# Establishment and Application of The Service Process for Discharge of Patients Undergoing Total Knee Arthroplasty

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## ABSTRACT

**Objective:** To explore the establishment and clinical application of the service process of preparation for discharge of patients undergoing total knee arthroplasty (TKA).

**Methods:** One hundred patients who would receive TKA from July 2019 to June 2020 were randomly divided into two groups, the control group, and the intervention group. The control group were given routine care and guidance of discharging. The intervention group would be receiving discharge planning service processes after being admitted to hospital, before surgery, after surgery, before discharge, and after discharge. The knee joint function score, daily living ability index, mental health level and patient's satisfaction were compared between the two groups of patients.

**Results:** The knee joint function score, daily living ability index, mental health level and patient's satisfaction in the intervention group were significantly higher than those in the control group (P<0.05, P<0.01).

**Conclusion:** The establishment and application of discharge preparation service process is beneficial to improve knee joint function, self-care ability in daily life and caregiving ability by caregivers.

## Keywords

Total Knee Arthroplasty (Tka); Discharge Preparation Service; Continued Nursing; Rehabilitation Training.

## Introduction

Total knee arthroplasty (TKA) is the final treatment for the serious disease of knee which can effectively relieve joint pain, reconstruction of knee function, improve the quality of life of patients. After the joint replacement, a special and full-time rehabilitation training is an important factor for obtaining the ability to live independently, also it is an effective way to improve surgical results [1]. However, with the deepening reform of China's health care system, patients' hospitalized time has been gradually shortened. The average hospitalized time is 1 to 2 weeks [2]. How to have patients continue to perform the rehabilitation exercise plan after discharge from the hospital and return to normal life as soon as possible is the focus of the research on rehabilitation nursing work [3]. Discharge preparation service is an emerging care model in recent years. It is part of extended nursing care. It is a process of centralized, coordinated, and multi-disciplinary integration [4]. Through the cooperation of the medical team, patients and their families, the inpatients can be receiving continuous care after discharge from the hospital[5]. In this study, we would establish and apply the discharge preparation service to patients with unilateral TKA, and to establish a team-based (specialist medical staff plus rehabilitation specialist) service framework. We would

provide discharge preparation assessment (family rehabilitation environment and daily life ability), to designate a rehabilitation and care plan for patients after discharge from the hospital. Moreover, we would help equip the proper medical equipment for their families. In addition, we would provide telephone consultation, regular follow-up, and regular review services, which would significantly improve the knee joint function score, daily living ability of patients with TKA, and patient's satisfaction. We aim to have full-process, systematic health monitoring and service for patients.

## Materials and methods
### General information
Inclusion criteria: ① diagnostic criteria of osteoarthritis; ② the first time to accept unilateral TKA; ③ patients with informed consent to participate in this study and written informed consent; ④ patients and their families can cooperate, communicate effectively and follow-up. Patients meeting with above 4 criteria can be included in the study.

Exclusion criteria: ① those with mental illness who cannot cooperate with treatment; ② those with severe dysfunction of other organs and unable to complete rehabilitation training; ③ those who cannot communicate effectively due to mental, hearing, or consciousness impairment. Test cases can be excluded if any of the above conditions are met.

According to the above inclusion and exclusion criteria, 100 patients with unilateral TKA from July 2019 to June 2020 had been selected. Half of them were regarded as the control group, and they were given routine care and discharge education guidance. Half of them were included in the intervention group. Among which, the discharge preparation service process was established and implemented at different stages of patients including after admission, before surgery, after surgery, before discharge, and after discharge.

## Implementation methods include
### Method 1: Establish a preparation service team for patients undergoing TKA
There are 6 people in this service team, one deputy chief physician, one attending physicians, one rehabilitation division, one supervisor nurse and 2 nurses. The surgeon was responsible for diagnosis and treatment of diseases, providing patients with the disease-related counseling and clinical review. The rehabilitation division is responsible for making plans for all stages of patient rehabilitation, guiding the use of rehabilitation equipment, and offering rehabilitation exercise video (videos about increasing muscle strength, increasing joint mobility and capability of standing and walking). The supervisor nurse was responsible for taking videos of patient's rehabilitation, assessing the patient's home rehabilitation environment, and instructing the use of auxiliary appliances in daily life. The nurses were responsible for assisting the rehabilitation teacher to supervise and urge patients to perform functional exercises according to the rehabilitation

training plans, and telephone follow-up of patients 1 week after discharge, 1 and 3 months after operation [6]. Team members will conduct unified training before launching this model. The training content includes knowledge about knee replacement surgery, common nursing problems, postoperative rehabilitation training projects, discharge preparation service plans, home rehabilitation environment modification, patient compliance analysis, etc.

