International Journal of Bio-Science and Bio-Technology
Vol.8, No.2 (2016), pp.353-362
http://dx.doi.org/10.14257/ijbsbt.2016.8.2.33

An Analysis of Education Effect on Physical Rehabilitation in Patients after Total Knee Arthroplasty

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Abstract

This paper performed an analysis of education effect on physical rehabilitation in patients after total knee arthroplasty. The subjects of this paper were 142 patients who had visited two general hospitals located in Chungnam area. As a result of this study, for the change of arthroplasty status, the follow-up survey was estimated to be higher in the experimental group than control group, regardless of the time elapsed of 2 weeks after physical rehabilitation education. However, the physical activities were decreased by the education more rapidly with time elapsed of 8 weeks in the experimental group as compared to the control group. Therefore, the education for the improving physical rehabilitation in patients after total knee arthroplasty can be applied to any hospital.

Keywords: *Analysis, Education effect, Physical rehabilitation, Patients, Knee arthroplasty*

1. Introduction

The knee joint is one of the most important joints in our daily lives, as it allows us to walk, run, walk up the stairs, and squat [1-3]. Thus, many patients who visit the hospital experience pain while doing the above activities. Knee pain is not only limited to the elderly who go through degenerative problems, ultimately requiring knee joint replacement surgery. It is also common among fairly young people who are actively engaged in sports activities [4-6].

As there are different causes of knee pain, the treatment method should differ based on age, occupation, and level of activity among patients. Knee degenerative arthritis is a very common disease among the middle aged, and it affects the damaged cartilage or meniscus due to overuse of knee. In most cases, if the arthritis is not severe, it is difficult to observe through a simple X-ray test. Thus, it is difficult to give a certain immediate answer to the patient. However, through physical examination, analysis of medical history, and MRI exam, one can provide a more accurate diagnosis of the patient's condition. Thus, if the knee pain persists for a long period of time, then an MRI exam is recommended to better understand the level of damage to the articular cartilage and meniscus [7-9].

Arthroplasty is an orthopedic surgical procedure where the articular surface of a musculoskeletal joint is replaced, remodeled, or realigned by osteotomy or some other procedure. It is an elective procedure that is done to relieve pain and restore function to the joint after damage by arthritis or some other type of trauma. With this information, an orthopedic specialist can provide the tailored treatment based on the individual's condition to slow down the progression of arthritis and even prevent it. Furthermore, orthopedic specialists pay close attention to the alignment of the lower extremities when treating knee pain. In patients with bowed legs, their weight is not aligned to the center of the knee. When this happens, the weight on the inner part of knee increases, and no weight is put on the outer part of knee, ultimately causing an imbalance of weight bearing on the knee joint. Thus, people with bowed legs are likely to experience knee arthritis more often than others without bowed legs, and they may experience faster progression of arthritis after it

ISSN: 2233-7849 IJBSBT

has occurred. For such patients, it is hard to reach satisfying results just by taking medications or receiving treatment for the meniscus or cartilage [10-12].

In order to meet increasing demand for better patient care and upgrading clinical research, there is a need for analysis of health promoting data with a common database including clinical data collected from patients of arthroplasty. Therefore, this paper performed an analysis of education effect on physical rehabilitation in patients after total knee arthroplasty. This study is to find the optimum methods for knee management after total knee arthroplasty.

2. Materials and Methods

2.1 Study Materials

This program was developed through review of existing literature, assessment of patients' information needs, available updates on education, web site analysis and solicitation of expert advice throughout the development process. Study participants were patients who were performed arthroplasty at least 1 year ago by orthopedic of two general hospitals in Chungnam area. The data were collected by interview and self-administered questionnaire from November 12, 2014 through February 20, 2015. This program was totally consisted 142 persons, it has been divided into two parts.

On the other hand, contents assigned for physical rehabilitation in patients after total knee arthroplasty are recognition, usefulness, application, impact, and improvement [Figure. 1].

