

# The Effect of an Integrated Information System Adoption for Performance Ability Improvement in Hypertensive Patients

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## Abstract

*The paper is to empirically examine the effect of an integrated information system adoption for performance ability improvement in hypertensive patients. The pairwise t-test was done to compare the before and after application by a database feedback system for clinical performance ability improvement in hypertensive patients. The present research showed that the practice rate of clinical performance ability of hypertensive patients could be increased to 54.8-72.6% by application of the integrated information system. The study presents a new information system in an effort to reduce inefficiency and improve reliability of information. By the adoption of this database feedback system, the integrated information can be effectively connected with any kinds of database systems such as Oracle, MS-SQL, and Access and contributed for improving treatment efficiency in chronic patients.*

**Keywords:** *Integrated information system, Database feedback system, Performance ability improvement, Hypertensive patients*

## 1. Introduction

These days, many people live a healthy life, but suffering caused by chronic diseases. The main factors of chronic diseases are stress, hypertension and obesity. Chronic diseases which are caused by high blood pressure are very high incidence [1, 2]. Therefore, this paper suggests the ways to prevent as diagnosis a phenomenon that occur rising in blood pressure consistently by analyzing the health behaviors according the rising in blood pressure. In recent years, health management services have been increased according to the increase in interests on health and the development of information technology(IT) based on increases in advanced ages and chronic disease patients. Thus, it requires the monitoring of health conditions and the specialized healthcare services not only in a hospital but also their own home. This study provides the specific information service related to the context information based on users' bio signal data and the notification services of hypertensive patients and attempts to develop a hypertension monitoring system and an integrated information system according to indexes [3].

The supply of an integrated information through the construction of database system is one of the most importance services that the information technology can provide to the citizens of a welfare nation. By using intervention effect, the database related to clinical information, treatment information and all kinds of information management and also user interface were developed for input and output of information [4]. This database also could be used for clinical study, patient care research and medical education. By the development of an integrated information system could be effectively connected with any kinds of database

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systems such as Oracle, MS-SQL and Access [5, 6]. Treatment information according to database system also could be contributed for improving treatment efficiency and cutting down the waiting time for clinic. Although precedent foreign researches are numerous so far, domestic researches are not sufficient for performance ability improvement of hypertensive patients. Especially, there were few studies to deal with feedback effect of an integrated information system. Therefore, this study was conducted to evaluate whether these technologies can enhance the value of information through user test. For efficient compatible system between medical clinics, the clinical information should be built on a standardized protocol such as a HL7 for text data and a Dicom for image data [7, 8]. But it could not exchange information between medical clinics because systems, softwares, a structure of data and a type of code are difference. Thus this study analyzed a structure of clinical information and designed a database system. This integrated information system can supply not only search of image data and patient information through integrated database, but also share clinical information without extra charge like construction of new system. This paper sought to apply the effect of it on the feedback of a database system of subjects for performance ability improvement in hypertensive patients. And then the follow-up survey was conducted at the end of this trial to compare the change before and after feedback effect of an integrated information.

Therefore, the purpose of this study was conducted to determine the feedback effect of an integrated information system for performance ability improvement in hypertensive patients. The highly easy access to the database system through the advanced information technology not only results in the optimization of health care and improvement of clinical information but also enhances the competitive power of domestic information technology to the foreign information technology.

