Application of Concept Mapping to Diabetes Primary Care Planning

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ABSTRACT

The concept mapping has been used in various health issues. However, there was still no application to planning of diabetes care model in primary care setting. The aim of this study was to generate and prioritize diabetes care activities which were continuous, integrated, holistic and involved community participation. The five steps were performed by all stakeholders including health care provider, policy maker, diabetes patient, care giver, health care volunteer and community representative. Firstly, the focus statement was identified as "Identify diabetes care activities which were continuous, integrated, holistic and involved community participation". Secondly, five-point Likert's scale was used for rating each activity relative to others in terms of importance and feasibility of each activity. Thirdly, all stakeholders generated, grouped, labeled and prioritized the activities to be the data input. Fourthly, the data were analyzed by multidimensional scaling and hierarchical cluster analysis. Finally, all activities were presented as concept maps. The fifty-four diabetes care activities were generated and grouped into five concepts. They were as follows: 1) providing comprehensive diabetic knowledge; 2) promoting health behavior; 3) setting diabetes management; 4) setting up diabetes care training volunteer (DCTV) and 5) classifying diabetes patient by disease severity, which had average importance values of 4.03, 3.76, 3.73, 3.71 and 3.48, respectively. These activities were prioritized as of relative importance and feasibility with limited barriers in decision- making process. The concept mapping technique was more advantageous in showing the ideas in pictorial form by reliable statistic, however, it could not stimulate creative thinking of stakeholders.

Key words: Concept mapping, Diabetes care planning, Primary care

INTRODUCTION

Diabetes mellitus (DM) is a major chronic disease with a prevalence that is rapidly growing worldwide especially in developing countries (King et al., 1998;

Aekplakorn et al., 2003; Wild et al., 2004). World Health Organization (WHO) estimated that the number of adults with diabetes globally would be doubled by the next twenty years. It was estimated that diabetic patients in 1995 would increase from 135 million to 300 million in 2025 (King et al.,1998). In Thailand, the diabetes prevalence had risen from 2.3% in 1991 to 4.6% in1996 and 6.9% in 2004 (Ekachampaka, 2008).

The effective diabetes care needs a comprehensive management of health care team approach and multifaceted intervention (Sadur et al.,1999; Renders et al., 2001; Majumdar et al.,2003;Maislos and Weisman 2004). To provide active participation of multiple stakeholders in diabetes care processes, an effective tool is required to reduce barriers arising from domination of some participants. The difficulty in performing of multiple stakeholders who have different education backgrounds, public health systems, diabetes knowledges, and diabetes care experiences is another obstacle in brainstorming step. In addition, a study found that organizational interventions that facilitated structured and regular review of patients were effective in improving the process care (Renders et al., 2001). However, the quality of diabetes care was still suboptimal to standard of care, especially in community setting (Grant et al., 2005). Many providers in community health centers indicated that enhancement in patient adherence, better health care delivery systems and reform to improve the affordability, accessibility, and efficiency of care are also likely to meet standard of care (Chin, 2001).

The concept mapping or structured conceptualization is a mixed method that combines group processes with a sequence of multivariate statistical analysis (Trochim and Linton, 1986). It takes the ideas of individuals and combines them in specific way to understand how a group thinks about a specific topic. All ideas are organized by multidimensional scaling and hierarchical statistic and displayed in a series of easily- readable concept map. Equality of power in decision making is applied at all steps of the concept mapping so the domination of participants is limited which is an advantage over other tools. The concept mapping has been used in many health issues such as mental illness, alternative medicine, tobacco control program, etc. However, it has not yet been applied in the planning of diabetes care (Galvin 1979; Trochim and Linton 1986; Trochim 1989; Trochim et al., 1994; Trochim 2003; Baldwin et al., 2004).

Therefore, this study was initiated to serve the equality of stakeholder power in conceptualization of the diabetes care model by the concept mapping. The purpose of the present study was to identify and prioritize diabetes care activities which were continuous, integrated, holistic and involved community participation.