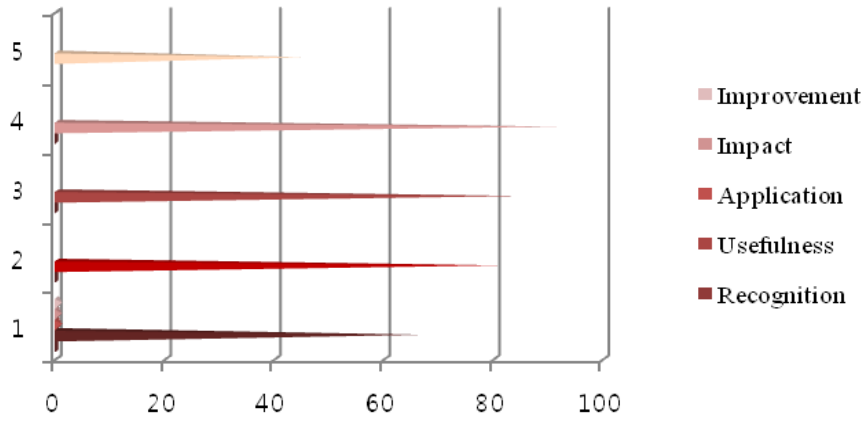


Figure 1. Contents Assigned for Physical Rehabilitation After Total Knee Arthroplasty

2.2 Three-Step Basic Strategies

This research is composed of three-step basic strategies. The first success factor of the system is subjects' lack recognition for total knee arthroplasty which is the biggest problem of the arthroplasty patients. The strategies of the second-stage are program which selected the order of priority of the time and the importance in the limitation of the budget and the practical implementation. The strategies of third-stage are the evaluation on the empirical performance for the physical rehabilitation in patients after total knee arthroplasty [Figure 2].

