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Analysis of Experiments on the Information Systems for the Improving Self-Management after Intracranial Hemorrhage Surgery

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Abstract

The present study is to investigate the analysis of experiments on the information systems for the improving self-management after intracranial hemorrhage surgery. The subjects of this paper were 136 patients who had visited a general hospital located in Metropolitan area. The pairwise t-test was done to compare the before and after application effect of self-management after intracranial hemorrhage surgery. The results of this study are as follows.

Firstly, in terms of respondents which have suffered from headache, subjects' score(54.92±4.18) after application by information systems significantly decreased than subjects(73.92±3.26) before application(t=2.49, p=.000) Secondly, for self-management, the change of follow-up survey showed higher level in the experimental group than the control group, regardless of the time elapsed of 8 weeks after application by information systems as compared with previous status. Therefore, this paper showed that health improving behaviors using the information systems as measurement tools was a good way to enhance the practice rate of self-management in patients after intracranial hemorrhage surgery.

Keywords*: Information systems, Experiments, Self-management, Intracranial hemorrhage, Surgery*

1. Introduction

Intracranial hemorrhage is a type of intracranial hematoma that occurs within the brain tissue. It is alternatively called a cerebral hemorrhage. It can be caused by brain trauma, or it can occur spontaneously in hemorrhagic stroke. On the other hand, non-traumatic intracerebral hemorrhage is a spontaneous bleeding in the brain tissue [1-3].

A cerebral hemorrhage is an intra-axial hemorrhage. That is, it occurs within the brain tissue rather than outside of it. The other category of intracranial hemorrhage is extra-axial hemorrhage, such as epidural, subdural, and subarachnoid hematomas, which all occur within the skull but outside of the brain tissue. There are two main kinds of intra-axial hemorrhages: intraparenchymal hemorrhage and intraventricular hemorrhages. As with other types of hemorrhages within the skull, intraparenchymal blood is a serious medical emergency because they can increase intracranial pressure, which if left untreated can lead to coma and death [4, 5]

The mortality rate for intraparenchymal bleeding is over 40%. For spontaneous intracranial hemorrhage seen on CT scan, the death rate is 35–51% by 40 days after its occurrence and half of the deaths occur in the first 3 days. Even though the majority of deaths occur in the first days after intracranial hemorrhage, survivors have a long term excess mortality of 28% compared to the general population. Although intracerebral hemorrhage is less common than ischemic stroke, it is more serious, with up to 42% of patients dying in the first month [6-8].

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Intracranial hemorrhage is the second most common cause of stroke, trailing only from ischemic stroke in frequency. Estimates of the annual incidence range from 16 to 33 cases per 100,000. There are many underlying pathological conditions associated with intracerebral hemorrhage. Hypertension, amyloid angiopathy, ruptured saccular aneurysm, and vascular malformation account for the majority of cases. Intracranial bleeding occurs when a blood vessel within the skull is ruptured or leaks. It can result from physical trauma or nontraumatic causes such as a ruptured aneurysm [9-11].

Anticoagulant therapy, as well as disorders with blood clotting can heighten the risk that an intracranial hemorrhage will occur. Intracranial hemorrhage is a serious medical emergency because the buildup of blood within the skull can lead to increases in intracranial pressure which can crush delicate brain tissue or limit its blood supply. Severe increases in intracranial pressure can cause potentially deadly brain herniation, in which parts of the brain are squeezed past structures in the skull. When intracranial pressure is increased the heart rate should be decreased. Types of intracranial hemorrhage are roughly grouped into intra-axial and extra-axial. The hemorrhage is considered a focal brain injury. that is, it occurs in a localized spot rather than causing diffuse damage over a wider area [12-14].

Intra-axial hemorrhage is bleeding within the brain itself, or cerebral hemorrhage. This category includes intraparenchymal hemorrhage, or blood within the brain tissue, and intraventricular hemorrhage, blood within the brain's ventricles. Intra-axial hemorrhages are more dangerous and harder to treat than extra-axial bleeding. Extra-axial hemorrhage, blood that occurs within the skull but outside of the brain tissue, falls into three subtypes. Epidural hemorrhage, which occur between the dura mater and the skull, is caused by trauma. It may result from laceration of an artery, most commonly the middle meningeal artery. This is a very dangerous type of injury because the blood is from a high-pressure system and deadly increases in intracranial pressure can result rapidly. However, it is the least common type of meningeal bleeding and is seen in 1% to 3% cases of head injury [15, 16].

