International Journal of Engineering & Technology, 8 (1.4) (2019) 191-204

SPC

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper



Adoption of Advanced Information System for Strengthening Leg Muscles After Knee Replacement Surgery

Seong-Ran Lee[1]*

[1]Dept of Medical Information, Kongju National University

Abstract

This paper is to identify the effect of advanced information system for strengthening leg muscles after knee replacement surgery after artificial joint surgery. The survey conducted a survey of 126 patients who visited an orthopedic surgery from January 8 to March 23, 2018 in the region of M. The general characteristics of the study participants were carried out with X^2-test. The research has been obtained the procedure that changed after the surgery by t-test. The practice for strengthening leg muscles after surgery was analyzed by t-test**.** As a result, first, in terms of men, 52.4% of the experimental group showed a significantly higher than 46.0% of control group(X^2=5.26, p<.05). Second, the mean score(57.85±1.72**)** of the patient's leg edema after the artificial joint surgery was significantly reduced than the mean score(74.19±2.85**)** before the application of the information system(t=2.17, p<.05). Third, the strength of the legs of patients had increased steadily after 8 days applying information system in the experimental group than control group. Therefore, the information system will be a useful tool for patients to strengthen leg muscles after surgery. lt will also provide infrastructure deployment in the medical information field.

Keywords: *Knee, Replacement, Surgery, Leg muscle, Strengthening.*

1.Introduction

According to recent statistics, arthritis has the highest distribution among Korean adult diseases. According to a recent survey, one out of three people aged 50 and over, and one out of two people over 65 are suffering from arthritis. Arthritis and osteoporosis patients are on a steady rise every year(1),(2),(3).

There are three types of arthritis in Figure 1. That is, degenerative arthritis, gouty arthritis, rheumatoid arthritis. In terms of degenerative arthritis, the cartilage can not feel pain because blood does not flow, but the worn cartilage feels pain as it is inflamed. Degenerative arthritis develops over many years and usually appears on the knees. lt can damage bones and ligaments due to gradual damage to cartilage or degenerative changes. Rheumatoid arthritis is an autoimmune joint disease that is greatly influenced by female hormones. Gouty arthritis in protein synthesis shows the symptoms of uric acid deposited in the joints(4),(5).

Chronic diseases such as diabetes mellitus, cancer are steadily increasing every year in Figure 2. In particular, arthritis is increasing rapidly in Figure 3. Arthritis is an inflammatory disease of the joints that has resulted from various causes. A typical characteristic of the joints is pain(6),(7),(8). Moreover, **a**rthritis is not only painful but also accompanied by edema and fever. Degenerative arthritis can use injection therapy and drugs at first(9),(10),(11).

Early arthritis occurs in small areas such as the hands and feet. In the latter part of the arthritis, I get swollen and fever. It is generally difficult to sit down or walk at this stage. Arthritis patients can hardly walk up or down the stairs(12),(13),(14),(15).

When joint damage is severe or serious, surgery should be performed as a final step. Degenerative arthritis requires knee replacement surgery. Arthritis is increasing every year as the number of elderly people in Korea. Figure 4 shows current status of knee replacement surgery by age in South Korea. Also figure 5 shows current status of knee replacement surgery by gender in South Korea. If the cartilage is worn out, people should perform knee replacement surgery. Any complications in artificial joints would be fatal to the effectiveness of artificial joint surgery Arthritis patients can have 80 to 90 percent of their joints restored after artificial surgery. Movement can function as a artificial joint to prevent the death of the elderly(16),(17),(18).

The movement should be made possible through artificial joint surgery to prevent death from fracture of the elderly. That is, **t**he movement should be made possible through artificial joint surgery to prevent the death of senior citizens from fracture(19),(20),(21). Many operations on arthritis are increasing year by year. Knee replacement surgery was found to have a higher incidence of women than men(22),(23),(24). The artificial joint surgery eliminates the upper thigh, lower schienbein, and the surface of the patella joint. The artificial joint surgery is used to eliminate old arthritis, arthritis after trauma, and stroke arthritis(25),(26).

The artificial joint may have a different lifespan. The life of artificial joints depends on their internal equipment. The artificial joint is used for 15 to 20 years. With recent advances in medical technology, artificial joints can be used for up to 30 years(27),(28). Current status of the ratio of knee replacement surgery every year In South Korea shows in Figure 6. The trend of arthritis among nations shows in Fgiure 7. The causes and treatment of arthritis are shown in Table 1. Knee replacement surgery is the most important thing for arthritis in Figure 8. The knee arthritis varies greatly depending on the rehabilitation and care after surgery in Figure 8. You shouldn't put a hot

Copyright © 2019 Authors. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

pack on patient knee because of a wound. However, the patients have to apply cold packs to the knee area where you have had knee artificial joint surgery(29),(30),(31).

Patients with arthritis should avoid hot packs because they are caused by infection. However, if you have pain in the lower leg, use a school pack(32),(33). Arthritis patients should avoid sitting on their feet or kneeling their knees after artificial surgery. Arthri
tis patients may not have an appetite or may skip meals for many reasons. After surgery of knee joint,,it needs to provide enough food to recover their joints quickly after the operation. Patients need to diagnose if your knees sound or hot after knee joint surgery(34),(35). The patients after the surgery need to take good care of the patient so that there are no side effects after artificial joint surgery. Previous researches show that there are many treatments for artificial joints, but it is not enough to strengthen leg muscles(36),(37).

Thus, this paper measures the development of advanced information system for strengthening leg muscles after knee replacement surgery. Through the construction of the information systems, it can improve the satisfaction level of the leg muscles after artificial joint surgery to patients. By doing so, the patients can lead a healthy life after performing surgery on artificial joints. The findings of this paper will contribute to improving the quality of life after knee replacement surgery.