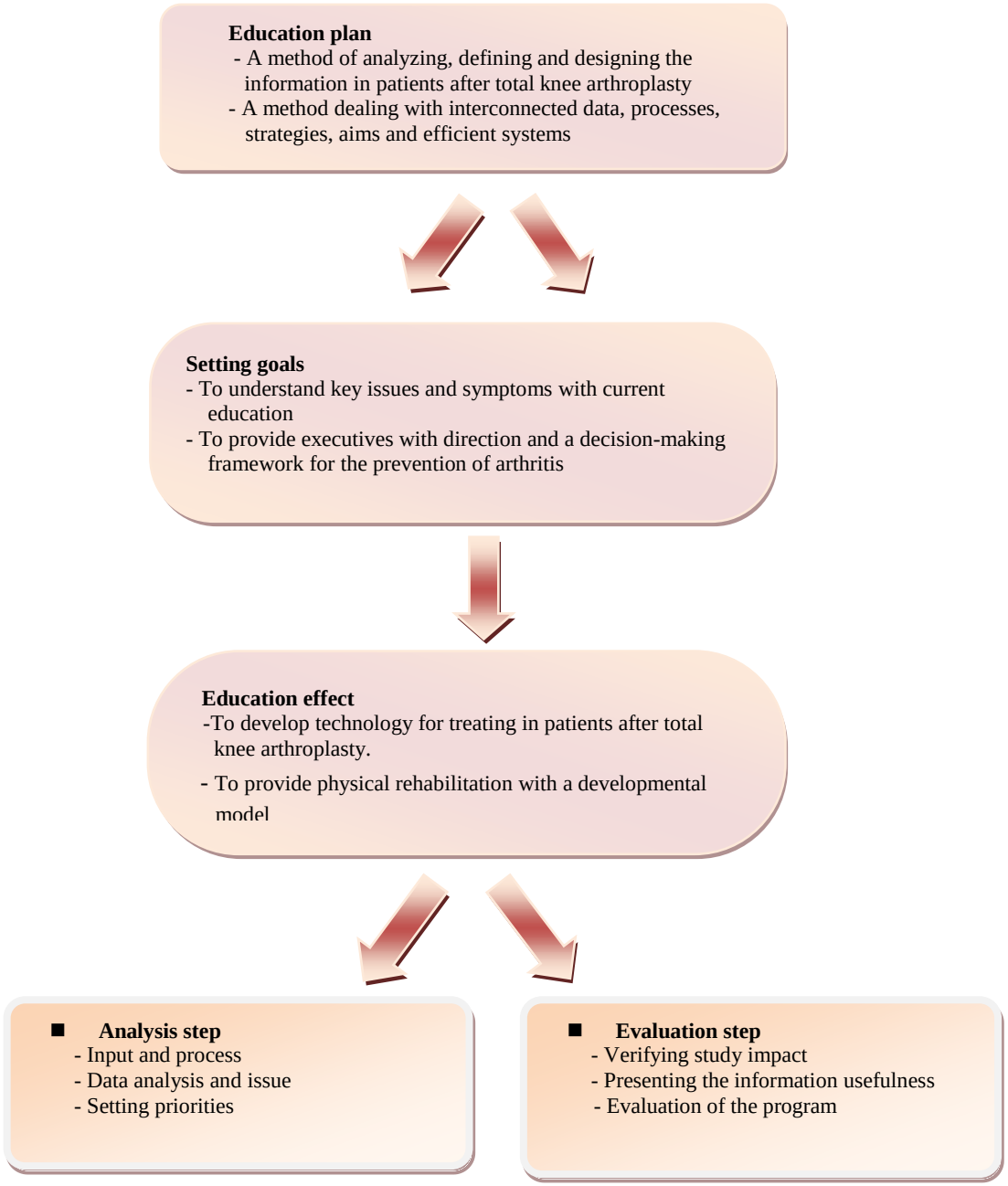


Figure 2. Construction of Physical Rehabilitation in Patients After Total Knee Arthroplasty

2.3 Research Instruments

The effects of this program were measured before and after the test by education. The data collection tool was composed of totally 25 items This questionnaires covered with 7 items(age, gender, marital status, monthly income, education level, another diseases, BMI) for basic information of study subjects, 18 items(complication, body weight control, cholesterol, stress status, jogging, hypertension control, exercise of muscle, vegetable intake, anxiety, counseling, smoking, diabetes mellitus, depression, swimming, dandelion tea drinking, garlic intake, mineral intake, calcium intake) for physical rehabilitation rate of before and after educational intervention. 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 education effect, a follow-up test had been estimated the durability of education effect for 8 weeks. The experimental group was applied by the education effect during a eight-week period of time, twice a month, for 5 sessions each of which lasted 30 minutes. During the period, the control group received no application. The control group was informated to conduct the program after finishing program for the experimental group.

2.4 Study Methods

The Chi-square test was performed to compare the general characteristics between two groups. In addition, it was measured by percentage and number. The pairwise t-test was done to compare the before and after education intervention in patients after total knee arthroplasty.

All p-values were found to be less than 0.05, indicating statistically significant differences for each variable compared between before and after the intervention of education. It was also performed to determine the statistical significant differences between the two groups on the satisfaction of an experimental analysis for measurement of education effect for the prevention of arthritis.

3. Results

3.1 Basic Information of Subjects in this Study

Table 1 presents basic information of subjects in this study. The age groups divided less than 39 years, 40 to 49 years, 50 to 59 years, and 60 years old or more. The proportion of respondents with 50-59 years old was lower in experimental group(26.8%) than in control group(31.0%). The respondent rate(45.1%) of experimental group was higher than the response rate(26.8%) of control group, however there was no significant difference for the age group in the 60 years old or more between two groups. The subject's gender was analyzed the experimental group in a female with 60.6% showed higher than female with 54.9% in the control group.

In a marital status, unmarried respondents with 35.2% in the experimental group were lower than respondents with 38.0% in the control group. On the other hand, about respondents who have another diseases, the experimental group with 64.8% showed statistically significantly higher than control group with 38.0% (χ^2=3.67, $p<0.05$). Particularly, as for BMI, study was divided into two groups. Experimental group(49.3%) and control group(38.0%) had over 25kg/m^2 for BMI. The experimental group higher than control group in the 25kg/m^2 or more for BMI.