METHODOLOGY

Study settings

Mitraparb Medical Center (MMC) was purposively selected as a primary care unit (PCU) which meets the standard criteria. It is a contracting unit for primary care (CUP) of Khon Kaen Hospital (KKH) and is located in urban area. It has

been set up in 1999 to provide primary care services which are responsible for registered population under the universal coverage policy, covering 11 communities. There were 13,399 registered residents in 2006. It has been managed as the semi-private clinic under the project of "Warm Community Clinic" since 2004. The majority of finance is supported directly from the National Health Security Office (NHSO). Regarding to the annual reports (2003-2005), diabetes mellitus was the first leading chronic disease with numbers of patients increasing about 30% within two years.

Study Sample

Fifteen participants were selected as representatives of each stakeholder by purposive sampling technique. They were a head of community medicine department, seven primary care professionals, four type 2 diabetes patients (2 patients with chronic complications and 2 patients without chronic complications), two community representatives (a head community and a health care volunteer) and a care giver.

Ethic consideration

The study was approved by two ethic committees: Khon Kaen Hospital and Khon Kaen University.

Steps of Concept Mapping Process

Step 1: Define a focus statement

The focus statement was defined by the researcher and then approved by all participants.

Step 2: Define scale and rating scale

In planning process, the participants discussed to rate how important and how feasible of each brainstormed item was.

Step 3: Generate Idea (brainstorming)

The participants were explained strength and weakness of usual diabetes care at MCC as background information. In addition, they were told the concept mapping process and schedule. After that, they were encouraged to generate a set of statements which ideally should represent the entire conceptual domain for the definite focus statement. Rules of brainstorming process were accepted and the facilitator recorded the ideas as they were generated so that all members of the group could see the set of ideas as they evolved without criticism or discussion of other's activity except for the purpose of clarification. Audio tape record and photograph were permitted to all participants.

Step 4: Structuring Idea

A set of all generated ideas were structured separately by each participant. There were four steps involved. First, each generated idea was printed on a separate index cards (5x5 cm). Second, a complete set of index cards was given to each

participant. All participants were instructed to organize the cards into categories by any implicit criterion as they wanted. Third, they wrote a short phrase, called the 'concept label', for each category to describe the characteristic of ideas in each group. Fourth, each idea was rated for its importance and feasibility. The participants were allowed to do the rating at their homes. Each participant finished sorting and rating activity within two weeks.

When each person had completed the sorting task, the results would be combined across people. This was accomplished in two steps. First, the results of the sort for each person were put into a square table or matrix which had fifty-four rows and columns. All of the values of this matrix were either zero or one. A '1' indicated that the activity for that row and column were placed by that person together in a category while a '0' indicated that they were not.

Second, the individually-sorted matrices were added together to obtain a combined group similarity matrix. However, the value in the matrix for any pair of activities indicated how many participants placed that pair of activities together in a pile regardless of what the pile meant to each person or what other statements were or were not in that pile. Values along the diagonal were equal to the number of people who sorted. Thus, in this square group similarity matrix, values could range from zero to the number of people who sorted.

This final similarity matrix was considered to be the relational structure of the conceptual domain because it provided information about how the participants grouped the statements. A high value in this matrix indicated that many of the participants put that pair of activities together in a pile and implied that the activities were conceptually similar in some way. A low value indicated that the activity pair was seldom put together in the same pile and implied that they were conceptually more distinct.

For each statement, one then obtained at least the arithmetic mean of the ratings and sometimes other descriptive statistical information.

Step 5: Representation Idea

Sorting data were analyzed by hierarchical cluster analysis, while rating data were analyzed by multidimensional scaling.

