

Effect of Bundled Care on Self-Efficacy and Functional Outcomes among Patients undergoing Total Hip Arthroplasty

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Abstract

Background: Total hip arthroplasty (THA) is one of the greatest successful orthopedic procedures achieved today. For patients with hip pain due to a diversity conditions, total hip arthroplasty can relieve pain, restore function, and improve quality of life. Patient education is carefully related to the early recovery process and promotes outcomes after hip replacement by supporting people to become empowered during the period of regaining. **The study** aimed to evaluate the effect of bundled care on self-efficacy and functional outcomes among patients undergoing total hip arthroplasty. **Study design:** A quasi-experimental design was used to attain this aim. **Setting:** This study was conducted at orthopedic surgery departments and Joint outpatient clinic at El-Demerdash Surgical Hospital, affiliated with Ain Shams University Hospitals, Cairo. **Sample:** A purposive sample included 78 patients. **Tools of data collection:** Data were collected using four tools: 1- Patient's Interview Questionnaire, 2- Hip disability and osteoarthritis outcome score scale, 3-Self-efficacy for rehabilitation outcome scale and 4-Hip Strengthening exercises performance checklist. **Results:** This study shows a statistically significant difference between study and control groups regarding Hip disability and osteoarthritis outcome score, self-efficacy level, and Hip Strengthening exercises performance as indicators of functional outcomes post bundled care application at $p (<0.05)$. There was a statistically significant positive correlation between patients' total knowledge, total hip Strengthening exercises performance and patients' total Hoos in the study group post bundled care application at ($P<0.001$). **The Conclusion:** bundled care was effective care in enhancing the functional ability among patients with total hip arthroplasty. **Recommendation:** Apply bundled care as a care protocols for patients undergoing total hip arthroplasty and replicate the study on a larger sample selected from different geographical areas in Egypt to obtain more generalized findings in relation to current study.

Key words: Bundled Care, Self-Efficacy, Functional Outcomes and Total Hip Arthroplasty.

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Introduction

Osteoarthritis is a major disabling joint disorder worldwide. With the hip being the second most affected joint, it is the primary indication for total hip arthroplasty (*Saunders, 2021*). Hip osteoarthritis has several etiologies, and the most common are injuries, dysplasia, age-related changes, or micro-injuries that cause joint overloads and inflammations. Degenerative changes certainly lead to pain and range of motion limitations. Total hip arthroplasty is a treatment of choice for patients with hip osteoarthritis. Arthroplasty is a biomechanical and not a biological process due to the inconsistency of metal and bone tissue (*Kaźmierski et al., 2018*).

Total hip arthroplasty is one of the most widely practiced surgeries worldwide, which aims to reduce pain, increase mobility and functionality, and improve quality of life (*Colibazzi, 2020*). Total hip arthroplasty delivers consistent outcomes for patients distress from end-stage progressive hip osteoarthritis. Generally, total hip arthroplasty provides consistent short-term and long term pain relief and positive patient-reported clinical and functional outcomes. Overall, total hip arthroplasty provides even consistent and more reliable positive results compared to its equivalent procedure (*Varacallo & Johanson, 2018*).

Self-efficacy, defined as one has perceived competence about their abilities to establish and

carry out a particular course of action (i.e., a belief that one is able and can do what is necessary for a general or specific situation), has been connected with emotional well-being and functional improvements in different people, such as hip fracture patients, non-surgical arthritis, and surgical patients. Self-efficacy has been found to be an adaptable mediator for reducing pain and anxiety postoperatively. Including a self-efficacy element in pre-operative education could improve physical and psychological outcomes for patients undergoing hip replacement (*Liu et al., 2021*).

The association between self-efficacy and rehabilitation outcomes in patients with total hip arthroplasty was established to be a vital element of therapy. A relationship between self-efficacy and pain self-management and coping strategies was also found in patients with total hip arthroplasty. Self-efficacy was shown to be more important than pain intensity and duration in determining disability among patients with chronic musculoskeletal pain (*Olsson et al., 2016*). Therefore, nursing interventions are directed to decrease pain and improve knowledge postoperatively to improve care and outcomes for patients with total hip arthroplasty. A growing number of self-management strategies are being included in bundled care for patients to enable them to have a central role in managing their illness and symptoms (*Chang et al., 2017*).

According to *Institute for Healthcare Improvement (2017)*, the definition of an evidence-based care bundle is “a structured way of improving the processes of care and patient outcomes: a small, straightforward group of evidence-based practices generally three to five that, when achieved cooperatively and dependably, have been verified to improve patient outcomes”. Standardized bundle approaches to care and care pathways for patients with total hip replacement have been exposed to improve patient participation in education, decrease length of stay, decrease patient anxiety while improving perception of care, and generally lead to the efficiency and enhanced care and outcomes (*Arkin et al., 2019*).

Implementation of a standardized bundle of care for patient with total hip arthroplasty including three elements: 1) a consistent

preoperative education (Completion of one or more of the organizational standard THA educational offerings developed to support the coordination of care and the bundle elements. 2) postoperative mobilization with emphasis on patients getting out of bed on day of surgery, 3) a more structured postoperative rehabilitation similar to group physical therapy, that provided education and exercises in a group setting in a large activity room (education on exercises and mobility strategies). results in better patient outcomes and lower costs in THA patients (*Arkin et al., 2019*). the combined elements when performed uniformly, reliably, and as a package create an outcome that is better than the impact of the individual elements alone (*Salmond et al., 2017*).

Significance of the study:

Worldwide, more than 1.4 million total hip replacement procedures are performed annually (*Pina, et al. 2019*) and graded as the 11th highest benefactor to global incapacity and 38th highest in disability-adjusted life years (*Svinøy et al., 2019*). The prevalence of Osteoarthritis is higher in females than males. *Singh, et al., (2019)* predicted that the total annual counts (95% prediction intervals) of total hip arthroplasty may increase by 75% in 2025 to 652,000 arthroplasties; by 129% in 2030 to 850,000 arthroplasties, and by 284% in 2040 to 1,429,000 arthroplasties. More recently, *Sloan, et al. (2018)* used the Total hip arthroplasty volume data from 2000 through 2014 and linear projection models and Poisson projection models to determine updated projected volumes. The models demonstrate that, by 2030, the volumes of total hip arthroplasty would increase between 71.2% and 145%, subsidiary global progress in patients undergoing total joint arthroplasty.

