.

In each individual, the program was also responded with a feedback answer, guided by the self-regulation theory. In response to the patients' questions, advice was given according to their contents (e.g. adjustment of diet or increase of physical activity). Feedback also was given visually in colors, tables and graphics.

3.2 Control group

Routinely, patients in randomized control group received knowledge or diabetic self-care from group meeting at month 0 and 3 month after. Furthermore, the knowledge was provided through email every week. Also, the participants in this group communicated via e-mail channel.

Additionally, each participant in both groups received a pedometer for measuring their physical activities. Both groups were invited to access another website—http:/www.cuwalks.com. Details of intervention provided for each group was briefly described in Table 2.

4. Post-test

Participants in both groups were repeated to measure outcomes (HbA1c and diabetes self-management) at month 3.

5. Qualitative data of self-management

At month 3, an open questionnaire of self-management was sent via email to each participant in both group to compare self-management before and after into the program. Additionally, focus group was deployed to collect the patients' behaviors and the program feedback.

Table 2 Comparison of interventions between the intervention group and the control group

Interventions	Intervention group	Control group
1. the interactive system 1.1 interactive website 1.2 reminder (email, SMS)	yes	no
2. website--chulawalks (up to patients)	yes	yes
3. group meeting (at 0-month, 3-month)	yes	yes
4. physical exam (at 0-month, 3-month)	yes	yes
5. self-administrative questionnaires online (at 0-month, 3-month)	yes	yes
6. pedometer	yes	yes
7. email communication with educator once a week	yes	yes

Data analysis

As there were two types of data in this study that were quantitative data and qualitative data. The details of both data analysis were described as follow:

The quantitative data consisted of demographic data (age, income, year of diabetes, sex, marital status, education, occupation), primary outcome (HbA1c) and secondary outcome (self-care, self –efficacy, quality of life).

To provide unbiased assessments of the intervention efficacy due to loss to follow-up of individual participants after 3-month overtime, the data was analyzed according to the intention-to-treat principle (60). Chi-square test and t-test were used to compare the patients' demographic characteristics between the intervention and control groups. Paired t-test assessed differences within group between pre- and post-test. Multiple regressing with correlation was used to determine the difference between

groups and over time for outcome analysis. The adjusted effects, with 95% confidence intervals, were presented. The details of statistical analysis was showed in Table 3

Table 3 Variables and statistical analysis

Group of variables	Variable scales	Summarized data	Statistics	otherwise
Demographic data				
Age , income, year of diabetes	continuous	proportion	t-test	Mann Whitney U-tests
Sex, Marital status, Education, Occupation	categories	proportion	Chi-square	Fisher's exact
Primary outcome (clinical data)				
HbA1c,	continuous	Mean , SD	t-test, multiple regression	
Secondary outcomes				
Self-care	rating	Mean , SD	t-test	
Self -efficacy	rating	Mean , SD	t-test	
Quality of life	rating	Mean , SD	t-test	

2. Qualitative data

The qualitative self-management behaviors that were from open questionnaire and focus group was analyzed by content analysis.

Ethic Approval and grant

This study was approved by the Institutional Review Board, Faculty of Medicine, Chulalongkorn University (IBR No. 032/53). Work on the study was supported by grant from the National Health Security Office (NHSO), Thailand GUC7/2551/23-04-2551 and Graduate school, Chulalongkorn University F-31-GS-ES13 no. 1/48-1.

CHAPTER IV
RESULTS

The study findings were presented according to study phase I and phase II. Phase I included the development of interactive multi-modality (IMM) and the effectiveness of the system. Phase II included results from the experiment.

PHASE I: DEVELOPMENT OF IMM FOR DIABETIC SELF-MANAGEMENT

The IMM consisted of interactive website, email and SMS. The website was the core modality of this study that included 4 functions (4F) and 4 categories of diabetic knowledge (4K). The four functions consisted of (1) self-regulation and management, (2) self-monitoring and evaluation, (3) social support and (4) reminder and virtual home visit.

The diabetic knowledge that was posed on the web page comprised of (1) food/nutrition, (2) exercise, (3) emotion and (4) general health care.

Before the website was displayed, its validation was conducted by the external multi-disciplinary commentators including two computer system management and software experts and three health providers. Prior to implementation, the web was tested by two diabetic volunteers practically. Furthermore, ten participants who visited the website during an early trial period were surveyed on its features, content, and functions suitability.

The suggestions of the experts and patients suggestion were summarized as follows:

Feature: The website should be attractive and reliable. Moreover, its alphabet size should be larger and use photo media rather than text for elderly users. Menu bar on the web page should be rearranged. Should display in Thai format (e.g., date-month-year) and avoid technical terms.

Content: The contents should avoid using some difficult wordings or specific terms and be careful to use other web links.

Function: To be easier to use, the website should display message or navigator step by step and remove functions which are not necessary. After finishing data record, the application should link to show user's statistics or graph presentation then it should be able to connect into detail of related knowledge or activities. Some functions (e.g., food menu lists) should type or key in data instead of scroll bar lists. There were technical problems 'pop-up warning' to request to enter data repeatedly. In addition, patients recommended that the website should provide user's own health box, health team advices, and any patient as the role model for self-management on the website.

Above of all comments were improved by health team and application team; for example, the web pages were changed color, format and alphabet size. However, some knowledge remained connection to other websites. For the functions, the application was shown the interactive navigator in each step. Also, the options to input data were supported in both typing and selecting scroll bar lists and it could link to statistic presentation. Moreover, patients who were good practitioners, heroes, were presented on the main web page. In addition, web board was operated to communicate between health providers and participants

PERSONALIZED DIABETIC SELF-MANAGEMENT SUPPORT PORTAL

As previously mentioned, diabetic self-management should be done by the patients themselves as a regular practice. Therefore, self-regulation theory (22) was integrated into the process of IMM development. The principal mechanisms of the theoretical model consisted of goal setting, active goal pursuit, and goal attainment and maintenance (21). These components were adapted as guidelines to provide tailor-made skills, to encourage diabetics to set their personal goals, to find individual's barriers, to make action plans, to carry out the plans, and to sustain self-behavior. These behavioral regulations were motivated by two main stimulants including internal and external motivations. The internal stimulus was within oneself and the other was from external motivating force such as behavioral intervention—IMM intervention. IMM was constructed for improving patient's self-efficacy which could subsequently influence the patient to follow diabetic self-management regularly. Therefore, the portal of IMM intervention, which is a website, contained features and options to

support the users through the self-management process. For example, once logging into the website, the patient was welcomed by an individual tailored welcome message, which included personal and summarized health data. Subsequently, the patient was provided with a set of goals, barriers, and strategies to achieve the goals. Then each patient could create an action plan to accomplish the goals. In order to sustain behaviors that led to an improvement, IMM's reminders, including email and SMS, were sent to the patients as an encouragement.

The aim of the IMM's development was to support diabetics to improve their behaviors as part of self-management. The website was created to be a communicational channel between health care providers and patients for health information interchange.

The following describes the design and interactions of personalized diabetic self-management support portal.

A. Design of Service System

The functional service system of the portal website was classified into four important services: providing self-regulation and management, self-monitoring and evaluation, social support, virtual home visit and reminder. In addition, the website provided support knowledge and tools related to the diabetic self-management. Some main functions were summarized in Figure 3 and the four support services were briefly described as follows.

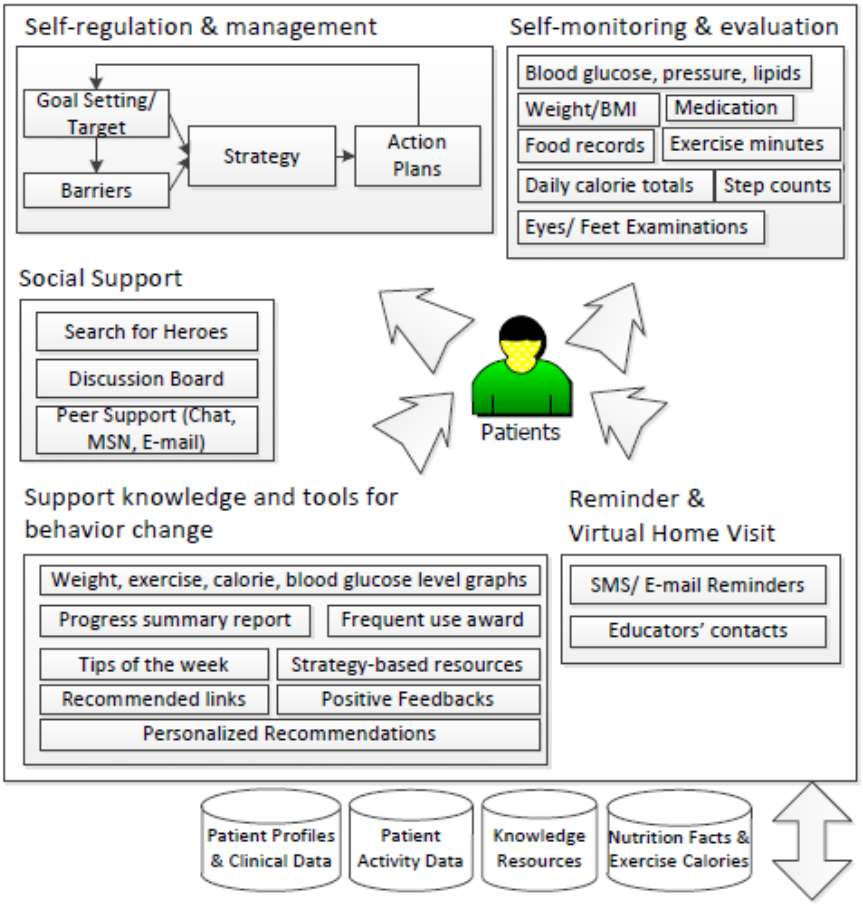


Figure 4 Functions of the patient's self-management support portal grouped by support services

1) Self-regulation and management

When patients logged on to the website: they set their targets and plans such as food control—decreasing carbohydrate or sugar and increasing fiber food, exercises, weight control, etc. After setting targets, the system then showed possible barrier lists, obstacles to reach the selected targets. Then patients were directed to determine their barriers. Subsequently, recommended strategies were displayed to aid diabetics to overcome their barriers. Each recommended strategy was linked to knowledge resources which were classified into 4 categories including food, exercise, emotion, and general health care (figure 5). Calendar plan, daily action plan, was shown to create personal self-care plan, as shown in Figure 6. This calendar was connected to IMM reminders (email and SMS) that were sent to notify and to encourage their acts.

