ACUTE CARE PHYSICAL THERAPY FOR A PATIENT AFTER TOTAL HIP ARTHROPLASTY DUE TO HIP OSTEOARTHRITIS

A Doctoral Project
A Comprehensive Case Analysis

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by

Taryn O'Connell

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Abstract

of

ACUTE CARE PHYSICAL THERAPY FOR A PATIENT AFTER TOTAL HIP ARTHROPLASTY DUE TO HIP OSTEOARTHRITIS

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A 58 year-old female patient with osteoarthritis of the left hip was seen after a total hip arthroscopy for student physical therapy treatment for 3 sessions over a 2 day period at a sub-acute inpatient unit under the supervision of a licensed physical therapist. The patient was evaluated at the initial encounter using a Numeric Pain Rating Scale, Manual Muscle Test, universal goniometry, Wells' Criteria, Activity Measure for Post-Acute Care Inpatient Basic Mobility Short Form, ambulation distance, 10 Meter Walk Test, and observational gait analysis.

A plan of care was established to address impaired left hip pain, muscle strength, and range of motion, and to reduce her risk for a deep vein thrombosis. Additionally, interventions targeted limitations in her functional mobility, ambulation distance, gait speed, and gait quality. The goals for the patient were to reduce left hip pain, improve muscle strength in left hip abductors, increase left hip abduction range of motion, and increase basic functional mobility during ambulation and transfers. Furthermore, goals were also made to increase ambulation distance, speed, and quality. Her primary goal was to be discharged home with family as soon as possible.

The main interventions used were task-specific functional training, gait training, and modalities. The patient was responsive to the intervention as she met most of her strength, range of motion, and functional goals, and showed substantial improvement with gait speed. Ultimately,

the patient met her main goal of being discharged to home with family to continue treatment in an outpatient physical therapy setting.

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Chapter 1

General Background

Total hip arthroplasty (THA), also known as a total hip replacement, is a widely used surgical procedure to address several disorders of the hip including end-stage hip osteoarthritis (OA).[1] Hip OA is often a progression of osteophytic buildup, subchondral sclerosis, and cysts within or around the joint space, ultimately leading to impaired hip range of motion (ROM), hip pain, impaired gait, and muscle weakness around the joint.[1,2] The disease can be a disabling condition that may limit activities of daily living (ADLs), ambulation speed, squatting ability, stair management, and may restrict workforce participation.[1-4] For inpatients over the age of 45, the incidence of a THA is about 257 per 100,000 individuals.[5] More than 310,800 THA procedures are performed each year in the United States, and about 2% require revision during the first year with a steady increase of 1% per year during the next 12 years.[5,6] The main indications for revision are hip dislocation (17.3%) followed by mechanical loosening (16.8%), and the risk for revision is increased for males, younger adults, and for individuals who use a low-volume surgeon.[6,7]

Surgical approaches to the hip joint used by surgeons include posterior, lateral, anterior, posterolateral, and anterolateral approaches, but the approach taken will depend heavily on the chosen surgeon's preference and experience.[8,9] Standard precautions for avoiding dislocation after a posterolateral approach, one of the most common approaches, include preventing hip flexion beyond 90°, no hip adduction past midline, and no internal rotation past midline.[10] A walking deviation frequently seen after THA is excessive lateral trunk lean toward the affected limb, and it is a variable affecting walking efficiency.[11]

The reported prevalence for thromboembolic events after THA varies widely from 4.0% to 20.3%.[12,13] Implementing post-surgical prophylaxis, such as early weightbearing and

pneumatic devices, can help reduce the risk of a deep vein thrombosis (DVT).[13] Compared with non-smokers, previous smokers have a 43% increased risk of experiencing post-operative complications with an odds ratio (OR) of 1.32 and a confidence interval (CI) of 95% within 1.04 to 1.97.[14] An operative time greater than 121 minutes (OR 2.4, 1.3-4.3), a history of preoperative anemia (OR 2.0, 1.0-3.8), and body mass index (BMI) greater than 30 kilograms per meter squared (kg/m^2) (OR 1.8, 1.0-3.3) are all associated with increased risk for incisional infections with a 95% CI.[15] Furthermore, a history of depression is a risk factor for joint infection after THA with a hazard ratio of 1.96 (95% CI: 1.1-3.5).[16]