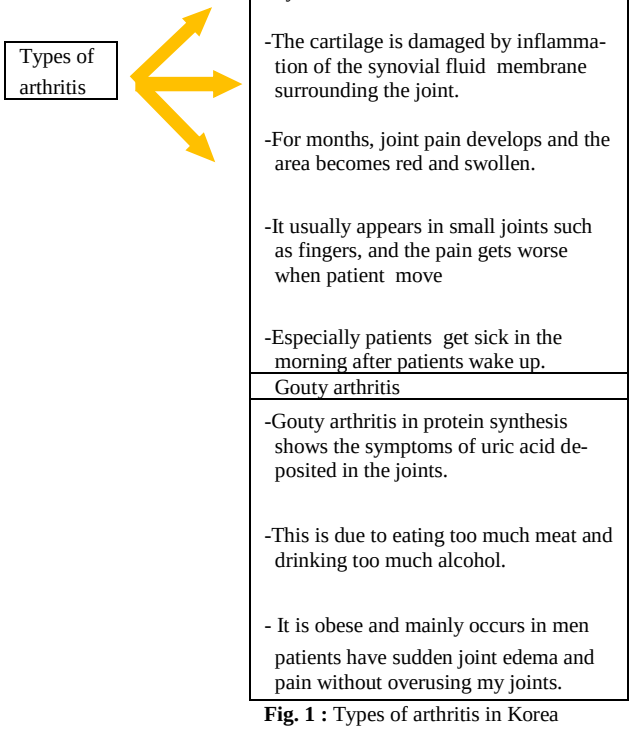


Fig. 1 : Types of arthritis in Korea

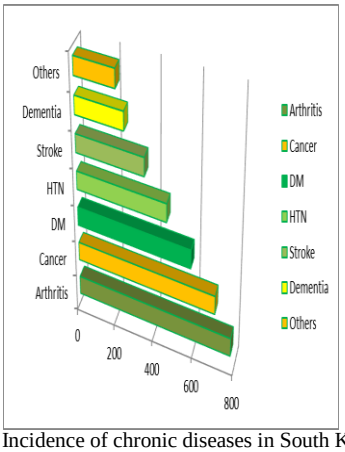


Fig.2: The Incidence of chronic diseases in South Korea (2017)

2.Materials and Methods

2.1 Process for Implementing the Information System

The paper is the process for implementing the information system. The advanced model is as follows. Program planning**,** collection of materials**,** system control process, storage of data processing, study of derived data, .extraction of data, application of data, analysis of system problems, feedback of data. The structure planned the design through data of the respondents at the beginning stage. Analysis of the information is made by the respondents in Figure 5.

In addition, this program is to explain the contents of several steps. The first phase, it sets a goal for the plan in the model. The second phase is designing a successful model and analyzing its contents. Moreover, in the preparation phase, The paper was analyzed the contents that specialize in artificial joint surgery. The final step is to analyze before and after application of information in the daily lives of the experimental and control group.

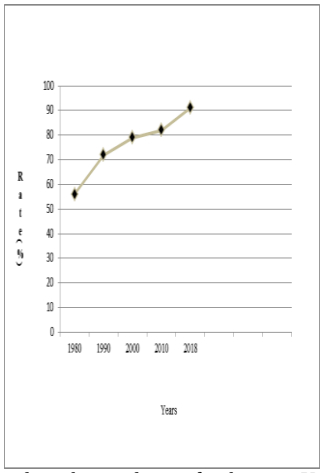


Fig. 3 : Trends in the incidence of arthritis in Korea(2017)

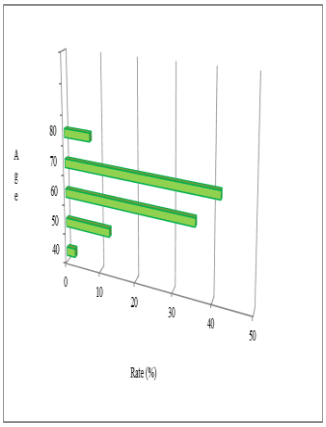


Fig. 4 : Current status of knee replacement surgery by agein South Korea (2017)

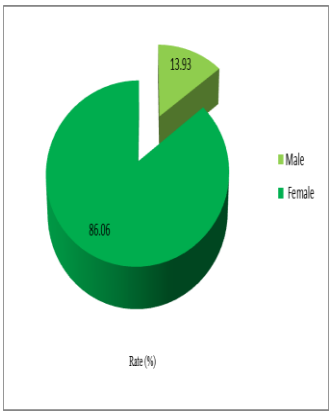


Fig. 5 : Current status of knee replacement surgery by genderin South Korea (2017)

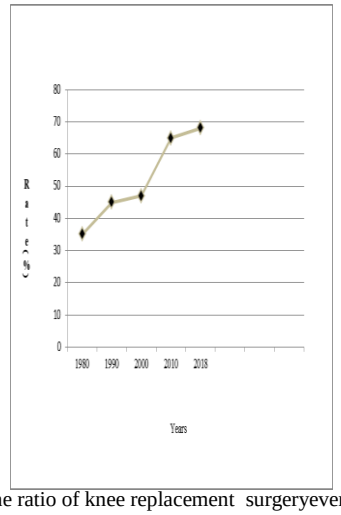


Fig. 6 : Current status of the ratio of knee replacement surgeryevery year In South Korea (2017)

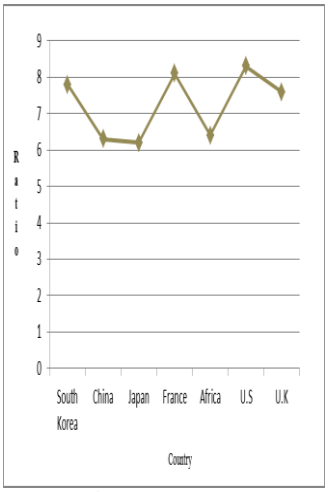


Fig. 7 : The trend of arthritis among nations (2017)

2.2 The framework of research for knee replacement surgery

This framework of research for knee replacement surgery was performed through a phased process**.** To this end, l analyzed the cause of arthritis and how to treat arthritis in Table 1.

