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ORIGINAL ARTICLE

Initiating Physical Therapy on the Day of Surgery Decreases Length of Stay Without Compromising Functional Outcomes Following Total Hip Arthroplasty

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Abstract In response to rising health care costs, hospitals are implementing clinical pathways in order to standardize care, improve cost efficiency and outcomes. The purpose of this study was to evaluate the effect of initiating physical therapy (PT) on post operative day 1 (POD1) compared to initiating PT on day of surgery (DOS), on length of stay and in-hospital rehabilitation functional outcomes in total hip arthroplasty patients. This change in PT guidelines was part of the implementation of a new multidisciplinary clinical pathway, adopted by the institution in 2007. A retrospective descriptive study of 408 subjects undergoing unilateral THA compared two groups (204 in each group): those who initiated PT on POD1 and those who initiated PT on DOS. Compared to the POD1 group, patients in the DOS group stayed on average 0.21 days less in the hospital. There was no difference in the achievement of functional milestones in spite of the shortened hospitalization. The initiation of a new clinical pathway was successful in reducing mean length of stay while still allowing patients to achieve all necessary functional outcomes, required for discharge home.

Keywords total hip arthroplasty · physical therapy · rehabilitation outcomes · length of stay · clinical pathway

Yolanda Capizzano, DPT, Adina Lempel, DPT, Emie Epelman, DPT, and Jennifer Kalowitz, DPT completed this study as students at Hunter College.

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Each author certifies that his or her institution has approved the reporting of these cases, that all investigations were conducted in conformity with ethical principles of research. Informed consent was waived by the institutional review board at Hospital for Special Surgery

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Introduction

Total hip arthroplasty (THA) is a successful surgical procedure for individuals with advanced hip osteoarthritis (OA) and other related musculoskeletal disorders of the hip joint [3, 4, 8]. This surgical intervention has been effective for pain relief, improvement of functional status and has resulted in improving quality of life [8, 11]. Over 250,000 THA surgeries are performed each year in the United States [10]. The number of total joint replacements performed each year is expected to continue to grow due to increased life expectancy and the desire for individuals to remain active [2, 11].

Rising health care costs have caused administrators and clinicians to try to reduce or control costs after THA [5, 6]. One factor in controlling costs is to reduce length of stay (LOS). Approaches to reducing LOS include the develop-

ment of multidisciplinary clinical pathways in order to standardize and deliver care in a cost-effective and efficient manner [1, 5, 9]. Previous studies have demonstrated that clinical pathways are effective in reducing LOS after THA [1, 5, 6]. One study demonstrated that the initiation of a clinical pathway reduced length of stay from 8.62 days (d) in 1991 to 5.67 d in 1993 [6]. Although this study outlined a specific clinical pathway with the initiation of physical therapy (PT) on post-op day one (POD1), it did not examine rehabilitation outcomes during the acute hospitalization phase.

In 1995, a study compared the number of days THA and TKA patients required to achieve certain functional milestones in the acute care setting [11]. Four key functional milestones were identified by the author and were considered necessary for a safe and independent discharge home. The milestones identified were transfers sit to stand, transfers supine to sit, ambulation to 100 feet, and climbing stairs [11]. However, this study did not discuss overall length of stay or define the PT protocol or the use of a clinical pathway. In 1994, a publication described a tool that was developed to document functional progression following THA, in the acute care setting [7]. This tool measured the following functional milestones; transfers, ambulation with an assistive device (walker, crutches, cane) and ascending/descending steps [7]. These activities were scaled as either assisted (requiring the presence of another person to perform the activity) or unassisted (independent) [7]. Another study [4] reports that starting PT earlier in the acute hospital stay following THA, between the years 1990 and 2003, resulted in a decreased LOS and earlier attainment of the functional milestones described by Kroll et al. [7]. This author also reported a decrease in the number of patients who achieved the higher-level functional milestones of cane and stairs as LOS decreased [4]. While these studies provide evidence about the attainment of functional milestones, they do not discuss current clinical pathways and may not be applicable given changes in standards of care.

The purpose of this study was to examine whether the implementation of a new multidisciplinary clinical pathway, which began PT on the day of surgery (DOS) rather than POD1 would reduce LOS for patients undergoing THA while in the acute care setting. Specifically, we wished to assess whether or not this new clinical pathway could reduce length of stay on average 0.5 d or more. Our second aim was to assess the functional milestones achieved by these patients during the hospital stay and whether or not the shortened length of stay resulted in patients being discharged with fewer of the milestones being reached.

Materials and methods

In this retrospective observational study, data was collected from a rehabilitation functional outcomes database maintained on all total hip replacement patients treated at our hospital. To be included in the study, subjects must have undergone primary unilateral THA during 2007 and 2008, were discharged directly home and were allowed weight bearing as tolerated following surgery. Subjects were excluded if they underwent revision or bilateral surgery, or were discharged to a rehabilitation facility or were re-hospitalized. In addition, subjects who would not be expected to achieve typical functional recovery due to the following co-morbidities were excluded from this study: stroke, multiple sclerosis, Parkinson's disease, post polio syndrome, nerve palsy with foot drop, Alzheimer's disease, seizure disorder or dementia.

