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Development of a New Experimental Model to Improve Daily Living Performance Ability in TB Patients

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Abstract

This paper is to estimate the effects of a new experimental model to improve daily life performance ability in tuberculosis patients. The subjects of this paper were 126 patients who had visited a hospital which located in Metropolitan area. The pair wise t-test was done to compare the before and after intervention by a new experimental model for measurement of health promoting practice in tuberculosis patients. As a result, for symptoms in terms of dizziness in the physical status, subjects' score (27.46±1.52) after application significantly decreased than subjects (31.58±3.47) before application (t=2.68, p=.004). In conclusion, this experimental study will be used frequently for the prevention of tuberculosis and verification of new research.

Keywords: *New experimental model, Tuberculosis, Daily life performance ability, Patient*

1. Introduction

Tuberculosis is caused by mycobacterium tuberculosis that most often affect the lungs. Tuberculosis is one of the world's top health challenges. More than 2 billion people, a quarter of the world's population, are infected with tuberculosis. World Tuberculosis Day is a chance for new action in the global fight against one of the world's top infectious killers. Tuberculosis is contagious and airborne. It is a disease of poverty affecting mostly young adults in their most productive years. 95% of tuberculosis deaths are in the developing world. The number of people who fell ill with tuberculosis dropped to 8.8 million in 2010 including 1.1 million cases among people with HIV.

The number has been falling since 2005. Over 95% of tuberculosis cases and deaths occur in low and middle-income countries. The progress in health status of the population indicates that about 80% of diseases in Ethiopia are attributable to preventable conditions related to infectious diseases, malnutrition, and personal and environmental hygiene. The prevalence of tuberculosis in Ethiopia is estimated to be 241 with incidence of 247 per 100,000 populations. The adult HIV prevalence is 1.5% in 2011 (4.2% for urban and 0.6% for rural) and is higher among females (1.9%) than males (1%). Environmental risk factors contribute of 31% of the total disease burden in the country [1-2].

Korea recorded 40,000 new cases of tuberculosis infections last year. Previous studies showed tuberculosis still needs more attention on the disease usually found in developing countries. According to a report released by the Ministry of Health and Welfare, a total of 49,532 people were reported as tuberculosis patients in 2012. Among them, 39,545 were cases of new infections. The number of male patients was some 30 percent higher than that of female patients. By age, 16,033 of the new tuberculosis patients were between 20 to 40 years, accounting for 40.5 percent of the entire new tuberculosis cases last year. Patients older than 65 years marked 32.4 percent of the new patient figures. Among the new cases recorded last year, 78.6

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percent had pulmonary tuberculosis. Some 40 percent of the pulmonary tuberculosis patients turned out to have active tuberculosis infections, which spread through phlegm or cough. It said 229 were infected with the so-called super tuberculosis, which is resistant to more than four types of medications. Multiple approaches are required to eradicate the disease from the countries [3-5].

Korea has the highest number of tuberculosis patients among the member states of OECD. As the report shows, the country still needs efforts such as thorough patient management and early-stage monitoring of primary infections to eradicate the disease. In 2012, meanwhile, the number of expats with tuberculosis stood at 1,510, representing almost a 10 fold increase from a decade ago. Many foreign workers and multicultural family members are overlooked from medical checkups which they deserve. The government should bolster its medical supports on them to allow more expats to receive tuberculosis examinations. The number of tuberculosis patients exceeded 40,126 last year, accounting for 43.1% of the total outbreaks of infectious diseases, the Korea Centers for Disease Control and Prevention said Wednesday[6],[7]. Tuberculosis cases were up 1.4 percent from the previous year. The total number of patients that suffered from tuberculosis and other infectious diseases stood at 93,119. The number of tuberculosis patients has been increasing over the past five years. In 2008, there were 34,157 tuberculosis patients but the number rose to 35,845 in 2009, 36,305 in 2010 and 39,557 in 2011. Other frequently occurring infectious diseases were chicken pox (29.8%), scrub typhus (9.3%), mumps (8.1%), and hepatitis B (3.6%).