### Method 2: Work out procedures and processes for preparation for discharge
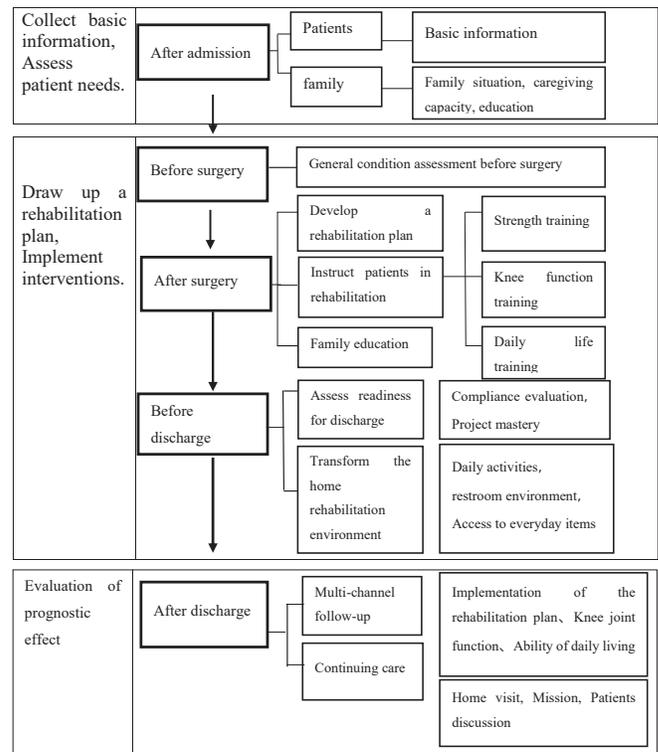


### Method 3: Specific intervention
**After admission:** When patients were on admission, designated nurses would guide them how to fill the general questionnaire (name, age, gender, height, weight, marriage status, career, family and individual source of income, living area, living conditions, contact information, etc.). They were also asked to fill in the basic information of the main caregiver (name, age, gender, education level, relationship with the patient). Upon this investigation, we could understand how they were accepting all of those arrangements and treatments, the home environment, and how the patient's family would be taking care of them after discharge. Moreover, we could get an idea of what's the plan after discharge, and what they need after discharge.

**Before surgery:** The attending physician would make a comprehensive assessment of patients' knee function including pain, function, range of motion, muscle strength, flexion deformity and stability before performing the surgery. After the surgery, nurses would emphasize the importance of precautions and postoperative rehabilitation to patients in person.

**After surgery:** The nurses would guide those patients that had undergone surgery on how to turn over their bodies, perform active and passive muscle exercise, heel sliding motion while being supine, knee flexion and extension exercises while being sitting, walking on the ground, using the walking aids, getting in and out of bed, going to the toilet, using the chairs, using the nursing appliances, the methods of going up and down stairs, etc. They would be taught one-to-one by the nurses by playing a video, explaining the scene, bedside demonstrations, presentations guidance, etc. [7]. For patients with poor compliance, the frequency of health education can be appropriately increased. For example, the Teach- Back health education model could be used for repeated and multiple guidance, and the results of health education are evaluated in a timely manner. Patients and their families are required to participate in the implementation process [8].

**Prior to discharge:** Before the patients were discharged from the hospital, they were assessed about how they were preparing for discharge. We would hand out the department's self-made "Knee Replacement Patient Discharge Manual". The responsible nurse and caregiver would work together to formulate a home rehabilitation and daily activity plan for the patient after discharge. They would evaluate the home rehabilitation environment, including vehicle for returning home, whether to take the elevator up and down the stairs, the height of the bed, chair and toilet, the shower and washing environment, and whether it was convenient to take and place commonly used items. Also, they would guide patients' family members to make necessary changes to the home environment to facilitate the daily activities of patients, to use special mobile phones in the department to establish the Doctor-Patient communication WeChat group. In this group, patients were informed that if they had any discomfort or questions after they were discharged from the hospital, they could consult in the group at any time, and designate medical staff to answer online questions at a fixed time during the working day.