RESULTS

Step 1: Define a focus statement:

The focus statement was defined as ***"Identifying diabetes care activities which are continuous, integrated, holistic and involved community participation".***

Step 2: Define scale and rating scale:

Five-point Likert's scale was selected for rating each activity relative to other activities in terms of the importance and feasibility of each activity, where 1= relatively unimportant or the least feasible, 2= somewhat important or may be feasible, 3= moderately important or feasible, 4= very important or more feasible

and 5 = extremely important or the most feasible.

Step 3: Idea generation (brainstorming)

Fifty-four activities to be the diabetes care model were characterized as continuous, integrated, holistic and involved community participation (Appendix I).

Steps 4&5: Structuring and representation of idea in concept maps

• The point rating map

The point rating map shows average rating scores across persons for each item. In this study, each activity was rated by its importance and feasibility. The points of importance and feasibility rating map are displayed in Figure 1 and Figure 2, respectively. The number of layer indicated the average importance and feasibility scores. The average data were represented by the layers shown in the upper left corner of each figure. The two maps were represented by the two rating scales in the interpretation form.

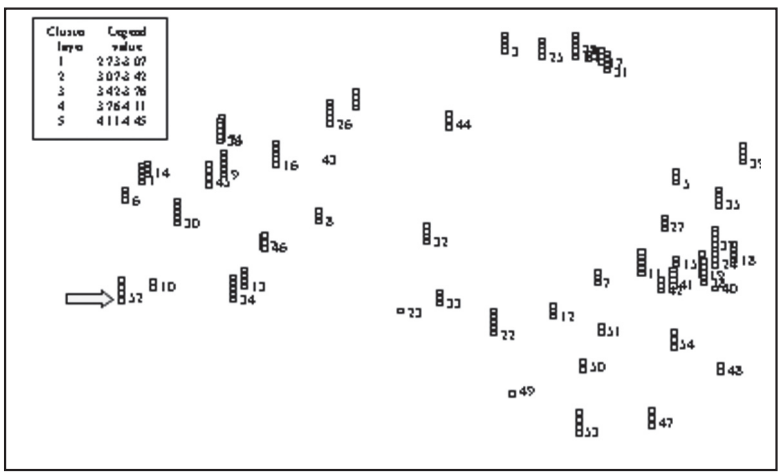

Figure 1: The point of importance rating map.

Note: A multiple layer point means average importance value according to legend value (upper left corner). For example: average importance value of activity number 52 (four layers) was between 3.76 and 4.11.

• The cluster rating map

When the stakeholders considered point rating maps, they grouped 54-diabetes activities into 5 concepts. They were *"providing comprehensive diabetic knowledge"*; *"promoting health behavior"*; *"setting diabetes management"*; *"setting up diabetes care training volunteer (DCTV)"*; and *"classifying diabetes patient by disease severity"*, which had average importance scores of 4.03, 3.76, 3.73, 3.71 and 3.48, respectively (Figure 3).

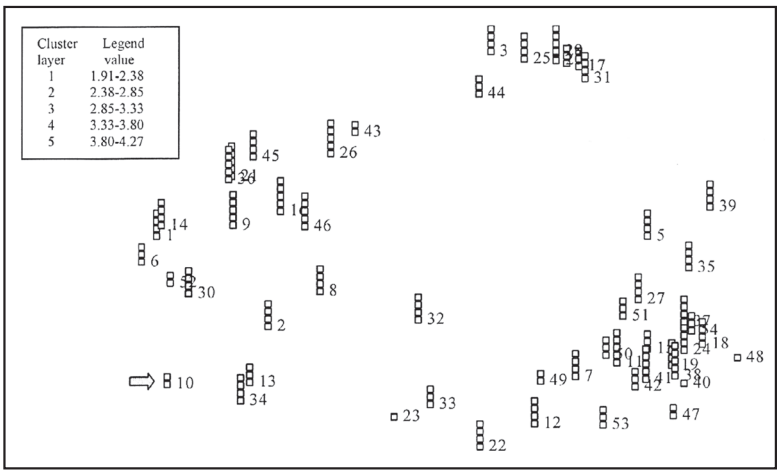

Figure 2: The point of feasibility rating map The point of feasibility rating map.