Increased length of stay in the hospital following THA can be influenced by the presence of heart disease and increased number of comorbidities with a risk ratio (RR) of 1.59 and 1.10 respectively (95% CI: 1.22-2.08; 1.05-1.56, respectively).[17] Single marital status (OR 1.7, 1.3-2.3), non-white race (1.5, 1.1-2.0) and increasing age (1.3, 1.1-1.6) are non-modifiable risk factors associated with length of stay greater than 3 days with a 95% CI; while potentially modifiable risk factors include low hemoglobin (OR 3.3, 2.4-4.5), high creatine (2.9, 1.8-4.5), and high glucose (1.8, 1.3-2.7) with a 95% CI.[18] Factors which reduce the risk of a prolonged length of stay include no hypertension (OR 2.10, 1.4-3.3), male sex (1.97, 1.3-2.9), less than 65 years old (1.91, 1.3-2.9), no preoperative anemia (1.89, 1.1-3.3), and BMI below 30 kg/m^2 (1.72, 1.1-2.6) with a 95% CI.[19]

A BMI greater than 25 kg/m^2 and age greater than 70 years old are both associated with delayed recovery of activity during hospital stay (95% CI: OR 2.2, 0.7-7.4; 1.2, 0.4-3.4, respectively).[20] Factors which may predict strong post-operative pain include current depressive symptoms (OR 7.33, 1.5-35.3), current severe anxiety (6.01, 1.6-22.9), female sex (4.91, 2.0-12.0), and pre-operative pain (2.64, 1.2-5.4) with a 95% CI.[21] Increased pain during activity does not predict the presence of chronic post-surgical pain at 6 months post THA.[22]

Chapter 2

Case Background Data

Examination – History

The patient was a 58-year-old female seen after a left posterolateral approach THA due to severe non-traumatic OA. In the last 1.5 years she reported constant 8-10/10 left hip pain using the Numeric Pain Rating Scale (NPRS) with all lower extremity activities, which increased in intensity the past 7 months. Pain was greater in her left hip than her right, and her OA diagnosis was confirmed with magnetic resonance imaging. Utilization of ice, heat, physical therapy, and pain medications were unsuccessful at providing relief. Prior to surgery she performed ADLs independently, but with pain, and she required a cane for ambulation.

The orthopedic surgical history of the patient was extensive with the majority of the surgeries occurring in the last 11 years. To alleviate her neck and back pain due to scoliosis she had 5 spinal surgeries, occurring 8, 9, 10, 11 and 43 years ago, As a result, her spine was fused from the 10^{th} thoracic vertebra to the 5^{th} lumbar vertebra, and from the 2^{nd} cervical vertebra to the 4^{th} cervical vertebra. She had 2 right rotator cuff repairs 8 and 10 years ago, a partial left hallux amputation 8 years ago due to melanomas, a right hip bursa removal 6 years ago due to impaired function, and bilateral carpal tunnel release surgery 5 years ago.

In addition to her orthopedic conditions, she had a history of anxiety, depression, and hypothyroidism, all of which were being addressed with medications. About 11 years ago, she became dependent on opioids for pain control, and she was considered disabled and unable to work due to chronic back pain. The patient had a positive relationship with her ex-husband and her adult daughter, who both agreed to assist the patient during recovery. She planned to stay at her ex-husband’s single level home for 2 weeks, then return to her own double level

home with 14 stairs. The patient had access to an elevated toilet seat and bathroom grab bars at both homes, but she needed a replacement for her old front wheel walker.

Her inpatient goals were to achieve enough independence to return home with family as quickly as possible and to safely manage any steps in the community.

