An Empirical Analysis on Development Effects of Diabetic Prevention Information System

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Abstract

The study deals with an empirical analysis on development effects of diabetic prevention information system. The subjects of this study were 114 patients who had been visited a general hospital which located in urban area. The validity of the developed information system was estimated using intervention method that measured action-oriented, relevant, and effect of time elapsed between groups. The present research showed that health practice behavior in diabetic patients can be increased to 61.5-87.2% by information system. This study showed that diabetic prevention information system could help patients with diabetes mellitus in providing effective practice of their health behavior.

Keywords: *Development, Information system, Diabetic prevention, Empirical analysis*

1. Introduction

Diabetes mellitus is one of most common disease in the world. Diabetes mellitus has approached to us as a social epidemic in Korea [1]. The prevalence of diabetes mellitus in Korea has increased five to six-fold from 1.5% to 7.9% during the past 30 years. This increasing rate is remarkably high in comparison with those of developed countries. In addition, diabetic complication is very common in diabetic patients. For example, a total of 70.5% among new patients who were started with renal replacement therapy over the last 20 years [1, 2]. The age-sex adjusted mortality rate of diabetic patients was about three-fold higher than those of general population. As a result, medical cost of diabetes mellitus covered by the national health insurance corporation was 3.2 trillion won and accounted for 19.2% of all medical costs [3, 4]. On the other hand, the rate of awareness and treatment in diabetic patients has improved from 2000 to 2010 [5]. Therefore, the comprehensive and integrated information system including public approach is urgently needed to control the increasing prevalence of diabetes mellitus and its related desirable outcomes.

However, we don't have any national program at all about it [6, 7]. In order to solve the urgent problem, we should look for the practical plans. There were few studies to deal with effect of information system for the prevention diabetic patients until present in Korea. To overcome this situation, this study developed effective information system to prevent the incidence of diabetic patients. And then this study sought to apply the effect of it on the change of practice behavior of subjects for occurrence prevention of diabetic mellitus using information system.

Therefore, this study was performed the series of information intervention for control the increasing prevalence of diabetic patients. On the other hand, the follow-up survey was conducted at the end of this trial to compare the change before and after information intervention for health promotion behavior between the two groups. Thus, this study is designed to develop the short-term information system for the prevention of diabetes mellitus and ultimately to analyze the development effect through its application. The development of the research field of diabetic patient-related outcomes in information system will make it possible to conduct better quality studies in the future.

2. Materials and Methods

2.1 Development of Information System

This study is to develop information system by making use of intervention method. This first of the development of diabetic prevention information system is to identify a problem through need-assessment of the participants（Figure 1）. And then it carries out the procedures of conducting problem analysis and sets a goal of diabetic prevention information system. When all of the above are done properly, the system planning is to be implemented. Second step is to identify the functional elements of successful models and gather the information about this. Diabetic prevention information system which will be reflected in health promotion behavior is designed as part of information gathering and synthesis. In the third step, an experimental stage, where preliminary program is to be applied in the field has been implemented. In the final step, in order to evaluate the program durability, follow-up test has been done for three months after termination of the program.

2.2 Study Materials

Study participants were 114 patients who were diagnosed with diabetes mellitus at least 6 months ago by internal medical of a general hospital in urban area. The data were collected by interview and self-administered questionnaire from February 8 through March 8, 2012.

For this quasi-experimental groups which are equivalent control groups have been implemented. The experimental group of 57 patients which was assigned as group with information intervention, while the control group of 57 patients was assigned as group with no information intervention. To conduct the intervention, large and small group education, e-The mail, telephone counseling and so on were performed. The two groups are compared to know the difference of changes which affects health promraotion behavior. In order to evaluate the program durability, follow-up test has been done for three months after termination of the program.

2.3 Study Methods

General characteristics of study subjects was measured by percentage and number. The pairwise t-test was done to compare the before and after intervention effect of health practice rate of diabetes mellitus. This was conducted to observe some significant difference between the two groups before and after the intervention program.