The number of patients with acute infectious diseases decreased by 10.5% last year from the previous one but diseases such as hepatitis B, mumps, and scrub typhus increased. More cases of infectious diseases have been reported as monitoring people's health has increased, according to the KCDC. Korea tops the list of Organization for Economic Cooperation and Development (OECD) nations for tuberculosis occurrences and records the highest death rate for the disease. In November last year, tuberculosis broke out in three schools in Seoul. Two high schools in Geumcheon-gu, Seoul, reported that 67 of its students were infected with tuberculosis. A middle school in Gangnam, southern Seoul, also reported that they had a student with tuberculosis. The Korean government plans to cut the disease occurrence ratio by half by the end of 2020. It has devised a five-year plan starting this year until the end of 2017 to invest in tuberculosis management and treatment and will spend 345 billion won on the project [8-9].

To overcome this situation, we need to develop the information system and ultimately to analyze the effects through its application. Therefore this research is to estimate the effects of information systems application to improve daily life performance ability in tuberculosis patients. This will take advantage of basic data for researcher and indicate the direction of their information system to prevent tuberculosis in the future.

2. Materials and Methods

2.1. Development of a New Experimental Model

The model is composed of input, store, analysis and result generation module. Linkage interface between the central database and each of the related modules is implemented by the visual concept. User interface and the relational database table are supported for user’s convenience. The detailed contents are summarized as follows. First, a new experimental model is a method of analyzing, defining and designing the information model of system. Second, it is a complex method dealing with interconnected data, processes, and strategies. Its purpose is to understand issues and opportunities with current applications. In addition,

this provides a new experimental model with a system framework for tuberculosis patients. Third, the results of a new experimental model will be a system evaluation in this Figure 1.

2.2. Study Materials

The study was developed through review of existing literature, assessment of tuberculosis patients' model needs, available updates on information, web site analysis and solicitation of expert advice throughout the development process. Study participants were patients who were diagnosed with tuberculosis at least 4 months ago by internal medicine of a general hospital in metropolitan area.

The data were collected by interview and self-administered questionnaire from January 5 through February 16, 2015. This program was totally consisted 126 persons, it has been divided into two parts. The experimental group of 63 patients which was assigned as group with information application, while the control group of 63 patients was assigned as group with no information application. The two groups are compared to know the difference of changes which affects health practice. On the other hand, the evaluation of patient satisfaction on the experimental model through information intervention was performed by two groups. In order to estimate the model efficiency, a follow-up test had been done for 12 weeks the health promoting behaviors of intervention program.

On the other hand, contents assigned for the improvement of daily living performance ability in tuberculosis patients are introduction, purpose, analysis, application, change and feasibility in this Table 1.

2.3. Research Instruments

The effects of this model are measured before and after the test by performance ability. The data collection tool was composed of totally 36 items This questionnaire covered with 9 items(age, marital status, monthly income, BMI, education level, complication, infectious disease history, cancer family history, another diseases) for general characteristics of subjects in this study, 19 items(dizziness, vomiting, nausea, lethargy, body weight control, cholesterol control, stress control, onion intake, hypertension control, regular exercise, vegetable intake, meat intake, smoking, diabetes mellitus control, depression, tomato intake, dandelion tea anorexia, cough, rhino rhea, tomato intake, soybean intake, chub mackerel intake, onion intake, dandelion tea, radish, weight loss, hypertension, hearing disorder, depression anxiety, stress) for health promoting behaviors rate of before and after information application, and 8 items(convenience, efficiency, usefulness, reliability of the new experimental model/two for each item) for evaluation on the satisfaction of information system between two groups. It employed a five point scale. After collecting the survey questionnaires, the usable data was analyzed after excluding data deemed as insincere or unreliable.

To see if the experimental group was equivalent to control group in the health-related pretest, the SPSS win 18.0 program was conducted to check the difference between the control and experimental group.

On the other hand, in order to estimate the experimental model efficiency, a follow-up test had been estimated the durability of health promoting ability rate for 12 weeks. The experimental group was applied by the experimental model for 4 sessions of information which lasted 20 minutes. During the period, the control group received no application. The control group was unformatted to conduct the program after finishing program for the experimental group.