## **2 Materials and Methods**

### **2.1. Study Design**

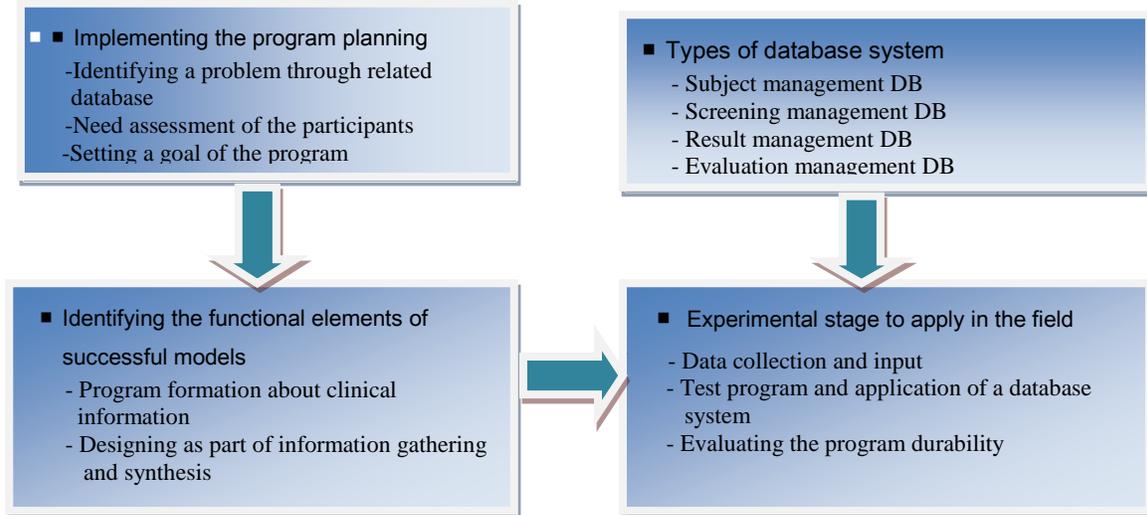
The study is to construct effectively database system by making use of intervention effect method [Figure 1]. The first step of the program development is to identify a problem through related database and need-assessment of the participants. And then carry out the procedures of conducting problem analysis and setting a goal of the program. When all of the above are done properly, the program planning is to be implemented. The second step is to identify the functional elements of successful models and gather the information about this program formation which will be reflected in effectively database system is designed as part of information gathering and synthesis. In the third step, an experimental stage, where preliminary program is to apply the techniques to the field. In the final step, in order to evaluate the program durability, follow-up test has been done for 120 days after termination of the program [Figure 2].

### **2.2. Materials**

As for the research tools, the questions developed by earlier researches were partially adjusted to be appropriately applied to the subjects [3, 9, 10]. Study participants were 112 patients who were diagnosed with hypertension at least 6 months ago by internal medicine of a general hospital in Metropolitan area. The data were collected by interview and questionnaires from July 15 through August 15, 2013.

For this quasi-experimental group which are equivalent control groups have been implemented. Experimental group of 56 patients was assigned as group with no intervention.

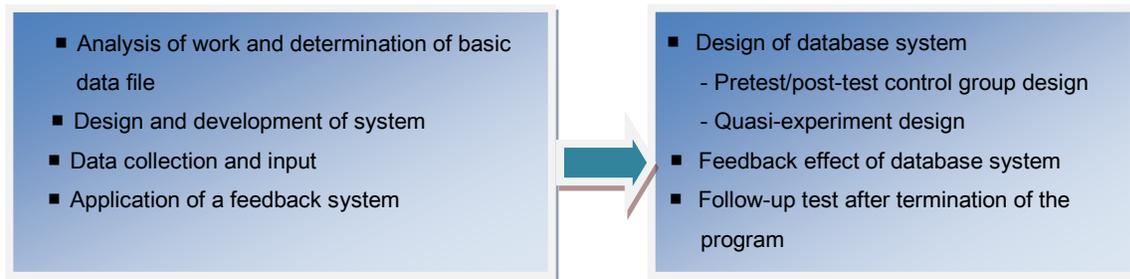
To conduct the intervention research method, large and small group education, individual education, counseling e-mail, telephone counseling and so on were performed. The two groups are compared to know the difference of an integrated information system which affects improvement of clinical information. In order to evaluate the program durability, follow-up test has been done for 120 days after termination of the program.



**Figure 1. Development of an Integrated Information System for Performance Ability Improvement**

### 2.3. Methods

General characteristics of study subjects were measured by percentage and number. The pairwise t-test was done to compare the before and after application by an integrated information system for clinical performance ability improvement of hypertensive patients. This was conducted to observe some significant differences between the two groups before and after the intervention effect program.