The program was provided by various stages. 1) We conducted an experiment to see if this system is useful. 2**)** The system provided a way to collect data. 3) The effectiveness of data entry methods was suggested 4) Effective data extraction methods and experiments were conducted on the subjects. **5)** Through data analysis, problems and improvement measures were analyzed. 6) The effectiveness of the system was verified through assessment by the target 7) l checked if it was a useful system for patients with knee replacement surgery

Table 1 : Causes and Treatment of Arthritis

Classification	Detailed classification
Cause of arthritis	■ Age - Degenerative arthritis from aging ■ Exercise - Excessive exercise ■ Impact - Damage to cartilage due to external impact ■ Repeat - Repetitive use of the joints causes cartilage and ligament wear. ■ Obesity - Joint and cartilage pressures caused by obesity ■ Nutrition - If the muscles and bones become undernourished
High-risk distribution	■ Arthritis rate - Obese person has twice the incidence of degenerative arthritis than normal person
Diagnosis	-Clinical symptoms, examination findings, and radiological findings - Clinical tests are combined to diagnose - CRP, ESR examination
Treatment	■ Early stage - Medication, exercise, and injection ■ Middle stage - Cellular gene therapy ■ Last stage - Cord blood stem cell transplantation ■ Polar period - Artificial joint surgery - Knee replacement surgery

2.3 Formation of A New System

A new system was introduced on the basis of prior research. (11)(20),(25),(28), The characteristics and needs of patients with artificial joint surgery were considered as research data. For this, it analyzed the status of artificial joint surgery.
The following new information system was introduced to improve patient condition**.** This paper presents a framework for analyzing the effects of newly introduced information systems based on the application process techniques in Figure 12. The framework enables a quantitative comparison and analysis of data and new systems in process oriented perspectives. In addition, a configuration tool for understanding and identifying a variety of variables is presented. Application process can be utilized for evaluating the performances of information systems because it provides various functions such as process discovery, performance analysis, and pattern analysis. This paper proposes a new method for quantitatively analyzing and comparing the effects of a newly adopted information system and its corresponding existing information system. l hope the framework and configuration tool could be utilized in various medical fields.
The four components of the information system are follows. 1) Automations 2) Rationalization of procedures 3) Medical process redesign 4) Paradigm shift 5) ldentifying processes that require change 6) Analyzing existing processes 7) Designing a new process 8) lmplementing new processes. 9) Continuous measurement

2.4 Strategies for Strengthening Leg Muscles

There are three types of arthritis treatments, depending on the patient's condition in Figure 8. The program was provided by various patient's condition**.** This was designed the strategies for strengthening leg muscles in Figure 9.
Participants were divided into experimental and control group. Participants look at the state of change with the advanced system. To verify the effectiveness of this information, l observed continuous improvement of leg muscles after artificial joint surgery. For this reason, it was observed over time. l measured.seven times as follows **:** 8, 18, 28, 38, 48, 58 days.

2.5 Data Analyses

The data conducted a survey of 126 patients who visited an orthopedic surgery from January 8 to March 23, 2018 in the region of M. The paper provided training and execution to participants four times a month through Excel, video, power point and data analysis by applying the information system.

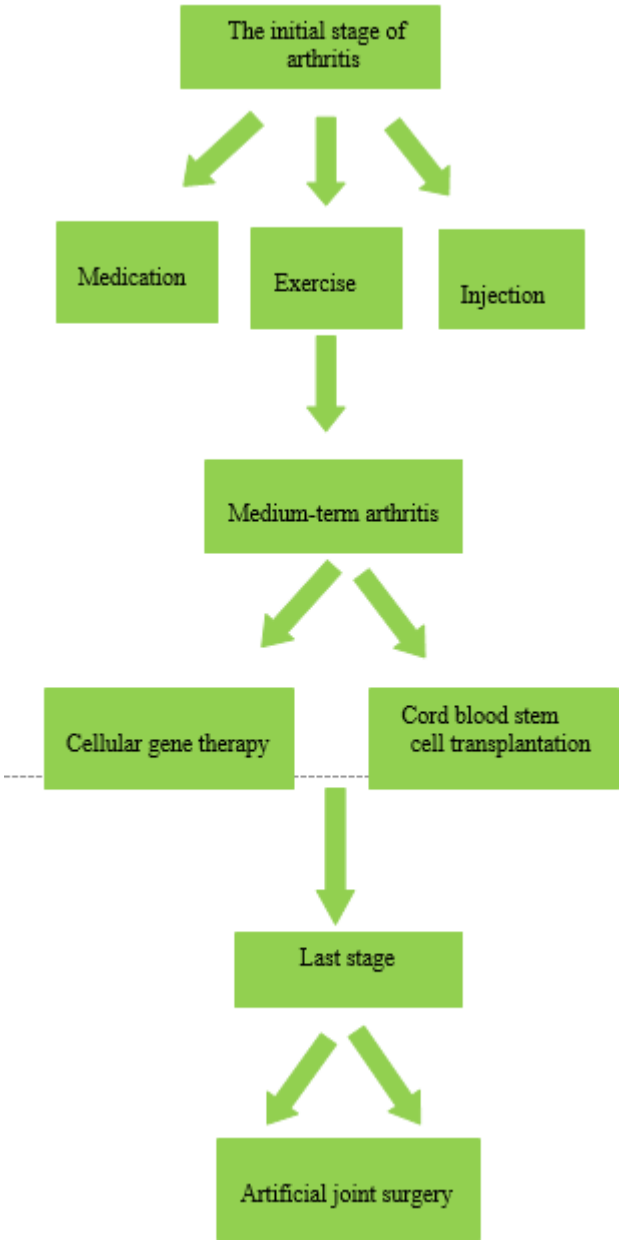


Fig. 8 : Periodic stage of treatment according to the conditionof arthritis patients

2.6 Two Groups of Subjects

The patients diagnosed with arthritis at least 2 months ago by general surgery in M province. A total of 126 patients involved in this research.

