



Orthopaedic Rehabilitation

## A New Multi-disciplinary Rehabilitation Outcome Checklist for the Rehabilitation of Total Knee and Total Hip Replacement Patients

—張新的多學科綜合性康復成果清單在全膝關節和全髖關節置換術後病人的應用

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### ABSTRACT

Use of clinical pathways in the rehabilitation of total knee and total hip replacement patients is on an increasing trend. However, in the literatures there was no universally agreed assessment and auditing method on the outcome of these clinical pathways. We created a new multi-disciplinary rehabilitation outcome checklist (MROC) to evaluate and audit the outcome of our patients after total joint replacement. MROC was applied in 96 total knee and 18 total hip replacement patients. The compliance rate of MROC was 100%. Most of the treatment goals of the clinical pathways were found to be fulfilled. The MROC provides an easy-to-use, free-of-charge, and tailor-made checklist for the evaluation and auditing purpose.

### 中文摘要

臨床復康路徑應用在全膝及全髖關節置換的患者上有增加的趨勢。然而，在文獻中卻沒有普遍認同的評估和審計方法，去評審對這些臨床復康路徑的成果。我們創建了一種名為「多學科綜合性康復成果清單」的新工具，來評審這些臨床復康路徑的成果。我們把這種工具應用在96全膝關節和18個全髖關節置換的患者上。結果發現清單的遵行率是100%。大部分臨床路徑的治療目標都能達到。「多學科綜合性康復成果清單」提供了一個易於使用，免費和量身定製的評估和審計工具。

### Introduction

With the ageing populations, the number of patients with arthritis of knees and hips is increasing. Consequently, the number of these joint replacement operations is also increasing worldwide.<sup>1</sup> However, joint replacement surgeries are expensive and there are operative risks in the elderly patients. A multidisciplinary collaborative management is essential in rendering an effective and efficient rehabilitation care for them.

In the past 10 years, the use of clinical pathways in the rehabilitation of total knee and total hip replacement patients is on an increasing trend. Studies have suggested that these clinical pathways can improve the patients' outcomes.<sup>2–4</sup> Following the

implementation of the total knee replacement clinical pathways in 2007 and the total hip replacement pathway in 2008 in our centre, the use of a clinical pathway has become the target and tool of our multidisciplinary rehabilitation team.

However, in the literatures there were no universally agreed assessment and auditing method on the outcome of these clinical pathways. A wide variety of parameters were used in different studies, including the length of stay, cost, functional status, and discharge mode. In the rehabilitation team, different disciplines also had different assessment criteria that were not comparable to each other. The users or the departments had to pay fees for some of the assessment tools and this also caused financial concern. In order to deal with these problems, we created a new multi-disciplinary rehabilitation outcome checklist (MROC) to evaluate and audit the outcomes of our total joint replacement pathways.

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**Objective of study**

Aim of this study was to apply the MROC to measure whether the treatment and care goals of the pathways in total knee and total hip replacement were achieved from a multidisciplinary perspective.

**Materials and Methods**

The MROC is created by a working group under the Orthopaedic Rehabilitation Team. The working group includes representatives from surgeons, orthopaedic rehabilitation fellows, nurses, physiotherapists, occupational therapists, prosthetics and orthotics, and

**A O&T Rehabilitation Outcome Checklist, UCH**

**Total Knee Replacement**

Patient label Name + HN
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\* Please put a '✓' on the appropriate box and fill in the required data

Expected Rehab Outcomes	Rehab Outcomes upon Discharge
1. Independent transfer and walking ± aid with MFAC at least 6	<input type="checkbox"/> Yes <input type="checkbox"/> No MFAC _____
2. Knee flexion range at least 80°	<input type="checkbox"/> Yes <input type="checkbox"/> No: ROM _____°
3. Post discharge OPD physiotherapy follow up within 2/52 scheduled.	<input type="checkbox"/> Yes <input type="checkbox"/> No
4. Independent up to toileting ± aids	<input type="checkbox"/> Yes <input type="checkbox"/> No
5. Able to manage bathing ± aids or with carer support (BI Bathing score ≥ 3)	<input type="checkbox"/> Yes <input type="checkbox"/> No BI Bathing score ____/5
6. Wound with no infection	<input type="checkbox"/> Yes <input type="checkbox"/> No
7. Pain score <5	<input type="checkbox"/> Yes <input type="checkbox"/> No Pain score: _____/10
8. Length of stay: 10-14 days	<input type="checkbox"/> Yes <input type="checkbox"/> No L.O.S: _____ days
Remarks:	