Table 1. Basic Information of Subjects in This Study

Variables	Experimental group N(%)	Control group N(%)	χ^2
Age/yrs.			
≤39	7(9.9)	12(16.9)	11.94
40-49	13(18.3)	18(25.4)	
50-59	19(26.8)	22(31.0)	
≥60	32(45.1)	19(26.8)	
Gender			
Male	28(39.4)	32(45.1)	7.16
Female	43(60.6)	39(54.9)	
Marital status			
Single	25(35.2)	27(38.0)	2.84
Married	46(64.8)	44(62.0)	
Monthly income			
<200	19(26.8)	21(29.6)	13.29
201-399	34(47.9)	27(38.0)	
400≤	18(25.4)	23(32.4)	
Education level			
Under middle school	17(23.9)	15(21.1)	5.81
High school	25(35.2)	32(45.1)	
Over college	29(40.8)	24(33.8)	
Another diseases			
Yes	46(64.8)	27(38.0)	3.67*
No	25(35.2)	44(62.0)	
BMI†			
18.5≤BMI<23.5	19(26.8)	23(32.4)	9.25
23.5≤BMI<25.0	17(23.9)	21(29.6)	
≥25.0	35(49.3)	27(38.0)	
Total	71(100.0)	71(100.0)	

†BMI : Body Mass Index

3.2 Effect of Physical Rehabilitation in Patients After Total Knee Arthroplasty

Table 2 represents the education effect on physical rehabilitation in patients after total knee arthroplasty. For the mean scores in the jogging, respondents' score(74.62±1.69) after education significantly increased than respondents(46.38 ±1.65) before education(t=-6.28, p=.000). For stress status, the mean of experimental groups was significantly higher score than control groups(t=3.15, p=.003). In terms of dietary factors, the subjects who had intaked garlic were statistically significant difference after application than the mean score of subjects who didn't intake garlic before application of information system(t=-1.64, p=.000).

Table 2. Comparison of Physical Rehabilitation in Patients Ater Total Knee Arthroplasty

Variables	Before Mean±S.D	After Mean±S.D	t	P
Complication	39.16±2.46	27.79±4.12	2.47	.514
Body weight control	67.84±0.91	53.26±0.68	5.01	.027
Cholesterol	74.26±5.25	62.84±2.91	0.62	.745
Stress status	82.71±3.92	67.19±5.24	3.15	.003
Jogging	46.38±1.65	74.62±1.69	-6.28	.000
Hypertension control	76.51±3.29	63.05±3.42	2.72	.052
Exercise of muscle	31.26±0.72	59.42±1.59	-4.35	.000
Having vegetable	69.44±1.36	87.59±6.23	-1.64	.000
Anxiety	83.25±3.79	75.47±2.81	3.29	.169
Counseling	65.92±5.26	83.02±5.24	-6.81	.000
Smoking	43.21±2.92	36.84±1.62	2.57	.361
Diabetes mellitus	67.93±4.35	62.19±2.46	5.28	.738
Depression	75.28±1.28	65.37±4.29	4.19	.257
Swimming	15.17±3.21	42.90±0.81	-7.61	.000
Dandelion tea drinking	12.59±1.63	58.29±1.37	-3.29	.000
Garlic intake	48.27±6.27	71.82±3.62	-1.64	.000
Mineral intake	59.83±2.51	74.39±2.45	-4.18	.000
Calcium intake	79.28±4.84	82.16±5.08	-2.95	.314

The t-test assess whether the means of two groups are statistically different from each other. This analysis is appreciate whenever you want to compare the means of two groups, and especially appreciate as the analysis for the posttest-only two-group randomized experimental design. This illustrates formula for the standard error of the difference between the means [1].