The paper was consisted of two groups of the subjects. The experimental groups are 63 patients who were classified as subjects applying program, while the control groups are 63 patients who were classified as subjects without applying program. The two groups are compared to check the changes which affects the leg muscles after knee replacement surgery.

2.7 Tool for Research

Figure 9 is a tool of this research for patients with knee artificial surgery. The total number of items in the data was 56. The general characteristics of the study subjects consisted of 9 items. Postoperative state changes were 16 items. That is, it was the process of changing the postoperative state before and after the application of
the information system. There were 13 items in the Implementation conditions for strengthening muscles after surgery.

On the other hand, there were 7 items in the requirements for the effectiveness of the information system. Also, there were 7 items in the strategies for applying information system**.** There were 4 items in the changes of muscle condition after the artificial joint surgery in Figure 12. .

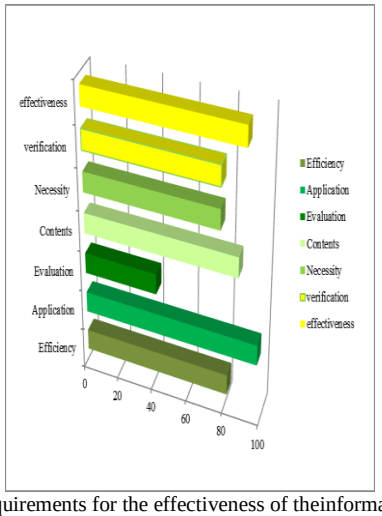


Fig. 9 : Requirements for the effectiveness of theinformation system

2.8 Characteristics of lnformation System

For the methods for strengthening leg muscles after artificial joint surgery, the characteristics of information system shows in Figure 9-10. 1) Automation to facilitate the use of information systems 2) Rationalization as a theoretical explanation of the information system 3) **A** paradigm adapted to the times 4) Measure the effectiveness of the patient 5) Speed of information systems 6) Realistic situation for patients 7) Economic expenses in Figure 11 in Table 2.

.

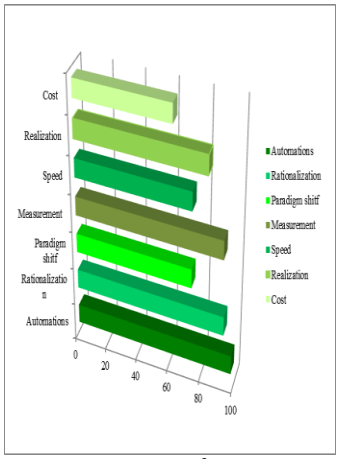


Fig. 10 : Characteristics of information systems

2.9 Data Analysis

The general characteristics of the study participants shows with X^2-test. The general characteristics of the study participants were calculated from means and percentages. The paper has been obtained the procedure that changed after surgery by t-test. The practice for stren

gthening leg muscles after surgery was analyzed with t-test**.** Before and after the application of the information system was tested for significance. This survey was conducted on a five-point scale. The survey excluded the missing or poorly written entries of knee joint surgery patients.

The experimental and control groups were composed of the same requirements. This research method was carried out by the SPSS win 17.0 program in Table 2.

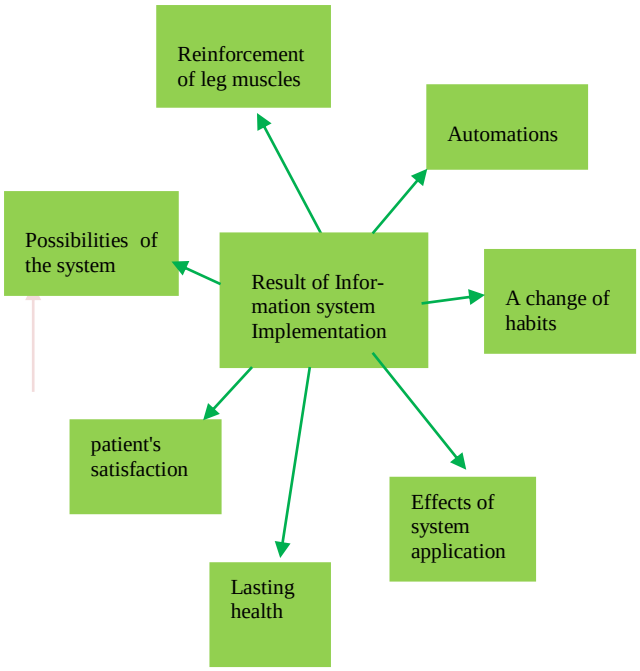


Fig. 11 : Methods for strengthening leg muscles after surgery

Table 2 : Direction of Information System Implementation

Division	Procedures	Materials
Preparatory stage	-Preparation of the information system's progress procedures -A preliminary survey for part icipants	Hand out
Progress	-Strategies for strengthening the leg muscle -Strategies to strengthen the body's immune system	Power point
Method of leg muscles	- Living habits for strengthening leg muscles after surgery - Methods to enhance leg muscle -The usefulness of system Application	Data
Life habits	-An exercise of muscle strength -An exercise of sitting and standing -Food to strengthen the body's immune system -Accessibility of communication system	Data analysis
Analysis	-Identifying problems by analyzing patient data -Identifying the benefits of making an infusion for health	Data analysis
Impact	- Effects of leg muscles on the leg after surgery -The usefulness of the latest information system -The potential to extend to health care	Video
Result	-Identifying the effect of strengthening leg muscle after applying the information system -An effective application to chronic diseases	Survey