Bundled care models seek to align surgeons and hospitals by engaging them at risk for financial forfeit if adequate outcomes are not attained or, oppositely, gain sharing opportunity if specified goals are reached. Successful participation be contingent on minimizing adverse events as, hospital length of stay (LOS), and hospital readmission are the primary drivers of cost during the episode of care (*Pinskiy, et al., 2021*). Preoperative education plays a vital role in create a quicker

recovery, reduce postsurgical pain, promote higher satisfaction and better functional status are very significant short term outcome measures. So, our study to evaluate the effect of bundled care on self-efficacy and functional outcomes among patients undergoing total hip Arthroplasty.

Aim of the Study:

The aim of the current study was to evaluate the effect of bundled care on self-efficacy and functional outcomes among patients undergoing total hip arthroplasty through:

- 1- Assessing of patients' self-efficacy and functional outcomes.
- 2- Implementing bundled care according to patients' needs.
- 3- Evaluating the effect of bundled care on self-efficacy and functional outcomes among patients with total hip arthroplasty after application.

Research Hypothesis

The current study hypothesized that:

- H 1.** Patients with total hip arthroplasty who exposed to bundled care will have significant improvement in hip disability and osteoarthritis outcome score (HOOS) for functional outcomes post bundled care application.
- H 2.** Patients with total hip arthroplasty who exposed to bundled care will have significant improvement in self-efficacy level post bundled care application.
- H 3.** Patients with total hip arthroplasty who exposed to bundled care will have significant improvement in hip strengthening exercises performance post bundled care application.

Operational Definition:

Bundled Care: Application of all three bundle elements including preoperative patient education, mobilization on day of surgery (DOS), and a more planned postoperative rehabilitation similar to group physical therapy for patients post THA.

Functional outcomes: Ability to perform physical daily tasks that improved health

outcomes and measuring changes in function through the level of accomplishment hip strengthening exercises and hip disability and osteoarthritis outcome score.

Subjects and Methods

A- Research design:

A quasi-experimental design pre/post-test study and control groups design was used in this study. It is used to estimate the effect of an intervention in the lack of randomization. The pre-test/post-test research plan contains assessing significant outcomes both before demonstrating the sample to a stimulant of about gentle and after disclosure to the stimulant. By creating an experiment in this direction, a researcher can value modification is directed outcomes to be exposed to the stimulant (*Braddock, 2019*). The post-test licenses the researchers to resolve the immediate effects of the treatment on the outcome variable(s). In addition to the pre-test and immediate post-test, a hindered post-test or post-tests are often encompassed to survey the treatment effects over the longer term (*Miller et al., 2020*).

B- Setting:

The study was conducted at orthopedic surgery departments (department 1 for males & department 2 for females each department containing 15-20 bed) and Joint outpatient clinic at El-Demerdash Surgical Hospital, affiliated with Ain Shams University Hospitals, Cairo.

C- Subject:

A purposive non-probability/nonrandomized sample of seventy-eight patients with total hip arthroplasty was nominated according to certain inclusion criteria. The study subjects were distributed randomly using computer program into two equal groups, the study group (n=39) who exposed to bundled care & routine hospital care and a control group (n=39) who had only the routine hospital care.

The sample size was calculated by adjusting the power of the test to 80%, and the confidence interval to 95% with a margin of error accepted adjusted to 5% using the following equation:

Type I error (α) = 0.05%
 Type II error (β) = 0.20%
 With power of test 0.80%

$$n = \frac{N \times p(1-p)}{\left[\left[N-1 \times \left(d^2 \div z^2 \right) \right] + p(1-p) \right]}$$

$$\begin{aligned} N \times p(1-p) &= (97 * (0.5 * (1-0.5))) \\ N-1 &= (97-1) * \\ d^2/z^2 &= 0.0025 / 3.8416 + \\ p(1-p) &= 0.5 * (1-0.5) \\ N &= 78 \end{aligned}$$

N= Community size

z= Class standard corresponding to the level of significance equal to 0.95 and 1.96

d= The error rate is equal to 0.05

p= Ratio provides a neutral property = 0.50

Based on above formula the sample size required per group is 39 patients.

Inclusion criteria:

The study sample was selected according to the following criteria: Adult patients from both genders, primary uncomplicated total hip arthroplasty, able to comprehend instructions, and agree to participate in the study.

Exclusion criteria:

Serious co-morbid or psychotic disorders, muscle weakness and recurrent operation in prosthesis.

D-Tools of data collection

I. Patient's Interview Questionnaire:

It was designed by the researchers; it involved the following three parts:

Part 1: Personal data, it was used to collect data from the patients regarding age, gender, marital status, educational level, living area, living status, job, smoking, BMI and practicing any sport regularly.

Part 2: patients' medical history, it was used to assess patients' clinical data as past history (Suffering from any chronic disease & Orthopedic surgery previously), Orthopedic family history for bone diseases, Medical diagnosis, Side of operation, Site of pain on admission, Symptoms associated with pain,

Factors that elevate pain in the affected hip and Factors that relieve pain in the affected hip.

Part 3: Patients' knowledge Questionnaire:

It was designed by the researchers after reviewing related literatures (*Svinøy, et al., 2019 and Saunders, et al., 2021*), to assess Patients' knowledge regarding total hip arthroplasty. It consists of 8 subgroups (meaning of total hip replacement, medications, pain management, joint protection, hip exercises after surgery and early ambulation, follow up, nutrition, and management of stress). It collected 26 items. The correct answer for each item was (1) and incorrect answer was (0) with total score (26) grades. Total score categorized as, ≥ 80 % had satisfactory level of knowledge, while < 80 % had unsatisfactory level of knowledge.