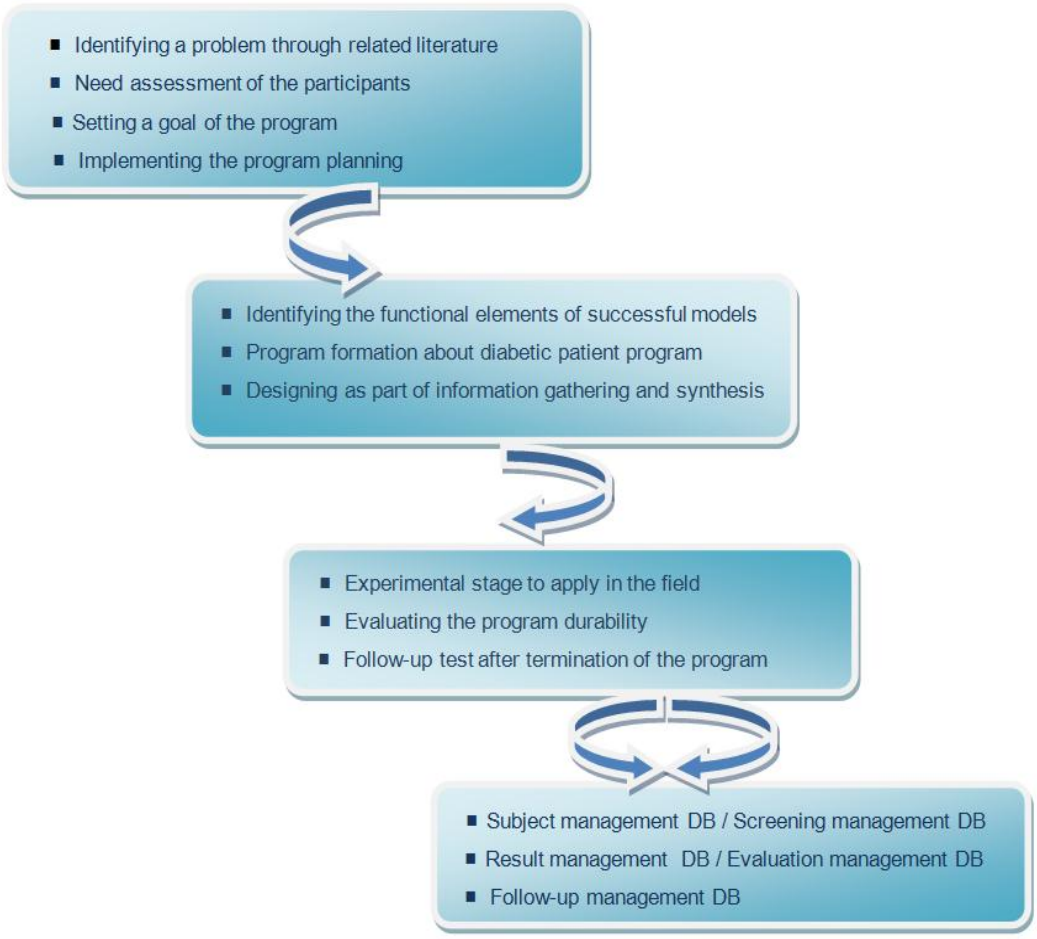

Figure 1. The Structure of Diabetic Prevention Information System

3. Results

3.1 Basic Information of Study Subjects

Table 1 presents basic information of study subjects. Comparing the proportion in the gender, male with 50.9% of the control group showed more than male with 43.9% of the experimental group. In a marital status, married respondents with 73.7% of the control group were higher than respondents with 68.4% of the experimental group. On the other hand, about respondents who have a family history of diabetes mellitus, the experimental group with 61.4% showed higher than control subjects with 35.1%.