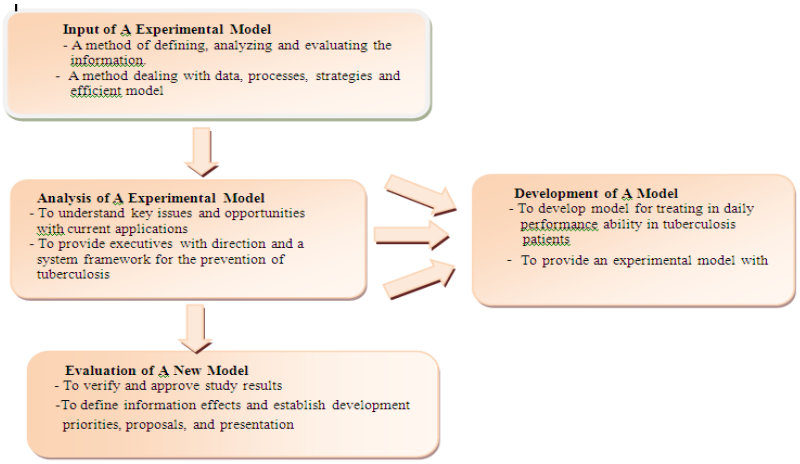


Figure 1. A Experimental Model for the Improvement of Daily Performance Ability in Tb Patients

2.4. Study Methods

The Chi-square test was performed to compare the basic information of study subjects between two groups. The χ^2-test was used to observe a statistically significant difference between experimental and control group. In addition, it was measured by percentage and number. The pair wise t-test was done to compare the before and after application of health promoting ability in tuberculosis patients. It was also performed to determine a statistically significant difference in mean scores between the two groups to improve performance ability in tuberculosis patients. All associations were considered to be statistically significant if the two-sided P value was .05 or less.

Table 1. Contents Assigned for the Improvement of Daily Performance Ability in TB Patients

Categories	Contents
Introduction	- Contents of input, procedure, store, analysis and result - Introduction of a new experimental model
Procedure	- Objective of an experimental model - Procedure of a new system
Attitude	- Recognition and attitude of tuberculosis patients
Analysis	
Change	- Timely management as provided by information application - Change of health condition
Feasibility	- Impact of health improvement after application - Feasibility of a model after application to patients
Effectiveness	- Effectiveness of an experimental model - Improvement of patients' health due to experimental model
Results	
Evaluation	- Clinical research and education data - Useful information for medical knowledge - Evaluation of a model quality - Experience among tuberculosis patients - Statistical data for tuberculosis

3. Results

3.1. General Characteristics of Subjects in this Study

Table 2 presents general characteristics of subjects in this study. Age groups were divided into four groups for two groups. That is, it was divided less than 49 years, 50 to 59 years, 60 to 69 years, and 70 years old or more. The response rate of experimental group was 12.7%, while the response rate of control group was 23.8% in subjects under the age of 49 years old. The response rate (25.4%) of experimental group was statistically significantly higher than the response rate (17.5%) in the 50 to 59 years old. The response rate (22.2%) of experimental group was lower than the response rate (31.7%) of control group in the age of 60 to 69 years old. The response rate (39.7%) of experimental group was higher than the response rate (27.0%) of control group in subjects over the age of 70 years old. However, there was no significant difference for the age group between two groups.

For marital status, the respondent rate (81.0%) of experimental group was higher than the respondent rate (77.8%) of control group in married respondents. However, there was no significant difference between two groups.

On the other hand, in terms of infectious disease history, it showed significantly higher in subjects(61.9%) who had suffered from infectious disease in the experimental group than that(23.8%) of control groups(X^2=7.26, p<.01). For other disease, the response rate(93.7%) of experimental group was statistically significantly higher than the response rate(33.3%) of control group in subjects who had suffered from other disease(χ^2=3.41, p<.01).

Table 2. General Characteristics of Study Subjects

Variables	Experimental group N(%)	Control group N(%)	χ^2
Age/yrs.			
≤49	8(12.7)	5(23.8)	1.36
50-59	16(25.4)	1(17.5)	
60-69	14(22.2)	0(31.7)	
≥70	25(39.7)	7(27.0)	
Marital status			
Single	.0)	14(22.2)	6.42
Married	.0)	49(77.8)	
Monthly income			
<200	.3)	14(22.2)	
200-399	.9)	22(34.9)	.16*
≥400	.8)	27(42.9)	
BMI(Kg/m²) †			
<18.5	.9)	15(23.8)	7.92
18.5-22.9	.4)	21(33.3)	
≥23.0	.7)	27(42.9)	
Education level			