**After discharge:** The patients were followed-up at one week after discharge, one and three months after the operation. For patients with different levels of discharge readiness, we used different ways to get in touch with them accordingly. Outpatient follow-up visits, WeChat platform, telephone follow-up, home visits and other methods were used to understand the patient's functional exercise after discharge, and to assess the patient's knee joint function and daily living ability. Personalized rehabilitation guidance was provided. At the same time, establish patient files, make follow-up records, and constantly re-evaluate patients' compliance with rehabilitation exercises and their mastery of disease-related knowledge, and then carry out a new round of targeted interventions.

**Evaluation methods include:**
Knee function evaluatio, evaluation the quality of life, Care Services Satisfaction.

**Knee function evaluatio:** Knee score standard from Hospital for Special Surgery in US were used to evaluate knee function (pain functions, range of motion, strength, and stability of flexion deformity) before surgery, after surgery, 1 week after discharge, 1 month and 3 months after discharge. Full score was 100 points, and score ≥ 85 was divided into excellent, 70-84 as good, 60-69 into still, <60 as bad [9].

**Evaluation the quality-of-life:** Barthel Index, anxiety and depression scores, and sleep quality scores were used to evaluate patients' living quality comprehensively before surgery, after surgery, 1 week after discharge, 1 month and 3 months after discharge.

Barthel index evaluation contents include dressing, washing, eating, urine, toileting, bathe, getting in and out of bed, activities, and going up and down the stairs. The total score is 100 points. 100 points refer to living on themselves independently, 95-75 as mild dependency, 70-50 as moderate dependence, 45-25 as severe dependency, 20-0 as completely dependent [10].

Self-rating anxiety scale (SAS) was used to evaluate patients' anxiety. It evaluates for 20 symptoms including the subjective feelings, psychological problems, physical performance, etc. Add all the individual score and then multiply 1.25 to get the rounded points. Total score is 100 points. 50-59 is mild anxiety, 60-69 as moderate anxiety, 69 and above as severe anxiety [11].

Self-rating depression scale score (SDS) was used to evaluate depression, which includes 20 subjective feelings of the project. After the completion of each evaluation item, obtained points were accumulated and then multiplied by 1.25 to give standard points rounded. Total score is 100 points. And 53-62 is regarded as mild anxiety, 63-72 as moderate anxiety, 73 or more as severe anxiety [12].

**Care Services Satisfaction:** When patients were discharged, health care service satisfaction survey were carried out to determine medical care service satisfaction rate. Questionnaire comprises 10 items with a total point of 100. Higher scores are better patient satisfaction. We define scores≥90 as very satisfied, 80-89 as satisfied, 60-79 as general, <60 as unsatisfied.

**Statistics**
Using the SPSS 23.0 statistical software (IBM, USA) for data entry and analysis, measurement data was shown as mean ± standard deviation ($\chi \pm S$). Groups were compared using independent sample t test or chi-square test. $P<0.05$ was considered statistically significant.

**Results**
**Result 1: Comparison of general information of the two groups of patients**
There was no significant difference between the two groups considering gender, age, and education (Table 1).

**Table 1:** General information of two groups of patients.

| Groups | cases | Gender (case) | | Age (years) | | | Education background | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | Male | Female | $\bar{x}\pm s$ | Illiteracy | Primary school | Junior high school | Senior high school and above |
| Experimental group | 50 | 20 | 30 | 66.26±7.31 | 4 | 5 | 11 | 30 |
| Control group | 50 | 22 | 28 | 63.91±8.16 | 6 | 6 | 15 | 23 |
| $x^2/t$ | - | 0.164 | | 1.145 | | | 3.342 | |
| $P$ | - | 0.685 | | 0.131 | | | 0.354 | |