Note: The multiple layer point means average feasibility value according to legend value (upper left corner). For example: average feasibility value of activity number 10 (two layers) was between 2.38 and 2.85.

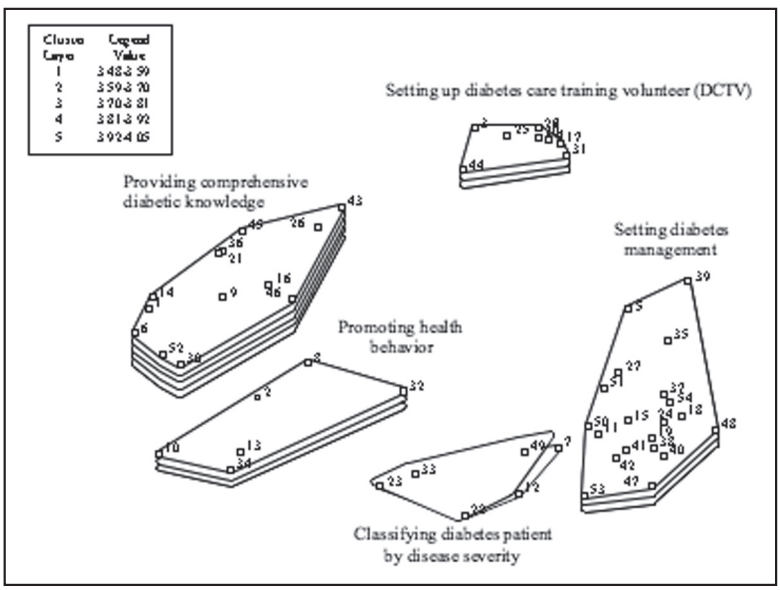

Figure 3: The cluster importance rating map.

Considering feasibility rating maps (Figure 4), the *"providing comprehensive diabetic knowledge"* concept was still the most feasible, and the *"classifying diabetes patient by disease severity"* concept was considered as the least feasible.

Considering the *"setting diabetes management"* concept, it showed high average importance score (3.70-3.81) but average feasibility score was the least (3.12-3.21). This meant that it was highly important but was too difficult to practise.

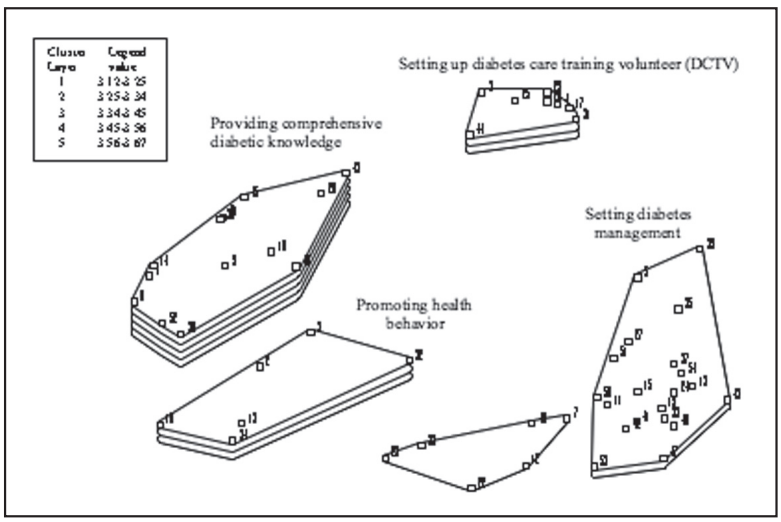

Figure 4: The cluster feasibility rating map.