Patients experience loss of consciousness, then a lucid interval, then sudden deterioration such as vomiting, restlessness, and loss of consciousness. Subarachnoid hemorrhage, which occurs between the arachnoid and pia meningeal layers, like intraparenchymal hemorrhage, can result either from trauma or from ruptures of aneurysms or arteriovenous malformations. Blooding is seen layering into the brain along sulci and fissures, or filling cisterns. The classic presentation of subarachnoid hemorrhage is the sudden onset of a severe headache. This can be a very dangerous entity, and requires emergent neurosurgical evaluation, and sometimes urgent intervention [17, 18].

In order to solve the problem, we should look for the practical plans. However, there were few studies that deals with the experimental analysis of information systems for the improving self-management in patients with intracranial hemorrhage until present. Therefore, the advance information systems are urgently needed to control the increasing prevalence of intracranial hemorrhage and produce its related desirable outcomes.

Thus, this paper attempts to investigate the experimental analysis of it on the change of self-management after intracranial hemorrhage surgery through development of advanced information systems. An improved information system will contribute to prevent disease in patients with intracranial hemorrhage

2 Materials and Methods

2.1. Development of Information Systems

This research is to provide for an efficient information system from strategic targets to solution method [Figure 1]. In the first stage, this step defines strategic targets and how to achieve them within the organization. In the second stage, it is to identify the functional elements of successful information system and gather the information. In the third stage, it

is the implementation stage where a preliminary program is to be applied and evaluated in the field has been implemented. It also demonstrated the need to separate data from its applications using it. When the health practice has finished its work on processes and data classes, it can explore the functions and effects of the information system [Figure 2].

2.2 Study Materials

Study participants were patients who were treated with intracranial hemorrhage surgery at least 6 months ago by neurosurgery of a general hospital in Metropolitan area. The data were collected by interview and self-administered questionnaire from January 26 through February 27, 2015.

A total of 136 persons consists this program. It was then divided into two groups. The experimental group of 68 patients which were assigned as group with information intervention while the control group of 68 patients was assigned as group with no information intervention. The two groups are compared to know the difference of changes which affects health promoting behaviors. On the other hand, the evaluation of patient's satisfaction on the information system through information intervention was performed by two groups. In order to estimate the system efficiency, a follow-up test had been done the health promoting behaviors for 16 weeks.

The contents assigned for intracranial hemorrhage surgery patients are as follows: 1) Introduction: introduction, objective, and procedure of information systems. 2) Quality: Positive changes of health condition, examination and therapeutic contents: just after application. 3) Motivation: disease recognition and attitude of patients. 4) Awareness: Medical research and education data 4) Change: change of health condition 5) Impact: impact of health improvement after intracranial hemorrhage surgery 6) Effectiveness: effectiveness of the information system 7) Evaluation: assessment of basic data file in patients with intracranial hemorrhage [Table 1].

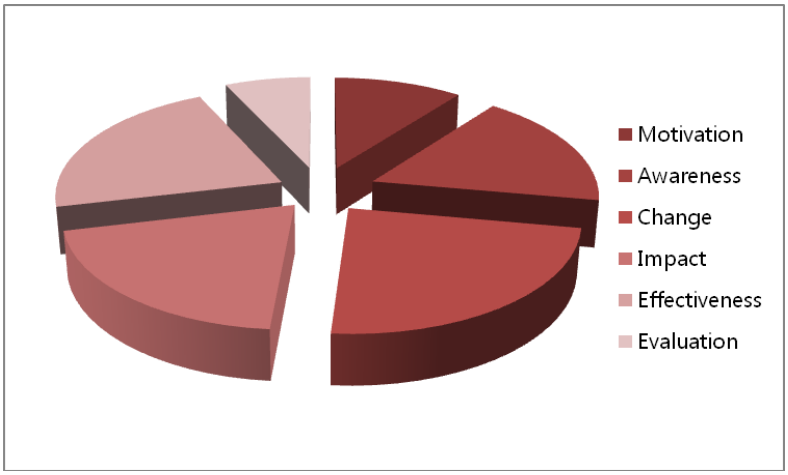

Figure 1. Contents Assigned for the Improving Self-Management of Information Systems