3. Results

3.1 General Characteristics of Subjects

Table 3 shows general characteristics of subjects**.** In terms of men, 52.4% of the experimental group showed a significantly greater distribution than 46.0% of control group(X^2=5.26, p<.05). In terms of age, the experimental group was found to be 17.5% at age 50 to 59, significantly lower than 30.2 % of control group. In terms of family living status, 49.2% of the experimental group was significantly higher than 34.9% of control group while living with the husband and wife(X^2=9.02, p<.05).

Table 3 : General Characteristic of Subjects

Variables	Experimental group N(%)	Control group. N(%)	X^2
Gender			
Men	33(52.4)	29(46.0)	5.26*
Women	30(47.6)	34(54.0)	
Level of education			
Below middle school	17(27.0)	14(22.2)	7.93
High school graduation	31(49.2)	28(44.4)	
College and over	15(23.8)	21(33.3)	
Age/years			
<40	3(4.8)	8(12.7)	11.25
40-49	15(23.8)	13(20.6)	
50-59	11(17.5)	19(30.2)	
≥60	34(54.0)	23(36.5)	
Average monthly income/million			
<1	20(31.7)	18(28.6)	13.48
1-1.99	12(19.0)	10(15.9)	
2-2.99	17(27.0)	23(36.5)	
≥ 3	14(22.2)	12(19.0)	
Marriage status			
Single	16(25.4)	14(22.2)	2.17
Married	47(74.6)	49(77.8)	
Family history			
Yes	18(28.6)	11(17.5)	4.95
No	45(71.4)	52(82.5)	
Other diseases			
Yes	51(81.0)	44(69.8)	7.20
No	12(19.0)	19(30.2)	
BMI (kg/m²)			
<18.5	17(27.0)	19(30.2)	11.64
18.5-24.9	12(19.0)	14(22.2)	
≥25	34(54.0)	30(47.6)	
Family living Status			
Husband, wife (or couple) and children	20(31.7)	26(41.3)	9.02*
Husband and wife or couple	31(49.2)	22(34.9)	
Alone	12(19.0)	15(23.8)	
Total	63(100.0)	63(100.0)	

*P<.05

3.2 The Process of Changing the Postoperative State

Table 4 shows the process of changing the postoperative state before and after the application of the information system. The mean score(57.85±1.72**)** of the patient's leg edema after the artificial joint surgery was significantly reduced than the mean score(74.19±2.85**)** before application of the information system(t=2.17, p<.05). The mean score(56.82±**0**.69**)** of the patient's vitality after the artificial joint surgery was significantly reduced than the mean score(39.15±3.73**)** before application of the information system(t=-1.26, p<.05).
The mean score(45.13±3.17**)** of the patient's shoulder pain after the artificial joint surgery was significantly reduced than the mean score(61.78±0.41**)** before application of the information system(t=-3.58, p<.05).

Table 4 : The process of Changing the Postoperative State

Items	Before	After	
	Mean±S.D	Mean±S.D	t
Edema	74.19±2.85	57.85±1.72*	2.17*
Joint pain for more than two weeks	79.62±0.83	61.47±3.84	5.84
Vitality	39.15±3.73	56.82±0.69	-1.26*
Shoulder pain	61.78±0.41	45.13±3.17	-3.58*
Anorexia	43.92±0.74	36.49±0.62	0.71
Pain at night	76.82±2.69	58.27±1.59	1.63*
Weight loss	23.57±1.83	36.54±0.73	-0.41
Rigid body	75.36±0.62	64.19±3.28	3.15
Insomnia	69.42±3.27	57.37±0.46	0.72
Flush of the joints	57.16±1.43	48.05±1.81	5.39
Emotional disorder	44.08±1.91	35.18±0.29	1.64
Joint movements	31.74±3.58	62.72±3.52	-4.57*
High fever	36.15±0.46	27.48±0.91	3.06
Alcohol drinking	64.37±1.95	35.17±2.58	1.91**
General weakness	66.28±0.34	57.82±4.15	4.27
Eating garlic	29.95±4.17	62.74±1.79	-2.64**

*p<.05 ** p<.01

3.3 Practice for Strengthening Leg

Table 5 shows practice for strengthening leg. After applying the information system, the mean score(36.14±0.83) of patients who ate garlic regularly was significantly higher than the mean score(24.73±0.69) before the applying information system(t=-1.57, p=.029).
The average score(31.67±0.38) of foot massage group after application of the information system was significantly higher than the mean score(17.62±4.29) before information application(t=-3.41, p=.000). The average score(39.52±1.61) of sun-exposing group after application of the information system was significantly higher than the average score(31.48±0.57) before the information application

Table 5 : Practice for Strengthening Leg

Variables	Before	After	t	P
	Mean±S.D	Mean±S.D		
Jogging	19.15±2.64	31.52±1.47	-3.64	.000
Eating garlic	24.73±0.69	36.14±0.83	-1.57	.029
Sun surfing	31.48±0.57	39.52±1.61	-4.82	.594
Egg intake	29.26±1.93	38.45±3.15	-0.51	.037
Stretching	23.64±0.35	35.31±1.46	-5.39	.000
Foot massage	17.62±4.29	31.67±0.38	-3.41	.000
Finger compression	20.37±1.56	39.15±4.29	-4.54	.000
Knee bending	23.08±3.29	28.73±0.36	-2.87	.152
Blood pressure control	22.86±4.51	19.52±4.18	0.48	.795
Acupressure of leg	24.14±0.76	13.47±1.95	3.17	.000
Control of depression	21.72±1.38	17.81±3.64	1.95	.045
Numbness in leg	23.50±3.45	19.63±0.72	5.16	.068
Leg exercise	24.96±1.70	15.98±1.46	3.59	.000

3.4 Process of strengthening leg muscles

Figure 12 shows the process of strengthening leg muscles. After knee replacement surgery, the degree of muscle enhancement in the leg was observed for 58 days after applying information system between two groups.
The strength of the legs of patients has increased steadily since 8 days of the application of the information system in the experim ental group than control group. However after 48 days, his leg muscles decreased slightly.