**Figure 2. A Design of a Database Feedback System for Hypertensive Patients**

### 3. Results

#### 3.1. General Characteristics of Study Subjects

Table 1 presents general characteristics of study subjects. Comparing the proportion in the gender, female (62.5%) of the experimental group showed more than male(51.8%) of the control group. In a marital status, married respondents(69.6%) of the experimental group were lower than respondents(78.6%) of the control group. On the other hand, in terms of respondents who have a family history of hypertension matter, the experimental group showed higher than control group.

**Table 1. General Characteristics of Study Subjects**

Variables	Experimental group	Control group	Variables	Experimental group	Control group
	N(%)	N(%)		N(%)	N(%)
Gender			Monthly income		
Male	21(37.5)	27(48.2)	≤99	9(16.1)	14(25.0)
Female	35(62.5)	29(51.8)	100-200	10(17.9)	7(12.5)
Age			200-299	23(41.1)	19(33.9)
≤39	4(7.1)	6(10.7)	≥300	14(25.0)	16(28.6)
40-49	13(23.2)	10(17.9)	Marital status		
50-59	18(32.1)	17(30.4)	Single	17 (30.4)	12(21.4)
≥60	21(37.5)	23(41.1)	Married	39(69.6)	44 (78.6)
Education			Comorbidity		
Under middle	16(28.6)	20(35.7)	Yes	17(30.4)	5(8.9)
High school	22(39.3)	15(26.8)	No	39(69.6)	51(91.1)
Over college	18 (32.1)	21(37.5)	Complication		
Family history			Yes	15 (26.8)	9(16.1)
Yes	34(60.7)	19(33.9)	No	41 (73.2)	47 (83.9)
No	22(39.3)	7(66.1)			
Total	56(100.0)	56(100.0)	Total	56(100.0)	56(100.0)

#### 3.2. Comparison of New Recognitive Change Before and After Application

Table 2 presents the comparison of new recognitive change before and after application of an integrated information system. In terms of scores in the body weight control, subjects' score(68.19±1.72) after application of the integrated information system decreased significantly than subjects(53.85±1.46) before application(t=-4.52, p=0.041). There was significantly high difference in the change of diet-related control after application than before application of an integrated information system(t=-3.62, p=0.013).

Suppose that the a measurements  $X_1, X_2 \dots, X_n$  make up a sample[1]. Then the sample standard deviation, denoted s, is defined to be in which X is the mean of the measurements.

$$\text{Mean} = \text{Sum of X values} / \text{N(Number of values)} \quad (1)$$

$$s = \sqrt{\frac{(X_1 - \bar{X})^2 + (X_2 - \bar{X})^2 + \dots + (X_n - \bar{X})^2}{n - 1}} = \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n - 1}} \quad (2)$$

**Table 2. Comparison of New Recognitive Change Before and After Application**

Items	Before	After	T	P
	Mean±S.D	Mean±S.D		
Body weight control	53.85±1.46	68.19±1.72	-4.52	0.041
Exercise	42.71±0.31	56.72±1.36	-3.08	0.028
Comorbidity	37.49±0.62	42.35±0.74	-5.26	0.692
Blood pressure control	74.82±0.41	48.97±0.31	-0.79	0.007
Smoking cessation	43.61±1.53	37.48±1.25	3.14	0.304
Drinking alcohol	61.50±1.59	53.05±1.56	4.71	0.287
Diet control	45.26±1.57	62.18±1.57	-3.62	0.013
Stress control	72.13±1.46	66.23±0.39	3.49	0.072
Complication	69.72±1.92	62.58±0.71	1.26	0.319
Medication intake	72.44±1.26	69.24±0.36	3.57	0.625
Cholesterol control	70.16±1.64	62.73±1.39	-3.84	0.073
Vegetable intake	41.39±1.62	72.18±1.75	-3.29	0.001
Osteoarthritis	39.27±1.37	37.62±0.49	-1.44	0.927
Meat intake	67.39±1.85	51.49±0.27	-1.38	0.029
Diabetes mellitus	48.12±1.36	42.62±0.92	3.17	0.724