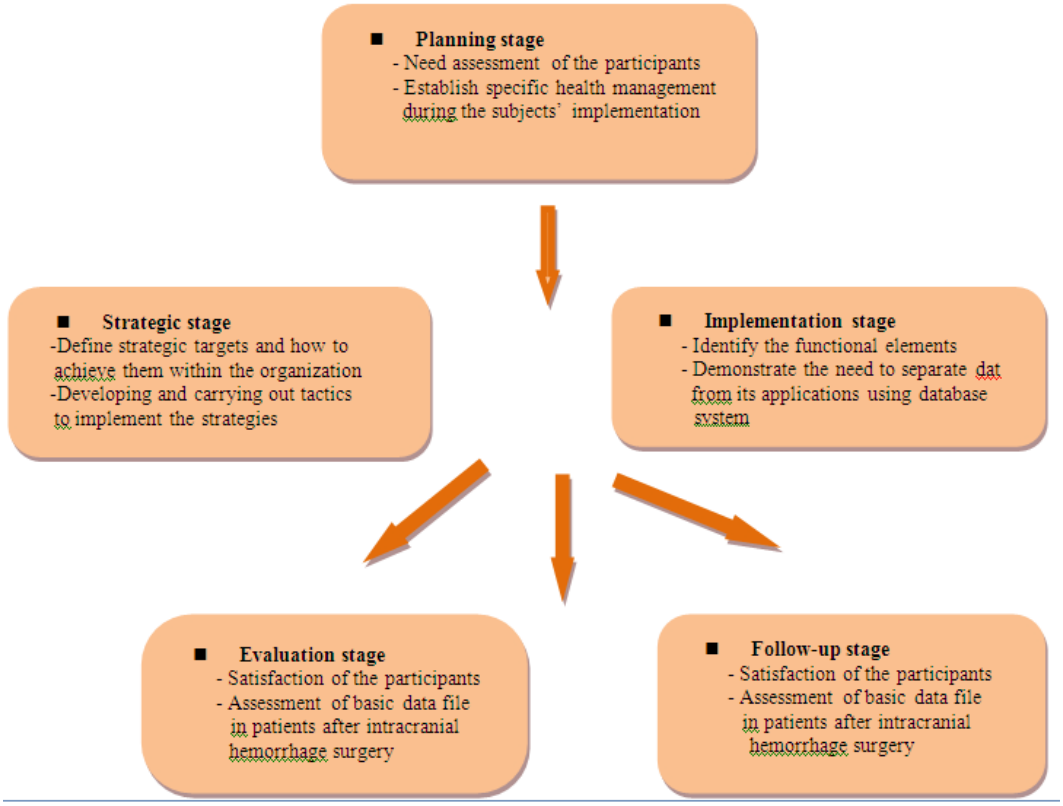

Figure 2. Structure of Information Systems for the Intracranial Hemorrhage Surgery Patients

2.3. Study Methods

General characteristics of the study subjects were measured by percentage and number. The χ^2-test was used to observe a statistically significant difference between experimental and control group. The pairwise t-test was done to compare the self-management before and after application of information systems after intracranial hemorrhage surgery. It was also performed to determine the statistical significant differences between the two groups on the satisfaction of information systems for

-measurement of health promoting behaviors for the prevention of recurrence in intracranial hemorrhage surgery.

The collected data were examined the distribution of intracranial hemorrhage surgery of the patients' characteristics using SPSS 19.0. Data analysis of t-test was performed with the level of statistical significance for testing at 0.05%.

Table 1. Contents Assigned for Self-Management After Intracranial Hemorrhage Surgery

Division	Contents
Strategics	- Strategiecs, objective, and procedure of information systems - Effectiveness and assessment of information systems
Positive change	- Positive changes of self-management and health condition after application of information systems
Attitude	- Attitude of intracranial hemorrhage patients
Statistics data	- Useful information for patients' management - Evaluation of the information system quality - Communication among intracranial hemorrhage patients - Statistical data for national health
Management	- Timely management as provided by information application - Change of health condition
Improvement	- Impact of health improvement after intracranial hemorrhage surgery - Feasibility of the information systems after application to patients
Impact	- Impact of health practice on life habits - Difference before and after application of the information system
Effects	- Effects of the information system - Improvement of patients' health due to information systems
Assessment	- Satisfaction of the participants - Assessment of basic data file in patients with intracranial hemorrhage