II. Hip disability and osteoarthritis outcome score (HOOS)

The HOOS is self-explanatory standardized tool in English language adopted from (*Nilsdotter, et al., 2003*) and the Arabic version developed by (*Al-Samhan, et al., 2020*) intended to evaluate symptoms and functional outcomes (limitations) related to the hip in patients assigned for total hip replacement by assessing changes from week to week induced by treatment (medication, operation and physical therapy). HOOS consists of 5 subscales with total 40 items; Pain (10 items), other Symptoms (5 items), Function in daily living (ADL) (17 items), Function in sport and recreation (Sport/Rec) (4 items) and hip related Quality of life (QOL) (4 items). Standardized answer options are given (5 Likert boxes), and each question gets a score from 0 to 4 (no, mild, moderate, severe, and extreme). To take the score, Scores are calculated for each subscale independently and the outcome measure is transformed in a worst to best scale from 0 to 100, with 100 representing no symptoms and 0 representing extreme symptoms. To calculate the total HOOS score the subscales need to be summed up, the result can be planned as an outcome profile. For manual calculations, use this formula for each subscale:

$$100 - \frac{\text{mean score} \times 100}{4}$$

III. Self-efficacy for rehabilitation outcome scale (SER)

The 12-item SER is English language scale adopted from (*Waldrop, et al., 2001*) asking about the patient's ability to perform rehabilitation behaviors. The scale measures the patient's beliefs about whether he/she can perform behaviors typical of physical rehabilitation after THA, that the SER can be divided into 2 subscales measuring influences linked with 'self-efficacy in disabling barriers' and 'self-efficacy for rehabilitation therapy exercises'. Items increase in difficulty from those items assessing beliefs in a person's ability to stretch his/her leg to items assessing a person's ability to walk. Additionally, items that measure a person's belief in the ability to perform behaviors in varying therapy situations, such as when experiencing pain and emotional distress. Items are valued on a 1-point Likert scale fluctuating from 0 (I can't do it) to 10 (certain I can do it). Efficacy scores are summed and then divided by the total number of items. The final SER score is the mean of the 12 items to specify the strength of perceived self-efficacy for the activity. Thus the mean self-efficacy score was used. Total scores for patient's self-efficacy categorized as, $\geq 80\%$ had high self-efficacy, while $< 80\%$ had low self-efficacy.

IV. Hip Strengthening exercises performance checklist:

It was developed by researchers and written in Arabic language based on the related literatures (*Varacallo & Johanson, 2018 and Ali & Abo El-Fadl, 2021*) to assess patients' ability to perform active ROM exercises after THA as; hip flexion, hip extension, hip abduction and hip adduction. The response of each procedure was (done correctly, done incorrectly and not done). The total score of Hip Strengthening exercises performance checklist was (20) grades, one grade was given to the step which was done correctly and zero to the step which was done incorrectly or not done. Total score categorized as, $\geq 90\%$ had competent level of practice, while $< 90\%$ had incompetent level of practice.

Total Hip Arthroplasty Bundled Care booklet

Developed by the researchers written in Arabic language directed by images, based on the assessment of patients' knowledge regarding total hip arthroplasty, as well as revising the recent and related literature (*Arkin,*

et al., 2019 and Liu, et al., 2021). The booklet was handed out for every patient; it was composed of 4 parts as follow: Part (1): Introduction about hip arthroplasty, causes, aim, complications, Description of artificial joint & pre-operative preparations. Part (2): hip joint protection methods & pain management strategies. Part (3): Hip exercises after surgery and early ambulation, follow up schedule & protective medication adherence & Part (4): Healthy dietary principles & maintaining ideal body weight, stress management (relaxation techniques).

Total Hip Arthroplasty Bundled Care booklet was revised by five experts, four professors of Medical-Surgical Nursing as well as one professor of orthopedic surgery, at Ain Shams University for content validity. Based on the opinion of a panel of expertise, some modifications were done, and then the final form was developed.

Tools validity and reliability

Validity: assessing face and content validity of the suggested tools through a jury of seven experts four professors of Medical-Surgical Nursing in addition to three assistant professors from Faculty of Nursing, Ain Shams University, who reviewed the instrument, for clarity, relevance, comprehensiveness, understanding, and easiness for administration, no modifications were required.

Reliability: Alpha Cronbach test was used to measure the internal consistency of the study tools. Patients' knowledge questionnaire regarding total hip arthroplasty were reliable at (0.92), HOOS total was reliable at (0.88), 0.79 for Symptoms, 0.87 for Sport/Rec, 0.85 for pain, 0.89 for ADL, 0.86 for QoL. SER was reliable at (0.94) for the entire scale, and for the two sub-scales is 0.94 and 0.87 and hip Strengthening exercises performance checklist was reliable at (0.826).

Preparatory phase:

Administrative design: The required official approvals were gotten from the administrators of the Ain Shams University Hospital.

Ethical considerations

In order to guard patients' rights in the scope of the study, before the primary interview, verbal consent was protected from each patient after being conversant about the nature, purpose, and benefits of the study. Patients were also aware of that participation is completely voluntary and could withdraw at any time without giving reasons. Confidentiality and anonymity of the data was guaranteed by testifying that the personal information will be kept private after being unified with the researchers and reassured patients that the data would be used only for the research objective. Moreover, the intervention used in the current study is safe and harmless to participants.

Pilot Study:

Once permission was approved to continue with the proposed study, a pilot study was carried out before starting data collection on eight of targeted patients (10% of sample) from the formerly mentioned setting according to the inclusion criteria and excluded from the main sample to assess feasibility, the clarity, applicability of the tools, and calculate the time needed to collect data to detect any potential interferences that might meet the researchers and limit with data collection.

I- Implementation phase

Field work: The study was carried out from the beginning of September 2020 to April 2021 (the data collection time takes more time due to covid 19 pandemic), including the development of the tools. It was based on reviewing recent and relevant literature regarding total hip arthroplasty, bundled care and functional outcomes. The researchers were visiting Orthopedic Surgery Departments and Orthopedic Joint out-patient Clinic over two days/week. The aim of the study was innocently clarified to patients who accepted to participate in the study previous data collection. Data collection was done by the researchers using the same tools for the same patient who fulfilled inclusion criteria; before and after application of bundled care (one and three months).

The baseline assessment: The first time; individualized interview session was showed to each participant by the researchers to collect

Patient's interview questionnaire, HOOS scale, SER scale and hip strengthening exercises performance checklist during preoperative phase (1-2 days before operation). Based on patients' level of knowledge, the researchers developed a total hip Arthroplasty Bundled Care booklet in Arabic language using the relevant literature (*Kaźmierski, et al., 2018 and Liu, et al., 2021*).

Total Hip Arthroplasty Bundled Care application was carried out at Orthopedic Departments and Orthopedic Clinic affiliated to Ain Shams University Hospital over two days for every one to two patients, conferring to their level of education and understanding taking into consideration application of preventive measures against coronavirus. The bundled care application was conducted through small group discussion, role play, and demonstration, supported by using posters and booklet.

Application of the total hip arthroplasty care bundle was the main intervention in the study. This care bundle consisted of three elements :1) a consistent preoperative education offered in three formats (class, video and booklet), 2) postoperative mobilization with emphasis on patients getting out of bed on day of surgery (patient's buttocks rise off the mattress, may stand, take a few steps, or ambulate with assistance, individualized according to capacity for mobility), 3) a more structured postoperative rehabilitation similar to group physical therapy, that provided education and exercises in a group setting in a large activity room (education on exercises and mobility strategies, including hints and tips for a safe discharge home). These interventions provided for a more deliberate patient centered multidisciplinary care process.