The t-test assess whether the means of two groups are statistically different from each other [3]. This analysis is appreciate whenever you want to compare the means of two groups, and especially appreciate as the analysis for the posttest-only two-group randomized experimental design. This illustrates formula for the standard error of the difference between the means [4].

$$T\text{-value} = (\text{Difference between group means}) / (\text{variability of groups}) \quad (3)$$

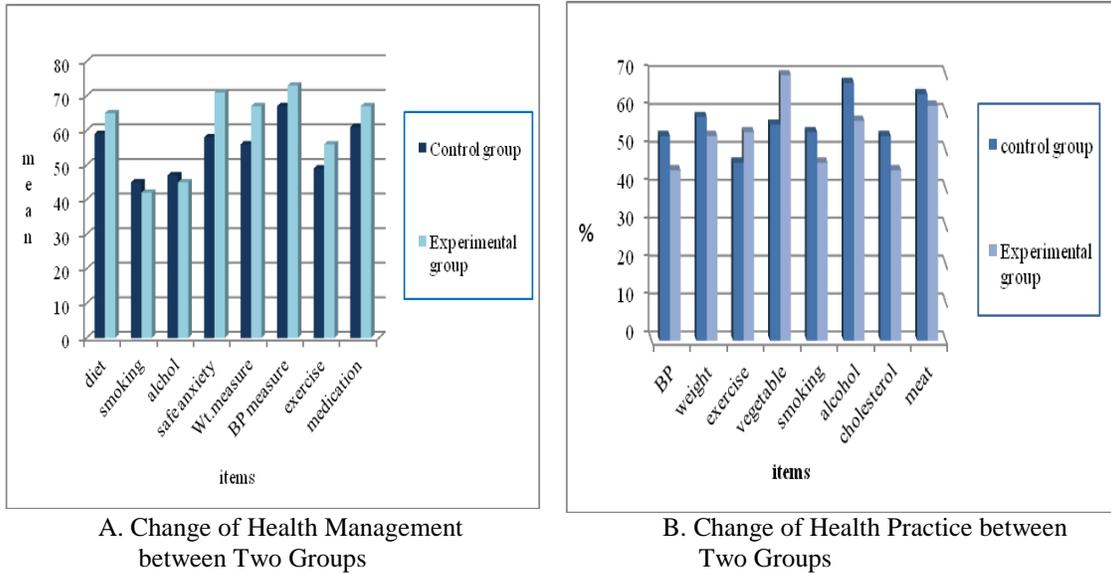
$$= \frac{\bar{X}_T - \bar{X}_C}{SE(\bar{X}_T - \bar{X}_C)} \quad (4)$$

The paired t-test is actually a test that the differences between the two observations is 0. So, if D represents the difference between observations, the hypotheses are: p-value associated with it is low (p<0.05). There is evidence to reject the null hypothesis. Thus, this would have evidence that there is a difference in means across the paired observations[5].

$$\begin{aligned} H_0 : D=0 \text{ (the difference between the two observations is 0)} \\ H_1 : D \neq 0 \text{ (the difference is not 0)} \end{aligned} \quad (5)$$

### 3.3. Comparison of the Practice Rate of Clinical Performance Ability

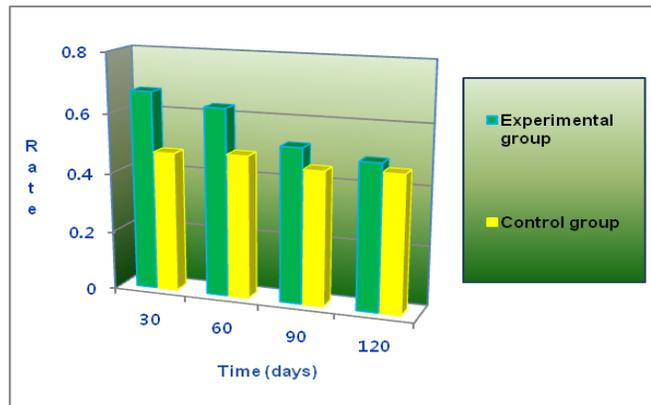
Figure 3 presents the practice rate of clinical performance ability between the two groups. According to application of the integrated information system, the mean score of experimental group showed statistically significant increase after application of an integrated information system than control group (p<0.05).