Under middle school	22(34.9)	9(30.2)	
High school	25(39.7)	1(33.3)	0.85
Over college	16(25.4)	3(36.5)	
Complication			
Yes	28(44.4)	4(38.1)	.19
No	35(55.6)	9(61.9)	
Infectious disease history			
Yes	39(61.9)	5(23.8)	.26**
No	24(38.1)	8(76.2)	
Cancer family history			
Yes	21(33.3)	3(20.6)	.18*
No	42(66.7)	0(79.4)	
Other diseases			
Yes	59(93.7)	1(33.3)	.41**
No	4(6.3)	2(66.7)	
Total	63(100.0)	3(100.0)	

† BMI : Body Mass Index * P<.05 ** P<.01

3.2. Health Promoting Behaviors after Application of a New Experimental Model

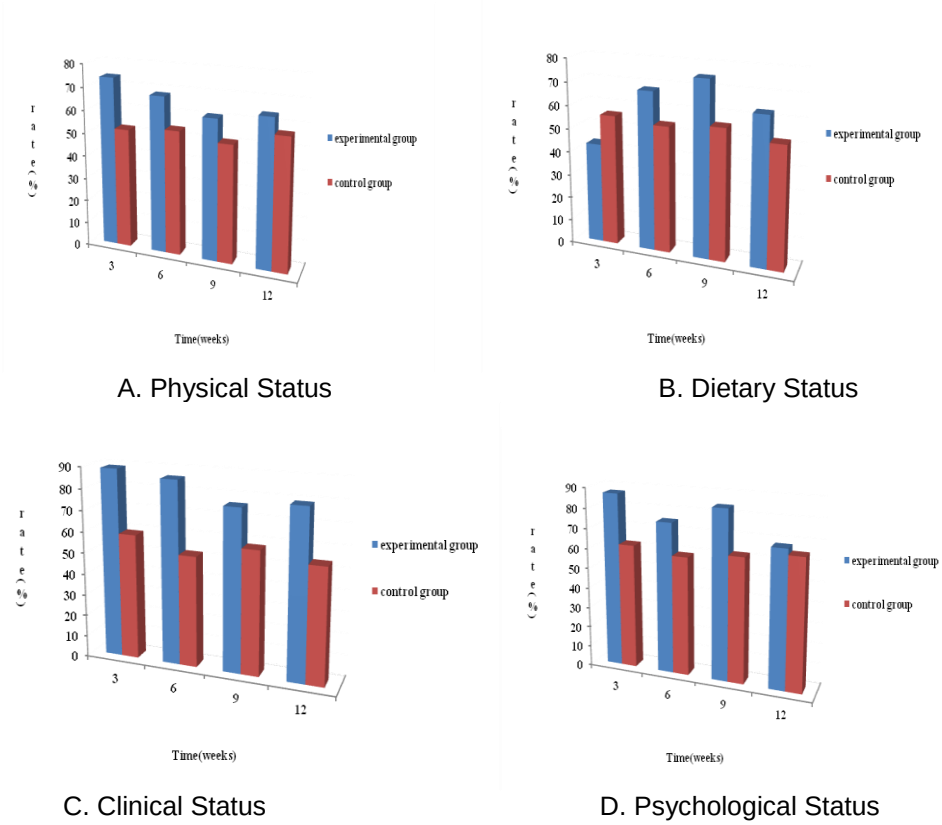
Table 3 represents health promoting behaviors before and after application of a new experimental model. In terms of dizziness in the physical status, subjects' score (27.46±1.52) after the application of a new experimental model significantly decreased than subjects (31.58±3.47) before the application of a new experimental model (t=2.68, p=.004). On the other hand, in terms of anorexia, there was a significant decrease in the mean score after application compared with before application (t=0.72, p=.038). For dietary status, there was a significant difference in practicing the healthy lifestyle of onion intake after application of the experimental model (t=-2.55, p=.000).