Evaluation phase:

The researchers evaluated the effect of bundled care on self-efficacy and functional outcomes by matching the results preoperative, post1 and post 2, the 2nd measurement (post1 bundled care) after one month of bundled care application (after operation) by using the same data collection tools Patients' knowledge questionnaire, SER, HOOS & hip Strengthening exercises performance checklist after the first intervention then the 3rd measurement (post 2 bundled care) after three months after discharge.

Statistical Design:

The data was encrypted and entered using a personal computer. Statistical Package for Social Science (SPSS) version 20 was utilized. Data were obtainable using descriptive statistics in the form of frequencies and percentages. The chi-square test was used to recognize the relationship between qualitative variables and Mean±SD also was used. Statistical significance was considered at p -value ≤ 0.05 , and < 0.001 was considered highly significant. r -test was utilized as an inferential statistic was used to explore the correlation between patients' Nursing Sensitive Outcomes and health care practices level in the study and control groups pre-and post-implementation of multimodal cardiac rehabilitation program.

Results

Concerning personal characteristics of the study and control groups, table 1 shows that mean age of the studied patients was 47.35 ± 5.9 and 48.4 ± 6.71 years for the study and control groups, respectively. About patients' gender, 71.8% of patients in the study group were females, compared to 66.7% of the control. In relation to marital status, 61.5% of both study and control groups were married. Regarding their level of education, 56.4% and 41.0% of the study and control groups respectively had secondary education. In addition to 69.2% and 64.1% of the study and control groups were from the rural area, 84.6% and 89.7% of the study and control groups respectively were living with the family. 59 % and 66.7% of the study and control groups respectively not working. According to smoking habit, 56.4% and 59% of the study and control groups were not smokers, respectively. Mean body mass index were 30.74 ± 4.26 and 30.15 ± 4.51 Kg for the study and control groups, respectively. In relation to practicing any sports regularly, 79.5% and 82.1% of the study and control groups, respectively, not practice any sports, with a non-significant statistical difference between both groups regarding all personal characteristics.

Table 2 shows that, 71.8 % of patients in the study group had osteoporosis, compared to 79.5% of the control. 7.7% of patients in the study group had previous orthopedic surgery of internal fixation and skeleton traction, compared to 5.1% of the control had previous

internal fixation. 17.9 % and 12.8% of the study and control groups respectively had orthopedic family history of osteoporosis. In addition to 59.0% and 51.3% of the study and control groups had right hip arthroplasty. Regarding site of pain on admission and symptoms associated with pain, 100% of both study and control groups suffering from hip and legs pain and unable to walk or move. Also, 61.5% used pain medications, massage and comfort to relieve pain in the affected hip, compared to 76.9% of the control used pain medications. 100% and 94.9% of the study and control groups respectively walking elevated their affected hip pain, with a non-significant statistical difference between both groups regarding medical history.

Figure (1) Clarifies that, 48.7% and 59.0% of the study and control groups respectively diagnosed on admission with Severe arthritis.

Table 3 indicates that there was no statistically significant difference between the patients' satisfactory knowledge level regarding total hip arthroplasty bundled care pre-application between both groups. In contrast, post 1month of bundled care application, there was a statistically significant difference between the patients' satisfactory level of knowledge in study and control groups regarding meaning of total hip replacement, medications, pain management, hip exercises after surgery and early ambulation, nutrition and management of stress. In relation to post 3 months of bundled care application, there was a high statistically significant difference between the patients' satisfactory level of knowledge in study and control groups regarding all items of knowledge, with a high statistically significant difference between the patients' total satisfactory level of knowledge in study group post bundled care (one month) and post bundled care (three months) p -value < 0.001 .

Table 4 reveals that there was no statistically significant difference between the patients' HOOS subscales scores regarding total hip arthroplasty bundled care pre- application between study and control groups. In contrast, post one month and post three months of bundled care application, there was a high statistically significant difference between the patients' HOOS subscales scores in study and control groups regarding Hoos Pain, Hoos

Symptoms, Hoos ADL, Hoos QOL and Hoos Sport/Rec. with also a high statistically significant difference between the patients' total Hoos all subscales score in study group post bundled care (one month) and post bundled care (three months) p-value <0.001.

Table 5 displays a non-statistically significant difference between the patients' Self-efficacy mean score regarding total hip arthroplasty pre bundled care application between study and control groups. In contrast, post one month and post three months of bundled care application, there was a high statistically significant difference between the patients' self-efficacy mean score among study group p-value <0.001.

Table 6 reveals that there was no statistically significant difference between the patients' hip strengthening exercises performance regarding total hip arthroplasty bundled care pre- application in study and control groups. In contrast, post one month of bundled care application, there was a statistically significant difference between the patients' hip strengthening exercises

performance in study and control groups regarding, hip flexion, hip extension, hip adduction and hip abduction post bundled care application. In relation to post three months of bundled care application, there was a high statistically significant difference between the patients' hip strengthening exercises performance in study and control groups, with also a high statistically significant difference between the patients' total hip strengthening exercises performance in study group post bundled care (one month) and post bundled care (three months) p-value <0.001.

Table 7 reveals a statistically significant positive correlation between patients' total knowledge, total hip strengthening exercises performance and total Hoos all subscales score in the study group post bundled care application at (P<0.001). This indicated that the bundled care improved patients' level of knowledge, total hip strengthening exercises performance and HOOS score.