• The pattern matching

Pattern matching is used to compare the patterns of variables across two maps. In this study, the importance rating score was compared between primary care professionals and non-primary care professionals (Figure 5). The results showed that both groups considered the *"providing comprehensive diabetic knowledge"* concept as the most importante and the *"classifying diabetes by disease severity"* concept as the least importante. On the other hand, there were different views regarding *"promoting health behavior"*, *"setting diabetes management"* and *"setting up diabetes care training volunteers (DCTV)"*. Primary care professionals ranked health promotion for diabetes as the second important while non-primary care professionals considered it as the second lowest important. However, the overall relationship between the two groups was still high (r = 0.68).

• Item analysis of rating activities

To examine the relationship between feasibility and importance, two variables of 54 activities were plotted in the scattered graph which was called "the Go-Zone" (Figure 6). The Go-Zone graph assisted the participants to identify areas that should be selected to implement. It was divided into four quadrants, using the axes of the two rating scales of this study. The A, B, C and D quadrants represent high feasibility but low importance; high feasibility and high importance; low feasibility and low importance; and low feasibility but high importance,

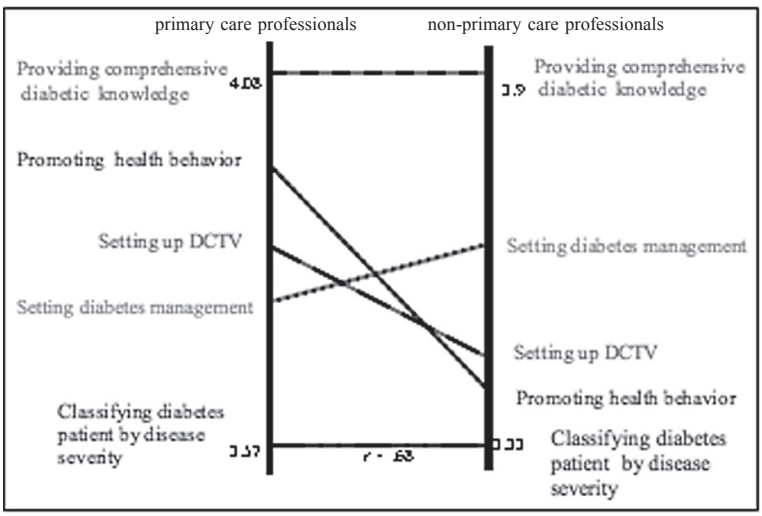

Figure 5: Ladder graph pattern match of primary care professionals and non-primary care professionals on importance rating score.

respectively. For example, the activity no.16[1] was rated with high scores in both of the importance and feasibility. It located in quadrant B which implied to high importance and high feasibility activity.

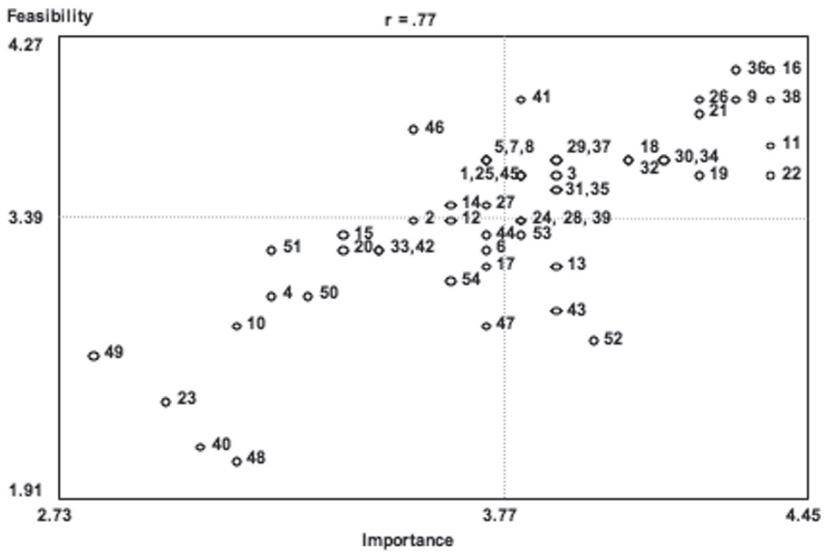

Figure 6: The Go-Zone.