Table 3. Health Promoting Behaviors after Application of a New Experimental Model

Items	Before Mean±S.D	After Mean±S.D	t	p
Physical status				
Dizziness	31.58±3.47	27.46±1.52	2.68	.004
Vomiting	26.13±0.69	21.37±0.37	0.57	.051
Nausea	33.49±1.26	29.85±0.64	3.81	.002
lethargy	29.65±0.79	24.16±2.19	1.26	.146
Anorexia	33.45±1.64	28.57±0.47	0.72	.038
Cough	27.17±0.38	23.41±1.66	1.64	.275
Rhinorrhea	23.64±1.27	18.52±0.71	0.49	.000
Dietary status				
Tomato intake	13.69±2.41	21.46±1.63		.000
Soybean intake	17.14±0.63	24.19±0.38	-0.68	.000
Chub mackerel intake	14.86±0.95	19.62±1.77	-3.73	.158
Onion intake	21.57±0.48	32.61±0.35	-2.55	.000
Dandelion tea	10.36±1.53	19.35±1.49	-0.27	.058
Radish	19.67±0.41	28.64±0.62	-3.61	.000
Clinical status				
Weight loss	11 .58±1.63	13.54±0.74	-3.17	.269
Hypertension	13.92±0.35	11.60±1.92	1.62	.304
Hearing disorder	6.49±1.25	4.94±0.36	0.29	.195
Psychological status				
Depression	1 2.19±1.78	7.54±0.62	1.56	.000
Anxiety	14.71±0.56	12.93±1.94		.172
Stress	14.58±1.34	9.24±0.18	0.62	.000

3.3. Changes of Health Promoting Behaviors in TB Patients between Two Groups

Figure 2 shows the changes in health promoting behaviors in tuberculosis patients between two groups after application of new experimental model. For dietary status, the follow-up survey showed higher level in the experimental group than the control group, regardless of the time elapsed of 6 weeks after application as compared with previous status. However, experimental group showed a rapid decrease as time elapsed of 9 weeks than control group after application.



A. Physical Status

B. Dietary Status

C. Clinical Status

D. Psychological Status

Figure 2. Changes in Health Promoting Behaviors in TB Patients between Two Groups

3.4. Evaluation of User's Satisfaction on the Experimental Model

Table 4 presents the evaluation of user's satisfaction on the new experimental model between two groups. For the user's convenience of the experimental model, it was easier to use the model in the experimental group(38.74±4.29) than the control group(35.16±1.57). For effectiveness of the new experimental model, the respondents who were easier to contact to operator in the experimental group(31.96±1.57) showed a higher rate in experimental group than the control group(28.51±4.38). There was a significantly higher difference in experimental group (t=4.51, p=.013) than control group. On the other hand, for usefulness of the new experimental model, the experimental groups (37.21±4.25) who showed useful information of health management were a higher rate than that of control groups (25.16±2.52). There was a significant difference between two groups (t=5.18, p=.000).

Table 4. Evaluation of User's Satisfaction on the Experimental Model

Variables	erimental up ±S.D.	Control group Mean±S.D.		P
Convenience of the new experimental model				
Easy to use the model	38.74±4.29	35.16±1.57	2.93	416
Easy to contact to operator	31.96±1.57	28.51±4.38	4.51	013
Effectiveness of the new experimental model				
Easy to connect with experimental model	36.24±0.3441	34.62±0.25	5.28	217
Fast to search information	29.67±2.31	27.34±4.73	-3.05	000
Usefulness of the new experimental model				
Useful information to the management of health	37.21±4.25	25.16±2.52	5.18	.000
Easy to understand the model	32.84±1.72	35.42±1.60	-4.17	428
Reliability in the process of decision making				
Accurate contact	36.41±3.52	27.51±4.28	2.62	.000
Detailed contents	32.75±0.28	36.14±1.53	-4.17	.179

4. Discussion

The study is to estimate the effects of a new experimental model adoption to improve daily life performance ability in patients with tuberculosis. As a result of the study, there has been a significant decrease at cough after intake dandelion tea after application of the model. The experimental study will be used frequently for the prevention of anorexia, vomiting, and dizziness and verification of new research. This experimental model will contribute to reduction of costs, improvement of daily performance ability, symptoms, operational efficiency, and mostly fundamental prevention of tuberculosis. The study is to investigate the adoption of an experimental model application to improve daily living performance ability in patients with tuberculosis. Tuberculosis is curable and preventable.