**Figure 3. Comparison of the Practice Rate of Clinical Performance Ability**

### 3.4. The Effect of Durability of Clinical Performance Ability

Figure 4 presents the effect of durability of clinical performance ability between the two groups. Application effect of the integrated information system was higher in the experimental group than the control group, regardless of the time elapsed of 60 days after application of the integrated information system. However, the application effect decreased rapidly with time elapsed of 90 days after application in the experimental group as compared to the control group.



**Figure 4. The Effect of Durability of Clinical Performance Ability**

\*Slope= $\frac{\Delta Y}{\Delta X}$  Where  $\Delta X$  : time interval

$\Delta Y$  : variation of application effect

\*Ratio= $\frac{\Delta Y_a}{\Delta Y_b}$  Where  $\Delta Y_b$  : the practice rate of performance ability before application

$\Delta Y_a$  : the practice rate of performance ability after application

The slope is often called delta x/delta y. This change in x/change in y. (6)

To actually calculate the y value of the triangle edge for a given integer value of x, as we move incrementally along the x axis one pixel at a time, we use the slope value.

## 4. Discussion

The study was a trial to investigate the effect of an integrated information system for performance ability improvement in hypertensive patients. Throughout the research, construction of a database feedback system for clinical performance ability has been successfully implemented. This integrated information system is to develop the comprehensive health promoting program for clinical patients using a feedback system. The strategies for effective information system are best for increasing the performance ability rate of clinical information.

In the empirical analysis result, the influence of the control of blood pressure by application of an integrated information system has appeared to give positive influence, which is meaning within the significance level of 5%. The finding was similar with the previous studies on the hypertension [10, 11]. This study suggests that individuals with hypertension should be targeted for specific information application to prevent the progression of disease. Based on the results obtained by the study, it is anticipated that this may be used as effective data for developing and intervening database system for the chronic disease [12, 13].

The practice rate of clinical performance ability of hypertensive patients could be increased to 54.8-72.6% by application of the integrated information system, which is similar to data reported in the previous study [14]. However, it should be noted that the application effect is not maintained for a long period. Accordingly, in order to adequate feedback period and perform various educational programs and managing program in consideration of their circumstances.

The quality of life in the experimental group has been enhanced as time passing by compared to control group, conclusively proving that it is the effective program of an integrated information system. Therefore, the database feedback program for clinical performance ability of hypertensive patients implemented by intervention research is quite meaningful in that it is evidence-based program development program development which will contribute in replicating the intention under field conditions for patients with chronic disease.

## 5. Conclusion

This study identified positive effects of an integrated information system for clinical performance ability improvement in hypertensive patients. The results of the study are as follows.

Firstly, comparing the proportion in the gender, female(62.5%) of the experimental group showed more than male(51.8%) of the control group. In a marital status, married respondents(69.6%) of the experimental group were lower than respondents(78.6%) of the control group

Secondly, in terms of scores in the body weight control, subjects' score( $68.19 \pm 1.72$ ) after application of the integrated information system decreased significantly than subjects( $53.85 \pm 1.46$ ) before the application of it ( $t=-4.52$ ,  $p=0.041$ ).

Thirdly, the practice rate of clinical performance ability in hypertensive patients could be increased to 54.8-72.6% by the application of the integrated information system.

Therefore, this database system using application of a feedback system could be used as an effective method to enhance clinical performance ability. It also demonstrated significant improvement in the quality of life of hypertensive patients and its implication could be used as the basic data for developing information. The integrated information system would be provided to each hospital and academic society. This research could be used for a research to

evaluate a feedback system and will contribute to next researches. The study may also contribute to improving the treatment of hypertension.

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