Note: Quadrant A = low importance but high feasibility, B = high importance and high feasibility, C = low importance and low feasibility, D = high importance but low feasibility

[1]No.16 activity is "To provide patient understanding in benefit of good and bad control of blood sugar".

The point map and the cluster map were shown and explained to all participants to further discuss about the maps and summarize the final cluster map. After that, the discussed Go-Zone results and selected 26 activities[2] which located in the quadrant B to be implemented because they were of high importance and high feasibility. The participants also selected other seven activities[3] which located outside the quadrant B but their locations were near the quadrant B and their activities were related to the 26 activities. Finally, 31 diabetic activities were selected to be implemented in the action step (see Appendix II).

DISCUSSION AND CONCLUSION

Fifty-four activities were generated and prioritized. They were grouped into five concepts as follows: 1) providing comprehensive diabetic knowledge; 2) promoting health behavior; 3) setting diabetes management; 4) setting up diabetes care training volunteers; and 5) classifying diabetes patient by disease severity, which had average importance values of 4.03, 3.76, 3.73, 3.71 and 3.48, respectively.

As all diabetes care activities were generated by focus group discussion following the concept mapping steps, all ideas were based on the participants' opinions. This, however, may not cover some activities that all being suggested elsewhere for improving of diabetes care such as psychological or dental aspects. To overcome this limitation, the multiple methods should be conducted for generating more ideas from various stakeholders, using focus group with well designed questionnaire.

In terms of importance and feasibility, the results showed that *"providing comprehensive diabetic knowledge"* was the main concept and it should be raised in implementation step. The results were similar to the study that applied concept mapping to identify information about techniques and devices generated by the diabetes as reported in this study (Detaille et. al, 2006). Both diabetes and medical professionals assigned the highest priority to the cluster referring to an employee's ability to accept and cope with the disease.

The pattern matching confirmed that knowledge and understanding of diabetic disease was recognized from health care professionals and diabetic patients as the most important aspect. On the other hand, the other clusters showed the opposite rating of importance rating score between health care professionals and diabetic patients. "Health promotion for diabetes" was the cluster expressed with the difference of average importance score by both groups. It was rated the second priority by health professionals, but the fourth priority by the diabetes. This might be because health promotion was the activity that did not affect a patient's health immediately. Most of the patients were more concerned to live from hand to mouth instead of taking care of themselves for disease prevention.

[2]activity no. 1,3,9,11,16,18,19,21,22,24,25,26,28,29,30,31,32,33,34,35,36,37,38,39,41,45
[3]activity no. 5,7,8,17,27,44,53

Limitation of Study

In this study, the confusion of participants during the structuring of ideas led to more time consumtion compared with other studies (Chin, 2001; Baldwin et.al, 2004; Grant et. al, 2004). When the usual concept mapping processes take around 15 hours, such time allocation was not enough for this study. So the process was modified by setting up a meeting schedule only twice. The two meetings were set up for generating ideas and the concept map interpretation. The researcher tried to solve the participants' confusion by extending the duration of sorting and rating of all activities for more than two weeks. Telephone and home visit were also used in reminding and clarifying the sorting, labeling and rating processes.

In spite of these limitations, the concept mapping still provided an effective way in generating understandable findings for nonscientists and clear implication for real practices. The concept mapping is useful in empowering of community and diabetic patients without any barriers.

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APPENDICES

Appendix I: Fifty-four diabetes care activities with average importance and feasibility that were generated and rated by the participants.