Figure 5 An example of knowledge resources on the main web page

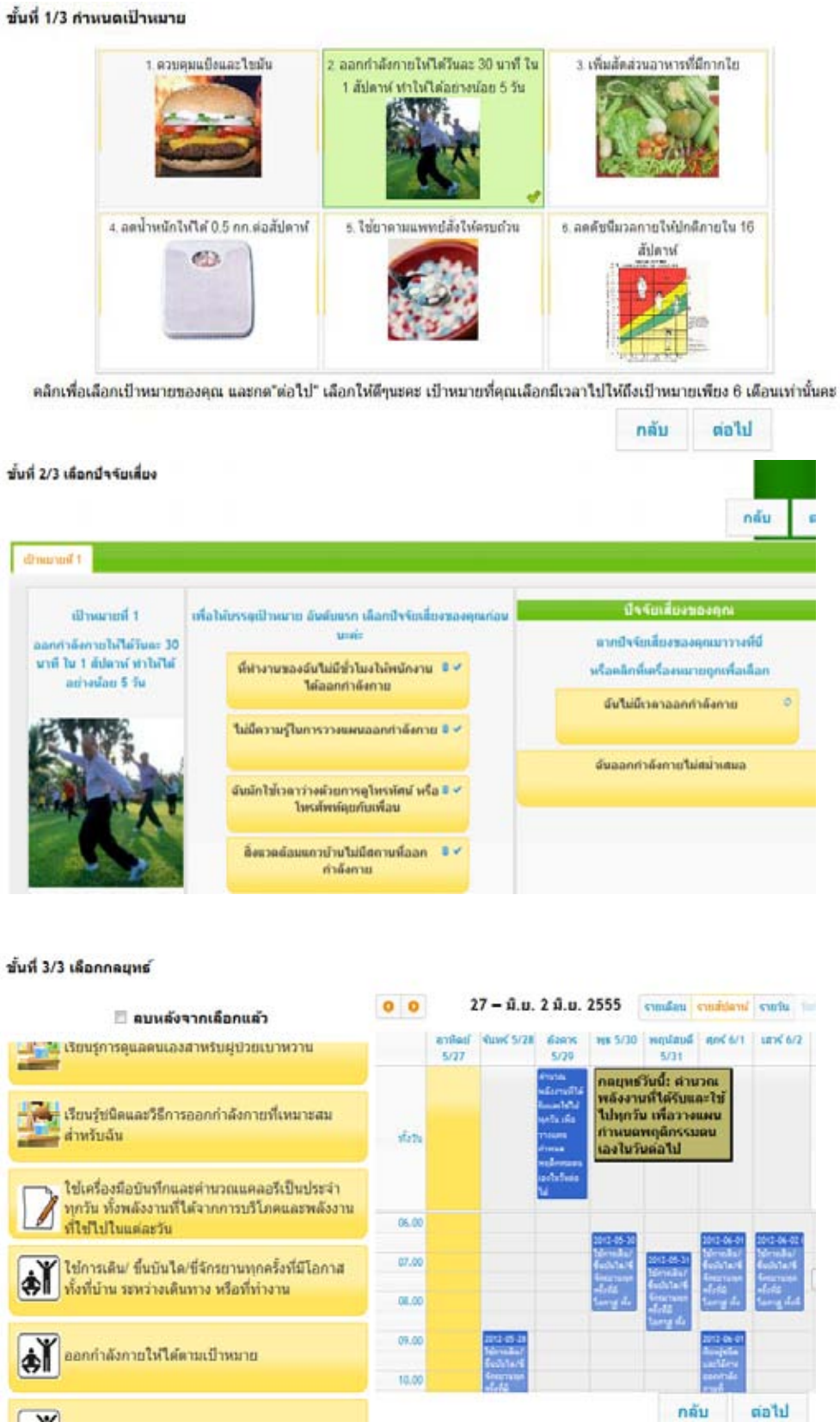


Figure 6 Series of user interface for patients creating action plans

2) Self-monitoring and evaluation

Health records such as bio-markers— HbA1c, fasting blood sugar level, lipids, weight, BMI, blood pressure could be created by patients. Also, they could record their daily activities, e.g. daily food consumption and exercise minutes. The system provided calculation tools for balancing energy—food and physical activities or exercises, and health to support self-care activities. In order to support self-monitoring and evaluation, personal health data were summarized to assist monitoring progress of self-care (Figure 7 and 7.1). Furthermore, diabetics could record and see reports of some major activities and milestones, e.g. changing targets, achieving the targets, visiting doctors, etc.

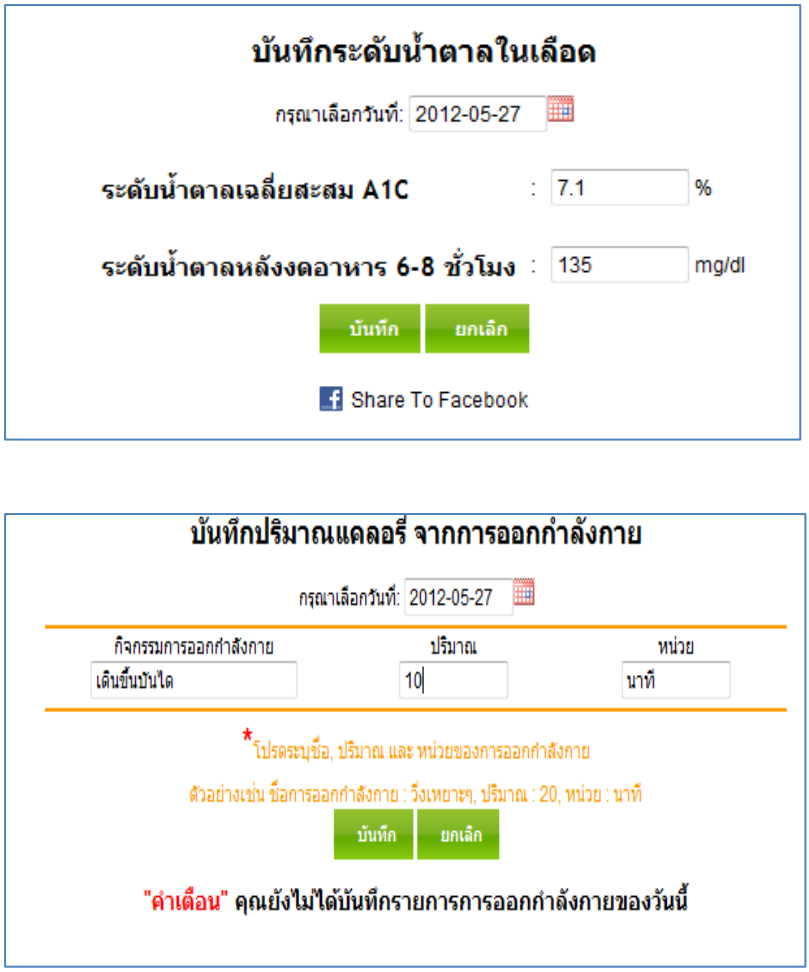


Figure 7 An example of patient data for self-monitoring and evaluation

Figure 7.1 An example of patient data for self-monitoring and evaluation

3) Social Support

Since social support is one of the external motivations to help patients accomplish their goals, the web board and private mailbox were provided for peer support and health care advice. In addition, patients with good

performance records were automatically promoted as “heroes”, and they were presented to other patients. (Figure 8 and 9)

Figure 8 Some examples of social support

Figure 9 An example 'Heroes' of social support

4) Reminder and Virtual Home Visit

The reminder system, including e-mail and SMS, was activated to encourage and remind patients to follow their action plans. In addition, health care providers, educators, could monitor and review each patient's record to assess their performances; then, they could give personalized recommendation or advice for each patient through e-mail and SMS. (Figure 10)

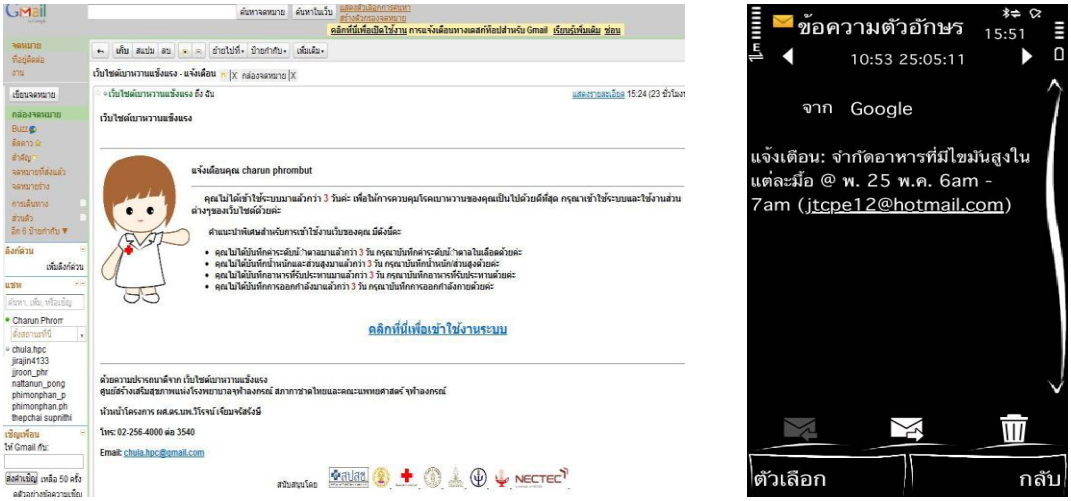


Figure 10 Examples of reminders

B. Interactions in Service System

This section exemplifies interactions between the service provider and the patient in this service system. Figure 11, 12 and Table 4 illustrated interactions between a diabetic and the service.