**Table 2:** Comparison of knee functional scores between groups.

| Groups | | HSS Knee function score ($\bar{x}\pm s$) | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | cases | At admission | At discharge | 1 week after discharge | 1 month after discharge | 3 months after discharge |
| Experimental group | 50 | 56.13±7.33 | 66.17±4.32 | 73.34±3.29 | 85.93±5.78 | 89.35±8.41 |
| Control group | 50 | 53.57±6.05 | 64.59±6.97 | 69.21±5.35 | 73.25±7.46 | 77.78±4.24 |
| $x^2/t$ | - | | 2.467 | 1.56 | 5.52 | 8.73 | 6.61 |
| $P$ | - | | 0.205 | 0.103 | 0.037 | 0.014 | 0.002 |

**Table 3:** Comparison of the ability of daily living between groups.

| Groups | | Barthel Index ($\bar{x}\pm s$) | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | cases | At admission | At discharge | 1 week after discharge | 1 month after discharge | 3 months after discharge |
| Experimental group | 50 | 72.52±1.54 | 76.35±6.46 | 79.92±9.44 | 85.17±6.53 | 94.62±4.12 |
| Control group | 50 | 73.88±2.11 | 77.05±2.14 | 78.83±8.73 | 83.55±3.82 | 89.42±2.53 |
| $x^2/t$ | - | | 1.85 | 8.22 | 9.35 | 1.24 | 5.86 |
| $P$ | - | | 0.253 | 0.121 | 0.033 | 0.003 | 0.012 |

**Table 4.1:** Comparison of SAS between groups.

| Groups | Cases | Anxiety Self-Rating Scale ($\bar{x}\pm s$) | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | | At admission | At discharge | 1 week after discharge | 1 month after discharge | 3 months after discharge |
| Experimental group | 50 | 48.44±12.56 | 45.72±10.88 | 36.61±9.51 | 35.58±12.33 | 36.22±11.28 |
| Control group | 50 | 47.26±13.90 | 46.68±12.33 | 38.21±10.44 | 37.15±10.84 | 36.92±13.94 |
| $x^2/t$ | - | | 4.26 | 3.11 | 1.27 | 2.61 | 9.17 |
| $P$ | - | | 0.463 | 0.004 | 0.051 | 0.019 | 0.042 |

**Table 4.2:** Comparison of SDS between groups.

| Groups | Cases | | Depression Self-Rating Scale ($\bar{x}\pm s$) | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | | At admission | At discharge | 1 week after discharge | 1 month after discharge | 3 months after discharge |
| Experimental group | 50 | 50.27±13.20 | 46.71±10.68 | 44.35±12.91 | 43.86±10.87 | 43.12±9.58 |
| Control group | 50 | 51.83±12.84 | 47.26±12.11 | 46.17±13.77 | 44.15±11.94 | 43.69±13.52 |
| $x^2/t$ | - | | 2.64 | 14.33 | 8.49 | 2.53 | 5.21 |
| $P$ | - | | 0.115 | 0.042 | 0.048 | 0.01 | 0.036 |

### Result 2: Comparison of knee function scores between the two groups

There was no significant difference in knee function scores between the two groups at discharge (P>0.05). One week after discharge, one month and 3 months after discharge, the knee function scores of the experimental group were higher than that of the control group (P < 0.05) (Table 2).

### Result 3: Comparison of the ability of daily living and mental health between the two groups

Comparison of the ability of daily living (Barthel index) between the two groups of patients: There was no significant difference in the Barthel index between the two groups at the time of follow-up at discharge (P > 0.05). One week after discharge, 1 month and 3 months after discharge, Barthel index in the experimental group higher than that in control group (P < 0.05) (Table 3).

### Result 4: Comparison of the mental health of the two groups of patients (SAS and SDS scale)

At discharge, 1 month and 3 months after discharge, the SAS scores of the experimental group were higher than those of the control group (P < 0.05), but it was not significant at 1 week after discharge (P > 0.05) (Table 4.1).

SAS scores of the experimental group were higher than that in control group at 1 week, 1 month and 3 months after discharge (P < 0.05) (Table 4-2).