Date of discharge: \_\_\_\_\_ Checked by: \_\_\_\_\_

**Figure 1.** The MROC for (A) total knee replacement and (B) total hip replacement. BI = Barthel index; HN = hospital number; L.O.S. = length of stay in hospital; MFAC = modified functional ambulation categories: I = lyer, II = sitter, III = dependent walker, IV = assisted walker, V = supervised walker, VI = indoor walker, VII = outdoor walker; OPD = out-patient clinic; ROM = range of motion.

medical social workers. The target is to create an outcome checklist that is user friendly and free of charge, and includes all key performances and discharge criteria as agreed by the multidisciplinary team. The MROC not only serves as a benchmark, but also allows auditing of the outcome of the joint replacement pathways.

The criteria listed in the MROC are the target outcomes that we aim to achieve in our joint replacement patients upon discharge (Figures 1A and 1B). The MROC includes criteria on different areas: mobility, self-care, pain score, wound problem, length of study, and

expected postdischarge follow-up rehabilitation arrangement. The items are explained as follows.

**Mobility:** Different reports use different assessment systems. Functional ambulatory category (FAC) is commonly used in rehabilitation assessment. In MROC, we used the modified functional ambulatory category (MFAC). The original FAC by Wade<sup>5</sup> does not take into account the use of walking aids. The MFAC is a modified version that is divided into seven categories (Table 1). The correlation between the original FAC and the

**B** O&T Rehabilitation Outcome checklist, UCH

Total Hip Replacement

Patient label Name + HN
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\*Please put a "✓" on the appropriate box and fill in the required data

Expected Rehab Outcomes	Rehab Outcomes upon Discharge
1. Independent transfer and walking ± aid with MFAC at least 6	<input type="checkbox"/> Yes <input type="checkbox"/> No MFAC _____
2. Post discharge OPD physiotherapy follow up within 2/52 scheduled.	<input type="checkbox"/> Yes <input type="checkbox"/> No
3. Independent up to toileting ± aids	<input type="checkbox"/> Yes <input type="checkbox"/> No
4. Able to manage bathing ± aids or with carer support (BI Bathing score ≥ 3)	<input type="checkbox"/> Yes <input type="checkbox"/> No BI Bathing score ____/5
5. Wound with no infection	<input type="checkbox"/> Yes <input type="checkbox"/> No
6. Pain score <5	<input type="checkbox"/> Yes <input type="checkbox"/> No Pain score: _____/10
7. Length of stay: 10-14 days	<input type="checkbox"/> Yes <input type="checkbox"/> No L.O.S: _____ days
Remarks:	

Date of discharge: \_\_\_\_\_ Checked by: \_\_\_\_\_

Figure 1. Continued

**Table 1**  
Modified functional ambulatory category

Category	Stage	Definition
I	Lyer	Patient who is unable to sit for 1 min without back and hand for support
II	Sitter	Patient who is able to sit for 1 min without back and hand for support. Patient cannot walk, or requires help of two or more people
III	Dependent walker	Patient requires firm continuous support from one person who helps carrying weight and with balance
IV	Assisted walker	Patient needs continuous or intermittent support of one person to help with balance or coordination
V	Supervised walker	Patient requires verbal supervision or standby help from one person without physical contact
VI	Indoor walker	Patient can walk independently on level ground, but requires help on stairs, slopes, or uneven surfaces
VII	Outdoor walker	Patient can walk independently anywhere

MFAC is shown in Table 2. The aim was to train the patients to achieve at least level 6 (independent indoor walker) upon discharge.

**Self-care:** The ability to walk to toilet and self-bathe were used as self-care criteria. Many of our patients are living all alone or alone in the daytime. Thus, independent toileting is important for them upon discharge. Bathing assessment included the bathing scores of the Barthel index, which had been shown to have strong inter-interpreter reliability, and the Barthel index was free of charge.<sup>6</sup> Home helper services would be arranged by medical social workers for patients who need carers to help with bathing.