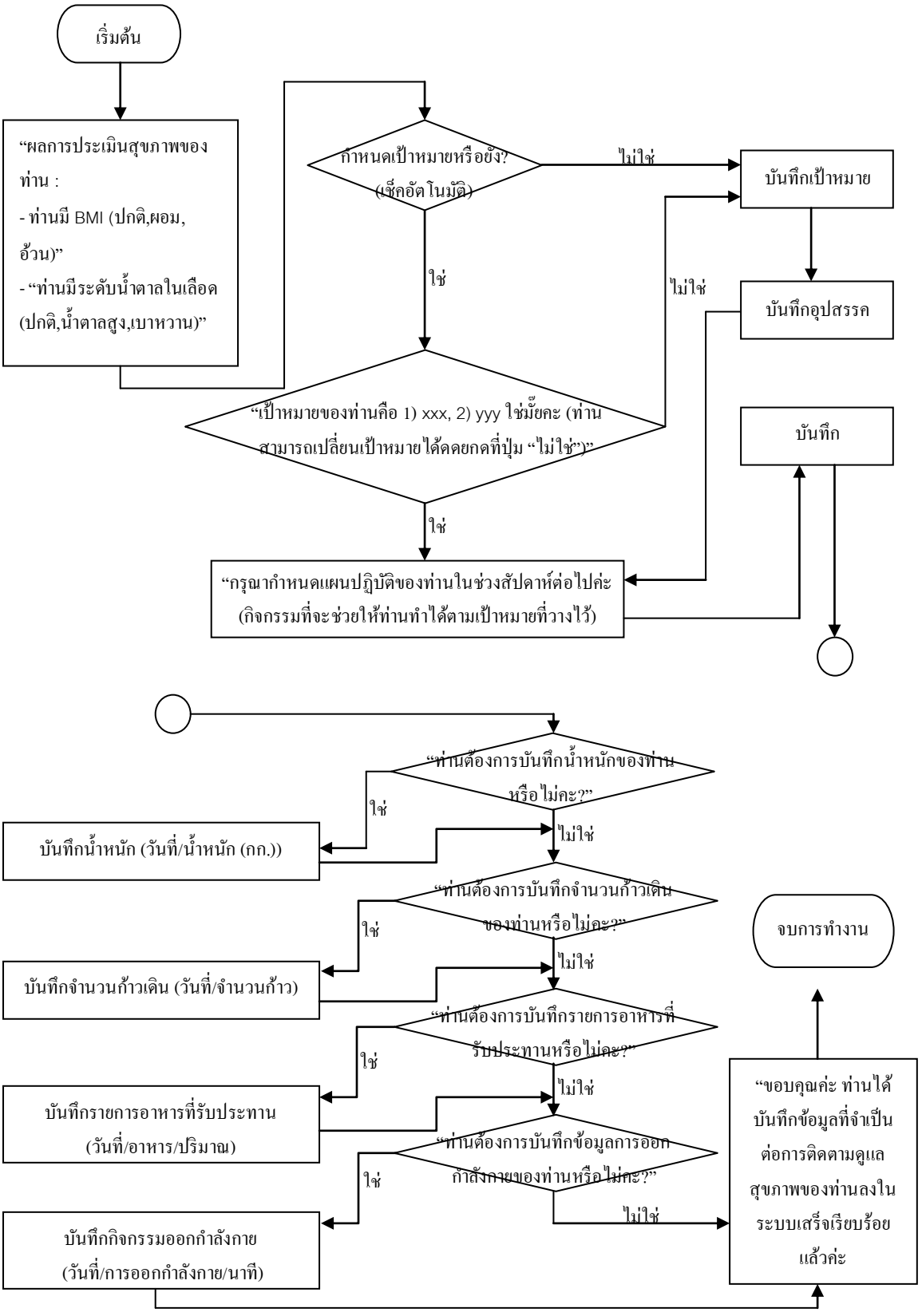


Figure 11 An example of interactive design for user record

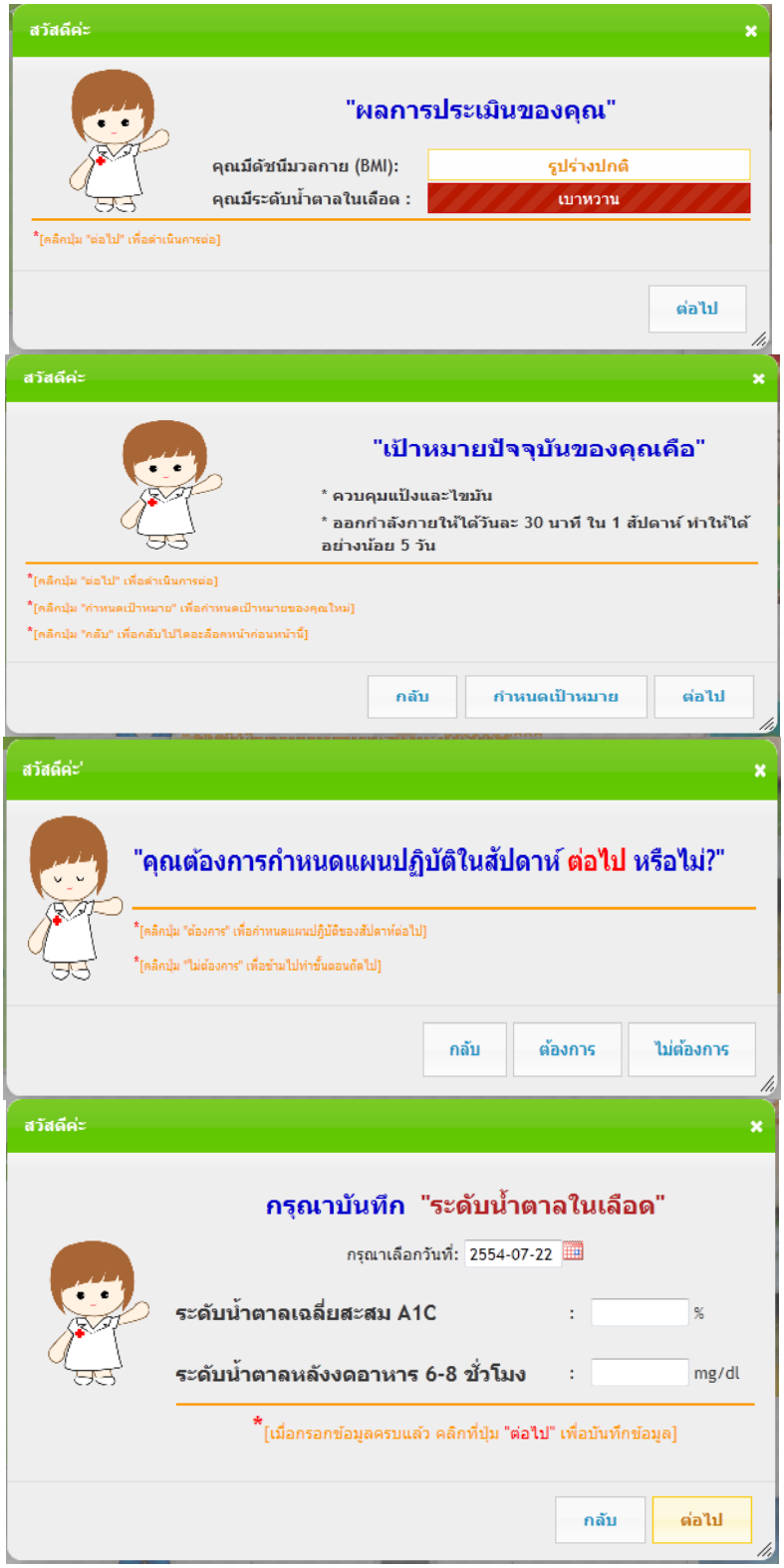


Figure 12 Some examples of a navigator for user record

Table 4 An example interactions between diabetic and the self-management support portal service

บทสนทนากับผู้ป่วยของระบบ	บทสนทนาของผู้ป่วย
“สวัสดีค่ะ คุณต้องการประเมินอะไรบ้างคะ โปรดเลือกรายการ” - ดัชนีมวลกาย (น้ำหนักเกินหรือไม่) - ระดับน้ำตาล (สูงขึ้นหรือไม่) เราจะช่วยในการบันทึกข้อมูลของคุณนะคะ	“ตกลง”
“คุณยังไม่ได้กำหนดเป้าหมายของคุณเลยค่ะ การจะกำหนดหรือไม่คะ”	“ตกลง”
“กรุณาเลือกเป้าหมายของคุณค่ะ”	ตัวอย่าง : ออกกำลังอย่างน้อยวันละ 30 นาที 5 วันต่อสัปดาห์
“กรุณาระบุอุปสรรคที่อาจทำให้คุณไม่บรรลุเป้าหมายค่ะ”	ฉันไม่มีเวลาไปฟิตเนส นั่งทำงานและไม่ค่อยลุกเดินจากโต๊ะทำงาน
“กรุณาระบุแผนปฏิบัติของคุณในสัปดาห์ที่จะถึงนี้ค่ะ”	วันที่ 19-22 มิถุนายน 2555 นี้ จะขี่รถจักรยานไปทำงาน วันที่ 19-22 มิถุนายน 2555 นี้ จะเดินขึ้นบันไดแทนการขึ้นลิฟท์
“กรุณาบันทึกข้อมูลส่วนตัวและกิจกรรมที่คุณได้ทำในสัปดาห์ผ่านมาค่ะ”	“ตกลง”
“คุณต้องการจะบันทึกระดับน้ำตาลในเลือดของคุณหรือไม่คะ”	“ตกลง” วันที่ 13 มิถุนายน 2555 น้ำตาลในเลือด 160 มก./ดล.
“คุณต้องการจะบันทึกน้ำหนักของคุณหรือไม่คะ”	ตกลง เมื่อวันที่ 13 มิถุนายน 2555 น้ำหนัก 60 กก.
“คุณต้องการจะบันทึกอาหารที่รับประทานไปแล้วหรือไม่คะ”	“ตกลง” วันที่ 13 มิถุนายน 2555 -อาหารเช้า ข้าวต้มหมู 1 ถ้วย น้ำเต้าหู้ 1 แก้ว ส้ม 1 ผล -อาหารกลางวัน ข้าวผัดกะเพรา 1 จาน ไข่ดาว 1 ฟอง -อาหารเย็น ส้มตำไทย 1 จาน ลาบหมู 1 จาน
“คุณต้องการจะบันทึกการออกกำลังกาย หรือไม่คะ”	“ตกลง” วันที่ 13 มิถุนายน 2555 เดินเร็ว 30 นาที ขี่จักรยาน 20 นาที
“ขอบคุณมากค่ะ คุณสามารถสรุปรายงานของคุณได้ -น้ำตาลในเลือด/-ดัชนีมวลกาย/-พลังงานสมดุล หากต้องการ เลือก “ตกลง”	“ตกลง” (ผู้ป่วยสามารถดูผลการเฝ้าระวังตนเองและศึกษาการดูแลตนเองจากคลังความรู้ที่จัดไว้ให้ผู้ป่วย)

PHASE II: EFFECTIVENESS OF IMM

Participants were recruited from 4 settings and were subsequently allocated to the intervention group and the control group. At baseline, 126 participants aged 31-72 were enrolled into this study with 76 in the intervention group (2 refused to join) and 48 in the control group. After 3 months, the number of participants decreased to 55 and 30 in the intervention and the control group respectively. Different means of primary outcome (HbA1c) and secondary outcomes (self-care, self-efficacy and QoL) were compared between groups and within group at baseline and 3-month follow up.

Demographic variables

Table 5 presents the demographic characteristics of the intervention and the control groups: the differences of characteristics between both groups at baseline were investigated with X^2 test and t-test. They were not significantly different in gender, age, marital status, education, income, the use of diabetic medication, co-morbidity, quality of life, self-efficacy, self-care activities. Also, there were no significant differences in biological markers in HbA1c, total cholesterol, triglyceride, LDL, systolic pressure, diastolic pressure, BMI. However, they were significantly different in occupation and duration of diabetic time.

Table 5 Demographic characteristic of participants at baseline

Characteristics (Total n; intervention/ control group)	Intervention group		Control group		p-value
	n	(%)	n	(%)	
Gender (126;78/48)					>0.05
-Female	34	(43.6)	24	(50.0)	
- Male	44	(56.4)	24	(50.0)	
Age (yr) (mean, SD) (126; 78/48)	53.59	(8.64)	51.31	(7.94)	>0.05
Marital status (86; 64/22)					>0.05
-Married	49	(76.6)	14	(66.6)	
-Single /divorce	15	(23.4)	8	(36.4)	
Education (86; 64/22)					>0.05
<Bachelor degree	13	(20.3)	9	(40.9)	
Bachelor degree	27	(42.2)	6	(27.3)	
>Bachelor degree	24	(37.5)	7	(31.8)	
Occupation (86; 64/22)					<.001
-Labour	8	(12.5)	3	(13.6)	
-Company employee	4	(6.2)	11	(50.0)	
-Civil worker	35	(54.7)	8	(36.4)	
-Retired/house wife	17	(26.6)	0		
Income (79; 59/21) (baht/month) (mean, SD)	54,100	(60,419)	62,000	(32,730)	>0.05

Table 5 Demographic characteristic of participants at baseline (cont.)

Characteristics (Total n; intervention/ control group)	Intervention group		Control group		p-value
	n	(%)	n	(%)	
Duration of DM (83; 62/21) (yr) (mean, SD)	7.14	(6.11)	3.81	(2.84)	<0.01
DM medication(86; 64/22)					>0.05
-Oral	55	(85.9)	19	(86.4)	
- Insulin	4	(6.2)	0		
- None	5	(7.8)	3	(13.6)	
Co-morbidity (86;64/22)					>0.05
-No	13	(20.3)	7	(33.3)	
-Yes	51	(79.7)	15	(66.7)	
QoL score (74;55/19) (mean, SD)	52.55	(9.28)	57.26	(7.81)	0.05
Self- efficacy score (79; 57/22) (mean, SD)	74.51	(17.94)	73.18	(17.46)	>0.05
Self-care score (73; 54/19) (mean, SD)	63.57	(17.90)	60.63	(17.42)	>0.05
HbA1c (124; 76/48) (%) (mean, SD)	7.92	(1.65)	7.58	(1.63)	>0.05
Cholesterol (112; 70/42) (mg/dl) (mean, SD)	188.04	(36.95)	191.05	(49.79)	>0.05
Triglyceride (113; 70/43) (mg/dl) (mean, SD)	134.46	(71.89)	144.49	(74.84)	>0.05
LDL (118; 76/42) (mg/dl) (mean, SD)	107.15	(33.49)	109.93	(46.09)	>0.05
Systolic pressure(124;76/48) (mm.Hg) (mean, SD)	135.29	(17.27)	134.98	(15.51)	>0.05
Diastolic pressure(122;74/48) (mmHg) (mean, SD)	81.72	(9.10)	83.44	(10.66)	>0.05
BMI (123; 76/47) (kg./m ^{2}) (mean, SD)	27.09	(5.05)	28.07	(3.76)	>0.05

EFFECTs OF IMM INTERVENTION

A. Biomarker changes between pre- and post-intervention

The means of biomarkers in each group and between groups both pre- and post-intervention were compared by pair- and unpaired t-test respectively. In the intervention group, there were no significant changes in HbA1c, cholesterol, triglyceride, LDL, systolic pressure, diastolic pressure, and BMI. The direction of changes revealed that HbA1c, triglyceride, LDL, systolic pressure, and diastolic pressure decreased while total cholesterol and BMI increased. For the control group, there was only a significant change of HbA1c and it was also found to be increased ($p < 0.01$).

Since it was found that the biomarker means were different from those of the baseline in each group. These changes between groups were investigated and it was found that there was only a significant difference in HbA1c between the intervention and the control group (p 0.001)(Table 6).

B. Diabetic behavioral changes between pre- and post- intervention

Behavioral changing scores of diabetes quality of life (QoL), self-efficacy, and self-management (self-care) were examined in each group and between groups. It was found that all these scores increased in both groups. In intervention group, there were QoL and self-care significant changes; however, there were no significant changes in the control group. The three categories were compared between groups and it revealed that there was only a significant change of self-care score ($p < 0.05$). (Table 6)

Table 6 Changes of bio-markers and behaviors (month 3 –month 0) within group and between groups

Biomarkers and Behaviors	Intervention group						Control group						Difference of changing mean of between groups p-value
	Baseline		3rd month		Different change		Baseline		3rd month		Different change		
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	
HbA1c	7.74	(1.66)	7.46	(1.67)	-0.28	(1.18)	7.47	(1.56)	8.05	(1.84)	+5.86	(1.00)*	.001
Cholesterol	187.22	(37.75)	191.63	(38.86)	+4.41	(37.23)	192.42	(50.44)	188.69	(45.37)	-3.73	(35.90)	>.05
Triglyceride	137.51	(80.01)	131.74	(68.79)	-5.77	(65.34)	145.59	(80.80)	131.52	(74.40)	-14.07	(43.93)	>.05
LDL	106.66	(33.45)	105.50	(34.24)	-1.16	(31.49)	114.40	(46.61)	109.23	(37.02)	-5.16	(34.53)	>.05
Systolic pressure	136.44	(15.74)	132.80	(12.68)	-3.64	(14.20)	134.13	(14.76)	132.40	(18.15)	-1.73,	(17.77)	>.05
Diastolic pressure	82.06	(9.06)	80.02	(9.31)	-2.04	(9.28)	84.03	(10.23)	80.47	(9.63)	-3.57	(9.40)	>.05
BMI	26.75	(5.00)	26.74	(5.04)	+0.01	(0.92)	28.59	(4.25)	28.31	(4.00)	-0.28	(1.11)	>.05

*sig <.01

Table 6 Changes of bio-markers and behaviors (month 3 - month0) within group and between groups (cont.)