Table 1. Basic Information of Study Subjects

Variables	Experimental group N(%)	Control group N(%)	Variables	Experimental group N(%)	Control group N(%)
Age/yrs.			≥300	19(33.3)	17(29.8)
≤39	4(7.0)	6(10.5)	Education level		
40-49	13(22.8)	10(17.5)	Under middle s†	18(31.6)	21(36.8)
50-59	19(33.3)	17(29.8)	High school s.	23(40.4)	17(29.8)
≥60	21(36.8)	24(42.1)	Over college	16(28.1)	19(33.3)
Gender			Family history		
Male	25(43.9)	29(50.9)	Yes	35(61.4)	20(35.1)
Female	32(56.1)	28(49.1)	No	22(38.6)	37(64.9)
Marital status			Comorbidity		
Single	18(31.6)	15(26.3)	Yes	18(31.6)	10(17.5)
Married	39(68.4)	42(73.7)	No	39(68.4)	47(82.5)
Monthly income			Complication		
≤199	12(21 .1)	16(28.1)	Yes	11(19.3)	5(8.8)
200-299	26(45.6)	24(42.1)	No	46(80.7)	52(91.2)

† S : School

3.2 Comparison of Health Practice of Before and After Information Intervention

Table 2 represents comparison of health practice of diabetic patients before and after information intervention. Comparing the scores in the diabetes mellitus-related measurement, subjects' score (71.25±0.49) after intervention increased significantly than subjects (48.57±1.62) before intervention (t=-2.85, p=.000). There was significantly high difference in the diet control after information intervention (t=-2.69, p=.007).

Table 2. Comparison of Health Practice of Before and After Information Intervention

Items intervention	Before Mean±S.D	After Mean±S.D	t	P
DM measurement†	48.57±1.62	71.25±0.49	-2.85	.000
B.W control ‡	52.91±0.37	61.74±1.57	-3.74	.065
Complication	49.65±1.22	60.55±0.30	-0.02	.004
BP measurement¶	45.10±0.42	53.83±0.63	-1. 62	.210
Exercise	55.67±0.17	67.18±0.62	-0.82	.029
Medication	64.52±0.63	59.30±0.44	0.17	.586
Diet control	58.72±1.69	65.42±0.49	-2.69	.007
Knowledge of diabetes mellitus	42.73±1.28	67.02±1.81	-2.40	.002
Health care	57.41±0.26	64.72±0.81	-0.03	.038
Smoking	45.52±0.67	41.28±0.47	1.79	.759
Alcohol	48.37±0.29	42.61±0.52	0.26	.521

† DM : Diabetes mellitus ‡ B. W : Body weight ¶ BP : Blood pressure

3.3 Change of Health Promotion Behavior Before and After Intervention

Figure 2 presents the change of health promotion behavior in diabetic patients before and after information intervention. According to the health promotion behavior, after the intervention, the mean scores of the experimental group showed increase after intervention than control group.

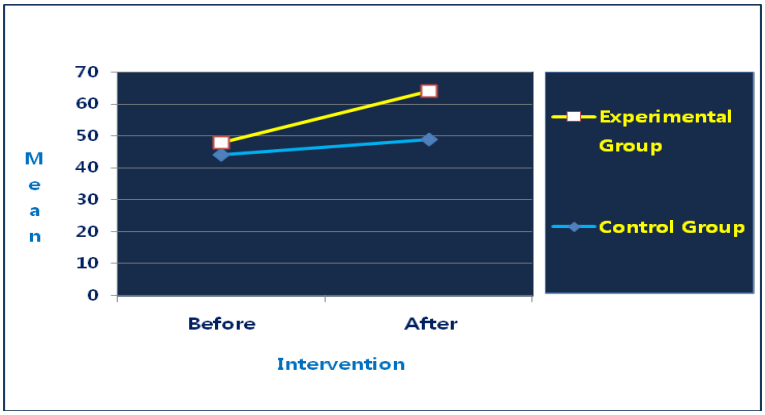

Figure 2. Change of Health Promotion Behavior Before and After Intervention

3.4 Follow-up of Practice Rate of Health Behavior Between Two Groups

Figure 3 compare the follow-up of practice rate of health behavior between two groups. The follow-up survey was estimated to be higher in the experimental group, regardless of the time elapsed of 20 days after the information intervention. However, the intervention effect was estimated to decrease more rapidly with time elapsed of 60 days after intervention in the experimental group as compared to the control group.