**Pain score:** We used visual analogue pain score (0–10 points) upon discharge in the MROC and aim to achieve a score of less than 5. Although pain score upon discharge is a commonly used outcome criterion, there is no single cut-off point for this. For example, Renkawitz et al used visual analogue score of 4, while Cook et al just set “pain controlled with oral medications” as the criteria.<sup>7,8</sup>

**Wound healing:** Among the early postoperative complications, we used wound problem as the outcome criterion because it could lead to deep surgical site infection or even failure of the joint replacement.<sup>9</sup>

**Length of study in hospital:** In our pathway, our aim was to discharge the patients within 10–14 days postoperatively, which was based on the local data from public hospitals. In 2009, the average length of stay (from date of admission to an acute hospital to date of discharge from rehabilitation centre) for primary total knee replacement patients in all the public hospitals in Hong Kong was 14 days. The corresponding average length of stay for primary total hip replacement patients was 15 days.<sup>10</sup>

**Range of flexion:** Different centres used different degrees of flexion in the outcome on range of motion. For patients with total knee replacement, our aim was to achieve knee flexion of at least 80°, which allows patients to have stable walking and sitting. This was also compatible with the findings in the literatures (between 70° and 90°). Teeny et al<sup>11</sup> reported that the range of knee flexion upon discharge after total knee replacement is 70.6–74°, Cook et al<sup>7</sup> as 90°, and Renkawitz et al<sup>8</sup> as 70°.

**Table 2**  
Correlation between MFAC and FAC

MFAC	Lyer I	Sitter II	Dependent walker III	Assisted walker IV	Supervised walker V	Indoor walker VI	Outdoor walker VII
FAC	0 Nonfunctional		1 Dependent level 2	2 Dependent level 1	3 Dependent supervision	4 Independent level ground	5 Independent

FAC = functional ambulatory category; MFAC = modified functional ambulatory category.

**Postdischarge rehabilitation arrangement:** With early discharge of patients, we also emphasized on postdischarge rehabilitation. The outcome might be affected if there was a long waiting time for physiotherapy. Our total joint replacement pathways aimed at providing fast tract rehabilitation by arrangement of early outpatient physiotherapy for the discharged patients within 2 weeks. The “postdischarge early physiotherapy” was one of the goals.

The forms would be filled up by the respective disciplines and completed upon patient discharge. We studied the patients having joint replacement operations of hips or knees between 1 July 2010 and 31 March 2011, who were having postoperative rehabilitation in our rehabilitation ward. The inclusion criteria included patients undergoing primary total knee or total hip replacement during this period. The exclusion criteria included patients with revision arthroplasty and those who were transferred to other departments due to nonorthopaedic problems.

## Results

A total of 115 patients were operated and rehabilitated in our ward in the study period. One patient who had a revision total knee replacement was excluded, and therefore 114 patients were included in the study. Among them, there were 96 total knee replacement patients (21 males, 75 females) and 18 total hip replacement patients (five males, 13 females). The mean age of the 114 patients was 68 years (range 34–85 years). All the operations in these patients were performed by the same group of arthroplasty surgeons. No patient was needed to be transferred to other wards during the rehabilitation period.

With the application of MROC, the rehabilitation outcomes were charted and analysed. The overall compliance rate of MROC was 100%.

### Total knee replacement results

Upon discharge, 96.8% patients were able to move independently (MFAC of at least level 6). Out of total knee replacement patients, 98.9% had at least 80° of knee flexion. The average knee flexion achieved was 89.2°. For the home care aspect, 95.8% of patients were independent in toileting, and 77.3% of patients could have bath with aids or with carer's support. All the patients (100%) had a pain score of less than 5, with a mean of 3.3. There was only one case of superficial wound infection, which subsided after antibiotic treatment and dressing care.

The mean hospital stay (including both acute and rehabilitation wards) was 12 days. Of all the patients, 83.2% could be discharged home in less than 14 days. For follow-up rehabilitation, 95% of patients would have out-patient physiotherapy appointment within 2 weeks after discharge. Four patients lived in districts other than the one served by our centre and thus were having physiotherapy in other hospitals.

### Total hip replacement results

Upon discharge, all (100%) patients were able to perform independent mobility (MFAC of at least level 6). For the home care aspect, 94.4% of patients were independent in toileting, while 72.2%

of patients could have bath with aids or with carer's support. All (100%) patients had a pain score of less than 5, with a mean of 2.7. There was no wound infection.

The mean hospital stay was 11 days. Of all the patients, 77.7% could be discharged within 14 days postoperatively. For follow-up rehabilitation, 94% of patients would have out-patient physiotherapy appointment within 2 weeks after discharge. One patient lived in another district and thus had postoperative physiotherapy in another hospital.