Table 1. Number and percentage distribution of the study and control groups according to their personal characteristics (n=78)

Personal characteristics	Study group (n=39)		Control group (n=39)		Chi-square	
	N	%	N	%	X ²	P-value
Age (years)						
20 < 40	9	23.1	10	25.6	0.210	0.900
40 < 60	12	30.8	13	33.3		
≥ 60	18	46.2	16	41.0		
Mean± SD	47.35±5.9		48.4±6.71			
Gender						
Male	11	28.2	13	33.3	0.241	0.624
Female	28	71.8	26	66.7		
Marital status						
Married	24	61.5	24	61.5	0.000	1.000
Unmarried	15	38.5	15	38.5		
Level of education						
can't Read/ Write	8	20.5	12	30.8	1.947	0.378
Secondary education	22	56.4	16	41.0		
Bachelor degree	9	23.1	11	28.2		
Residence						
Rural	27	69.2	25	64.1	0.231	0.631
Urban	12	30.8	14	35.9		
Living status						
Alone	6	15.4	4	10.3	0.459	0.498
Live with the family	33	84.6	35	89.7		
Job						
Work	16	41.0	13	33.3	0.494	0.482
Not work	23	59.0	26	66.7		
Smoking habit						
Yes	17	43.6	16	41.0	0.053	0.819
No	22	56.4	23	59		

Personal characteristics	Study group (n=39)		Control group (n=39)		Chi-square	
	N	%	N	%	X ²	P-value
BMI						
<29 KG	15	38.5	14	35.9	0.055	0.815
≥29 KG	24	61.5	25	64.1		
Mean± SD	30.74±4.26		30.15±4.51			
Practice any sports regularly						
Yes	8	20.5	7	17.9	0.083	0.774
No	31	79.5	32	82.1		

Not Significant (NS) $P > 0.05$

Table 2. Distribution of the study and control groups regarding their medical history (n=78)

patients' medical history	Study group (n=39)		Control group (n=39)		Chi-square	
	N	%	N	%	X ²	P-value
Past history:						
*Suffering from any chronic disease						
Osteoporosis	28	71.8	31	79.5	0.626	0.429
Hypertension	21	53.8	18	46.2	0.462	0.497
diabetes mellitus	7	17.9	11	28.2	1.156	0.282
Systemic lupus	2	5.1	3	7.7	0.214	0.644
Orthopedic surgery previously						
Internal fixation	3	7.7	2	5.1	0.214	0.644
External fixation	0	0.0	1	2.6	1.013	0.314
Skeleton traction	3	7.7	1	2.6	1.054	0.305
Family history:						
Orthopedic family history for bone diseases						
Rheumatoid arthritis	2	5.1	2	5.1	0.000	1.000
Osteoporosis	7	17.9	5	12.8	0.394	0.530
Malignant bone tumor	2	5.1	0	0.0	2.053	0.152
Present history:						
Side of operation						
Right	23	59.0	20	51.3	0.466	0.495
Left	16	41.0	19	48.7		
*Site of pain on admission						
Hip	39	100.0	39	100.0	0.000	1.000
Legs	39	100.0	39	100.0	0.000	1.000
lower back	34	87.2	29	74.4	2.063	0.151
all body	33	84.6	27	69.2	2.600	0.107
*Symptoms associated with pain						
Inability to walk or move	39	100.0	39	100.0	0.000	1.000
Tingling of limbs.	31	79.5	30	76.9	0.075	0.784
cramp in muscles	33	84.6	26	66.7	3.409	0.065
edema around the hip	29	74.4	33	84.6	1.258	0.262
*Factors that elevate pain in the affected hip						
Walking	39	100.0	37	94.9	2.053	0.152
Standing for long periods.	36	92.3	34	87.2	0.557	0.455
Sitting for long periods.	36	92.3	30	76.9	3.545	0.060
Sudden getting up from a sitting position	35	89.7	39	100.0	0.157	0.692
Descending or ascending stairs	29	74.4	31	79.5	0.289	0.591
*Factors that relieve pain in the affected hip						
Comfort	24	61.5	22	56.4	0.212	0.645
compresses	15	38.5	18	46.2	0.473	0.492
pain medications	24	61.5	30	76.9	2.167	0.141
massage	24	61.5	24	61.5	0.000	1.000

* Answers are not mutually exclusive

Not Significant (NS) $P > 0.05$

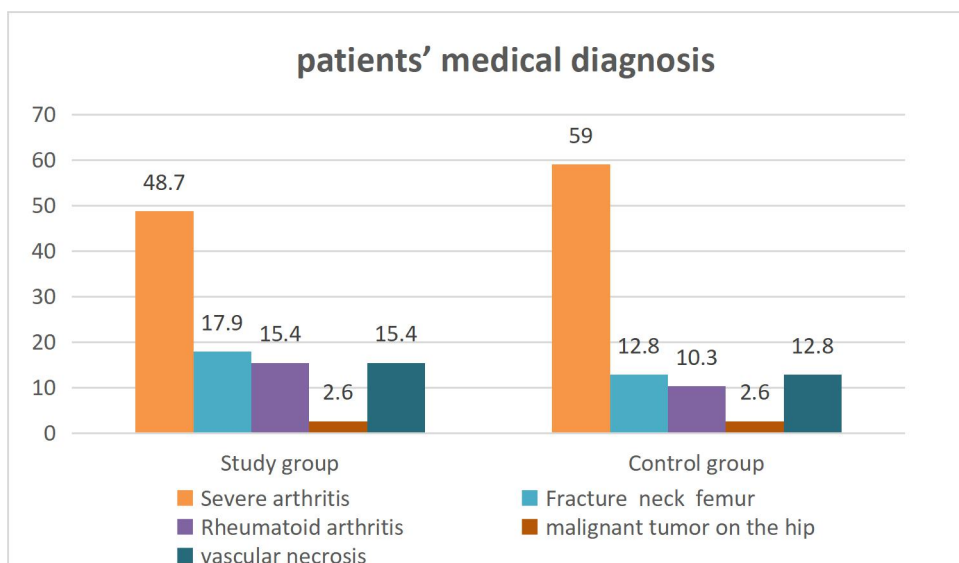


Figure (1): Percentage distribution of the study and control groups regarding their medical diagnosis on admission (n=78)

Table 3. Mean scores of the study and control groups regarding their satisfactory level of knowledge during preoperative, after one month and after three months' post bundled care application. (n=78)