Tuberculosis is spread from person to person through the air. When there are people with lung tuberculosis, cough, sneeze or spit, they propel the tuberculosis germs into the air. A person to inhale only a few of these germs becomes infected. About one-third of the

world's population has latent tuberculosis, which means people have been infected by tuberculosis bacteria but are not ill with the disease and cannot transmit the disease. People infected with tuberculosis bacteria have a lifetime risk of falling ill with tuberculosis of 10%. However persons with compromised immune systems, such as people living with HIV, malnutrition or diabetes, or people who use tobacco, have a much higher risk of falling ill. Disease caused by resistant bacteria fails to respond to conventional, first-line treatment. MDR-TB is treatable and curable by using second-line drugs. However second-line treatment options are limited and recommended medicines are not always available. The extensive chemotherapy required (up to two years of treatment) is more costly and can produce severe adverse drug reactions in patients. In some cases more severe drug resistance can develop. Extensively drug-resistant tuberculosis, XDR-TB, is a form of multi-drug resistant tuberculosis that responds to even fewer available medicines, including the most effective second-line anti-tuberculosis drugs.

As a result of this study, there were statistically significantly positive changes of clinical factors such as anorexia, rhino rhea, and dizziness. It diminished the progression rate of tuberculosis patients. The findings were similar to the previous studies on the other patients [8-9]. This study suggests that individuals with tuberculosis should be targeted for specific health promoting behaviors for the tuberculosis. However, in order to maintain desirable dietary behaviors, convergence educational program for tuberculosis patients focused on health promoting behavior is more successful than single program. The results of this paper, after receiving intervention, there was a positive change for psychological status after intervention than before intervention in the mean score of stress. The finding was consistent with the results of earlier researches [4, 10]. Therefore, it needs to perform systematic tuberculosis program.

The result of this study after apply the experimental model, there has been a significant decrease at vomiting after intake onion. The finding is similar to previous studies on the tuberculosis [11-12]. This experimental mode will contribute to reduction of costs, improvement of daily performance ability, operational efficiency, and mostly fundamental prevention of tuberculosis. The proposed information-based medical model 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 information. The proposed model with application is more efficient than web-based medical information systems. Because this experimental model itself provides more flexibility and extensibility than previous information system.

5. Conclusion

The study is to estimate the effects of a new experimental model adoption to improve daily life performance ability in patients with tuberculosis.

The data were collected by interview and self-administered questionnaire from January 5 through February 16, 2015. This program was totally consisted 126 persons, it has been divided into two parts. The experimental group of 63 patients which was assigned as group with information application, while the control group of 63 patients was assigned as group with no information application. The two groups are compared to know the difference of changes which affects health practice. On the other hand, the evaluation of patient 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 for 12 weeks the health promoting behaviors of intervention program.

The results of this study are as follows. The Chi-square test was performed to compare the basic information of study subjects between two groups. The χ^2-test was used to observe a statistically significant difference between experimental and control group. In addition, it was measured by percentage and number. The pair wise t-test was done to

compare the before and after application of health promoting ability in tuberculosis patients. It was also performed to determine a statistically significant difference in mean scores between the two groups to improve performance ability in tuberculosis patients. The results of this study are as follows.

Firstly, in terms of infectious disease history, it showed significantly higher in subjects(61.9%) who had suffered from infectious disease in the experimental group than that(23.8%) of control groups(X^2=7.26, p<.01). For other disease, the response rate (93.7%) of experimental group was statistically significantly higher than the response rate (33.3%) of control group in subjects who had suffered from other disease (χ^2=3.41, p<.01).

Secondly, in terms of dizziness in the physical status, subjects' score (27.46±1.52) after the application of a new experimental model significantly decreased than subjects (31.58±3.47) before the application of a new experimental model (t=2.68, p=.004).

Thirdly, for dietary status, the follow-up survey showed higher level in the experimental group than the control group, regardless of the time elapsed of 6 weeks after application as compared with previous status. However, experimental group showed a rapid decrease as time elapsed of 9 weeks than control group after application.

This experimental model will contribute to reduction of costs, improvement of daily performance ability, symptoms, operational efficiency, and mostly fundamental prevention of tuberculosis.

Acknowledgements

I would like to express my deepest appreciation to study subjects who have participated in the application of a new experimental model for the improvement of daily performance ability in tuberculosis patients in a busy life. The experimental model will provide effective services in multi-environments to tuberculosis patients and help in improving their health conditions. This paper was a revised and expanded version of my paper. I gave a present it that my paper entitled "Effect of An Information System Application to Improve Daily Life Performance Ability in TB Patients", submitted to CIA 2015, has been accepted. The 3rd International Conference on Computer, Information and Application had been held on May 21-23, 2015 at MVL Hotel, Yeosu, Korea

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