

## Comparative Inpatient Rehabilitation Outcomes of Total Hip Arthroplasty Patients with and without Restrictive Hip Precautions

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### Abstract

**Objective:** To compare rehabilitation outcomes based on anterior hip arthroplasty for patients with and without post-operative surgical precautions.

**Methods:** Sixty-eight consecutive patients' medical records were retrospectively reviewed. Main outcome measures included total admission and total discharge functional independence measure (FIM) scores, FIM gain, FIM gain per day, and length of stay (LOS).

**Results:** Group 1, n=31, included patients admitted to inpatient rehabilitation without post-operative surgical precautions. Group 2=37, included patients admitted to inpatient rehabilitation with post-operative surgical precautions. No statistically significant differences were observed between the groups at admission for age (Group 1 mean age=66.74 years; Group 2=67.30 years;  $F=0.014$ ,  $p=0.811$ ) and admission FIM scores ( $p=0.866$ ), suggesting groups were similar at admission. At discharge, both groups made similar progress related to overall FIM gain ( $p=0.679$ ) and discharge FIM scores ( $p=0.864$ ). There was a statistically significant difference between the groups for LOS with the no-precaution group demonstrating approximately a 3-day shorter stay (Group 1=8.97 days; Group 2=11.73 days;  $F=0.195$ ,  $p=0.012$ ). This finding translated into improve FIM efficiency for Group 1 with statistically significant differences observed for Motor FIM gain per day for Group 1=2.83 and for Group 2=2.0 ( $F=17.275$ ,  $p=0.007$ ) and Total FIM gain per day with Group 1=2.90 and Group 2=2.07 ( $F=15.318$ ,  $p=0.006$ ).

**Conclusion:** Both groups made similar progress during inpatient rehabilitation with respect to overall FIM gain and discharge FIM scores. The no-precaution group made gains within a shorter timeframe reflecting improve efficiency with rehabilitation outcomes for the no-precaution group.

**Keywords:** Hip arthroplasty; Physical rehabilitation; Hip precautions; Outcomes; Subacute

### Introduction

The incidence of total hip arthroplasties (THA) has increased over the past 2 decades [1] and is now considered to be one of the most successful surgical procedures today. Common THA procedures employ surgical approaches either anterior or posterior to the trochanter. Worldwide survey of orthopedic surgeons of their choice of hip arthroplasty approach revealed that North American surgeons favored the posterior approach more often than European surgeons (69% compared to 36%, respectively,  $p<0.0001$ ), and surgeons from other countries (69% compared to 45%, respectively,  $p=0.01$ ) [2]. The anterior approach, also called the Smith-Petersen approach, gains exposure to the hip without detaching the surrounding muscles. An interval is created between the tensor fascia and the sartorius. Access to the hip is provided through the anterior hip capsule. This approach is performed with the patient supine and often with the assistance of fluoroscopy [3,4].

According to Pfluger et al. [5,6] "minimally invasive surgery" performed through the anterior lateral approach potentially lead to

reduction in operative trauma with this similar soft tissue wound, a reduction in postoperative pain, and early mobilization accomplished by preserving muscle insertions. Theoretically these improvements should result in a shorter hospitalization, convalescence and rehabilitation period.

Jayankura and associates [6] studied advantages and disadvantages of anterior approach and posterior approach in performing THA by a systematic review of the orthopaedic literature, plus their own experience of first 100 THAs implanted by mini invasive, direct anterior approach. Compared to posterior approach the anterior approach was associated with a low dislocation rate. Authors also noted that recent randomized studies highlighted an earlier functional recovery in patients treated by mini invasive approaches and particularly by direct anterior approach. This advantage seemed to persist only the first 6 weeks.

In a comparative study of THA using 41 anterior and 47 posterior surgical approaches mean hospital length of stay was 2.9 days for anterior and 4 days for posterior. All patients were instructed to use hip precautions: Patients who underwent the posterior approaches were taught not to hyper flex, adduct and internally rotate the femur and those with the anterior approach were taught not to hyperextend and externally rotate the femur. Eight of 88 of these patients did not

achieve independent mobility and were discharged to a rehabilitation or skilled nursing facility. The study did not report their functional outcomes during rehabilitation [7].