Items of knowledge	Satisfactory level of knowledge								
	preoperative (1- 2 days before operation)			Post bundled care (1 month)			Post bundled care (3 months)		
	Study (n=39)	Control (n=39)	t1	Study (n=39)	Control (n=39)	t2	Study (n=39)	Control (n=39)	t3
	X±SD	X±SD	[p-value]	X±SD	X±SD	[p-value]	X±SD	X±SD	[p-value]
1. Meaning of total hip replacement	0.21±0.41	0.13±0.34	0.905 [0.369]	0.85±0.37	0.54±0.51	3.082 [0.003*]	1.00±0.00	0.74±0.44	3.62 [$<0.001^{**}$]
2. Medications	0.15±0.37	0.15±0.37	0 [1.000]	0.77±0.43	0.49±0.51	2.66 [0.010*]	0.90±0.31	0.56±0.50	3.535 [$<0.001^{**}$]
3. Pain management	0.28±0.46	0.23±0.43	0.513 [0.610]	0.59±0.50	0.31±0.47	2.578 [0.012*]	0.92±0.27	0.36±0.49	6.337 [$<0.001^{**}$]
4. Joint protection	0.21±0.41	0.21±0.41	0 [1.000]	0.54±0.51	0.31±0.47	2.094 [0.040*]	0.92±0.27	0.31±0.47	7.118 [$<0.001^{**}$]
5. Hip exercises after surgery and early ambulation	0.18±0.39	0.18±0.39	0 [1.000]	0.49±0.51	0.23±0.43	2.418 [0.018*]	0.85±0.37	0.26±0.44	6.418 [$<0.001^{**}$]
6. Follow up	0.26±0.44	0.18±0.39	0.816 [0.417]	0.74±0.44	0.54±0.51	1.908 [0.060]	0.95±0.22	0.74±0.44	2.585 [0.012*]
7. Nutrition	0.26±0.44	0.23±0.43	0.26 [0.795]	0.67±0.48	0.33±0.48	3.082 [0.003*]	0.69±0.47	0.46±0.51	2.094 [0.040*]
8. Management of stress	0.15±0.37	0.26±0.44	1.116 [0.268]	0.51±0.51	0.13±0.34	3.943 [$<0.001^{**}$]	0.79±0.41	0.26±0.44	5.581 [$<0.001^{**}$]
Total knowledge	1.69±1.66	1.56±1.65	0.342 [0.733]	5.15±1.65	2.87±1.67	6.07 [$<0.001^{**}$]	7.03±1.16	3.69±1.49	11.033 [$<0.001^{**}$]

Not Significant (NS) $P > 0.05$, *Significant (S), $P \leq 0.05$, **Highly Significant $P < 0.001$

t1 denotes to the comparison between study and control group pre application of bundled care. t2 denotes to the comparison between study and control group post 1 month of bundled care application. t3 denotes to the comparison between study and control group post 3 months of bundled care application.

Table 4. Mean scores of the study and control groups regarding HOOS score for functional outcomes during preoperative, after one month and after three months' post bundled care application. (n=78)

HOOS	Functional outcomes								
	preoperative (1- 2 days before operation) t1			Post bundled care (1 month) t2			Post bundled care (3 months) t3		
	Study (n=39)	Control (n=39)	t1	Study (n=39)	Control (n=39)	t2	Study (n=39)	Control (n=39)	t3
	X±SD	X±SD	[p-value]	X±SD	X±SD	[p-value]	X±SD	X±SD	[p-value]
Hoos Pain	7.31±4.49	8.91±4.58	1.560 [0.123]	38.33±7.40	19.94±5.40	12.549 [<0.001**]	84.68±4.94	31.41±6.20	[<0.001**]
Hoos Symptoms	7.18±4.56	6.92±7.31	0.186 [0.853]	35.38±3.51	19.62±8.06	11.199 [<0.001**]	66.15±10.54	23.72±14.22	[<0.001**]
Hoos ADL	7.92±3.67	8.71±4.02	0.908 [0.367]	9.20±78.85	6.19±26.41	6.772 [<0.001**]	78.85±5.67	26.41±5.89	[<0.001**]
Hoos Sport/Rec	5.93±4.74	7.37±7.70	0.995 [0.323]	28.04±15.50	20.99±9.46	2.425 [0.018*]	86.38±16.15	29.17±13.32	[<0.001**]
Hoos QOL	13.78±8.01	14.26±8.95	0.250 [0.803]	34.94±10.21	22.92±9.44	5.398 [<0.001*]	80.45±11.93	19.71±19.71	[<0.001**]
Total Hoos all subscales scores	42.12±10.93	46.18±17.63	1.222 [0.225]	171.16±38.98	26.73±130.40	8.624 [<0.001**]	396.51±28.54	130.40±23.51	[<0.001**]

Not Significant (NS) $P > 0.05$, *Significant (S), $P \leq 0.05$, ** Highly Significant $P < 0.001$

t1 denotes to the comparison between study and control group pre application of bundled care. t2 denotes to the comparison between study and control group post 1 month of bundled care application.

t3 denotes to the comparison between study and control group post 3 months of bundled care application.

Table 5. Mean scores of the study and control groups regarding Self-efficacy for rehabilitation outcome scale (SER) during preoperative, postoperative after one month and postoperative after 3 months post Bundled Care application. (n=78)

Self-efficacy for rehabilitation outcome scale (SER)		preoperative (1- 2 days before operation)		Post bundled care (1 month)		Post bundled care (3 months)	
		Mean	SD	Mean	SD	Mean	SD
Study group		1.08	0.27	1.69	0.47	1.85	0.37
Control group		1.15	0.37	1.13	0.34	1.26	0.44
T-test	t	1.057		6.102		6.418	
	P-value	0.294		<0.001**		<0.001**	

Not Significant (NS) $P > 0.05$, **Highly Significant $P < 0.001$

Table 6. Mean scores of the study and control groups regarding Hip Strengthening exercises performance satisfactory level preoperative, postoperative after one month and postoperative after three months post Bundled Care application. (n=78)

Hip Strengthening exercises performance checklist	Functional outcomes								
	preoperative (1- 2 days before operation) t1			Post bundled care (1 month) t2			Post bundled care (3 months) t3		
	Study (n=39)	Control (n=39)	t1	Study (n=39)	Control (n=39)	t2	Study (n=39)	Control (n=39)	t3
	X±SD	X±SD	[p-value]	X±SD	X±SD	[p-value]	X±SD	X±SD	[p-value]
Hip Flexion	0.28±0.46	0.36±0.49	0.721 [0.473]	0.74±0.44	0.41±0.50	3.124 [0.003*]	0.92±0.27	0.54±0.51	4.194 [<0.001**]
Hip Extension	0.31±0.47	0.36±0.49	0.475 [0.636]	0.77±0.43	0.54±0.51	2.179 [0.032*]	0.85±0.37	0.49±0.51	3.590 [<0.001**]
Hip Adduction	0.44±0.50	0.54±0.51	0.899 [0.371]	0.72±0.46	0.36±0.49	2.349 [0.021*]	0.85±0.37	0.62±0.49	3.364 [<0.001**]
Hip Abduction	0.49±0.51	0.46±0.51	0.224 [0.823]	0.64±0.49	0.41±0.50	2.070 [0.042*]	0.87±0.34	0.59±0.50	2.923 [0.005*]

Total Hip Strengthening exercises performance	1.51±1.05	1.72±1.12	0.834 [0.407]	2.87±1.00	1.72±0.97	5.155 [$<0.001^{**}$]	3.49±0.68	2.23±1.18	5.754 [$<0.001^{**}$]
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Not Significant (NS) $P > 0.05$, *Significant (S), $P \leq 0.05$, **Highly Significant $P < 0.001$

t1 denotes to the comparison between study and control group pre application of bundled care. t2 denotes to the comparison between study and control group post 1 month of bundled care application. t3 denotes to the comparison between study and control group post 3 months of bundled care application.