3. Results

3.1. General Characteristics of Subjects in this Study

Table 2 presents general characteristics of the subjects in this study. Age groups were divided into four groups. That is, it was divided less than 40 years, 40 to 49 years, 50to 59 years and 60 years old or more. The response rate of experimental group was 13.2%, while the response rate of control group was 17.6% in subjects under the age of 40 years old. The response rate(16.2%) of experimental group was statistically significantly lower than the response rate(23.5%) in the 40 to 49 years old(χ^2=12.74, p<.05). The response rate(26.5%) of experimental group was lower than the response rate(30.9%) of control group in the age of 50 to 59 years old. The response rate(44.1%) of experimental group was higher than the response rate(27.9%) of control group in subjects over the age of 60 years old.

In terms of gender, the male(60.3%) of the controlled group showed a higher rate than the females male(47.1%) of the experimental group. In a marital status, unmarried respondents(30.9%) of the experimental group were a higher rate than respondents(22.1%) of the control group. For marital status, the respondent rate(30.9%) of experimental group in unmarried respondents was higher than the respondent rate(22.1%) of control group, however, there was no significant difference between two groups. On the other hand, for other disease, the response rate of experimental group(83.8%) was

statistically and significantly higher than the response rate(55.9%) of control group in subjects who have suffered from other disease(χ^2=2.91, p<0.05).

Table 2. General Characteristics of Study Subjects

Variables	Experimental group N(%)	Control group N(%)	χ^2
Age/yrs.			
‹40	9(13.2)	12(17.6)	12.74*
40-49	11(16.2)	16(23.5)	
50-59	18(26.5)	21(30.9)	
≥60	30(44.1)	19(27.9)	
Gender			
Male	32(47.1)	41(60.3)	6.18
Female	36(52.9)	27(39.7)	
Marital status			
Unmarried	21(30.9)	15(22.1)	3.65
Married	47(69.1)	53(77.9)	
Monthly income			
<200	19(27.9)	27(39.7)	10.93
200-399	31(45.6)	25(36.8)	
≥400	18(26.5)	16(23.5)	
Education level			
Under middle school	21(30.9)	18(26.5)	
High school	28(41.2)	33(48.5)	8.54
Over college	19(27.9)	17(25.0)	
Other diseases			
Yes	57(83.8)	38(55.9)	2.91*
No	11(16.2)	30(44.1)	
Complication after ICH surgery			
Yes	53(77.9)	7(10.3)	7.18**
No	15(22.1)	61(89.7)	
Family history of stroke			
Yes	27(39.7)	12(17.6)	5.36**
No	41(60.3)	56(82.4)	
Total	68(100.0)	68(100.0)	

† ICH : Intracranial hemorrhage * P<.05 ** P<.01

3.2. Change of Self-Management According to Application of Information System

Table 3 represents the change of self-management according to application of information system. In terms of respondents which have suffered from headache, subjects' score(54.92±4.18) after application significantly decreased than subjects(73.92±3.26) before application(t=2.49, p=.000). On the other hand, for alcohol drinking, there was a significant difference in practicing the healthy lifestyles of alcohol drinking after application of information system(t=3.41, p=.029).

Table 3. Change of Health Behaviors According to Application of Information System

Items	Before	After	t	P
	Mean±S.D	Mean±S.D		
Symptoms				
Headache	73.92±3.26	54.92±4.18	2.49	.000
Dizziness	71.05±1.74	62.57±2.63	0.61	.018
Dyspepsia	54.26±4.61	69.15±4.51	-1.47	.052
Vomiting	67.71±3.27	51.38±1.92	0.89	.037
Hemiplegia	59.34±1.58	52.65±3.64	0.72	.485
Nausea	52.72±4.15	48.16±1.79	3.46	.162
Language disorder	42.82 ±6.72	31.82±2.63	1.75	.309
Self-management				
Exercise	32.74±3.19	57.29±2.15	-0.94	.000
Nutritional status	40.62±1.52	63.14±5.72	-2.17	.000
Smoking	59.15±5.19	35.51±0.84	0.52	.000
Alcohol drinking	62.75±2.84	41.97±3.66	3.41	.029
Stress status	74.39±2.72	57.49±1.73	1.89	.000
Clinical status				
Diabetes mellitus	57.18±3.29	51.72±3.62	3.18	.618
Hypertension control	68.42±0.84	47.36±0.57	0.56	.037
Cholesterol control	65.75±4.61	59.18±1.39	1.72	.193