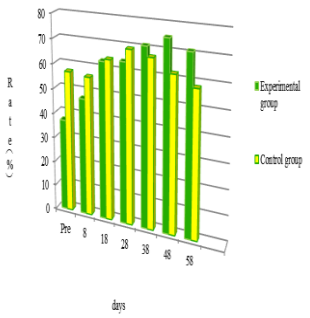


Fig.12 : Process of strengthening leg muscles

3.5 Condition of arthritis pain over time

Figure 13 shows calculated the condition of arthritis pain over time. L observed the relief of arthritis pain after knee replacement surgery for 58 days after the applying information system between two groups.
The pain and relaxation process of arthritis was repeated**.** However, arthritis pain had decreased steadily after 28 days of the application of information system in the experimental group than control group.

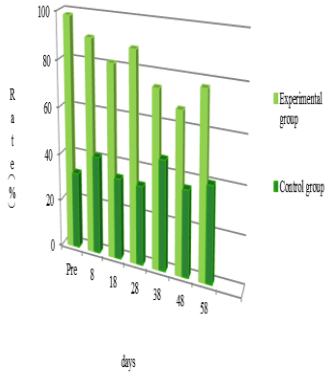


Fig. 13 Condition of arthritis pain over time

3.6 Effectiveness of information system

Figure 14 shows the effectiveness of information system after knee replacement surgery. The effectiveness of the system was observed for 58 days. The effectiveness of the system was found to be more effective in the experimental group than that of the control group. The effectiveness of the system was found to be higher in the experimental group than control group.

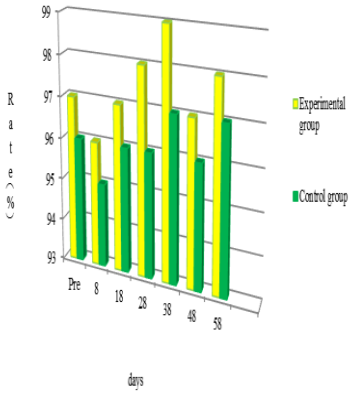


Fig.14 : Effectiveness of information system after surgery

3.7 Persistence of Joint Movements After Surgery

Figure 15 shows the persistence of joint movement after knee replacement surgery. The durability of joint movement showed significantly higher rate after the application in the experimental group than in the control group($p<.05$).

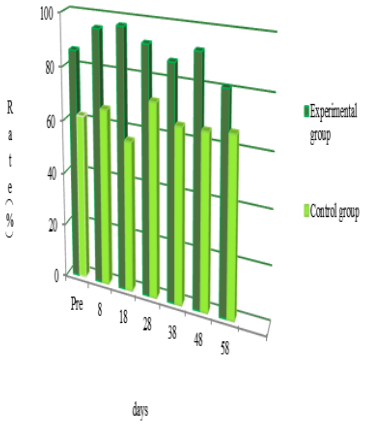


Fig.15 : Persistence of joint movements after surgery

4. Discussion

This paper is to identify the effect of introducting the advanced information system for strengthening leg muscles after artificial joint surgery after artificial joint surgery
As a result, the experimental groups who ate garlic after applying the information system have significantly improved their leg muscles after artificial joint surgery. In previous studies, garlic was also consistent with the results that it had an effect on frac
Garlic will help reduce the pain of arthritis

tures(37),(38),(39). So, garlic has the effect of relieving inflammation and boosting immunity. People's chronic illnesses are linked to inflammation caused by an imbalance in the body. Garlic will help naturally reduce the pain in patients with arthritis and muscle diseases by soothing inflammation and acting as a painkiller. Therefore, this means that a steady intake of garlic can prevent and treat arthritis.
The leg muscles were significantly strengthened after bending, stretching, and exercising. This was similar to the previous study in which leg motion reduced leg numbness(40),(41),(42). Muscular movement is an exercise that puts a certain amount of weight on muscles. Increasing the load gradually increases the strength of muscles, or muscles. It is part of an anaerobic movement because muscles do not need to consume oxygen to generate muscle strength. Muscular exercise is performed in parallel with aerobic exercise to improve blood sugar levels. Increasing muscle mass through muscular exercise helps regulate blood sugar levels. As muscles increase, the base amount increases, which consumes calories, and is effective in preventing or improving obesity. It was turned out that the acupressure strengthens the leg muscles. Hand-pressure aids in the recovery of the stomach and health through smooth circulation and metabolism.
The feet are furthest from the heart and are therefore prone to blood circulation problems in that area. The acupressure can automatically relieve stress and relieve accumulated fatigue. Because it gives people a sense of relaxation, various hormones in human body are released normally.
The sun exposing group was significantly stronger leg muscle after the application of the information than group which do not expose in the sun. This was similar to the study which sunlight stops depression. The sun is also known for its natural nutrients, which are said to be pouring out of the sky. The sun has vitamin D to activate serotonin and discover blue rays. The information system has demonstrated the effect of strengthening leg strength after surgery
The paper is provided through the introduction of information system to improve health. It provides the ability to search and analyze patients' health information, and determine the accuracy and reliability of sources It can have the ability to make good health decisions. The research was designed to develop a health information system and apply it to patients and measure effectiveness. Information systems are effective in terms of increasing familiarity with patients and improving their knowledge of health information. l hope that more diverse patient information programs will be applied to chronic disease patients in the future.