## Discussion

The clinical pathway, also called care pathway or critical pathway, is a method for the coordination of multidisciplinary care to deal with a health problem.<sup>12</sup> Clinical pathway is different from the ordinary clinical practice guidelines. Guidelines aim at overall management planning and decision making, while pathways concern about the actual day-to-day patient care.<sup>13</sup> In the rehabilitation of total knee and total hip replacement patients, clinical pathways have been applied in many countries with the purpose of reducing cost and improving outcomes. Several studies focused on the effectiveness of clinical pathways in total joint replacement.<sup>2–4</sup>

However, most of the studies focused only on one or two aspects of the patients' outcomes. In particular, there was no inclusion of comments from different disciplines, thus making the evaluation and auditing incomplete. Barbieri et al<sup>14</sup> performed a detailed meta-analysis on the effects of total joint replacement pathways, but used only four criteria: postoperative complications, number of patients discharged home, length of in-hospital stay, and direct costs. There was no evaluation of the outcome on the mobility, ability to manage activity of daily living, and ranges of knee motion.

Some authors used variance analysis (meaning deviation of the proposed standard of care from the pathways) to evaluate clinical pathways in total joint replacement.<sup>15</sup> However, they mainly focused on the complications such as wound infection, chest infection, and cardiac conditions. There was lack of holistic view on total patient care.

Our MROC provides coverage of comments from several disciplines and allows more complete and holistic evaluation. It is useful in auditing process. The excellent compliance rate reflected that MROC is a simple and easy-to-fill documentation of the outcome upon discharge. It can even be filled by nonmedical staff who minimize the professional bias. Hence, it does not significantly increase the workload of medical staff. As a routine, MROC also helps identify the problems that may be missed by medical staff. It reminds the staff about the target outcome of the pathways and helps identify the weakness in executing.

For our total knee and total hip replacement results, MROC reflected that the mobility recovery was good, but there were still rooms for improvement in activities of daily living training, especially bathing training. We have to teach the patients how to use adaptive aids and sometimes even require modification work on the bathroom before discharging the patients. One study in Denmark found that the mean length of stay was 7.4 and 8.0 days after total hip and total knee replacement surgeries.<sup>16</sup> The mean lengths of stay identified by MROC in our centre were longer (12 days for total knee and 11 days for total hip replacement), although they were shorter than the averages. These findings suggested further room for improvement. The MROC may help in the future planning and resource allocation.

The district served by our centre has one of the highest proportions of elderly in Hong Kong. Many of these patients have poor social support with problems in caring, and some are even living alone. Many patients do not have lift landing at their home.

Community nurses and medical social workers in our team helped solve this problem by providing preoperative education and assessment, as well as postoperative home support programme (e.g., community nurse, home helper, and meal delivery services). Our target is to have more than 90% of patients being discharged within 10–14 days of hospitalization. We can use the MROC in future to measure the improvements obtained with these methods.

The flexibility of MROC can be applied in other centres and conditions with appropriate modifications. The key step is to set a list of benchmarks agreed and contributed by different disciplines in the team. For example, for patients with spinal cord injuries, the occurrence of decubitus sore should certainly be included.

Comparing this study with other studies in the English literature, most of them did not include assessment of multidisciplinary outcome. Only one report emphasized the multidisciplinary outcome criteria in total hip replacement patients. Ridge and Goodson<sup>17</sup> reported usage of their own discharge outcomes on 21 primary total hip replacement patients. However, they did not include the length of stay. The assessment form was much more complicated (consisting of 136 statements), which was time consuming and might decrease the compliance rate as well. Also their assessment was done by nurses only, unlike our checklist that truly involved different disciplines in rehabilitation.

The recent paper by Renkawitz et al<sup>8</sup> described a discharge criteria checklist for their total knee replacement patients. However, they used 70° knee flexion as the outcome endpoint and again did not include the length of stay in the checklist.

With this experience, we may have some modifications of the checklist in future such as further delineating the pain score by dividing it into pain at rest and pain on walking, and adding one more criteria that whether the patient is able to "perform home exercise programme independently" upon discharge, which was used by Renkawitz et al.<sup>8</sup> This may be useful while the patients are waiting for out-patient physiotherapy.

## Conclusions

The MROC allows multidisciplinary assessment of the outcome in total joint replacement patients. Most of the treatment goals of the clinical pathways have been found to be fulfilled. However, the MROC should not replace the current assessment and scoring system, but should provide an easy-to-use, free-of-charge, and tailor-made checklist for the evaluation and auditing process. Further studies will be needed to evaluate its use in other orthopaedic conditions.

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