**Table 5:** Comparison of satisfaction rate between groups.

| Groups | Cases | Satisfaction rate (%) | | | |
|---|---|---|---|---|---|
| | | Very satisfied | Satisfied | General | unsatisfied |
| Experimental group | 50 | 42 (84.0%) | 6 (12.0%) | 2 (4.0%) | 0 |
| Control group | 50 | 29 (58.0%) | 15 (30.0%) | 5 (10.0%) | 1 (2.0%) |
| $x^2/t$ | - | | 8.523 | | |
| P | - | | 0.036 | | |

## Result 5: Comparison of satisfaction rate on medical service between the two groups

Satisfaction rate on medical service in the experimental group were higher than that in the control group (P<0.05).

## Discussion

### "Discharge planning services" in favor of knee function rehabilitation

Knee osteoarthritis (KOA) is a common chronic progressive joint disease. Its incidence in middle-aged and elderly people has increased year by year in recent years. Patients with end- stage KOA are often due to pain, deformity, and restricted lower extremities, leading to decline in activities of daily living, seriously affecting the quality of life. While the artificial knee arthroplasty (TKA) is the principal mean of treatment for end-stage KOA. TKA rehabilitation after surgery, not only rely on the orthopedic surgeons. More importantly, it relies on long-term and standardized rehabilitation after surgery. The problem is that patients and their families find it difficult to master the rehabilitation project within a short period of hospitalization. What's worse, the follow-up compliance of elderly patients is poor. It is difficult to continue the rehabilitation training program after discharge, which brings great challenges to the rehabilitation and nursing work after discharge [13]. Therefore, the "discharge preparation service" carried out by our department provides intervention measures during the hospitalization period, establishes a team service framework, and requires patients and their families to participate in the rehabilitation plan, extending the hospital's medical care and rehabilitation work to the family, and through regular follow-up and re-intervention significantly promoted the postoperative knee function rehabilitation of TKA patients. The results of this study showed that the knee function scores of patients in the experimental group were higher than those in the control group at one week after discharge, one month and three months after discharge. The difference was statistically significant. It can improve the quality of life of T KA patients and is worthy of further promotion.

### "Discharge planning service" can promote the patients' physical and mental health

Knee replacement surgery serves as an implantable treatment undertaken in recent years. The lack of sufficient knowledge for elderly patients can easily lead patients in the perioperative period into an unknown and negative mood like anxiety, fear, and other negative psychological disorders. This will decrease their enthusiasm for follow-up rehabilitation treatment. Therefore, by carrying out "discharge preparation service", nursing staff can effectively combine the actual situation of the patient and inform the patient in detail of the basic knowledge of the disease, the significance of the knee replacement surgery and the postoperative precautions, so as to eliminate their negative psychological factors and improve the patients 'movement. In this study, quality of daily living (Barthel Index) and mental health score (SAS, SDS) of patients in the experimental group were higher than in the control group at one week, one month and three months after being discharged, indicating that continuous and systematic care or discharge preparation services can promote the physical and mental health of TKA patients.

### "Discharge planning services" can improve satisfaction rate on nursing service

In the process of discharge preparation services, the formulation and implementation of the rehabilitation plan requires the participation of patients and their families. After discharge, doubts and needs of patients and their families are resolved in a timely manner through telephone follow-up, WeChat platform, home follow-up, and outpatient review. Patients obtain comprehensive and continuous rehabilitation training. The results of this study showed that the nursing satisfaction rate of the experimental group was significantly higher than that of the control group after the operation, indicating that the discharge preparation service improved the quality of care of TKA patients, thereby increasing the patient's satisfaction with the services of medical staff.

In short, applying the "discharge preparation service" model to patients undergoing TKA can effectively promote the patient's knee function rehabilitation, help improve the patient's ability of daily living, and improve the patient's quality of life. It is worthy of further promotion. Discharge preparation services have been carried out in Hong Kong and Taiwan for many years [14]. The connection process of hospitals, community medical institutions, home care centers and other institutions is very mature, and good social and economic benefits have been achieved. However, the development of communities in mainland China is relatively late, and community medical services are not yet perfect. Only relying on the limited medical resources of tertiary hospitals cannot meet the needs of the people. The promotion of "discharge preparation services" still requires the government to formulate relevant policy support.