5. Conclusion

This paper measures the adoption of advanced information system for strengthening leg muscles after knee replacement surgery after artificial joint surgery. As a result, the mean score of the patient's leg edema after the artificial joint surgery was significantly reduced than the mean score before application of the information system. Furthermore, the strength of the legs of patients had increased steadily after 8 days applying the information system in the experimental group than control group.
Therefore, the formation system will be a useful tool for patients to strengthen leg muscles after surgery. The information system must take into account the personal circumstances. The information system will also provide infrastructure deployment for arthritis patients in the medical information field.

Acknowledgments

We would like to express our deep gratitude to those who attended the event to strengthen leg muscles after the artificial surgery.
The paper was revised and expanded under the title of "Optimum Information System Adoption for Improving Lower Limb Function." This paper was presented at the Bioscience and Medical Research Workshop held in April 2018 at Hanbat University.

References

[1] Cho JH, Chang SA, Kwon HS, Choi YH, KoSH, Moon SD, Yoo SJ, Song KH, Son HS, Kim HS, Lee WC, Cha BY, Son HY & Yoon KH (2006), Long-term effect of the internet-based glucose monitoring system on HbA1c Reduction and glucose stability: a 30-month follow-up study for diabetes management with a ubiquitous medical care system. *Diabetes Care* 29, 2625–2631.
[2] Fischer CL, Gill CW (2013), Forrester MG and Nakamura R, Quantitation of acute phase proteins postoperatively value in detection and monitoring of complications, Am J Clin Pathol. Vol. 66, pp. 817-823.
[3] Estes CS, Beauchamp CP, Clarke HD, Spangehl MJ (2010), A two stage retention debridement protocol for acute periprosthetic Joint lnfections. *Clin Orthop Relat Res*. 468, pp. 2020- 2022.
[4] Chiu FY and Chen CM (2007), Surgical debridement and parenteral anti-biotics in infected revision total knee arthroplasty. *Clin Orthop Relat Res*. 461, pp132- 134.
[5] Dupont C, Rodenbach J, Flachaire E (2008), The value of C-reactive protein for postoperative monitoring of lower limb arthroplasty. *Ann Readapt Med Phys.* 51, pp. 3336- 3338.
[6] Koo KH, Yang JW, Cho SH, Song HR, Park HB, Ha YC (2001), Impregnation of vancomycin, gentamicin, and cefotaxime in a cement spacer for two stage cementless reconstruction in infected total hip arthroplasty, *J Arthroplasty*, 16, pp. 875-877.
[7] Suh YS, Choi HS, Nho JH, Won SH, Choi JW, Piper KE, Jacobson MJ, Cofield R:H, Sperling TW, Sanchez-Sotelo J, Dsmon DR (2009), Microbiologic diagnosis of prosthetic shoulder infection by use of implant sonication, *J Clin Microbiol*. 47, pp. 1871-1873.
[8] Filches F, Martinez-Pastor JC, Garcia-Ramiro S, Bori1 G, Macule F, Sierra J (2011), Outcome and predictors of treatment failure in early post-surgical prosthetic joint infections due to staphylococcus aureus treated with debridement, *Clin Microbiol Infect*, 17, pp. 430- 433.
[9] Enquobahrie A, Gobbi D, Matthew WT, Cheng P, Yaniv Z. Frank L, Cleary K (2008), Designing tracking software for image-guided surgery applications : lGSTK experience, *International Journal of Computer Assisted Radiology and Surgery*, 3, 5, pp. 395-401.
[10] Seemann, R, Bruckner F, Figl M, Wagner A, Schichl K, Elmenreich W (2003), Applying a real-time interface to an optical tracking system, *in Proceedings of the Workshop on Augmented Reality in Computer Aided Surgery*, 87.
[11] Jon T, Dane W. Aron M. Michael A. Peshlin, C. Kenzle, Stulberg D (2005), Registration and immobilization in robot-assisted surgery, *International Symposium on Medical Robotics and Computer Assisted Surgery*, 80, 87.
[12] Lee SR (2018), Optimum information system adoption for improving lower limb function after artificial joint surgery, *Proceedings of International Workshop of Bioscience and Medical Research*, Daejeon, Korea, April.
[13] Kleunen VJ, Knox PD, Garino JP, Lee GC (2010), Irrigation and
debridement and prosthesis retention for treating acute periprosthetic infections. *Clin Orthop Relat Res*. 468, 2024-2028.
[14] Chiu FY, Chen CM (2007), Surgical debridement and parenteral antibiotics in infected revision total knee arthroplasty. *Clin Orthop Relat Res*. 461, 130-135.
[15] Tsukayama DT, Estrada R, Gustilo RB (2006), Infection after total hip arthroplasty. a study of the treatment of one hundred and six ilnfections. *J Bone Joint Surg Am*. 78, 512-523.
[16] Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG (2002), CDC Definitions of nosocomial surgical site infections : a modification of CDC definitions of surgical wound infections. *Am J Infect Control*. 20, 271-274
[17[Andinel E. David G. Mathew W. Turek, Patrik C. Ziv Y. Frank L, Kevin C (2008) Designing tracking software for image-guided surgery applications : IGSTK experience, *International Journal of Computer Assisted Radiology and Surgery*, 3, 5, pp. 396-398.
[18] Seemann, R, Bruckner M, Flgl, A, Wagner K, Schichi W, Elmenreich (2003), Applying a real-time interface to an optical tracking system, *In Proceesing of the Workshop on Augmented Reality in Computer Aided Surgery*, pp. 86-88.
[19] Jon TL, Dane W, Aron M, Michael A, Peshin, Thomas C, Kenzle lll, S, David S (2005), Registration and immobilization in robol-assisted surgery *International Symposium on Medical Robotics and Computer Assisted Surgery*, pp. 81-83.
[20] Russel H, Taylor (2003), Medical robotics in computer-integrated surgery, lEEE Transactions on robotics and automation, 19, 5, pp. 766-780
[21] Besl PJ, Mckay HD (2002), A method for registration of 3-D shapes, IEEE, Transactions on pattern analysis and machine intelligence, 14, 2, pp. 240-250.
[22] Kim YH, Park H (2016), Study on the anti-Inflammatory activity and mechanism of medicinal plants used in the treatment of arthritis. *Korean J Clin Lab Sci*. 48, pp. 176-182.
[23] Barbara E, Mabry T, Tsaras G, Spangehl M, Erwin PJ, Murad MH
(2010), Inflammatory blood laboratory levels as markers of prosthetic joint infection: a systematic review and meta-analysis. *J Bone Joint Surg Am*. 92, pp. 2102-2109
[24] Van Kleunen JP, Knox D, Garino JP, Lee GC (2010), Irrigation and debridement and prosthesis retention for treating acute peri- prosthetic infections. *Clin Orthop Relat Res*. 468, pp. 2024- 2028.
[25] Bilgen O, Atici T, Durak K, Karaeminoğullari, Bilgen MS (2001), C-re-active protein values and erythrocyte sedimentation rates after total hip and total knee arthroplasty. *J Int Med Res*. 29, pp. 11-12.
[26] Piper KE, Jacobson MJ, Cofield RH, Sperlıng TW, Sanchez- Sotelo J, Osmon DR (2009), Microbiologic diagnosis of prosthetic shoulder infection by use of implant sonication. *J Clin Microbiol*.
47, pp. 1878-1884.
[27] Park SK. (2012) Gender difference in the association of metabolic syn- drome with hs-CRP concentration of blood. Korean J Clin Lab Sci. 44, pp.86-96.
[28] Galat l, McGovern DD, Larson SC, Harrington DR, Hanssen JR, larke AD (2009), Surgical treatment of early wound complica- tions following primary total knee arthroplasty. *J Bone Joint Surg Am*. 91, pp.48-54.
[29] Garrett JR, William E (2006), American Board of Orthopedic Surgery Practice of the Orthopaedic Surgeon : part-H certification examination case mix, The Journal of Bone and Joint Surgery, 88, 3, pp. 660-557.
[30] Scuderi, GR, Insall JN, Windsor RE, Moran MC (2009), Survivorship of Cemented knee replacements, Journal of Bone and Joint Surgery, British Volume, 71, 6, pp. 798-799
[31] Burkart A, Debski RE, McMahon J, Rudy F, Fu H, Musahl V, Van
Scyoc A (2001), Precision of ACL tunnel placement using traditional and robotic techniques, Computer Aided Surgery, 6, 5, pp. 270-278.
[32] Kwon, MJ (2015), Convergence Study on the Relation between cog
nition, depression and aggression in the elderly, *Journal of the
Korea Covergence Society*, 6, 6, pp. 171-176.
[33] Suh HJ, Yoo YS (2007), Intensive care unit nurse's knowledge, nuring performance, *Korean Journal of Adult Nursing*, 19, 1, pp. 55-65.