3.3. Changes of Symptoms As the Time Elapsed Between Two Groups

Figure 2 shows the changes of symptoms as the time elapsed between two groups before and after application of information systems. The change of follow-up survey showed higher level in the experimental group than the control group, regardless of the time elapsed of 8 weeks after application of information systems as compared with previous status. However, experimental group showed a little increase again as time elapsed of 16 weeks as compared with previous experimental group after application of information systems.

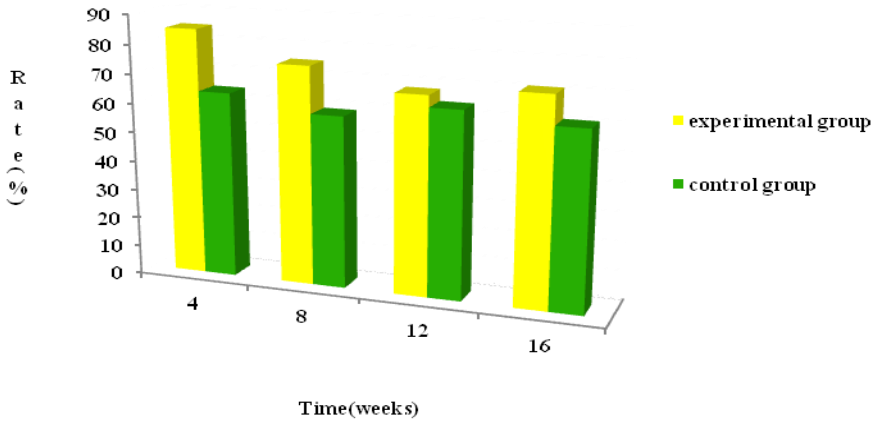

Figure 2. Changes of Symptoms As the Time Elapsed Between Two Groups

3.4. Changes of Self-Management As the Time Elapsed Between Two Groups

Figure 3 shows the changes of self-management as the time elapsed between two groups before and after application of information systems. For self-management, the change of follow-up survey showed higher level in the experimental group than the controlled group, regardless of the time elapsed of 8 weeks after application as compared with previous status. However, experimental group showed rapidly decrease as time elapsed of 12 weeks in the experimental group after application.

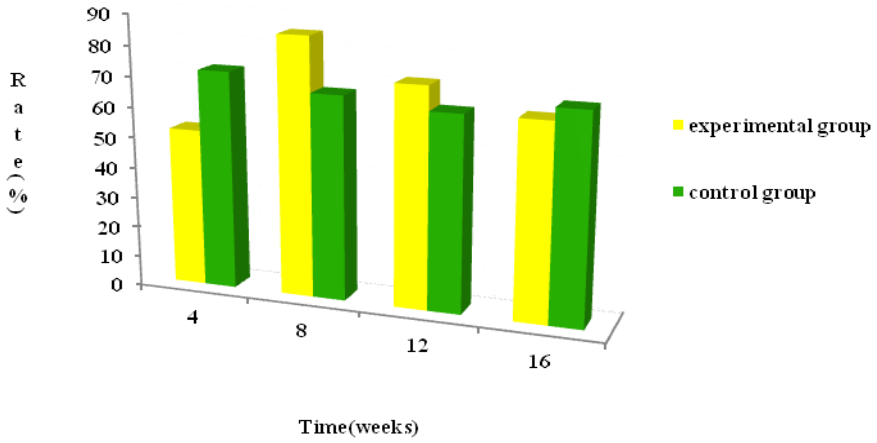

Figure 3. Changes of Self-Management as the Time Elapsed between Two Groups

4. Discussion

The present study conducted to investigate basic data for the development of information system for the intracranial hemorrhage prevention and management by examining the control of symptoms, health behaviors and clinical status.