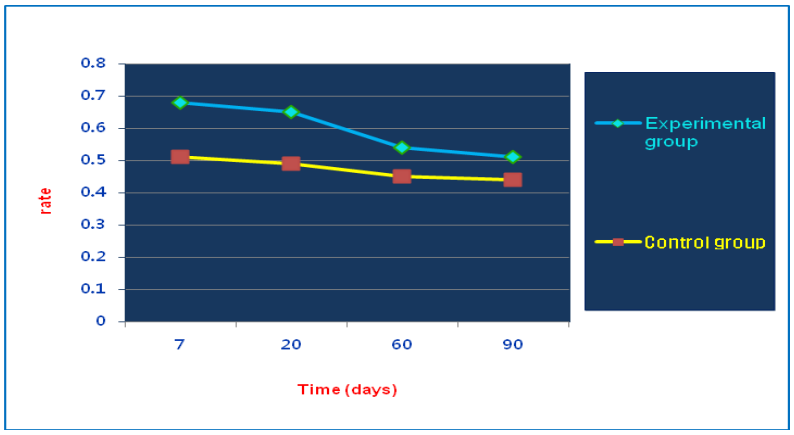

Figure 3. Follow-up of Practice Rate of Health Behavior Between Two Groups

$$\text{*Slope} = \frac{\triangle Y}{\triangle X} \quad \text{Where} \quad \triangle X : \text{time interval}, \ \triangle Y : \text{variation of intervention effect by information system} \tag{1}$$

$$\text{*Ratio} = \frac{\triangle Ya}{\triangle Yb} \quad \text{Where} \quad \triangle Yb : \text{practice rate before intervension by information system}, \ \triangle Ya : \text{practice rate after intervension by information system}$$

4. Discussion

This paper is focused mainly on the intervention effect of information system in the health promotion behavior for diabetic patients. Recently, health policy making is increasing based on evidence. Diabetic prevention information system was developed to meet such need [8]. Therefore, the paper is to evaluate the development of information system and apply actually the effect to diabetic patients.

The intervention effect did not increase alcohol drinking rate significantly, and then multi-displinary approach is required to reduce the smoking prevalence. As a result of this study, positive changes of behaviors related smoking diminished the progression rate of diabetes mellitus. The finding was similar with the previous studies on the chronic disease [9, 10]. This study suggests that individuals with diabetes mellitus should be targeted for specific health behavioral intervention to prevent the progression of diabetes mellitus. Based on the results obtained by the study, it is anticipated that this paper may be used as basic data for developing and intervening health promotion behavior for the chronic disease patients. However, the result shows that in order to maintain non-smoking of diabetic patients, various and long-term smoking cessation program is more successful than single and short-term program. The results of this paper, after receiving intervention, there were significant changes for the diet control than before intervention in the mean score of diet control. The finding was consistent with the result of earlier research [10]. Therefore, it needs to perform systematic diet management. There is a need for a separate program to be implemented on the groups who characterize having lower levels of health knowledge and health promotion behavior.

The present research showed that practice rate of the health behavior can be increased 61.5-87.2% by information system, which is similar to data reported in the previous studies [11, 12, 13]. However, it should be noted that the intervention effect by information system is not maintained for a long period of time. Accordingly, in order to maintain the intervention effect by information system, it is very important to determine adequate intervention period and perform various programs in consideration of their circumstances. The present work elucidated throughout the statistical analysis how effectively the synthetic and systematic education contributes to health promotion behavior for the prevention of diabetes mellitus. The future work should focus on the study of the intervention effect as a classification of patient throughout more prolonged research based on a larger data base.

Until the present, the limitation of diabetic patients lies in that there in nothing put into action despite the increase of knowledge. The result of this study would be the enhancement of practice behavior for the prevention of diabetes mellitus. Thus, this study indicated that the implemented systematic intervention showed significant positive effects on the life of subjects and health behavior. The quality of life in the experimental group has been enhanced as time passes by compared to control group, showed that it is an effective program for the prevention of diabetes mellitus. This information intervention has been developed by complementing and revising preliminary program. Therefore, the information program for diabetic patients implemented by intervention research is quite meaningful in that is evidence-based program development which will contribute in replicating the intention under field conditions for diabetic patients.