In a prospective randomized study following THA through an anterolateral approach, all patients underwent hip precautions of range of motion limitation of less than 90° of flexion and 45° of external and internal rotation and avoidance of adduction during first 6 weeks after surgery. A subgroup had further restrictions of using abduction pillow in the operating room, before bed transfer, and use of pillows to maintain abduction in bed, elevated toilet seats and elevated chairs in the hospital, rehabilitation facility and home. There was no significant difference in duration of hospitalization between these groups of 3.5 days; however, the number of patients who required a rehabilitation stay was significantly higher in the restricted group (n=152) than in the unrestricted group (n=151). This study did not address functional outcomes of study patients during their inpatient rehabilitation [8].

Talbot et al. reported a low early dislocation rate of 0.6% following anterolateral hip arthroplasty in patients without using any restrictions on post-operative mobilization, rendering these restrictions not justifiable [9].

In a study with no traditional functional restrictions following direct anterior and anterolateral hip arthroplasty, the dislocation rate was 0.15%. (4 out of 2,612). The authors questioned the necessity of hip precautions in anterior approaches [10].

Outcome metrics following arthroplasty is an important concept to meaningfully measure functional status during the early inpatient rehabilitation time continuum. The Functional Independence Measure (FIM™) instrument is a basic indicator of inpatient rehabilitation facility (IRF) patients' severity of disability that can be administered by clinical staff (nurses and therapists). The FIM trade mark (FIM™) is owned by UB Foundation Activities, Inc. and commonly referenced as the Uniform Data System for Medical Rehabilitation (UDSMR), which has a long history of instrument validity and reliability performance evidence [11]. The overall FIM change score from admission to discharge and the incremental FIM change (gain) per day are also common metrics used for IRFs' data applications.

The FIM™ items are included within of a larger instrument called the Inpatient Rehabilitation Facility - Patient Assessment Instrument (IRF-PAI). Beginning in 2002, the Centers for Medicare and Medicaid Services (CMS) required mandatory submission of IRF-PAIs on patients admitted to and discharged from IRFs on patients covered by CMS for healthcare services [12].

Surgeon's preference dictates no post-operative hip precautions in patients following anterior approach hip arthroplasty admitted to post-acute inpatient rehabilitation facilities. The literature review is limited to acute hospital level of care outcomes without post-acute inpatient rehabilitation considerations. Clinical outcomes of patients after THA without any restrictive precautions during a post-acute inpatient rehabilitation stay have not been studied.

The objective of this study is to compare rehabilitation clinical outcomes based on hip arthroplasty with an anterior surgical approach for patients with and without post-operative surgical precautions. The primary study hypothesis is that patients admitted to IRFs without any restrictive hip precautions after THA will have superior functional inpatient rehabilitation outcomes compared to those with some level of restrictive hip precautions.

## Materials and Methods

### Design

This was a retrospective, observational, descriptive study design. All patient subjects were admitted to a sub-acute unit of a free standing Midwest IRF between July 2009 and June 2014.

Based on the medical chart review, subjects were classified with no anterior hip precautions or anterior hip precautions. Case inclusion was limited to all status post hip arthroplasty patients who were consecutively admitted to the IRF's sub-acute unit during the specified study period for an initial rehabilitation episode of care. All patients went through a consistent multidisciplinary rehabilitation protocol given the type of hip precautions as specified by the referring surgeon following arthroplasty surgery. This study was reviewed and approved by the local institutional review board under expedited review, with waiver of informed consent.

### Data collection and main outcome measures

Total FIM™ sum of score at admission and discharge, FIM™ change per day, LOS, and discharge destination were collected as dependent variable outcomes. Arthroplasty hip precaution's level was collected as the independent grouping variable for planned inferential analyses. All data extracted from medical records were entered into the SPSS Version 23 for statistical analyses.

## Results

### Participants

Sixty-eight patients' medical records were retrospectively reviewed using a sample of convenience. Group 1, n=31, included patients admitted to inpatient rehabilitation without post-operative surgical precautions following an anterior total hip arthroplasty. Group 2, n=37, included patients admitted to inpatient rehabilitation with post-operative surgical precautions following an anterior total hip arthroplasty. Table 1 summarizes the patient demographics and main outcome measures. No statistically significant differences were observed between the two groups at admission for age and admit FIM scores, suggesting both groups were similar at admission.