## References

1. Connelly, J. W. *et al.* Which Preoperative Factors are Associated with Not Attaining Acceptable Levels of Pain and Function After TKA? Findings from an International Multicenter Study. *Clin Orthop Relat Res. 2020:* 478; 1019-1028. DOI: 10.1097/CORR.0000000000001162.

2. Kayani, B., Konan, S., Tahmassebi, J., et al. Robotic-arm assisted total knee arthroplasty is associated with improved early functional recovery and reduced time to hospital discharge compared with conventional jig-based total knee arthroplasty: a prospective cohort study. *The bone & joint journal. 2018:* 100-b; 930-937. DOI: 10.1302/0301-620x.100b7.Bjj-2017-1449.R1.

3. Husby, V. S., Foss, O. A., Husby, O. S. et al. Randomized controlled trial of maximal strength training vs. standard rehabilitation following total knee arthroplasty. *Eur J Phys Rehabil Med. 2018:* 54; 371-379. DOI:10.23736/S1973-9087.17.04712-8.

4. Mabire, C., Bachnick, S., Ausserhofer, D. et al. Patient readiness for hospital discharge and its relationship to discharge preparation and structural factors: A cross-sectional study. *International journal of nursing studies. 2019:* 90; 13-20, DOI: 10.1016/j.ijnurstu.2018.09.016.

5. Mabire, C., Dwyer, A., Garnier, A. et al. Effectiveness of nursing discharge planning interventions on health-related outcomes in discharged elderly inpatients: a systematic review. *JBI database of systematic reviews and implementation reports. 2016:* 14; 217-260. DOI: 10.11124/jbisrir-2016-003085.

6. Courtney, M. D. *et al.* Improved functional ability and independence in activities of daily living for older adults at high risk of hospital readmission: a randomized controlled trial. *Journal of evaluation in clinical practice. 2012:* 18; 128-134. DOI:10.1111/j.1365-2753.2010.01547.x.

7. Gwam, C. U. *et al.* Factors associated with non-home discharge after total knee arthroplasty: Potential for cost savings? *Knee. 2020:* 27; 1176-1181. DOI: 10.1016/j.knee.2020.05.012.

8. Ha Dinh, T. T., Bonner, A., Clark, R., et al. The effectiveness of the teach-back method on adherence and self-management in health education for people with chronic disease: a systematic review. *JBI database of systematic reviews and implementation reports.* 2016: 14(1); 210-247. DOI: 10.11124/jbisrir-2016-2296.

9. McDonald, S., Page, M. J., Beringer, K., et al. Preoperative education for hip or knee replacement. *Cochrane Database Syst Rev.* 2014(5): Cd003526, DOI: 10.1002/14651858.CD003526.pub3.

10. Tanaka, R., Hayashizaki, T., Taniguchi, R., et al. Effect of an intensive functional rehabilitation program on the recovery of activities of daily living after total knee arthroplasty: A multicenter, randomized, controlled trial. *J Orthop Sci. 2020:* 25; 285-290. DOI: 10.1016/j.jos.2019.04.009 (2020).

11. Wang, Y. *et al.* Prospective assessment and risk factors of sleep disturbances in total hip and knee arthroplasty based on an Enhanced Recovery After Surgery concept. *Sleep Breath.* 2021: 25(3); 1231-1237. DOI:10.1007/s11325-020-02213-y.

12. Geng, X. *et al.* A Randomized Controlled Trial of Psychological Intervention to Improve Satisfaction for Patients with Depression Undergoing TKA: A 2-Year Follow-up. *J Bone Joint Surg Am. 2021:* 103; 567-574. DOI:10.2106/jbjs.20.00169 (2021).

13. Pulkkinen, M., Jousela, I., Engblom, J., et al. The effect of a new perioperative practice model on length of hospital stay and on the surgical care process in patients undergoing hip and knee arthroplasty under spinal anesthesia: a randomized clinical trial. *BMC Nurs. 2020:* 19:73. DOI:10.1186/s12912-020- 00465-3.

14. Shyu, Y. I., Chen, M. C., Chen, S. T., et al. A family caregiver-oriented discharge planning program for older stroke patients and their family caregivers. *J Clin Nurs. 2008:* 17(18); 2497-2508. DOI:10.1111/j.1365-2702.2008.02450.x.