Biomarkers and Behaviors	Intervention group						Control group						Difference of changing mean of between groups p-value
	Baseline		3rd month		Different change		Baseline		3rd month		Different change		
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	
QoL score	52.55	(9.28)	57.87	(6.87)	+2.95	(6.38)	57.26	(7.81)	59.05	(6.42)	+1.79	(3.76)	>.05
Self-efficacy score	74.51	(17.94)	83.42	(11.10)	+3.38	(11.06)	73.18	(17.50)	76.52	(15.18)	+1.67	(5.94)	>.05
Self-care score	63.57	(17.90)	73.03	(16.02)	+7.73	(11.86)*	60.63	(17.42)	62.47	(17.62)	+1.84	(4.84)	<.05

*sig <.01

Correlation of HbA1c and participants' behaviors

As there were significant changes of HbA1c and self-care scores between groups, diabetic behaviors—QoL, self-efficacy, and self-care, were included to consider relationships of them. The findings illustrated that there was the only self-efficacy that associated with HbA1c change significantly ($p < 0.05$). (Table 7)

Table 7 Correlation of HbA1c and diabetic behaviors (n=28)

Outcomes	HbA1c change	QoL	Self-efficacy change	Self-care change	DM year
HbA1c change	1.00	-0.31	-0.35	-0.27	-0.32
QoL	-0.31	1.00	0.27	0.04	-0.17
Self-efficacy change	-0.35*	0.27	1.00	-0.17	0.03
Self-care change	-0.27	0.04	-0.17	1.00	0.03
Duration of DM (yr)	-0.32*	-0.17	0.03	0.03	1.00

*Sig. (1-tailed)

Behavioral changes in intervention group

Since there was a significant improvement of self-care in the intervention group, the related activities of self-care including food/nutrition, exercise, self-monitoring complications, and drug adherence were examined. The results found that food/nutrition and self-monitoring were significantly higher than those of the baseline ($p < 0.05$). However, there were no significant differences in exercise and drug adherence. (Table 8)

Furthermore, web use of the intervened participants was monitored. The numbers of people who used web every 3-day, 7-day, 14-day, 30-day, and over 30-day were 9(12.9%), 8 (11.4%), 11(15.7%), 3 (4.3%) and 39 (55.7%) respectively. (Table 8)

Table 8 Behavioral change of Intervention group

Behavioral variables (n)	Baseline	3rd month	p-value
	Mean (SD)	Mean (SD)	
Self-care (26)			
-Food/nutrition	13.85 (4.37)	16.08 (3.97)	.03
-Exercise	5.92 (3.73)	6.62 (4.24)	>.05
-self- monitoring	28.00 (13.44)	32.35 (10.34)	.01
-Drug adherence	10.85 (4.31)	10.92 (4.32)	> .05
Web use (70) n (%)			
Every 3-day		9 (12.9)	
7 -day		8 (11.4)	
14-days		11 (15.7)	
30-day		3 (4.3)	
Over 30-day		39 (55.7)	

Summary of Qualitative outcome

Qualitative outcome consisted of self-management Behavior and feedback of IMM system as following

I Self-management Behavior

After 3-month follow up, the participants in both groups were asked about their behaviors via individual interview and focus group. The data revealed 4 themes as follows:

1.Food/ Nutrition

In the intervention group, most participants gained awareness and changed their eating habits that control carbohydrate and sugar. They reported the record consumption to take their balancing energy per day such as *"I always ate high carbohydrate and I liked sweet desserts. Now I eat less, just to get by";* male, aged 61, *" I am now stricter and I record food intake too";* male, aged 58. In addition, the participants were aware better to buy food products with label nutrition e.g., *"Now, I get used to reading nutrition labels when buying food products*"; male, aged 55.

For participants in control group, most participants intended to change consumption behavior that was *"I pay attention to the amount of food and use food substitutes"*; female, aged 41. However, some of them were able to select suitable nutrition for diabetics *"I am more selective about the type of food I eat and almost stop eating sweet desserts"*; male, aged 60. And *"I select food with low sugar/ carbohydrate";* male, aged 39.

2.Exercise

Participants in the intervention group have changed from knowing to acting and they integrated exercise/physical activity on a daily basis. For instance, the participants stated that "*I knew that exercise is beneficial but I did not take it; Now, I do the activities that are really good for health"*; female, aged 31. *"Most evenings, I walk home; I do not drive my car";* female, aged 56. *"I have set a goal to exercise 30 minutes per day, 5 days per week*"; male, aged 52. *" On working day, I walk instead of driving to take my child to school"* ; male, aged 50. *"At work, I walk up stairs instead of an elevator and I change from sitting to eat at work to walking outside for lunch"* ; male, aged 34. In addition, they set to walk for decreasing HbA1c as in words *"I have set a goal to walk at least 10,000 steps per day in order to decrease my HbA1c to lower than 7%"*; male, aged 55. *"I exercise 3 times per week; I do not sit still for long periods;"* male, aged 61.

In control group, most participants showed their intention to exercise, but they did not engage in real practice. For instance, the participants reported that *" I could not find free time to exercise"*; male, aged 44. *"I tried to exercise every month but I had to stop due to muscle pain. So, I cannot do it every day*"; male, aged 33. *"I select suitable exercise";* male, aged 39. *" I try to walk more—I walk in the park occasionally";* male, aged 56. However, there was a retired participant could exercise routinely as his wording *"I have increased the frequency of exercise to 5 days per week, sometimes twice a day*"; male, aged 60.

3.Emotion

Although participants in both groups did not express their feelings regarding self care management, the participants in the control group

reported their feeling stress of work and ate a lot more. For instance, he said that *"Although I can diet, I cannot control stress" "There were many conferences and I was stressed. So,I ate more sweet desserts*"; male, aged 44.

4.General health care

Participants in the intervention group demonstrated self-care behaviors such as monitoring their diabetic complications (e.g. hypo- and hyper-glycemia, skin care, foot care, and taking medication). For example the participants stated that " *I also be more conscious about skin care";* male, aged 66. *"Previously, I did not eat every meal because I misunderstood that would help decrease my blood sugar. Presently, I have improved my eating; I eat proper food at proper time*" ; male, aged 45.

In the control group, although most participants showed their awareness of self-care better, they did not change their self care behaviors. For instance, one participant was admitted to a hospital because of pulmonary infection and renal failure during the study period. He told later *" A prior admission I did not take diabetic medications regularly, I am afraid of its effect to kidneys"* male, 53.

Regarding diabetic medications, participants in both groups interested Thai herbs to be alternative treatment. They thought that if they take drug for longtime, it makes renal problems.

II Feedback of IMM system

Furthermore, feedback data on IMM intervention was gained from interviewing the intervention group. Some participants commented on the IMM system, the website, was complicate to use especially recording calories into the website. Additionally, network was not easy to access as well as technical errors. However, users accepted the project that is very beneficial for them. For instance, participants stated that *"When I inputted my food intake on the program, it immediately showed 'error' and also my old information is lost. I wonder why*"; male, aged 60. *"This project is very beneficial to me but the computer system is less than complete*"; male, aged 50.

CHAPTER V
DISCUSION AND CONCLUSION

The purpose of this study was to develop the interactive technology (website, email, SMS) for self-management support and to evaluate the effects of the interactive system among patients with diabetes type 2 who lived in Bangkok after 3-month overtime. To briefly understand, describing the development and its effects are presented and these findings are discussed subsequently.

Development of IMM

The key output of the development was the interactive website that leads to the implementation and evaluation of the effects of IMM.

A. During the development period

During the development of the website, external multi-disciplinary commentators were invited to share ideas relating to the website. Subsequently, diabetic volunteers were visited to retest it. Their opinions were grouped to 3 categories i.e., feature, content suitability and function. Description in details was as follows:

a) External commentators' opinions

Feature:

The website should be attractive and reliable that should not use a depressible color tone and should pose a name of the website owner with the phone number shortly. Alphabet size should be large to accommodate elderly users. Moreover, sequences of menu bar should be rearranged. News box should not include answers and questions which should be move to the web board.

Content:

Avoid using some difficult wordings or specific terms; i.e., risking, strategy. Knowledge resources should not come from web links which may cause troubles when the original webs change contents thereafter.

Function:

Several functions were not available or 'search function' on the first page should be removed if not use. A decorative feature/furnish should be careful because its effect when a user open the webpage for a long time. Message or navigators should show step by step to access easily. On health data page, after finishing the data record, it should be able to link to statistics or graph presentation. Calendar plan should connect to detail of related knowledge or activities. Functions with many selected lists such as Food menu should use typing the menu instead of scroll bar lists. The system should calculate health indices autonomously. Briefly, the website was expected to function intelligently.

b) The patients' comments

After program improvement, two diabetic volunteers were invited to do practical test. One volunteer had previous experience on website development, while the other had low computer skill. Most of their opinions were similar to the external commentators. Furthermore, they suggested using photo media rather than text to easier understanding. Also, date-month-year, as well as technical term such as vital sign, blood pressure, BMI, etc. should be displayed in Thai format. Finally, the users still felt that the functions were complicated.

Subsequently, the architectural team of NECTEC brought these comments to improve the practicability of the program in further phase.

B. During an early trial period

Six weeks later, after the first participants' group visited the website, their opinions were surveyed again. Most ideas were positive; however, their comments showed several difficulties in using the program including technical problems and data lists; for example, the main page always appeared 'pop-up warning' to ask users to enter data again and again which should be occurred only once at first, and the existing food lists did not accord with users' food consumption items. Moreover, the participants recommended that the system should have professional health providers (a physician or a nurse) who checked the patients' health profiles and advised

them through the website every month. In response to the health advices, the website should have menu 'health box' of each patient to record their physicians' advices; so that health team on the website could receive the patients' health data currently. In addition, the users suggested that there should be information of "role model", who is any patient with good self-management practice that could be shared with other program users.

Finally, the outputs of this interactive development program consist of 4 main functions that were self-regulation, self-monitoring and assessment, social support, and reminder system. In addition, the diabetic knowledge included 4 categories which were food/nutrition, exercise, emotion, and general health care.

Implementation and Evaluation

The purpose of this essential process was to investigate whether HbA1c at post- intervention was better than at pre- intervention, and whether it is better than the control group after 3-month follow up.

Most demographic characteristics of the participants in both groups were not different, except the duration of diagnosed diabetes and occupations.

A. Primary outcomes

After 3 months, the results of HbA1c showed different change between groups and within group. HbA1c decreased in the intervention group but increased in the control group.

B. Secondary outcomes

At 3-month follow up, the results of QoL, self-efficacy, and self-care scores increased in both groups; especially, self-care score showed significant increase between groups and within the intervention group. Also, QoL scores of the intervention participants were significantly higher than those scores at baseline.

When these behavioral scores were examined for their correlations with HbA1c change; the results revealed that self-efficacy score inversely related to the change of HbA1c significantly; that was, if self-efficacy score increase, HbA1c level will decrease. As mentioned previously that the

duration of diagnosed diabetes differed between groups at baseline, this variable was therefore treated as a potential confounder in verifying the association of these behavioral scores and HbA1c changes. The findings indicated that diabetic duration significantly and inversely related to HbA1c. The patient with increased years of diabetes is more likely to decrease the level of HbA1c.

Discussion

Participant enrollments

Previous studies most commonly recruited participants from hospital setting (61-67) or health system (68-72). Some studies recruited the patients via advertisements in mass media, distribution of flyers (73) and mixed media(74). This current study is one of the latter. Consequently, possible reasons participants who were within hospitals based that were followed by hospital providers easier than other settings.

Moreover, the most patients in this study have the potentials for health care—healthy welfare because there are health service centers at their offices that it may caused attrition for persistence as the previous study by Nijiland et.al (53) which mentioned a ceiling effect that patients thought they are doing well, so they do not need the technology. The past research suggested that a ceiling effect should be avoided; therefore, the technology should have persuasive elements such as feedback mechanisms and triggers (email messages) to stimulate users to persist.

Therefore, there are two possible reasons to explain the attrition of the participants after 3 months in this study. Firstly, participants were recruited from their offices that it was difficult to follow up them. Secondly, the participants could access to their health service easily that possibly had the 'ceiling effect' as mentioned above.

IMM development and self-management behavior

The initial study used the interactive technology (IMM) to improve self-management that consisted of the 4 key functions (i.e., self-regulation, self-monitoring and assessment, social support, and reminder system) and the 4 knowledge (i.e., food/nutrition, exercise, emotion and general health care).

The 4 functions are addressed to be a collaborator. For example, the first function, self-regulation and management, is a motive for behaving in a specific way such as decreasing carbohydrate. Then the second function, self-monitoring and evaluation, is a stimulator to reach the target by food record. Social support function is a keeper to drive oneself successfully and sustainable behavior. Finally, reminder function, auto-email and SMS, is a stimulator to act as self-plan regularly. Furthermore, the 4 knowledge assist to fill fully for self-management such as diabetic food, suitable exercise, emotion and diabetic control, and general health care for complication surveillance.