Data was collected for patients who initiated PT on POD1 and for patients who initiated PT on the DOS. Information was examined from an existing functional outcomes database. Consent was waived by the Institutional Review Board, as the collection of necessary data occurred as part of the normal standard of care. No further information from the chart or the patient was obtained.

Each group contained 204 subjects. For the DOS group, there were 109 females and 95 males. Age ranged from 32 to 83 years old, with a mean age of 60.2 years. In the POD1 group, there were 106 females and 98 males. Age ranged from 27 to 82 years old, with a mean age of 60.4 years. Average body mass index (BMI) for the DOS group was 27.7±6.15, and for the POD1 group was 28.3±6.37. There were 21 different surgeons performing the surgeries in the DOS group and 23 surgeons in the POD1 group. We also examined the day of the week the surgery was performed, whether the subject was living alone prior to surgery, pre-op ambulation distance, whether or not there were stairs at home, the use of a pre-op assistive device, subject race, and side of surgery. This information is summarized in Table 1.

Patients between the two groups were matched by the week the surgery was performed to ensure a consistent comparison in the level of care throughout the course of the study. Other descriptive variables were also measured, including age, gender, race, BMI, the side of surgery, the day of the week surgery was performed, preoperative assistive device used, preoperative maximum distance ambulated, the presence of stairs in the home, and social support system at home.

Both clinical pathways used in this study are accepted standards of care at our institution and are both currently in use. Both pathways are multidisciplinary, including the Departments of Anesthesia, Orthopedic Surgery, Medicine, Nursing, Nutrition, Case Management, and Physical Therapy. The first clinical pathway being examined called for PT to begin on the day after surgery (POD1) and was based on an anticipated 4-day LOS. The 2nd clinical pathway included beginning PT on the DOS and was based on a 3-day LOS. The specific guidelines for PT treatment from each clinical pathway can be found in Table 2.

Length of hospital stay and the attainment of functional outcomes, such as transfers, ambulation with use of assistive devices, and negotiating stairs were examined. In addition to the achievement for each functional milestone, the level of independence, either assisted or unassisted, was examined. In this study, we chose to specifically examine the achievement of the cane and stairs because as LOS decreases the attainment of higher-level milestones might also decrease. The tool utilized to collect this information has been proven valid, reliable, and sensitive to change by Kroll et al. [7].

Table 1 Demographic characteristics of the DOS and POD1 groups

	DOS		POD1		*P* value
	Number of subjects	Percentage of subjects	Number of subjects	Percentage of subjects	
Sex					
Males	109	53.4	106	52.0	0.77
Females	95	46.6	98	48.0	
Day of the week					
Monday	28	13.7	29	14.2	0.77
Tuesday	77	37.7	69	33.8	
Wednesday	20	9.8	19	9.3	
Thursday	49	24.0	45	22.1	
Friday	27	13.2	36	17.6	
Saturday	3	1.5	6	2.9	
Living situation					
Lives alone	38	18.6	44	21.6	0.46
Lives with others	166	81.4	160	78.4	
Pre-op ambulation					
<1 block	14	6.9	18	8.8	0.19
1-5 blocks	80	39.2	67	32.8	
6-10 blocks	20	9.8	33	16.2	
>10 blocks	90	44.1	86	42.2	
Stairs					
Stairs at home	145	71.1	155	76.0	0.18
No stairs	59	28.9	49	24.0	
Pre-op assistive device					
None	157	77.0	144	70.6	0.19
Cane	43	21.1	57	27.9	
Walker	2	1.0	0	0.0	
Crutches	2	1.0	3	1.5	
Race					
African American	1	0.5	2	1.0	0.33
Hispanic	2	1.0	3	1.5	
Caucasian	201	98.5	195	95.6	
Other	0	0.0	2	1.0	
Unknown	0	0.0	2	1.0	
Side of surgery					
Right	115	56.4	93	45.6	0.03
Left	89	43.6	111	54.4	

A power analysis was completed by a statistician and it was determined that 200 patients in each group was needed for a 99% power to detect a 0.5-d difference in LOS and an 80% power to detect a 10% or greater difference in the achievement of functional milestones outcomes. Difference in LOS between the two groups was analyzed with a *t* test. In comparing the groups as to the attainment of functional outcomes a Chi-square test was used to analyze the data. For all tests, a *P* value of <0.05 was considered statistically significant.

Results

Initiation of physical therapy on the day of surgery rather than POD1 was associated with a shorter length of stay. (p=0.014). Initiation of PT on DOS resulted in a decrease in LOS of 0.21 d compared to when PT began on the POD1. In the DOS group, 67% were discharged in 3 days or less, while in the POD1 group only 57% were discharged within that time frame. Average LOS for those receiving the initial PT visit on POD1 was 3.48±0.88 d compared to the average LOS of 3.27±0.85 d for those receiving the initial PT visit on the DOS

More patients in the DOS group attempted use of the cane and became independent during the hospitalization compared to the POD1 group (p=0.001). For stair climbing, the percentage of subjects who attempted the stairs and became independent was similar between the groups (Table 3). A shortened length of stay did not reduce the achievement of functional milestones.