Table 7. correlation coefficient between patients' total knowledge and total Hip Strengthening exercises performance in the study group preoperative and Post three months post Bundled Care application. (n=39)

Study group	Total Hoos			
	Preprogram (1-2 days before operation)		Post Bundled Care (3 months)	
	r	P-value	r	P-value
Total knowledge	0.657	$<0.001^{**}$	0.781	$<0.001^{**}$
Total Hip Strengthening exercises performance	0.639	$<0.001^{**}$	0.704	$<0.001^{**}$

**Highly Significant $P < 0.001$

Discussion

Total hip arthroplasty is one of the most widely practiced surgeries across the whole world. It is indicated in patients suffering from end-stage osteoarthritis and has been proven to decrease pain, improve joint mobility, and quality of life following surgery (Colibazzi et al., 2020). Suitable postoperative management following total hip arthroplasty is an important factor contributing to better surgical outcomes. So application bundled of care for patients with total hip replacement have been shown to decrease length of stay, improve patient participation in education, decrease patient anxiety while improving perception of care, and lead to overall efficiency and improved care and outcomes (Singh et al., 2021).

Regarding the personal characteristics of the study and control groups, two matched groups were enrolled in this study with no-significant difference between both groups regarding all personal characteristics, this is an indicator for bias prevention. The current study results showed that approximately about less than half of patients in the study and control groups were in the same age group above 60 years, with mean age (47.35 ± 5.9) (48.4 ± 6.71) years respectively. This result was in agreement with Huang et al. (2017) whose study titled "The effects of the empowerment education program in older adults with total hip replacement surgery" and mentioned that nearly half of patients in the study and control groups were in the same age group above 60 years.

On the other hand, this result was incongruent with Liu et al. (2021) who described in their study about "Effects of continuous nursing based on WeChat platform on the functional recovery and quality of life in elderly patients after total hip arthroplasty", that mean age of study and control groups was (73.9 ± 6.1) (73.1 ± 6.5) respectively. Also this result was disagreement with Gabor et al. (2020) in study nearby "Similar Outcomes After Hospital-Based Same-Day Discharge Vs Inpatient Total Hip Arthroplasty" and mentioned that less than half of patients in the study and control groups were in the similar age group beneath 60 years.

The results of the present study revealed that more than two thirds of study and control groups were females. This result was in the same line with Arkin et al. (2019) who reported in their study nearby "Impact of Bundled Care on Outcomes Following Elective Primary Total Hip or Total Knee Arthroplasty" that two thirds of study and control groups were females. This might be due to females are more expected to have increased incidence of osteoarthritis than male and arthritis is most common indication for total hip arthroplasty. While, this result was incongruent with Liu et al. (2021) who mentioned that two thirds of study and control groups were males.

In the current study, the results showed that about two thirds of the study and control groups were married. This result was matching with Wu et al. (2018) in their study about "Relationship between the social support and self-efficacy for

function ability in patients undergoing primary hip replacement” and signified that the majority of the study sample was married. This may be due to about half of the study sample was in their sixth decade of age and typically, by this age, they are married according to Egyptian culture.

The current study results indicated that, more than half of study group and less than half of the control group had secondary education. This result was reinforced by *Brembo (2017)* in their study titled in " Role of self-efficacy and social support in short-term recovery after total hip replacement: a prospective cohort study" who stated that less than half of the studied sample had secondary education.

With respect to the patient’s residence, two thirds of the study and control groups lived in a rural area. This result is congruent with *Bakr (2018)* in a study titled “Effect of Educational Program on Quality of Life for Patients Post Hip Joint Replacement” that about two thirds of the study sample were from rural areas.

The results of the present study revealed that majority of study and control groups live with their family. This result was in the same line with *Frane et al. (2021)* in their recent study titled "Patient Satisfaction After Lower Extremity Total Joint Arthroplasty: An Analysis of Medical Comorbidities and Patient Demographics”, that more than half of study and control groups live with their family. This may be due to total hip arthroplasty required continuous care and observation after discharge from hospital.

The study result illustrated that more than half of the study and control groups were not working. This result was consistent with *Brembo et al. (2017)* who mentioned that two thirds of their study samples were retired. This may be due to about half of the study sample was in their sixth decades of age, in addition to sever pain and decrease of mobility before surgery which qualified them for not working.

The present study showed that two fifths of the study and control groups were smokers, this result was consistent with *Frane et al., (2021)* who found that two fifths of the studied sample were smoking. This may be because of that more than two thirds of study and control groups were females. On the other hand, this result is in disagreement with *Arkin et al., (2019)* who stated

that majority of patients in the study sample weren’t smokers.

Considering the body mass index, the present study indicated that approximately two thirds of the study and control groups were overweight, With the mean score of body mass index in study and control groups was (30.74±4.26) (30.15±4.51) Kg respectively, this result is in agreement with *Johnson et al. (2019)*, in USA in their study about" Short-term functional regaining after total joint arthroplasty is unaffected by bundled payment participation" found that the mean score of body mass index in study and control groups was (30.9 ± 8) (30.4 ± 6.6) respectively. While this result was incongruent with *Gabor, et al, (2020)* who mentioned that less than half of the study and control groups were overweight.

Regarding practice any sport regularly, the present study findings showed that the minority of the study & control groups were practicing exercise. This may be due to the absence of knowledge regarding the benefits of practicing exercise regularly. This result was supported by *Chang et al., (2017)* in his study titled “Effects of a Home-Based Resistance Training Program on Recovery from Total Hip Replacement Surgery: Feasibility and Pilot Testing” mentioned that one third of their studied sample were acting regular exercise.

In the current study, the results showed that there were no statistically significant differences between study and control groups regarding all features of personal characteristics; this result indicates that both study and control groups were compatible. This result is in arrangement with *Liu et al. (2021)*, who mentioned that there was no statistical difference in all aspects of demographic characteristics between the two groups.