Although the results of this study showed increasing self-care score significantly, improving self-efficacy score was not significant. Importantly, self-efficacy score associated with improving HbA1c significantly but self-care score did not correlate with HbA1c change. In term of these findings, there are possible reasons for the explanations. Firstly, self-management behavior cannot evaluate in a short duration. Secondly, there are some supports in the system need to be improved; for example, attractive exercise for diabetics, and using medication (drug adherence). Since the increasing scores of the two parts were not significant after 3-month overtime. In addition, there are technical problems such as the application, hardware (server) and network that have to do better. However, a live social support by health provider via email or telephone is a very charismatic approach for self-management support.

Users' compliance

Consequently, few participants answered the online questionnaires; therefore, the intention-to-treat analysis was assessed by the secondary outcomes after 3 months. However, they were willing to participate in physical examination and HbA1c tests which were given free of charge. Although the number of participants of both groups is not equal, the changes of HbA1c, self-care, and self-efficacy are interesting. The possible explanations for the low feedback of the online questionnaires may be the inability to use the internet of the participants, the limitation/problem of the public online channel, the reluctance to give one's own data or privacy.

Reminder system

Apart from the participants' factors, the reasons they left early may be that the website was not user-friendly for them and there was computer server trouble. Due to limitations of free public network, the interactive technology in this pilot study is not complete as a fully functional system is expected to include an interactive reminder system such as email and SMS; consequently, later participant groups are not reminded by the system that is one of possible reason why they drop out.

Another reason, as mentioned previously that the participants were not recruited at clinics or hospitals; therefore, the patients could not access to their medical records (e.g., blood glucose, schedule physician visit) but instead they have to upload their existing data into the system by themselves. In term of this, the previous review had shown that the highest satisfaction of patients about the web-based self-management support was that they were able to tract blood glucose, receive electronic reminders, schedule physician visits, email their health care team, and interact with other diabetic patients (30).

Health professional feedback

Additionally, health multi-professional health staffs could not work exclusively for this study; therefore, interactive response for participants support is not rapid. As the published review by Ramadasa et al.(75)reported that the success of e-interventions were determined by several factors such as frequent contact between the intervention participants and their physicians, weekly therapeutic changes; training on the website usage, interactive and individualized approach, online group discussion and integration of medical data. The findings of the past review is confirmed by the patients' recommendation in this study that the system should have professional health providers (a physician or a nurse) to check the patients' health profiles and to advise them through the website every month. In addition, the previous review by Brown (30) found the programs could work best when staff was specifically assigned to support web-assisted intervention.

Social support

Accordingly, not only the offering personalized email helps to support to each patient for self-management, but web board discussion can also serves to monitor 'virtual support groups' where the patients interact with others online via informational chat rooms and blogs(76). In this study, there were also a group meeting and nurse contact through email, web board discussion, and cellular phone for fostering continued relationships between the health providers and the participants. These meeting and contact were also provided to the control group; participants always communicate with researcher via email with friendly words such as "*Very nice, my care giver*".

Web use and HbA1c change

In term of the inconsistency findings about the relationship of web use and HbA1c, one possible explanation is that the participants can record their past activities retrospectively into the web site e.g. a participant had stated on the web board that *"I record my activities everyday then enter them into the website after*". This function was requested by the participants and the system provided it for the users.

In response to self-monitoring via web use, previous study by Robinson et.al.(77) mentioned that logging into the website was a necessary but self-monitoring behavior was not predicted by frequencies of login only. Since the study reported patients preferred to receive their illness data (e.g. treatment, blood glucose, and advice) from their health care providers. Therefore, the procedure of sending clinical laboratory data from healthcare provider directly to the patients could stimulate them to change their self-monitoring behaviors. The research concluded that careful monitoring of blood glucose levels was one the most important predictors to encourage patients' self-management.

HbA1c and Self-efficacy

The result of HbA1c agrees with that of several previous studies (37, 40-42, 54), which indicated that the HbA1c level of the patients who enrolled in online diabetic self-management program improved. Also, the finding of

self-efficacy is consistent with the previous studies on a significant improvement of patients' confidence in their ability to perform self-care activities (35, 54). However, Jennings et.al (52) reported self-efficacy score significantly decreased from baseline to follow up.

As this finding that increasing self-efficacy score associates with decreasing HbA1c is in agreement with the previous investigation results (25, 35, 54, 78), it was therefore concluded that self-efficacy could function as a moderator for diabetes self-care (78).

Implication

From the conclusion of the literary review by Azar M. and Gabbay R. was that the patients with type 2 diabetes who enrolled in the web-based diabetes self- management support program seemed to do better than the controls with significant differences in HbA1c (28). The past conclusion is confirmed by this study which showed that the self-care activity of the intervention group was significantly improved from baseline to 3-month follow up, especially for food consumption and self-monitoring. According to this reasonable support, the 3 most popular web pages are food intake, walk step, and exercise record. Furthermore, qualitative data of the intervention participants indicated their behavior changed as some participants said "*Now, I get used to reading nutrition labels when buying food products and I have set a goal to walk at least 10,000 steps per day in order to decrease my HbA1c lower than 7%*"; and *"I have set a goal to exercise 30 minutes per day, 5 days per week and I eat forbidden food less than before*".

With all above reasons, these initial findings point to a need to a further study of a large population and with sufficient a number of subjects. In order to deliver the technology into the quality of clinical care for patients with type 2 diabetes; it should be improved to be a program with fully functionality. Importantly, the program should be overseen by full-time health professional who can provide prompt feedback to the user(s). Additionally, the health interactive technology is able to expand for other high risk groups e.g., obesity, hypertension, and hyper-lipidemia.

Limitation

A significant limitation of this study is the difficulty to find patients with type 2 diabetes who has the ability to use internet well. Surprisingly, the enrollment period of this study was nearly two years. This might imply that the internet-based self-management support system for type 2 diabetes might be too early for present context in Thailand.

Another limitation, the dropout rate of participants is higher than our prior expectation that should not exceed 20 %. Also, the incomplete data collections via public online network infer from Thai patients' behavior that they were no longer interested in answering a set of questionnaire.

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APPENDICES

APPENDIX A

DIABETES SELF-CARE ACTIVITY (ONLINE) QUESTIONNAIRE

กิจกรรมการดูแลตนเอง

กิจกรรมการดูแลตนเองในช่วง 7 วันที่ผ่านมา
ทุกคำตอบของท่านเป็นแนวทางในการสนับสนุนการดูแลตนเอง
* Required

รหัสประจำตัว *
กรอกรหัสประจำตัวของท่าน(ตามที่แจ้งให้ทาง email) เช่น suwaree611

H1 ท่านกินอาหารในปริมาณที่เหมาะสมกับผู้เป็นเบาหวาน และเหมาะกับการใช้แรงงานประจำวันของท่านกี่วัน (ในช่วง 7 วันที่ผ่านมา) *
เลือกจำนวนวันที่ท่านได้ปฏิบัติ ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ทำเลย	○	○	○	○	○	○	○	○	ทำทุกวัน

H2 ท่านกินอาหารจุบจิบระหว่างมื้อกี่วัน (ในช่วง 7 วันที่ผ่านมา) *
เลือกจำนวนวันที่ท่านได้ปฏิบัติ ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ทำเลย	○	○	○	○	○	○	○	○	ทำทุกวัน

H3 ท่านกินอาหารที่มีน้ำตาลมาก เช่น น้ำหวาน หวานเย็น ผลไม้หวานจัด เช่น ทุเรียน มะม่วง ลำไย ลิ้นจี่ ละมุด โดยไม่คำนึงถึงปริมาณที่กินได้กี่วัน (ในช่วง 7 วันที่ผ่านมา) *
เลือกจำนวนวันที่ท่านได้ปฏิบัติ ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ทำเลย	○	○	○	○	○	○	○	○	ทำทุกวัน

H4 ท่านกินอาหารที่ไขมันสูง เช่น หมูสามชั้น ขาหมู หนังเป็ด หนังไก่ กะทิ อาหารทอดต่างๆ ไข่แดง หอยนางรม ปลาหมึก กี่วัน (ในช่วง 7 วันที่ผ่านมา) *
เลือกจำนวนวันที่ท่านได้ปฏิบัติ ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ทำเลย	○	○	○	○	○	○	○	○	ทำทุกวัน

H5 ท่านกินอาหารตรงเวลาครบ 3 มื้อ กี่วัน (ในช่วง 7 วันที่ผ่านมา) *
เลือกจำนวนวันที่ท่านได้ปฏิบัติ ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ทำเลย	○	○	○	○	○	○	○	○	ทำทุกวัน

H6 ท่านใช้หลักการแลกเปลี่ยนอาหารในการกินอาหาร ได้กี่วัน (การแลกเปลี่ยนอาหาร เช่น กินข้าว โพด 1 ฝัก แทนการกินข้าว 2 ทัพพี กินข้าวเหนียว 1 ปั้นเท่าไข่ไก่ แทนการกินข้าว 1 ทัพพี) *
เลือกจำนวนวันที่ท่านได้ปฏิบัติ ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ทำเลย	○	○	○	○	○	○	○	○	ทำทุกวัน

H7 ท่านดื่มเครื่องดื่มที่มีแอลกอฮอล์ เช่น เหล้ามากกว่า 2 เป็ก เบียร์มากกว่า 1 กระป๋อง ไวน์ มากกว่า ครึ่งแก้ว กี่วัน *
เลือกจำนวนวันที่ท่านได้ปฏิบัติ ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ทำเลย	○	○	○	○	○	○	○	○	ทำทุกวัน

H8 ท่านมีการออกแรงทำกิจกรรมอย่างต่อเนื่องอย่างน้อย 30 นาที เช่น ถูบ้านจนเหงื่อออก ทำสวน เดิน กี่วัน *
เลือกจำนวนวันที่ท่านได้ปฏิบัติ ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ทำเลย	○	○	○	○	○	○	○	○	ทำทุกวัน

H9 ท่านมีกิจกรรมออกกำลังกายที่เฉพาะเจาะจง เช่น เต้นแอโรบิก ว่ายน้ำ วิ่ง ขี่จักรยาน กี่วัน *
เลือกจำนวนวันที่ท่านได้ปฏิบัติ ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ทำเลย	○	○	○	○	○	○	○	○	ทำทุกวัน

H10 ให้ท่านทบทวนตนเองในเรื่องการกินอาหารว่า กินมากเกินไป หรือ น้อยเกินไป กี่วัน *
เลือกจำนวนวันที่ท่านกินมากเกินไป หรือ น้อยเกินไป ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ทำเลย	○	○	○	○	○	○	○	○	ทำทุกวัน

H11 ท่านสังเกตตนเองว่ามีอาการน้ำตาลในเลือดสูง เช่น กระหายน้ำบ่อย ปัสสาวะบ่อย ตาพร่ามัว อ่อนเพลีย หรือมีอาการน้ำตาลต่ำ เช่น หิว ใจสั่น เหงื่อแตก กี่วัน *
เลือกจำนวนวันที่ท่านมีอาการน้ำตาลในเลือดสูง หรือต่ำ ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่มีอาการ	○	○	○	○	○	○	○	○	มีอาการทุกวัน

H12 ท่านตรวจร่างกายตนเองตามซอกอับ เช่น รักแร้ ใต้ราวนม ขาหนีบ ว่ามีการติดเชื้อหรือไม่ กี่วัน *
เลือกจำนวนวันที่ท่านได้ตรวจร่างกายตนเอง ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ตรวจ	○	○	○	○	○	○	○	○	ตรวจทุกวัน

H13 ท่านตรวจเท้าอย่างละเอียดกี่วัน *
เลือกจำนวนวันที่ท่านได้ตรวจเท้าตนเอง ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ตรวจ	○	○	○	○	○	○	○	○	ตรวจทุกวัน

H14 ก่อนใส่รองเท้าท่านตรวจดูที่รองเท้าว่ามีเศษหิน ทราย หรือ ของมีคม อยู่ที่รองเท้า กี่วัน *
เลือกจำนวนวันที่ท่านได้ตรวจรองเท้าตนเอง ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ตรวจ	○	○	○	○	○	○	○	○	ตรวจทุกวัน

H15 ท่านทำความสะอาดเท้าอย่างทั่วถึงกี่วัน *
เลือกจำนวนวันที่ท่านได้ทำความสะอาดเท้า ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ทำ	○	○	○	○	○	○	○	○	ทำทุกวัน

H16 ท่านเช็ดซอกเท้าให้แห้งหลังทำความสะอาดเท้ากี่วัน *
เลือกจำนวนวันที่ท่านปฏิบัติ ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ทำ	○	○	○	○	○	○	○	○	ทำทุกวัน