[34] Choi JY (2012), Research on nurses' stress for elderly care and stress-coping strategies, *Journal of Digital Convergence*, 10, 8, pp. 275-286.
[35] Contin AM, Perez J, Alonso A, Enguix A, Ramos F (2005), Postoperative delirium after elective orthopedic surgery, *International Journal of Geriatric Psychiatry*, 20, 6, pp. 595-597..
[36] Robinson TN, Raebum CD, Angles ZV, Brenner LA, Moss M(2009), Postoperative delirium in the elderly: Risk factor and outcomes, *Annals of Surgery*, 249, 1, pp. 173-178.
[37] Wit lox J, Eurelimg LS, de Jonghe JF ,Kalisvaaart KJ, P. Eikelenboom P, Van Gool WA(2010), Delirium in elderly patients and the risk of postdischarge mortality, institionalization, and dementia: A meta-analysis, *Journal of the American Medical Association*, 304, 4, pp. 443-451.
[38] Tak VJ (2015). Comparison of characteristics of risk behaviors and injuries between elderly and young population in Korea: application of convergence educational concept, *Journal of Digital Convergence*, 13, 5, pp. 289-296.
[39] Koster S, Oosterveld FG, Hensens AG, Wijma A, Van der Palen J (2008), Delirium after cardiac surgery and predictive validity of a risk 7,8,9 checklist, *The Annals of Thoracic Surgery*, 86, 6, pp. 1883-1887.
[40] Marcantonio ER,, Goldman L, Orav EJ, Cook EF, Lee TH(2008), The association of intraoperative factors with the development of postoperative delirium, The American Journal of Medicine, 105, 5, pp. 380-384.
[41] Benoit AG, Campbell Bl, Tanner JR, Staley JD, Wallbridge HR, Biehl DR(2005), Risk factors and prevalence of perioperative cognitive dysfunction in abdominal aneurysm patients, *Journal of Vascular Surgery*, 42, 5, pp. 884-890.
[42] Lee, SR (2018), Optimum Information System Adoption for Improving Lower Limb Function After Artificial Joint Surgery, *Proceedings of International Workshop of Bioscience and Medical Research,* Hanbat National University, Korea, April, 13, 15