Considering past medical history, the present study indicated that less than one fifth of the study group and more than one fourth of the control group had diabetes mellitus. This may be due to that less than half of patients in the study and control groups were in the same age group above 60 years, and this age group is a common high-risk group for diabetes mellitus. This result was in accordance with *Arkin et al, (2019)* who mentioned that slightly one fourth of study patients had diabetes mellitus.

In the same context of past medical history, the present study showed that nearly half of the study and control groups had hypertension. This may be due to less than half of patients in the study and control groups were in the same age group above 60 years, and this age group is a common high-risk group for hypertension. This result was similar to *Frane, et al. (2021)* who mentioned that two thirds of their study patients had hypertension.

As regard to previous Orthopedic surgeries the present study presented that the minority of the study and control groups had internal fixation. This result was in incongruent with *Bakr (2018)* who found that one third of the study sample had external fixation.

With regard to side of operation, the study result illustrated that more than half of study and control groups have surgery in right side. This result was constant with *Saunders et al. (2021)* in their recent study titled "Comparing an eHealth Program (My Hip Journey) With Standard Care for Total Hip Arthroplasty: Randomized Controlled Trial" who mentioned that more than half of their study sample have surgery in right side.

As regard to medical diagnosis, the present study showed that nearly half of the study and control groups had severe arthritis. This result was in agreement with *Huang et al., (2017)* who evaluated the effects of the empowerment education program in older adults with total hip replacement surgery and found that about two-thirds of the study sample had severe arthritis. This might be due to total hip arthroplasty is a treatment of choice for patients with hip osteoarthritis.

The present study results illustrated that, there was a statistically significant improvement of mean scores of all items of knowledge among the study group post 1 month and post 3 months of bundled care application. This finding is similar to the results of *Ali and Abo El-Fall (2021)* who studied "Effect of Evidence Based Progressive Exercise Program on Functional Outcomes for Patients after Total Hip Replacement Surgery," stated that the difference in mean scores of knowledge was highly statistically significant, in term of knowledge improvement after program implementation

where mean score of awareness was higher than before program accomplishment.

In relation to the patient's total knowledge scores, this study reveals that there was a high statistically significant difference between the patients' total satisfactory level of knowledge in study and control groups post one month and post three months of bundled care application. This can be explained by the effectiveness of the care bundle which facilitated patient's interaction with the health care providers and improved the patient's knowledge level. This finding is in accordance with *Bakr (2018)* who stated that there was high statistically significant relation between study and control groups total knowledge scores post and follow up education program accomplishment.

Considering total hip disability and osteoarthritis outcome score (HOOS), this study reveals that a high statistically significant difference between the patients' total Hoos all subscales score in study and control groups post bundled care (one month) and Post bundled care (three months), this prove the effectiveness of care bundle on improving patients' functional outcome after total hip arthroplasty. This finding was incongruent with *Saunders, et al. (2021)* who stated that no significant differences in changes between the intervention and control groups were noticed at baseline and at 6 weeks, 3 months, and 6 months after surgery for the HOOS scores.

The present study results illustrated that, there was a statistically significant improvement of mean scores of all items of hip disability and osteoarthritis outcome score including (Pain, Symptom, ADL, Sport and QOL) among the study group than control group post one month and three months of bundled care application. This finding is corresponding to the results of *Finch et al., (2020)* who studied "The Effects of Bundled Payment Programs for Hip and Knee Arthroplasty on Patient-Reported Outcomes," stated that there was development of mean scores of all items of hip incapacity and osteoarthritis outcome score at 1, 3 and 6 months postoperatively among the study group.

The above mentioned results proved the hypothesis number (1) of the present study which revealed that patients with total hip arthroplasty who exposed to bundled care will

have significantly improvement in hip disability and osteoarthritis outcome score for functional outcomes post bundled care application.

Regarding Self-efficacy for rehabilitation outcome, the present study indicated that there was a high statistically significant difference between the patients' Self-efficacy mean scores among study and control groups post one month and post three months' bundled care application. with increase in mean score of Self-efficacy in study group than control group through study phases. This result is constant with *Huang et al., (2017)* who mentioned that the mean score of self-efficacy in the study group increased at post-test 6 weeks and 3 months after discharge, and there were significant differences between the groups over the follow-ups phases.

This prove the research hypothesis number (2) which stated that patients with total hip arthroplasty who exposed to bundled care will have significantly improvement in self-efficacy level post bundled care application.

With regard to total hip strengthening exercises performance, the present study results illustrated that there was a statistically significant improvement of the mean scores of all items of hip strengthening exercises performance among the study group. Also there were high statistically significant differences between study and control groups post one month and post three months of bundled care application. This prove the effectiveness of care bundle on enhancing patients' mobility after total hip arthroplasty. This finding is corresponding to the results of *Schache et al., (2016)* who studied "Does the addition of hip strengthening exercises improve outcomes following total knee arthroplasty? A study practice for a randomized trial "stated that a notable enhancement of the mean scores of hip strengthening exercises performance was observed among the intervention group over the stages of the study.

On the other hand, this result was disagreement with *Saueressig et al. (2021)* who carried out a recent study about " Evaluation of Exercise Interventions and Outcomes After Hip Arthroplasty A Systematic Review and Meta-analysis" who stated that there was no significant association of the intervention with

hip abduction muscle strength after total hip arthroplasty.

The current study results revealed a statistically significant positive correlation between patients' total knowledge, total performance and total Hoos in the study group post bundled care application. this result was in agreement with *Ali and Abo El-Fadl (2021)*, who stated that there was a significant positive correlation with each of hip range of motion and Hip disability and Osteoarthritis Outcome Score. This finding prove the research hypothesis number (3) which stated that patients with total hip arthroplasty who exposed to bundled care will have significantly improvement in hip strengthening exercises performance post bundled care application

Conclusion

The current study concluded that:

The present study suggested that bundled care was an effective care in enhancing knowledge, self-efficacy, hip disability and osteoarthritis outcome score, hip Strengthening exercises performance as indicators of the functional capability. Patients who had all elements of the THA bundle had the best outcomes.

Recommendations

Based on the finding of the present study, the researchers recommended the following:

- Apply bundled care as a care protocols for patients undergoing THA.
- Implementation of intensified follow up programs to improve functional outcome of patients with THA and should be offered whenever possible.
- Providing patients with self-care practices guidelines after surgery to improve their knowledge and practices
- The study can be replicated by using a large sample there by findings can be widespread.

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