H17 ท่านดูแลความสะอาดของผิวหนัง โดยเฉพาะตามซอกอับต่างๆ กี่วัน *
เลือกจำนวนวันที่ท่านปฏิบัติ ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ทำ	○	○	○	○	○	○	○	○	ทำทุกวัน

H18 ท่านกินยาเบาหวานครบทุกมื้อ และตามขนาดที่แพทย์กำหนดให้ กี่วัน *
เลือกจำนวนวันที่ท่านปฏิบัติ ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ทำ	○	○	○	○	○	○	○	○	ทำทุกวัน

H19 ท่านกินยาเบาหวานได้ตรงเวลาครบทุกมื้อ กี่วัน *
เลือกจำนวนวันที่ท่านปฏิบัติ ตั้งแต่ 0 วัน จนถึง 7 วัน

	0	1	2	3	4	5	6	7	
ไม่ได้ทำ	○	○	○	○	○	○	○	○	ทำทุกวัน

Submit

APPENDIX B

DIABETES SELF-EFFICACY (ONLINE) QUESTIONNAIRE

ความมั่นใจในการดูแลตนเอง

ทุกคำตอบของท่านคือแนวทางการสนับสนุนการดูแลตนเอง
* Required

รหัสประจำตัว *
กรอกรหัสเลขประจำตัวของท่าน (ที่แจ้งให้ทาง email) เช่น suwaree611

F1 ท่านมีความมั่นใจในระดับใดว่า ท่านสามารถรับประทานอาหารมื้อเช้าได้ทุกวันและทานมื้อต่อๆไป ทุก 4-5 ชม. *
เลือก ระดับ 1-10 (ระดับความมั่นใจจากน้อยไปมาก)

	1	2	3	4	5	6	7	8	9	10	
มั่นใจน้อยที่สุด	○	○	○	○	○	○	○	○	○	○	มั่นใจมากที่สุด

F2 ท่านมีความมั่นใจในระดับใดว่า ท่านสามารถควบคุมการรับประทานอาหารของท่านได้เมื่อต้องร่วมรับประทานอาหารร่วมกับบุคคลอื่นที่ไม่ได้เป็นโรคเบาหวาน *
เลือก ระดับ 1-10 (ระดับความมั่นใจจากน้อยไปมาก)

	1	2	3	4	5	6	7	8	9	10	
มั่นใจน้อยที่สุด	○	○	○	○	○	○	○	○	○	○	มั่นใจมากที่สุด

F3 ท่านมีความมั่นใจในระดับใดว่า ท่านสามารถเลือกรับประทานอาหารว่างได้อย่างเหมาะสม เมื่อท่านรู้สึกหิว *
เลือก ระดับ 1-10 (ระดับความมั่นใจจากน้อยไปมาก)

	1	2	3	4	5	6	7	8	9	10	
มั่นใจน้อยที่สุด	○	○	○	○	○	○	○	○	○	○	มั่นใจมากที่สุด

F4 ท่านมีความมั่นใจในระดับใดว่า ท่านสามารถออกกำลังกายได้อย่างน้อยวันละ 30 นาที เป็นเวลา 5 วันต่อสัปดาห์ อย่างสม่ำเสมอ *

เลือก ระดับ 1-10 (ระดับความมั่นใจจากน้อยไปมาก)

	1	2	3	4	5	6	7	8	9	10	
มั่นใจน้อยที่สุด	○	○	○	○	○	○	○	○	○	○	มั่นใจมากที่สุด

F5 ท่านมีความมั่นใจในระดับใดว่า ท่านสามารถป้องกันระดับน้ำตาลในเลือดต่ำ ขณะออกกำลังกายได้ *

เลือก ระดับ 1-10 (ระดับความมั่นใจจากน้อยไปมาก)

	1	2	3	4	5	6	7	8	9	10	
มั่นใจน้อยที่สุด	○	○	○	○	○	○	○	○	○	○	มั่นใจมากที่สุด

F6 ท่านมีความมั่นใจในระดับใดว่า ท่านสามารถดูแลตนเองได้เมื่อเกิดอาการน้ำตาลในเลือดสูงหรือต่ำ *

เลือก ระดับ 1-10 (ระดับความมั่นใจจากน้อยไปมาก)

	1	2	3	4	5	6	7	8	9	10	
มั่นใจน้อยที่สุด	○	○	○	○	○	○	○	○	○	○	มั่นใจมากที่สุด

F7 ท่านมีความมั่นใจในระดับใดว่า ท่านสามารถตัดสินใจได้ว่าเมื่อเจ็บป่วยระดับใดจึงควรไปพบแพทย์ *

เลือก ระดับ 1-10 (ระดับความมั่นใจจากน้อยไปมาก)

	1	2	3	4	5	6	7	8	9	10	
มั่นใจน้อยที่สุด	○	○	○	○	○	○	○	○	○	○	มั่นใจมากที่สุด

F8 ท่านมีความมั่นใจในระดับใดว่า ท่านสามารถไปพบแพทย์ตามนัดได้อย่างสม่ำเสมอ *

เลือก ระดับ 1-10 (ระดับความมั่นใจจากน้อยไปมาก)

	1	2	3	4	5	6	7	8	9	10	
มั่นใจน้อยที่สุด	○	○	○	○	○	○	○	○	○	○	มั่นใจมากที่สุด

F9 ท่านมีความมั่นใจในระดับใดว่า ท่านสามารถที่จะใช้ยาตามที่แพทย์สั่งได้อย่างสม่ำเสมอ *
เลือก ระดับ 1-10 (ระดับความมั่นใจจากน้อยไปมาก)

	1	2	3	4	5	6	7	8	9	10	
มั่นใจน้อยที่สุด	○	○	○	○	○	○	○	○	○	○	มั่นใจมากที่สุด

F10 ท่านมีความมั่นใจในระดับใดว่า ท่านสามารถดูแลสุขภาพเท้าได้อย่างสม่ำเสมอ *
เลือก ระดับ 1-10 (ระดับความมั่นใจจากน้อยไปมาก)

	1	2	3	4	5	6	7	8	9	10	
มั่นใจน้อยที่สุด	○	○	○	○	○	○	○	○	○	○	มั่นใจมากที่สุด

F11 ท่านมีความมั่นใจในระดับใดว่า ท่านสามารถควบคุมอาการของโรคเบาหวานได้โดยไม่รบกวนการทำกิจกรรม *
เลือก ระดับ 1-10 (ระดับความมั่นใจจากน้อยไปมาก)

	1	2	3	4	5	6	7	8	9	10	
มั่นใจน้อยที่สุด	○	○	○	○	○	○	○	○	○	○	มั่นใจมากที่สุด

F12 ในภาพรวม ท่านมีความมั่นใจในประสิทธิภาพการดูแลเบาหวานด้วยตนเอง ในระดับใด *
เลือก ระดับ 1-10 (ระดับความมั่นใจจากน้อยไปมาก)

	1	2	3	4	5	6	7	8	9	10	
มั่นใจน้อยที่สุด	○	○	○	○	○	○	○	○	○	○	มั่นใจมากที่สุด

Submit

APPENDIX C

DIABETES QUALITY OF LIFE (ONLINE) QUESTIONNAIRE

ประเมินคุณภาพชีวิต

คุณภาพชีวิต
ทุกคำตอบของท่านคือแนวทางการสนับสนุนการดูแลตนเอง
* Required

รหัสประจำตัว *
กรอกรหัสประจำตัวของท่าน(ที่แจ้งให้แล้วทาง email) เช่น suwaree611

E1 ท่านพอใจแค่ไหนกับผลการรักษาโรคเบาหวานของท่านในปัจจุบัน *
เลือกระดับความพอใจที่ตรงกับท่าน
1. ไม่พอใจมาก

E2 ท่านพอใจแค่ไหนกับเวลาที่เสียไปในการจัดการโรคเบาหวานของท่าน *
เลือกที่ตรงกับท่าน
1. ไม่พอใจมาก

E3 บ่อยครั้งแค่ไหนที่ท่านพบว่า รับประทานอาหารโดยไม่บอกผู้อื่นว่า เป็นโรคเบาหวาน *
เลือกข้อความที่ตรงกับท่าน
1. ตลอดเวลา

E4 บ่อยครั้งแค่ไหนที่ท่านกังวลว่า จะไม่สามารถทำงานได้ตามปกติหรือต้องขาดงาน *
เลือกข้อความที่ตรงกับท่าน
1. ตลอดเวลา

E5 ท่านพอใจแค่ไหนกับเวลาที่เสียไปในการเข้ารับการตรวจวัดระดับน้ำตาลในเลือดในโรงพยาบาลหรือสถานพยาบาล *
เลือกข้อความที่ตรงกับท่าน
1. ไม่พอใจมาก

E6 ท่านพอใจแค่ไหนกับเวลาที่ได้ใช้ไปเพื่อการออกกำลังกาย *
เลือกข้อความที่ตรงกับท่าน
1. ไม่พอใจมาก

E7 บ่อยครั้งแค่ไหนที่ท่านมีอาการเจ็บปวดจากการรักษาโรคเบาหวาน *
เลือกข้อความที่ตรงกับท่าน
1. ตลอดเวลา

E8 บ่อยครั้งแค่ไหนที่ท่านต้องกังวลว่า จะเกิดอาการหมดสติหรือหน้ามืดจากโรคเบาหวาน *
เลือกข้อความที่ตรงกับท่าน
1. ตลอดเวลา

E9 ท่านพอใจแค่ไหนกับเวลาที่ใช้เพื่อเข้าตรวจโรคเบาหวานของท่าน *
เลือกข้อความที่ตรงกับท่าน
1. ไม่พอใจมาก

E10 ท่านพอใจแค่ไหนกับความรู้ของท่านเกี่ยวกับการดูแลสุขภาพในเรื่องโรคเบาหวาน *
เลือกข้อความที่ตรงกับท่าน
1. ไม่พอใจมาก

E11 บ่อยครั้งแค่ไหนที่ท่านประสบปัญหาเรื่องการนอนหลับเนื่องจากเป็นโรคเบาหวาน *
เลือกข้อความที่ตรงกับท่าน
1. ตลอดเวลา

E12 ท่านพอใจแค่ไหนเกี่ยวกับกิจกรรมทางเพศของท่านในปัจจุบัน *
เลือกข้อความที่ตรงกับท่าน
1.ไม่พอใจมาก

E13 บ่อยครั้งแค่ไหนที่ท่านรู้สึกว่าโรคเบาหวานที่เป็น มีผลทำให้ทำงานได้ไม่เต็มที่ *
เลือกข้อความที่ตรงกับท่าน
1. ตลอดเวลา

E14 ท่านพอใจแค่ไหนกับภาวะของโรคเบาหวานของท่านที่ส่งผลต่อครอบครัว *
เลือกข้อความที่ตรงกับท่าน
1. ไม่พอใจมาก

APPENDIX D

QUALITATIVE QUESTIONNAIRE AND DATA

a) Guideline for Individual interview and focus group
Do you change your diabetic self-care behaviors below? And How to?

Self-care behaviors	Before entry	After entry
Food/Nutrition		
Exercise		
Emotion		
General health care or other		

b) Qualitative outcome of self-management behaviors in both groups (from individual interview and focus group)

Categories of behaviors	Intervention group	Control group
Food	*"Earlier, I did not control eating; however, I am now stricter and I record food intake too";* male, aged 58, *"I always ate high carbohydrate and I liked sweet desserts. Now I eat less, just to get by;* male, aged 61. *I eat less forbidden food than before*" ; male, aged 52 *"I am more aware of food consumption than before*"; male, aged 64. *"After I participated in this project my bodyweight has gone down by 3 kilograms although I have not done any exercise*"; female, aged 52.	*"Nothing has changed"*; female, aged 46. *"I am more selective about the type of food I eat and almost stop eating sweet desserts"* ; male, aged 60. *"There were many conferences and I was stressed. So, I ate more sweet desserts*"; male, aged 44. *"I select food with low sugar/carbohydrate";* male, aged 39. *"I pay attention to the amount of food and use food substitutes"*; female, aged 41. *.I try to exercise*"; female, aged 41.

b) Qualitative outcome of self-management behaviors in both groups (from individual interview and focus group) (cont.)