Number of Activities	Diabetes care activities	Average Importance	Average Feasibility
1	providing group education for diabetic patients, particularly appropriate diet control	3.82	3.64
2	setting up patients meeting once a month at MPCU to share their experiences among patients with optimal blood sugar control and the others	3.55	3.36
3	regular update diabetic knowledge for diabetic care training volunteers (DCTV)	3.91	3.64
4	providing first-aid kit for taking care of diabetes patients in communities	3.18	2.91
5	promoting diabetic screening in high risk group, especially diabetic relatives	3.73	3.73
6	providing health education for diabetic patients weekly	3.73	3.18
7	developing diabetic care system by disease severity	3.73	3.73
8	demonstrating about medication taking per day for individual patients especially in non adherent groups	3.73	3.73
9	providing medication counseling individually for all diabetic patients	4.36	4.09
10	monitoring patients diet in their homes	3.09	2.73
11	providing comprehensive diabetic care including screening, education, treatment, monitoring chronic complications, and home care visits	4.45	3.82
12	classification of diabetic patients by disease severity for appropriate treatment	3.64	3.36
13	providing exercise demonstration in communities every week	3.91	3.09
14	giving advice about appropriate food taking to individual	3.64	3.45
15	extending office hours for general patient in the afternoon or in the evening	3.36	3.27
16	providing patient understanding in benefits of good blood sugar control and effects of bad control	4.45	4.27
17	setting up DCTV to be community representatives who would provide moral support and remind patients to see doctors	3.73	3.09
18	setting up to regularly monitor eye and foot complication	4.09	3.73
19	setting up diabetic care management as standard of MOPH	4.27	3.64
20	providing herbal knowledge by performing collaboration among DCTV, health volunteers and primary care professionals	3.36	3.18

21	describing effects of low and high blood sugar, and how to cope with it	4.27	4.00
22	providing proactive home care visit and close monitoring in case of high riskto diabetic complications	4.45	3.64
23	visiting other primary care settings to learn how to be effective diabetic care management	2.91	2.27
24	checking fasting blood sugar before 8.00 AM at diabetic clinic	3.82	3.36
25	demonstrating and preparing diabetes diet for patients every week	3.82	3.64
26	admiring diabetic patients who can control blood sugar, and exchange their experience with others	4.27	4.09
27	building up a multidisciplinary team by cooperative setting of therapeutic plan and monitoring diabetic patients	3.73	3.45
28	Setting up DCTV in each community (at least one volunteer per community)	3.82	3.36
29	Setting up a DCTV monitoring book record to regularly monitor patients and provide continuity record	3.91	3.73
30	counseling proper exercise to individual patients	4.18	3.73
31	Monitoring and advising DCTV on their duties continuously	3.91	3.55
32	strengthening diabetic patients to participate in diabetic prevention activities and promote diabetic screening	4.09	3.73
33	providing a spiritual room for psychological counseling in diabetic patients with mental problems such as stress, anxiety etc.	3.45	3.18
34	emphasizing activities to improve quality of life such as exercise, foot care, appropriate diet, recreation of primary care professionals and diabetic patients	4.18	3.73
35	setting up to regularly monitor system for home care visit in discharge patients	3.91	3.55
36	providing group education emphasizing on how to detect abnormal symptoms and serious diabetic complications	4.36	4.27
37	fixing two staff members of primary care professionals who are responsible for diabetic patients	3.91	3.73
38	updating diabetic database for effective care and monitoring	4.45	4.09
39	providing diabetic care at home in case of handicapped patients	3.82	3.36
40	providing transportation service for diabetic patient who must go to wound dressing every day	3.00	2.00
41	determining appropriate number of patients for each clinic visit	3.82	4.09
42	revising the follow up system for each community	3.45	3.18
43	educating care givers about patients care at home	3.91	2.82

44	providing diabetic knowledge to diabetic patients, care givers, and DCV	3.73	3.27
45	educating diabetic patients and their families by providing leaflets	3.82	3.64
46	counseling diabetic patients about duration of prescription refill	3.55	3.91
47	setting up Diabetic Patient Foundation for health expenditure to support the patients who have no money	3.73	2.73
48	providing a small transportation vehicle for diabetic patients	3.09	1.91
49	providing alternative medicine in clinic such as massage	2.73	2.55
50	providing home care visit for discharge diabetic patients	3.27	2.91
51	providing online consultation	3.18	3.18
52	promoting diabetic patients to eat brown rice for peripheral neuropathy prevention	4.00	2.64
53	providing diabetic screening in community every year	3.82	3.27
54	setting up diabetic complication monitoring criteria and alert sign in patient profile	3.64	3.00

Appendix 2: Thirty-three activities were selected for implementation.