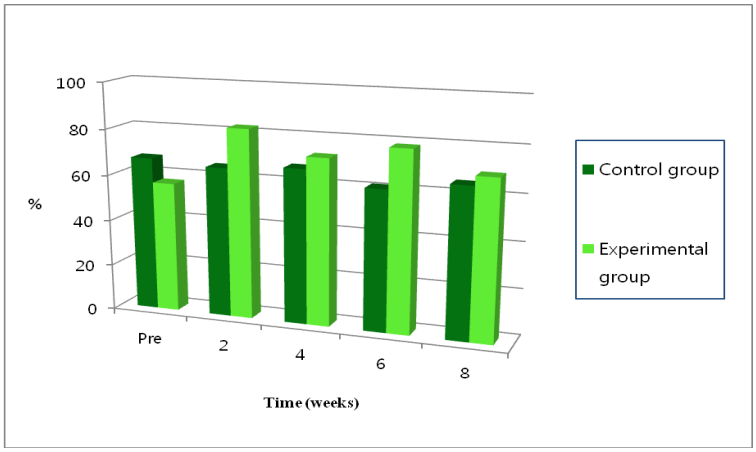
T-value = (Difference between group means) / (variability of groups)

The paired t-test is actually a test that the differences between the two observations is 0. So, if D represents the difference between observations, the hypotheses are : p-value associated with it is low (p<0.05), there is evidence to reject the null hypothesis. Thus, this would have evidence that there is a difference in means across the paired observations [2].

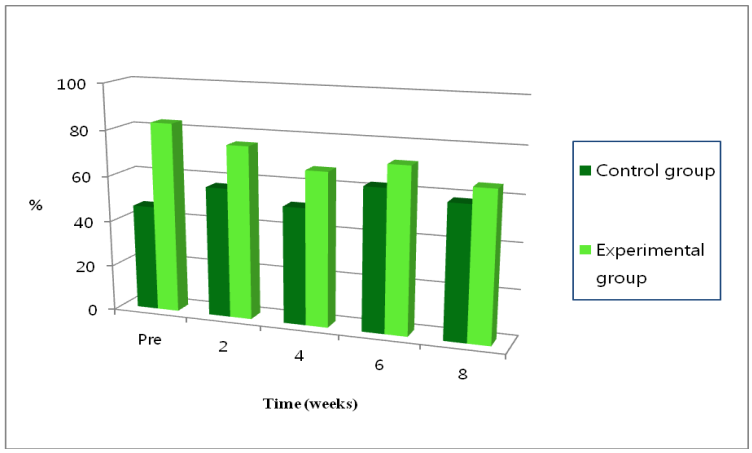
Ho : $Do = 0$ (the difference between the two observations is 0)
Ha : $D0 \neq 0$ (the difference is not 0) (2)

3.3 Changes of Knee and Physical Activities in Patients after Total Knee Arthroplasty

Figure. 3 shows the changes of knee and physical activities between experimental and control group. For the change of arthroplasty status, the follow-up survey was estimated to be higher in the experimental group, regardless of the time elapsed of 2 weeks after physical rehabilitation education. However, the physical activities were decreased by the education more rapidly with time elapsed of 8 weeks in the experimental group as compared to the control group.



(a). Change of Total Knee Status



(b). Change of Physical Activities

Figure 3. Comparison of Knee and Physical Activities According to Education

4. Discussion

This paper attempted the measures for the enhancement of the education effect on physiotherapy rehabilitation in patients after total knee arthroplasty. The implementation of physical rehabilitation brought better health related quality of life in patients after total knee arthroplasty than control group.

As a result of this study, statistically significantly positive changes of behaviors such as mineral intake, and dandelion tea drinking diminished the progression rate of knee arthritis. The findings were similar with the previous studies on the chronic diseases [13-15]. This study suggests that individuals with arthritis should be targeted for specific health behavioral intervention to prevent the progression of arthritis [16- 17]. Based on the results obtained by the study, it is anticipated that this paper may be used as basic data for developing and interventing health promotion behavior for the arthroplasty patients. However, it needs periodic education programs related patients with knee arthritis. Until the present, the limitation of patients with arthritis lies in that there was in nothing put into action despite the increase of knowledge.