Categories of behaviors	Intervention group	Control group
Food	*"Prior to entry I knew nothing about nutrition. Presently, I control food consumption";* male, aged 66. *"Now, I get used to reading nutrition labels when buying food products*"; male, aged 55.	
Exercise	*"I exercise 3 times per week; I do not sit still for long periods;"* male, aged 61. *Now, I do the activities that are really good for health"* ; female, aged 31. *"I have set a goal to walk at least 10,000 steps per day in order to decrease my HbA1c to lower than 7%"*; male, aged 55. *"Presently, I control food consumption and think about exercise method";* male, aged 66. *"Most evenings I walk home, I do not drive my car. I am healthier";* female, aged 56. *" On working day, I walk instead of driving to take my child to school"* ; male, aged 50. *"At work, I walk up stairs instead of an elevator and I change from sitting to eat at work to walking outside for lunch"*; male, aged 34.	*"I could not find free time to exercise"*; male, aged 44. *"I tried to exercise every month but I had to stop due to muscle pain. So, I cannot do it every day*"; male, aged 33. *. I try to exercise*"; female, aged 41. *"I select suitable exercise";* male, aged 39. *" I try to walk more—I walk in the park occasionally";* male, aged 56. *"I have increased the frequency of exercise to 5 days per week, sometimes twice a day*"; male, aged 60.

b) Qualitative outcome of self-management behaviors in both groups (from individual interview and focus group) (cont.)

Categories of behaviors	Intervention group	Control group
Emotion	*none*	*"Although I can diet, I cannot control stress"* ; male, aged 44.
General health care	*"I have goal setting to self-care";* male, aged 44. *"Previously, I did not eat every meal because I misunderstood that would help decrease my blood sugar. Presently, I have improved my eating; I eat proper food at proper time*"; male, aged 45. *"Now, I get used to reading nutrition labels when buying food products and I have set a goal to walk at least 10,000 steps per day in order to decrease my HbA1c to lower than 7%"*; male, aged 55. *"My morbidity is warned by the internet surveillance; food plan is very good";* male, aged 49. *" I also be more conscious about skin care";* male, aged 66. *"After I participated in this project my bodyweight has gone down by 3 kilograms although I have not done any exercise*"; female, aged 52.	*"Sometimes I am concerned about my blood sugar";* male, aged 56. *" A prior admission I did not take diabetic medications regularly, I am afraid of its effect to kidneys"* male, 53.

c) Feedback IMM system

a. *"It is difficult to record nutrition intake data into the program since I always forget to do so and it is hard to count food calories*"; female, aged 38.

b. *"The data on the website is beneficial for health; however, new or update information should be labeled and made it accessible by simply clicking on it.*;" male, aged 62.

c. *"This project is very beneficial to me but the computer system is less than complete*"; male, aged 50.

d. *"I often cannot log into the website. So, my walking data is not recorded, I feel very bored*"; female, aged 54.

e. *"When I inputted my food intake on the program, it immediately showed 'error' and also my old information is lost. I wonder why*"; male, aged 60.

APPENDIX E

ETHIC APPROVAL

COA No. 130/2010
IRB No. 032/53

INSTITUTIONAL REVIEW BOARD
Faculty of Medicine, Chulalongkorn University

1873 Rama 4 Road, Patumwan, Bangkok 10330, Thailand, Tel 662-256-4455 ext 14, 15

Certificate of Approval

The Institutional Review Board of the Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand, has approved the following study which is to be carried out in compliance with the International guidelines for human research protection as Declaration of Helsinki, The Belmont Report, CIOMS Guideline and International Conference on Harmonization in Good Clinical Practice (ICH-GCP)

Study Title : Development and Implementation of an Interactive Multi-modality (IMM) for Self-management Support among Patients with type 2 diabetes in Bangkok, Thailand

Study Code : -

Study Center : Department of Preventive and Social Medinine, Faculty of Medicine, Chulalongkorn University

Principal Investigator : Asst. Prof. Wiroj Jiamjarasrangsi, MD., PhD

Document Reviewed :

1. Protocol Version 2.0 Dated 15 Fab 2010
2. Protocol synopsis Version 2.0 Dated 15 Fab 2010
3. Information sheet for research Participant Version 2.0 Dated 8 Oct 2009
4. Consent Form Version 2.0 Dated 8 Oct 2009
5. Case Record Form Version 2.0 Dated 15 Fab 2010

Signature: .....
(Professor Tada Sueblinvong MD)
Chairperson of
The Institutional Review Board

Signature: .....
(Assistant Professor Apichai Vasuratna MD)
Committee and Assistant Secretary, Acting
Secretary of The Institutional Review Board

Date of Approval : March 11, 2010

Approval Expire Date : March 10, 2011

Approval is granted subject to the following conditions: (see back of this Certificate)

APPENDIX F

EXAMPLES OF ADVERTISEMENT IN THE MEDIA

The Nation

The Nation
Circulation: 68,200

Section: First Section/NATIONAL AFFAIRS
Date: Wednesday 1 September 2010
Volume: 35 **No:** 52707 **Page(s):** 15A (Top Left)
Col.Inch: 25 **Ad Value:** 37,500 **PRValue (x3):** 112,500 **Clip:** Full Color
Column: AROUND THE COUNTRY: Self-care system for diabetes

AROUND THE COUNTRY

Self-care system for diabetes

Diabetes patients in Thailand will soon be able to take care of themselves effectively thanks to a high-tech interactive multi-modality system.

In a move to cope with a shortage of physicians, researchers at the National Electronics and Computer Technology Centre (Nectec) have integrated different communication channels to educate patients on self-care and help make diagnosis and follow up treatment quicker and easier for doctors, Nectec chief Pansak Siriruchatapong said.

Dr Wiroj Jiamjarasrangsi, assistant dean of Medicine at Chulalongkorn University, said the technology would be available for diabetes patients treated at Chulalongkorn Hospital this month.

Pansak said the system would be available via the Internet, e-mail, CDs or online chats, and patients would be given pointers on their eating habits and exercise.

"After patients answer health questions, physicians will immediately analyse their condition and contact them if there are any complications, such as wounds on the patient's feet."

He said the technology would be linked to the hospital's database making analysis of patient's conditions quicker. The system could also be applied to patients suffering other chronic diseases such as hypertension, pulmonary emphysema and asthma.

ไทยโพสต์
Thai Post
Circulation: 450,000
Section: First Section/การศึกษา-สาธารณสุข
วันที่: พุธ 1 กันยายน 2553
ปีที่: 14 ฉบับที่: 5052 หน้า: 8 (บน)
Col.Inch: 47.50 Ad Value: 38,000 PRValue (x3): 114,000 คลิป: ขาว-ดำ
หัวข้อข่าว: จุฬาฯ ใช้เน็ตดูแลผู้ป่วยเบาหวาน

จุฬาฯใช้เน็ตดูแลผู้ป่วยเบาหวาน

รพ.จุฬาฯ ● รพ.จุฬาฯ จับมือเนคเทค เปิดโครงการพัฒนาระบบสื่อสารโต้ตอบอัตโนมัติดูแลผู้ป่วยเบาหวานที่บ้านก่อนมา รพ. รายแรกของไทย แก้ปัญหาขาดแคลนบุคลากร รองรับคนไทยที่เป็นเบาหวานมากขึ้น โดยเฉพาะคนวัยทำงานที่ไม่ออกกำลัง กินอาหารไม่เหมาะสม เตรียมขยายโครงการโรคเรื้อรังอื่นๆ

ศ.นพ.อติศร ภัทราดูลย์ คณบดีคณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย และ ผอ.รพ.จุฬาลงกรณ์ สภากาชาดไทย พร้อมด้วย นายพันธ์ศักดิ์ ศิริรัชตพงษ์ ผอ.ศูนย์เทคโนโลยีอิเล็กทรอนิกส์และคอมพิวเตอร์แห่งชาติ (เนคเทค) ลงนามโครงการความร่วมมือ "แพทย์จุฬาฯ-เนคเทค" เพื่อวิจัยและพัฒนาด้านเทคโนโลยีอิเล็กทรอนิกส์และสารสนเทศทางการแพทย์ เริ่มด้วยโครงการพัฒนาการใช้ระบบสื่อสารโต้ตอบหลายช่องทาง (Interactive Multi-modality : IMM) เพื่อสนับสนุนการดูแลผู้ป่วยโรคเบาหวานโครงการแรกของประเทศไทย โดยมีการนำวิธีการติดต่อสื่อสารต่างๆ ประกอบด้วย โทรศัพท์อัตโนมัติ เสียงสังเคราะห์ (Interactive Voice Response : IVR - Speech Synthesis) อินเทอร์เน็ต จดหมายอิเล็กทรอนิกส์ (E-mail) และซีดีรอม (CD ROM) มาผสมผสานกัน

ผศ.นพ.วิโรจน์ เจียมจรัสรังสี ผู้ช่วยคณบดีฝ่ายสร้างเสริมสุขภาพ คณะแพทยศาสตร์ และผู้ช่วย ผอ.ด้านสร้างเสริมสุขภาพ รพ.หัวหน้าโครงการดังกล่าว กล่าวว่า โรคเบาหวานเป็นโรคเรื้อรังที่ต้องได้รับการดูแลจากบุคลากรทางการแพทย์ รวมทั้งการดูแลตนเองอย่างถูกต้องของผู้ป่วย แต่เนื่องจากวิธีการค่อนข้างซับซ้อน ผู้ป่วยกับแพทย์จำเป็นต้องติดต่อสื่อสารกันมาก แต่มีข้อจำกัดว่าจำนวนบุคลากรทางการแพทย์ในปัจจุบันไม่เพียงพอกับจำนวนผู้ป่วยที่เพิ่มขึ้น ทำให้อัตราเฉลี่ยที่ผู้ป่วยเบาหวานจะได้พบกับบุคลากรทางการแพทย์ 365 วันไม่เกิน 24 ชั่วโมง อีกทั้งผู้ป่วยเบาหวานปัจจุบันส่วนใหญ่เป็นผู้สูงอายุที่อาจไม่สะดวกในการมา รพ. บ่อยครั้ง รวมทั้งผู้ป่วยในกลุ่มคนวัยทำงานที่มีจำนวนเพิ่มมากขึ้น เนื่องจากภาวะปัจจุบันที่คนขาดการออกกำลังกายและรับประทานอาหารที่อุดมสมบูรณ์มากขึ้น ทำให้ป่วยเป็นโรคเบาหวานเพิ่มขึ้น

ผศ.นพ.วิโรจน์กล่าวต่อว่า โครงการสนับสนุนการดูแลผู้ป่วยโรคเบาหวานมีโครงการย่อย 2 โครงการ คือ 1.ระบบส่งเสริมการจัดการดูแลตนเองทางโทรศัพท์ โดยระบบโทรศัพท์จะบริการผู้ป่วยโรคเบาหวานที่ยังไม่ถึงเวลานัดพบแพทย์ โดยผู้ป่วยสามารถลงทะเบียนขอใช้บริการแบบสมัครใจ แจ้งเวลาที่สะดวกรับสายให้โทรศัพท์อัตโนมัติโทร.ไปหา เมื่อโทรศัพท์อัตโนมัติติดต่อผู้ป่วยจะสอบถามข้อมูล ติดตามอาการเจ็บป่วย พร้อมให้คำแนะนำเบื้องต้นกับผู้ป่วยแต่ละราย จากนั้นจะส่งข้อมูลที่ได้รับจากผู้ป่วยมาที่ส่วนเก็บข้อมูลเพื่อให้บุคลากรทางการแพทย์และพยาบาลประมวลผลว่าจะต้องโทรศัพท์ติดตามเพิ่มเติมหรือไม่ ซึ่งหากมีข้อบ่งชี้บอกถึงภาวะแทรกซ้อนร้ายแรงของโรคหรือภาวะฉุกเฉิน เจ้าหน้าที่จะติดต่อโทรศัพท์กลับไปเพื่อให้การดูแลเป็นกรณีไป ซึ่งวิธีการดังกล่าวเหมาะสมกับผู้ป่วยซึ่งเป็นผู้สูงอายุ 2.ระบบส่งเสริมการจัดการดูแลตนเองทางคอมพิวเตอร์และอินเทอร์เน็ต ผู้ป่วยสามารถเข้าลงทะเบียนขอใช้บริการจากเว็บไซต์ เพื่อวางแผนการดูแลสุขภาพ โดยระบบจะเตือนหรือให้คำแนะนำอัตโนมัติกับผู้ป่วยแต่ละรายเช่นกัน เช่น เตือนการออกกำลังกาย บอกปริมาณแคลอรีในอาหาร กรณีผู้ป่วยต้องควบคุมแป้ง เชื่อว่าระบบอินเทอร์เน็ตจะเหมาะกับผู้ป่วยวัยทำงานที่มีการใช้อินเทอร์เน็ตเป็นประจำทุกวัน

"เมื่อทดสอบระบบจนมีความมั่นใจก็จะเริ่มให้บริการผู้ป่วยเบาหวานของ รพ.จุฬาฯ ซึ่งปัจจุบันมีกว่า 4,000 รายก่อนภายใน 1-2 เดือนข้างหน้า ซึ่งหากได้ผลดีก็จะขยายไปสู่ผู้ป่วยเบาหวานในเขต กทม. เนื่องจากได้รับงบประมาณสนับสนุนส่วนหนึ่งจากสำนักงานหลักประกันสุขภาพแห่งชาติ (สปสช.) เขต กทม. และระบบส่งเสริมการจัดการดูแลตนเองสามารถประยุกต์ใช้กับโรคเรื้อรังอื่นๆ ได้ต่อไป อาทิ โรคความดันโลหิตสูง โรคปอด โรคถุงลมโป่งพอง" ผู้ช่วย ผอ.ด้านสร้างเสริมสุขภาพ รพ.จุฬาฯ กล่าวและว่า ยอมรับว่าต้องมีการติดตามตรวจสอบการให้ข้อมูลที่ถูกต้องจากคนไข้เพื่อการวินิจฉัยโรคไม่ผิดพลาด ซึ่งอาจต้องให้ญาติคนไข้ช่วยให้ข้อมูลเพื่อป้องกันการปกปิดข้อมูลที่แท้จริง.