Concept	Diabetes care activities	Average Importance	Average Feasibility
Concept 1: Comprehensive diabetic knowledge		**4.03**	**3.67**
16	Promoting patient understanding in benefits of good blood sugar control and negative effects of its bad control	4.45	4.27
36	Providing group education emphasizing on how to detect abnormal symptoms and serious diabetic complications	4.36	4.27
9	Providing medication counseling individually for all diabetic patients	4.36	4.09
21	Describing effects of low and high blood sugar, and how to cope with it	4.27	4.00
26	Admiring diabetic patients who can control blood sugar, and exchange their experiences with others	4.27	4.09
30	Counseling proper exercise to individual patients	4.18	3.73
45	Educating diabetic patients and their families by providing leaflets	3.82	3.64
1	Providing group education for diabetic patients, in particular of appropriate diet control	3.82	3.64
Concept 2: Health promotion for diabetes		**3.76**	**3.39**
34	Emphasizing activities to improve quality of life such as exercise, foot care, appropriate diet, recreation of primary care professionals and diabetic patients	4.18	3.73
32	Strengthening diabetic patients to participate in diabetic prevention activities and promote diabetic screening	4.09	3.73

Concept 3: Diabetes management in primary care unit		**3.73**	**3.30**
38	Updating diabetic database for monitoring and having more effective care	4.45	4.09
11	Providing comprehensive diabetic care including screening, education, treatment, monitoring chronic complications, and home care	4.45	3.82
19	Setting up diabetic care management following the standard of MOPH	4.27	3.64
18	Setting up regular monitoring system for eye and foot complications	4.09	3.73
35	Setting up regular monitoring system for home care in discharged patients	3.91	3.55
37	Fixing two staff members of primary care professionals who are responsible for diabetic patients	3.91	3.73
39	Providing diabetic care at home for handicapped patients	3.82	3.36
53	Providing annual diabetic screening in community	3.82	3.27
41	Determining appropriate number of patients for each clinic visit	3.82	4.09
24	Checking fasting blood sugar before 8.00 AM at diabetic clinic	3.82	3.36
27	building up a multidisciplinary team by cooperative setting of therapeutic plan and monitoring diabetic patients	3.73	3.45
Concept 4: Community participation by setting up DCTV		**3.71**	**3.37**
3	Educating regular update of diabetic knowledge for DCTV	3.91	3.64
31	Monitoring and advising DCTV on their duties continuously	3.91	3.55
29	Setting up a DCTV monitoring book record to regularly monitor patients and provide continuity record	3.91	3.73
25	Demonstrating and preparing diabetes diet for patients every week	3.82	3.64
28	Setting up diabetic training volunteers in each community (at least one volunteer per community)	3.82	3.36
17	Setting up diabetic care volunteers to be community representatives who provide moral support and being a patient's reminders for the doctor appointments	3.73	3.09
44	Providing diabetic knowledge to diabetic patients, care givers, and DCTV	3.73	3.27
Concept 5: Classification of diabetes patient by disease severity		**3.48**	**3.12**
22	Providing proactive home care and having closer monitoring in case of high risk to diabetic complications	4.45	3.64
7	Developing diabetic care system by disease severity	3.73	3.73
12	Classification of diabetic patients by disease severity for appropriate treatment	3.64	3.36

Note: DCTV means Diabetes Care Training Volunteer

none