The result of this study would be the enhancement of practice behavior for the prevention of arthritis. Thus, this paper indicated that the implemented systematic

education showed significant positive effects on the treatment of subjects and physical rehabilitation. The quality of life in the experimental group has been enhanced as time passes by compared to control group. It showed that it is an effective program for the health in patients after total knee arthroplasty. Therefore, the management program for patients with arthritis implemented by education research is quite meaningful in that it is evidence-based program development which will contribute in replicating the education under field conditions for patients with total knee arthroplasty.

The patients with knee arthritis who had moderate exercise level and who were under diet care had better quality of life. Current practice of exercise in patients with knee arthritis was obtained through the education. Therefore, adequate physiotherapy rehabilitation in patients with knee arthritis will improve their quality of life in accordance with appropriate education. The development about education system is so essential to the patients with knee arthritis. For successful performance of this study, this paper had tried to provide various information to enhance the practice rate of physiotherapy rehabilitation in arthroplasty patients using an education system. So, there were many changes which improve physical rehabilitation in patients after arthroplasty using the education.

5. Conclusion

This paper performed an analysis of education effect on physical rehabilitation in patients after total knee arthroplasty.

This program was developed through review of existing literature, assessment of patients' information needs, available updates on information, web site analysis and solicitation of expert advice throughout the development process. Study participants were patients who were performed arthroplasty at least 1 year ago by orthopedic of two general hospitals in Chungnam area. The data were collected by interview and self-administered questionnaire from November 12, 2014 through February 20, 2015. This program was totally consisted 142 persons, it has been divided into two parts.

The Chi-square test was performed to compare the general characteristics between two groups. In addition, it was measured by percentage and number. The pairwise t-test was done to compare the before and after education effect of knee and physical status in patients after total knee arthroplasty. All p-values were found to be less than 0.05, indicating statistically significant differences for each variable compared between before and after education. It was also performed to determine the statistical significant differences between the two groups on the satisfaction of an experimental analysis for measurement of education effect for the prevention of knee arthritis. The results of this study are as follows.

First, about respondents who have another diseases, the experimental group with 64.8% showed statistically significantly higher than control group with 38.0% (χ^2=3.67, $p<0.05$).

Second, for stress status, the mean of experimental groups was significantly higher score than control groups(t=3.15, p=.003). In terms of dietary factors, the subjects who had intaked garlic were statistically significant difference after application than the mean score of subjects who didn't intake garlic before application of information system(t=-1.64, p=.000).

Third, for the change of arthroplasty status, the follow-up survey was estimated to be higher in the experimental group, regardless of the time elapsed of 2 weeks after physical rehabilitation education. However, the physical activities were decreased by the education more rapidly with time elapsed of 8 weeks in the experimental group as compared to the control group. For the change of arthroplasty status, the follow-up survey was estimated to be higher in the experimental group, regardless of the time elapsed of 2 weeks after physical rehabilitation education. However, the physical activities were decreased by the education more rapidly with time elapsed of 8 weeks in the experimental group as

compared to the control group. This paper found that physical rehabilitation in patients after total knee arthroplasty was increased by 68.2-85.4% compared with the previous status and the patients positively perceived on a health education effect.

Therefore, this paper showed that the education as physiotherapy rehabilitation tool was a good way to enhance the practice rate of health behavior in patients after total knee arthroplasty.

Acknowledgments

I appreciate to study subjects who had participated in the analysis of education effect on physical rehabilitation in patients after total knee arthroplasty. The education model will provide effective services in multi-environments to patients and help for improving their physical rehabilitation in arthroplasty patients.

This paper was a revised and expanded version of a paper entitled "A Measure of Educational Effect on Physical Rehabilitation in Patients After Receiving Arthroplasty," Workshop on Bioscience and Medical Research 2015 presented at Jeju National University International Center, December 14-16, 2015.