ไทยรัฐ
Thai Rath
Circulation: 1,000,000
Section: First Section/การศึกษา-ศาสนา-สาธารณสุข
วันที่: เสาร์ 4 กันยายน 2553
ปีที่: 61 ฉบับที่: 19219 หน้า: 12 (บนขวา)
Col.Inch: 10.50 Ad Value: 15,750 PRValue (x3): 47,250 คลิป: ขาว-ดำ
หัวข้อข่าว: จุฬาฯนำไฮเทคสื่อสารกับผู้ป่วย

จุฬาฯนำไฮเทคสื่อสารกับผู้ป่วย

ศ.นพ.อดิสร กัทราดูลย์ คณบดีคณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย และผอ.รพ.จุฬาลงกรณ์สภากาชาดไทย เปิดเผยว่า คณะแพทย์จุฬาฯ ร่วมกับศูนย์เทคโนโลยีอิเล็กทรอนิกส์และคอมพิวเตอร์แห่งชาติ (เนคเทค) จัดทำโครงการความร่วมมือ "แพทย์จุฬาฯ-เนคเทค" เพื่อวิจัยและพัฒนาเทคโนโลยีอิเล็กทรอนิกส์และสารสนเทศทางการแพทย์ โดยเริ่มด้วยโครงการพัฒนา "การใช้ระบบการสื่อสารโต้ตอบแบบหลายช่องทาง" เพื่อสนับสนุนการดูแลตนเองของผู้ป่วยที่บ้าน โดยนำจุดแข็งของวิธีการติดต่อสื่อสารต่างๆ เช่น โทรศัพท์อัตโนมัติ-เสียงสังเคราะห์, อินเตอร์เน็ต, จดหมายอิเล็กทรอนิกส์ และซีดีรอม มาผสมผสาน เพื่อสนับสนุนการดูแลตนเองของผู้ป่วยเบาหวาน ลดข้อจำกัดในการติดต่อสื่อสารกับผู้ป่วย อันเนื่องมาจากจำนวนแพทย์และพยาบาลไม่สมดุลกับจำนวนผู้ป่วยที่มารับบริการที่โรงพยาบาล และลดการสูญเสียเวลาและงบประมาณที่ต้องใช้ในการเดินทางมาโรงพยาบาล ซึ่งนับเป็นโครงการแรกที่ดำเนินการในประเทศไทย.

เดลินิวส์
Daily News
Circulation: 850,000

Section: First Section/ภาพ-ข่าวสังคม
วันที่: พฤหัสบดี 2 กันยายน 2553
ปีที่: -- ฉบับที่: 22239 หน้า: 5 (ขวา)
Col.Inch: 16 Ad Value: 33,600 PRValue (x3): 100,800 คลิป: สี่สี
ภาพข่าว: ตรีศูล: ลงนาม

ตรีศูล

trisoon@dailynews.co.th

ลงนาม **ศ.นพ.อดิศร ภัทราดูลย์** คณบดีคณะแพทยศาสตร์ จุฬาฯ และ **ดร.พันธ์ศักดิ์ ศิริรัชตพงษ์** ผู้อำนวยการเนคเทค ร่วมลงนามบันทึกข้อตกลงความร่วมมือการพัฒนาด้านเทคโนโลยีอิเล็กทรอนิกส์และสารสนเทศทางการแพทย์ ที่โรงพยาบาลจุฬาลงกรณ์

กรุงเทพธุรกิจ
Krungthep Turakij
Circulation: 145,530

Section: จุดประกาย/โซไซตี้
วันที่: พุธ 8 กันยายน 2553
ปีที่: 23 ฉบับที่: 8021 หน้า: 2 (กลาง)
Col.Inch: 9 Ad Value: 13,500 PRValue (x3): 40,500 คลิป: สี่สี
ภาพข่าว: ถนนรอบเมือง: ศ.นพ.อดิศร ภัทราดูลย์

ถนน ปิดมยาม รอบเมือง

ศ.นพ.อดิศร ภัทราดูลย์ คณบดีคณะแพทย์ศาสตร์ จุฬาลงกรณ์-มหาวิทยาลัย และดร.พันธ์ศักดิ์ ศิริรัชตพงษ์ ผู้อำนวยการศูนย์เทคโนโลยีอิเล็กทรอนิกส์และคอมพิวเตอร์แห่งชาติ ร่วมกันเป็นประธานในการลงนามบันทึกข้อตกลงโครงการร่วมมือ "แพทย์จุฬาฯ-เนคเทค" เพื่อวิจัยและพัฒนาด้านเทคโนโลยีอิเล็กทรอนิกส์และสารสนเทศทางการแพทย์

APPENDIX G
AN EXAMPLE OF OFFICIAL LETTER

ที่ จพ.ล.4834 /2554

สภากาชาดไทย
The Thai Red Cross Society

โรงพยาบาลจุฬาลงกรณ์ สภากาชาดไทย
ถ.พระราม 4 ปทุมวัน กทม. 10330

21 ตุลาคม 2554

เรื่อง ขอความอนุเคราะห์ประชาสัมพันธ์โครงการวิจัย "เบาหวานแข็งแรง"

เรียน

สิ่งที่ส่งมาด้วย

1. แผ่นประชาสัมพันธ์โครงการวิจัย "เบาหวานแข็งแรง" ขนาด A3 จำนวน แผ่น

ด้วยศูนย์สร้างเสริมสุขภาพ โรงพยาบาลจุฬาลงกรณ์ สภากาชาดไทย และสำนักงานหลักประกันสุขภาพแห่งชาติ (สปสช.)เขต 13 กรุงเทพมหานคร ได้ดำเนินโครงการ "การศึกษาวิจัยเรื่องการพัฒนารูปแบบการส่งเสริมศักยภาพการจัดการดูแลตนเองของผู้ป่วยและกลุ่มเสี่ยงต่อโรคไม่ติดต่อเรื้อรังในพื้นที่กรุงเทพมหานคร (โครงการเบาหวานแข็งแรง)" โดยใช้ระบบอินเตอร์เน็ตในการให้ความรู้ในการดูแลตนเองของผู้ป่วยและติดตามอาการผู้ป่วยเพื่อนำไปสู่การดูแลรักษาที่มีคุณภาพและลดสภาวะการแทรกซ้อน

ในการนี้ โครงการวิจัยฯ จึงขอความอนุเคราะห์จากท่านโปรดช่วยประชาสัมพันธ์โครงการเพื่อเผยแพร่ประชาสัมพันธ์ให้แก่ผู้ป่วยโรคเบาหวานในการเข้าร่วมโครงการดังกล่าวต่อไปด้วย

จึงเรียนมาเพื่อโปรดพิจารณาให้ความอนุเคราะห์ด้วย จักเป็นพระคุณยิ่ง

ขอแสดงความนับถือ

(รองศาสตราจารย์นายแพทย์โศภณ นภาธร)
ผู้อำนวยการโรงพยาบาลจุฬาลงกรณ์

ผู้ประสานงาน นางสาวจริญเนตร ยอดคีรี
ศูนย์สร้างเสริมสุขภาพ โรงพยาบาลจุฬาลงกรณ์ โทร 02-256-4000 ต่อ 3540

APPENDIX H

EXAMPLES OF POSTER AND BROCHURE ON THE PROJECT


ท่านจะได้รับ
ความรู้เกี่ยวกับโรคเบาหวานและการดูแลรักษา
ความรู้ด้านโภชนาการสำหรับผู้ป่วยเบาหวาน
หลักการออกกำลังกายสำหรับผู้ป่วยเบาหวาน
ผู้ป่วยสามารถวางแผนการรักษาและการดูแลตนเอง
ผู้ป่วยสามารถขอรับคำปรึกษาปัญหาด้านสุขภาพกับแพทย์ผู้เชี่ยวชาญด้านเบาหวาน
เพียงท่านมีคุณสมบัติ++
เป็นผู้ได้รับวินิจฉัยว่า เป็นเบาหวานชนิดที่ 2
มีค่าน้ำตาลสะสม (HbA1c) มากกว่า 7% หรือค่าน้ำตาลในเลือดหลังอดอาหารมากกว่า 126 มก.%
มีความสามารถใช้คอมพิวเตอร์และอินเตอร์เน็ต
อาศัยอยู่ในกรุงเทพมหานคร
อย่ารอช้า !!
ผู้เข้าร่วมโครงการทุกท่านจะได้รับ
กล่องยาตั้งเวลาและเครื่องนับก้าวเดิน
สนใจติดต่อ
ศูนย์สร้างเสริมสุขภาพฯ
ตึก อปร. ชั้น 6 ห้อง 605/2
Tel. 02 256 4000 ต่อ 3540
www.chula-hp.org/web
แข็งแรง
เบาหวาน
โอกาสทอง!!!มาถึงท่านแล้ว
ขอเชิญชวนผู้ที่เป็นเบาหวาน ชนิดที่ 2
เข้าร่วมโครงการ
การส่งเสริมการดูแลตนเอง
"ผ่านระบบอินเตอร์เน็ต"
สนับสนุนโดย
ศูนย์สร้างเสริมสุขภาพ
โรงพยาบาลจุฬาลงกรณ์ สภากาชาดไทย
คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
ร่วมกับ
สำนักงานหลักประกันสุขภาพแห่งชาติ
กรุงเทพมหานคร (สปสช.)
สปสช
เบาหวานเป็นโรคที่ยังไม่สามารถรักษาให้หายขาดได้ในปัจจุบัน แม้เทคโนโลยีเจริญขึ้นเรื่อยๆ จนมียาที่ใช้ในการช่วยควบคุมระดับน้ำตาลในเลือดใหม่ๆอย่างไรก็ตามการรักษาโรคเบาหวานยังจำเป็นต้องควบคู่ ไปกับการคุมอาหารและการออกกำลังกาย เนื่องจากภาวะแทรกซ้อนที่มากับเบาหวาน แม้เบาหวานจะควบคุมได้ แต่สถิติเบาหวานก็มิได้ลดลง แต่กลับสูงขึ้นเรื่อยๆ จนเปรียบเสมือนเป็นโรคระบาดในยุคนี้
ศูนย์สร้างเสริมสุขภาพ โรงพยาบาลจุฬาลงกรณ์ เล็งเห็นความสำคัญ จึงได้จัดทำ
"โครงการเบาหวานแข็งแรง"
การส่งเสริมการดูแลตนเองสำหรับผู้เป็นเบาหวาน
โดยระบบคอมพิวเตอร์และอินเตอร์เน็ต
เพื่อส่งเสริมศักยภาพการจัดการดูแลตนเองของผู้ป่วยเบาหวาน
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APPENDIX I

THE PANEL OF EXPERTS

Name	Position
1. Assoc. Prof. Dr. Wiroj Jiamjarasrangsi	Medical doctor and Advisor
2. Asst. Prof. Dr. Arunya Tuicomepee	Psychologist and Co-advisor
3. Dr. Marut Buranarach	Expert in Computer Technology
4. Assoc. Prof. Dr.Vivat Chavananikul	The DM patient and Expert in Computer science
5. Ms. Yupa tasakul	The DM patient
6. Asst. Prof. Varee Tanthulakorn	Expert in language and communication
7. Dr. Artitaya Lophatananon	Nutritionist
8. Ms. Monthalee Nooseisai	Expert in Communication of Art
9. Mr. Hirun Dhitipanitchayakul	The DM patient and Expert in Computer system
10.Ms. Nilubon Wangsirikul	Programmer and Computer science

BIOGRAPHY

Name	Mrs. Suwaree Wongrochananan
Date of birth	13th June 1962
Place of birth	Kamphaengphet, Thailand
Instruction attended	Mahidol University (1988-1990)
	Master of Science (Epidemiology)
	Buddhachinaraj Nursing College (1980-1984)
	Diploma in Nursing Science
	Sukhothai Thammathirat Open University (1998)
	Bachelor of Public Health (Public Health Administration)