	Group 1 (n=31) No Operative Surgical Precautions	Group 2 (n=37) Post-Operative Surgical Precautions	Significance
Age	66.74 years (SD ± 9.7 years)	67.30 years (SD ± 9.15 years)	t=-0.240, p=0.811 Non-significant
Sex	F= 61.3% (19/31) M= 38.7% (12/31)	F= 81% (30/37) M=19% (7/37)	$\chi^2=3.281$ , p=0.07 Non-significant
Admit Motor Score	48.90 (SD ± 4.3)	48.68 (SD ± 6.68)	t=0.17, p=0.866 Non-Significant

**Table 1:** Demographics at Admission.

At discharge, both groups made similar progress related to overall FIM gain and discharge FIM score. However, there was a statistically

significant difference between the two groups for LOS with the no-precaution group demonstrating approximately a three-day shorter stay. This finding translated into improves FIM efficiency for Group 1 with statistically significant differences observed for both Motor FIM gain per day and Total FIM gain per day. Table 2 summarizes the specific outcome measures for this study.

Variable	Group 1 (n=31) No Post-Operative Surgical Precautions	Group 2 (n=37) Post-Operative Surgical Precautions	Significance
LOS	8.97 days	11.73 days	t=-2.59, p=0.012 Significant
D/C Motor FIM	70.03 (SD ± 3.05)	70.19 (SD ± 4.47)	t=-0.166, p=0.869 Non-significant
Motor FIM Gain	21.13 (SD ± 4.9)	21.51 (SD ± 5.8)	t=-0.290, p=0.773 Non-significant
Motor FIM Gain Per Day	2.83 (SD ± 1.45)	2.0 (SD ± 2.08)	t=2.821, p=0.007 Significant
Total FIM Gain Per Day	2.90 (SD ± 1.4)	2.07 (SD ± 0.834)	t=2.854, p=0.006 Significant

**Table 2:** Showing Outcomes.

## Discussion

Patients following THA surgery were admitted to inpatient rehabilitation based on functional impairments and medical necessity. In contrast to hospital based IRF rehabilitation, inpatients with significant functional impairments necessitating at least three hours of therapy daily, medical comorbidities necessitating close medical management, and rehabilitation nursing needs, this study involved only patients admitted to a single free-standing IRF's sub-acute unit as admission requirements were less stringent and the patient population was more homogenous, excluding those with complex medical and surgical complications following hip arthroplasty procedures. In contrast to previous studies reported in the cited literature, this study addresses outcomes from the inpatient rehabilitation segment following patients' hip arthroplasty surgery.

Both groups of patients did not have complications of hip dislocations and were discharged home.

All patients were admitted to the IRF under one physiatrist, treated by a consistent multidisciplinary team, specialized in rehabilitation of patients following arthroplasty procedures. The anterior hip arthroplasty patients had no post-operative hip precautions during their inpatient rehabilitation, per the protocol of two surgeons in the same practice group who performed those procedures. This could have contributed to the observed functional outcomes as the patients had no positioning constraints and the therapists and nursing staff did not have to devote time to teach and train patients on hip precautions for discharge planning. The implication for healthcare professionals will be not be overly concerned about not using hip precautions after anterior approach hip replacement surgery, if the operating surgeon had made a clinical determination that the patient did not need such precautions. This study is important to the rehabilitation multidisciplinary healthcare professionals' knowledge about the post-acute recovery of

THA patients, given respective hip precautions during the IRF episode of care. The study is also important to the orthopaedic surgical referring physicians who recommend inpatient rehabilitation therapy to optimize coordination of future patient care, across the continuum of healthcare settings.

This study will be important to patients as it gives an opportunity of choice to patients in selecting surgeons who may not place their patients under restrictions after anterior hip arthroplasty procedure. This will be based on surgeon's expertise and suitability of patients. The patient could make an informed decision prior to their hip replacement surgery.

Implications to rehabilitation facilities will be with newer surgical techniques and improved expertise of surgeons, more patients are being discharged home directly following this procedure. This is more evident in patients not requiring hip precautions than in patients who have restrictions. If this trend continues, we may want to expand our existing outpatient therapy programs to accommodate more of these patients.

The study was based on a single study site and respective patient population, which may limit external validity and generalizability of results. This study did not include a financial comparison of inpatient rehabilitation costs between arthroplasty approaches, analgesia needs by arthroplasty hip precautions' group during rehabilitation, patient satisfaction with community reintegration following rehabilitation completion, comorbidity analysis, surgeon attributes, or acute care hospital data. Another study limitation could be measurement of short term outcomes of inpatient rehabilitation and it is conceivable that over a long-term period there may not be significant differences.

## Conclusion

Both groups made similar overall progress during inpatient rehabilitation with respect to overall FIM gain and discharge FIM scores. The no-precaution group made gains within a shorter time frame reflecting improve efficiency with rehabilitation outcomes for the no-precaution group.

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