References

[1] Statistics Korea, Annual Report on the Cause of Death Statistics, **(2014)**.
[2] D. P. Sakalkale, W. J. Hozack, R. H. Rothman, "Total Hip Arthroplasty in Patients on Long-Term Renal Dialysis", J Arthroplasty, **(2009)**, vol. 14, pp. 571-585.
[3] T. Shiga, Z. Wajima, Y. Ohe, "Is Operative Delay Associated with Increased Mortality of Hip Fracture Patients ? Systematic Review, Meta-Analysis, and Meta-Regression", Can J. Anesth, **(2008)**, pp. 146-148.
[4] C. A. Engh, J. P. Hooten, K. F. Zetti-Schaffer, "Porous-Coated Total Hip Replacement", Clin Orthop Res. **(2004)**, pp. 89-95.
[5] J. G. Delee, J. Charnley, "Radiological Demarcation of Cemented Sockets in Total Hip Replacement", Clin Orthop Relat Res, **(2006)**, pp. 20-32.
[6] A. F. Brooker, J. W. Bowerman, R. A. Robinson, L. H. Riley, Ectopic Ossification Following Total Hip Replacement, Incidence and A Method of Classification, J, Bone Joint Surg Am. vol. 55, **(2003)**, pp. 1629-1632.
[7] J. J. Roche, R. T. Wenn, O. Sahota, C. G. Moran, Effect of Comorbidities and Postoperative Complications on Mortality After Hip Fracture in Elderly People : Prospective Observational Cohort Study, BMJ, **(2005)**, pp. 331-336.
[8] J. H. Nho, H. S. Choi, K. H. Park, J. S. Park, Y. S. Suh, Analysis About Complications of Hip Arthroplasty in Patients with Chronic Renal Failure on Hemodialysis, J Korean Ortho Assc, vol. 46, **(2011)**, pp. 222-226.
[9] S. Garcia-Ramiro, F. Cofan, P. I. Esteban, Total Hip Arthroplasty in Hemodialysis and Renal Transplant Patients, Hip Int, vol. 18, **(2008)**, pp. 51-57
[10] J. R. Lieberman, M. D. Fuchs, S. B. Haas, Hip Arthroplasty in Patients with Chronic Renal Failure, J Arthroplasty, vol. 10, **(1995)**, pp. 191-195.
[11] S. R. Lee, "The Effect of An Integrated Information System Adoption for Performance Ability Improvement in Hypertensive Patients", IJSEIA, vol. 8, no. 3, **(2014)**, pp. 435-442.
[12] S. R. Lee, The Model Development and Empirical Application for the Alleviation of Low Back Pain, The 5th International Conference Ubiquitous Computing and Multimedia Application, Indonesia, **(2014)**, pp. 19-22 .
[13] S. R. Lee, A Measure of Educational Effect on Physical Rehabilitation in Patients After Receiving Arthroplasty, Workshop on Healthcare and Nursing 2015 at Jeju National University International Center, Jeju Island, Korea, **(2015)**, pp. 14-16.
[14] K. C. Abbott, J. R. Bucci, L. Y. Agodoa, "Total Hip Arthroplasty in Chronic Dialysis Patients in the United States", J Nephrol., vol. 16, **(2003)**, pp. 34-39.
[15] S. R. Lee, "The Effect of an Integrated Information System Adoption for the Health Promotion in Patients with Laparoscopic Colon Resection", IJBSBT, vol. 6, **(2014)**, pp. 1-12
[16] S. R. Lee, "Development of An Empirical Model for the Health Improvement of Patients with Thyroidectomy", IJBSBT, vol. 6, no. 3, **(2014)**, pp. 63-70
[17] M. Naitro, K. Ogata, E. Shiota, M. Nakamoto, T. Goya, "Hip Arthroplasty in Hemodialysis Patients", Journal of Bone Joint Surg Br, vol. 76, **(2004)**, pp. 428-432.

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