This attempt of the information system had brought a significant improvement in self-management of intracranial hemorrhage patients. The intervention effect did not

significantly decrease hypertension, and then a multi- disciplinary approach is required to reduce the factors related to hypertension

As a result of this study, statistically significantly positive changes of behaviors such as drinking alcohol, smoking. It diminished the progression rate of intracranial hemorrhage. The findings were similar to previous studies on other brain diseases [19-21]. This study suggests that individuals with intracranial hemorrhage should be targeted for specific health behavioral intervention to prevent the progression of intracranial hemorrhage. 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 brain disease patients. However, in order to maintain desirable health behaviors, convergence information system for intracranial hemorrhage patients on health promoting behavior is more successful than single program. The results of this paper, after receiving intervention, there was a positive change for the health behavior after intervention than before intervention in the mean score of having headache symptoms. The finding was consistent with the result of earlier researches [22, 23]. Therefore, it needs to perform systematic health management.

The results of this paper, after receiving intervention, there was a positive change for physical factors after intervention than before intervention in the mean score of stress status. The finding was consistent with the result of earlier researches [24, 25]. Therefore, it needs to perform systematic stress management.

After the experiment, the experimental group which experienced patients' information application level on information systems showed the effectiveness of improvement of health improving behaviors in intracranial hemorrhage patients. Therefore, a comprehensive and systematic adoption of the information system to minimize the damage of intracranial hemorrhage will contribute effectively to the rapid disease recovery and prevention.

In the future, this experimental study will be used frequently for the prevention of intracranial hemorrhage and verification of new research. Thus, efficient and error-free information system for handling personalized medical history and test results are infallibly necessary. In this paper, I have proposed an information system for informatization of intracranial hemorrhage patients that support the healthcare environment based on application. The proposed system supports systematization of whole application process and information of health promoting system.

The information systems will contribute to reduction of costs, improvement of operational efficiency, and mostly fundamental prevention of intracranial hemorrhage. The proposed information-based medical information system will also contribute to solve the problems of current information systems by enabling integration of separated information and by allowing data exchange and sharing through internet. The proposed system with application is more efficient than web-based medical information system. Because this information systems itself provides more flexibility and extensibility than previous information system.

The information systems that participated in an experimental study in intracranial hemorrhage patients were carried out through the experimental model which was developed. This study will contribute to reducing intracranial hemorrhage. The information system is a system composed of patients and computers that processes or interprets information. The model is also sometimes used in more restricted senses to refer to only the software used to run a computerized database or to refer to only a computer system. Information systems are an academic study of systems with a specific reference to information and the complementary networks of hardware and software that intracranial hemorrhage patients and organizations use to collect, filter, process, create, and also distribute data

An emphasis is placed on an information system having a definitive boundary, users, processors, stores, inputs, outputs and the communication networks. This information

system aims to support operations, management and decision making. The information system is the information and communication technology that intracranial hemorrhage patients' use, and also the way in which patients interact with this technology in support of information processes. In addition, the system will be set up to link all information on subsidy spending by different healthcare.

5. Conclusion

This paper attempted to investigate the experimental analysis of it on the change of self-management after intracranial hemorrhage surgery through development of advanced information systems. The results of this study are as follows.

First, the response rate(16.2%) of experimental group was statistically significantly lower than the response rate(23.5%) in the 40 to 49 years old(χ^2=12.74, p<.05).

Second, in terms of respondents which have suffered from headache, subjects' score (54.92±4.18) after application significantly decreased than subjects (73.92±3.26) before application(t=2.49, p=.000). On the other hand, for alcohol drinking, there is a significant difference in practicing the healthy lifestyles of alcohol drinking after application of information system (t=3.41, p=.029).

Third, for self-management, the change of follow-up survey shows higher level in the experimental group than the control group, regardless of the time elapsed of 8 weeks after application as compared with previous status. However, experimental group shows rapid decrease as time elapsed of 12 weeks in the experimental group after application.

In conclusion, this paper conducted a positive effect on health enhancement of intracranial hemorrhage patients. This paper also shows the feasibility of the information systems through some tests. Moreover, this paper shows that health improving behaviors using the information systems as measurement tools are a good way to enhance the practice rate of self-management in patients with intracranial hemorrhage surgery.

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I would like to express my deepest appreciation to study subjects who have participated in development of the structure model of information system and empirical application for the self-management in a busy life.

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