Diabetic patients who had moderate exercise level and who were under diet care had better quality of life. Current practice of exercise in diabetic patients were obtained through intervention of information system. Therefore, adequate health practice behavior in diabetic patients will improve their quality of life in accordance with proper information program. The development about information system is so essential to the diabetic patients. For successful performance of this study, this paper had tried to provide various information to enhance the

practice rate of health behavior in diabetic patients using information system. So, there were many changes which improve the quality of life in diabetic patients using information system. This study showed that information system could help diabetic patients in providing effective practice of their health behavior.

5. Conclusion

This paper developed information system to control the increasing prevalence of diabetic patients and applied it to subjects. The developed information system focuses on health practice rate before and after intervention to identify health promotion behavior by information system in diabetic patients. As a result of the research, this study found that the health promotion behavior in diabetic patients were many increased compared to the previous status and the patients positively perceived on information system. Moreover, this study showed that using information system as health practice tool was a good way to enhance the practice rate of health behavior in diabetic patients.

The information system for health promotion can be applied to any hospital which has health promotion center. Also, this system can be applied to any hospital which has health promotion center. Also, this system can be extended to inpatient or outpatient departments. With integration of information system, the effective management of chronic disease patients would also be possible.

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References

[1] Statistics Korea, "Annual Report on the Cause of Death Statistics", **(2011)**, pp. 13-15.
[2] Ministry of Health and Welfare, "Annual Report of Cancer Registry Programmes", **(2011)**, pp. 23-24.
[3] American Cancer Society, "The American Cancer Society Guidelines for the Cancer Related Checkup", Cancer, **(2003)**, pp. 42-45.
[4] S. R. Preis, "Trends in Cardiovascular disease Risk Factors in Individuals with and without Diabetes Mellitus in the Gramingham Heart Study", Circulation, **(2008)**, pp. 123-126.
[5] E. B. Rimm, "Prospective Study of Cigarette Smoking, Alcohol Use and the Risk of Diabetes in Men", British Medical Journal, **(2007)**, pp. 316-321.
[6] L. Suarez, L. Lloyd, N. Weiss, T. Rainbolt and L. V. Pulley, "Effect of Social Networks on Cancer-Screening Behavior of Older Mexican-American Women", Journal of the National Cancer Institute, vol. 86, **(2004)**, pp. 776-778.
[7] W. P. Moran, K. Nelson, J. Wofford and R. Velez, "Computer-Generated Physician and Patient Reminder Tools to Improve Population Adherence to Selected Preventive Services", J Fam Pract., vol. 5, **(2002)**, pp. 534-536.
[8] M. Azarbad, S. Hakimi and A. Brahimzadeh, "Automatic Recognition of Digital Communication Signal", IJEIC, vol. 3, **(2012)**, pp. 21-34.
[9] S. M. Omstein, D. R. Garr, R. G. Jenkins, P. F. Rust and A. Amon, "Computer-Generated Physician and Patient Reminder Tools to Improve Population Adherence to Selected Preventive Services, J Fam Pract., vol. 32, **(2008)**, pp. 83-85.
[10] D. K. Litzelman, R. S. Dittus, M. E. Miller and W. M. Tiene, "Requiring Physicians to Respond to Computerized Reminders Improves Their Compliance with Preventive Care Protocols", J Gen Intern Med, vol. 8, **(2003)**, pp. 315-316.
[11] J. V. Santiago, "Clinical Report: Intensive Management of Insulin Dependent Diabetes: Risks, Benefits and Unanswered Questions", J Clin Endocrinol Metab., vol. 81, **(2009)**, pp. 102-105.

[12] S. -R. Lee, "Effect of Computer-based Clinical Reminder System to Colorectal Cancer Screening", International Journal of Bio-Science and Bio-Technology (IJBSBT), vol. 4, no. 2, SERSC, **(2012)**, pp. 103-110.
[13] A. Nicolucci, "A Comprehensive Assessment of the Avoidability of Long-Term Complication of Diabetes: A Case-Control Study SID-AMD Italian Study Group for the Implementation of the St. Vincet Declaration", Diabetes Care, vol. 21, **(2006)**, pp. 812-816.

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