Discussion

The aims of this study were to evaluate if the use of a new clinical pathway which includes initiating PT on the day of surgery could lead to a reduced length of stay and how this earlier start of therapy affects the achievement of functional milestones following THA. We found that the use of the new pathway, with starting PT on the day of surgery compared to POD1 reduced length of stay by an average of

Table 2 Physical therapy guidelines for THA: 4 day LOS clinical pathway vs. 3 day LOS clinical pathway

	4-day length of stay THA clinical pathway	72-h clinical pathway
DOS	No physical therapy intervention	Treatment occurs bedside Evaluation Dangle, stand, or ambulate as tolerated Bedside exercises THA precautions instructed
POD1	Treatment occurs bedside Evaluation Dangle, stand, or ambulate as tolerated Bedside exercises THA precautions instructed	Treatment occurs bedside Transfer training Progress ambulation distance as tolerated with walker Review exercises and precautions High chair sitting and privileges
POD2	Treatment occurs bedside Transfer training Progress ambulation distance as tolerated with walker Review exercises and precautions High chair sitting and bathroom privileges	Continue transfer training Attempt gait progression to cane or crutches and stair training[a] Treatment session in PT gym Progression of exercise program Review precautions High chair sitting and bathroom privileges
POD3	Continue transfer training Attempt gait progression to cane or crutches and stair training[a] Treatment sessions in PT gym Progression of exercise program Review precautions High chair sitting and bathroom privileges	Continue transfer training Continue gait progression and stairs[a] Treatment session in PT gym Review home exercise program and ADL technique Discharge if appropriate
POD4	Continue transfer training Continue gait progression and stairs[a] Treatment session in PT gym Review home exercise program and ADL technique Discharge if appropriate	
	*PT will be provided on Sunday for those patients whose discharge plan is home	*PT will be provided on Sunday for those patients whose discharge plan is home

[a] The stairs are negotiated with one rail and a cane or two rails, depending on the patient's need to negotiate stairs and home environment

0.21 d without compromising the achievement of functional milestones.

There were no significant differences found between the demographics of the two groups except for the side of surgery. The authors do not feel this finding affects the comparison of the groups as all patients underwent unilateral THA. This study had several limitations: PT alone cannot be credited with the reduction of LOS as this was a hospital-wide initiative and included multiple disciplines. Additionally, the subjects appropriate to initiate PT on the DOS were a population with no medical co-morbidities and were medically stable. The neuraxial block had completely recovered, and there were minimal side effects of nausea or dizziness. The surgery was performed early enough in the day to participate in PT by 8 pm. The exact time of day surgery was performed and PT services were initiated was not examined. Regardless of the hour of surgery, POD1 was considered the calendar day following the day surgery was performed. If this study had recorded and examined results based on hourly intervals, instead of

Table 3 Milestone achievement: cane and stairs

	DOS group *N*=204	POD1 group *N*=204	Chi-square *P* value
Cane not attempted	16 (8%)	44 (22%)	0.0001
Cane attempted	188 (92%)	160 (78%)	
Cane attempted and independence achieved	160 (85% of 188)	133 (83% of 160)	0.6595
Cane attempted and assistance required[a]	28 (15% of 188)	27 (17% of 160)	
Stairs not attempted	2 (1%)	6 (3%)	0.2842
Stairs attempted	202 (99%)	198 (97%)	
Stairs attempted and independence achieved	191 (95% of 202)	181 (91% of 198)	0.2438
Stairs attempted and assistance required[a]	11 (5% of 202)	17 (9% of 198)	

[a] Assistance refers to the need for physical assistance or supervision required to do the task

daily intervals, the study may have more accurately quantified the discharge time between the two groups and more effectively determined the magnitude of the difference. The subject pool was mostly comprised of Caucasian subjects, and therefore these results may not be typical for a non-Caucasian population. Additionally, this study did not account for factors affecting discharge and LOS that are not medically based, such as lack of transportation home. Therefore, recording discharge delays and actual discharge in hours from surgery might have been more accurate.

Decreasing LOS by initiating PT earlier was consistent with the findings of a previous study [4]. This study also confirms previous studies [1, 5, 6] results which indicated that the use of clinical pathways was effective in reducing LOS. However, our study specifically describes two PT guidelines as part of two individual multidisciplinary clinical pathways and the relationship between the initiation of PT and LOS. Additionally, we chose to specifically examine the achievement of the cane and stairs because as LOS decreases, the concern was that the achievement of higher-level milestones might also decrease. We found the earlier start of PT led to a greater percentage of these patients attempting the use of the cane and no change in the percentage of patients attempting the stairs. This result contradicts previous findings which demonstrated that fewer patients achieved the higher-level functional milestones of cane and stairs as LOS decreased [4].

The use of the new clinical pathway which includes the earlier start of PT was associated with a 10% increase in patients going home by postoperative day 3 without any compromise in patient functionality. This modest gain, when extrapolated to the large number of THA surgeries performed on a yearly basis at our hospital, actually represents an important increase in patient throughput and hospital productivity.

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