Systems Review

The patient's general health screen was unremarkable. Her cardiopulmonary system was impaired as her blood pressure (136/73 millimeters of mercury) and cholesterol were elevated; however, she had no diagnosis of hypertension, her ECG was normal, and her hemoglobin levels, oxygen saturation (99% on room air), respiratory rate (14 breaths per minute), and heart rate (53 beats per minute) were within normal limits. Her integumentary system was impaired secondary to surgery on the left posterolateral thigh, along with scar tissue from previous surgeries along her spine, right shoulder, right hip, and wrists. Her musculoskeletal system was impaired based on her report of left hip pain, unspecific chronic back pain, reduced left hip ROM and strength, and her gait and transfer difficulties. Her neuromuscular system was not impaired based on her denial of numbness and tingling in both lower extremities. Urogenital and gastrointestinal systems were unimpaired based on recent patient report and the surgeon's notes. Communication, affect, and cognition were unimpaired based on observation, however she was prescribed anti-anxiety medications in the hospital. The patient was fluent in English and had no barriers to learning. She had a healthy calculated BMI of 21.6 kg/m^2 and she reported a sedentary lifestyle. She had a 20-pack-year history of tobacco use before reportedly quitting at an unknown time, and she had a familial history of cancer. Concern regarding her long history of opioid use was addressed by her orthopedic surgeon and the patient agreed to have a pain management clinic supervise her future opioid use.

Examination - Medications

Table 1

Medications[23]

MEDICATION	DOSAGE	REASON	SIDE EFFECTS
Acetaminophen (325 mg) + oxycodone (5 mg)	2 tabs, Q4H, Oral, PRN	Analgesic	Headache, difficulty breathing, GI distress, drowsiness, mood changes.
Enoxaparin (Lovenox)	40 mg, QD, Subcut INJ	Blood clot prevention	GI distress, fever, abnormal bleeding, extremity swelling.
Hydromorphone (Dilaudid)	1 mg, Q4H, IV push, PRN	Analgesic	Headache, difficulty breathing, lightheadedness, GI distress, drowsiness, muscle or joint pain, mood changes.
Ketorolac (Toradol)	15 mg, Q6H, IV push, PRN	Analgesic	Headache, dizziness, drowsiness, GI distress, unusual bleeding, fatigue, tachycardia.
Sertraline	75 mg, QHS, Oral	Mood stabilizer for anxiety & depression	GI distress, difficulty breathing, difficulty sleeping, dizziness, headache, nervousness, uncontrolled shaking, abnormal bleeding.
Trazodone	50 mg, QHS, Oral	Mood stabilizer for anxiety & depression	GI distress, difficulty breathing, dizziness, headache, uncontrolled shaking, abnormal bleeding, seizures, decreased coordination, cognitive changes, muscle pain, irregular heartbeat.
INJ = injection; IV = intravenous; mEq = milliequivalent; mg = milligrams; mL = milliliters; PRN = as needed; QD = once a day; Q4H = once every 4 hours; Q6H = once every 6 hours; QHS = once at bedtime; QID = 4 times a day.			

Chapter 3

Examination – Tests and Measures

The patient's deficits were categorized using the International Classifications of Functioning, Disability, and Health (ICF) model.[24] At the ICF body structure and function level, the NPRS, Manual Muscle Testing (MMT), and goniometry were used as outcome measures, while the Wells' Criteria were used as a diagnostic tool to determine the likelihood of a DVT occurrence. At the ICF activity level, the Activity Measure for Post Acute Care (AM-PAC) "6-Clicks" Inpatient Basic Mobility Short Form served as both an outcome measure and a prognostic tool to determine discharge destination and length of stay. Additionally, the 10-Meter Walk Test (10MWT), ambulation distance, and Observational Gait Analysis (OGA) were used as outcome measures at the ICF activity level. When documenting the AM-PAC and ambulation distance results, the level of assistance was noted to monitor functional independence. At the ICF participation level, the patient's discharge destination was used as an outcome measure. The psychometric properties of these measures are described below.

The NPRS is a patient-reported measure used to track pain intensity. This 11-point scale ranges from 0 to 10, where 0 represents no pain and 10 represents the worst imaginable pain.[25] The minimal clinically important difference (MCID) reflects the lowest amount of change for the patient to detect meaningful improvement, and for patients with postoperative pain this is often reflected in percent change rather than a raw change in points.[25] When considering the extent of pain reduction, a 35% decrease is considered "minimal" relief, 67% is "moderate", 70% is "much", and 93% is "complete" relief.[25] For patients with chronic pain the MCID is a 30% change or a 2-point change (85% CI), however the percent change is also considered more meaningful for patients with higher pain levels as it adjusts for baseline pain

score.[26] The NPRS has good inter-rater reliability with an interclass correlation coefficient (ICC) of 0.92 indicating consistency between healthcare workers.[27]

The MMT was used to assess muscular strength at the hip joint. The test consists of applying a directional force to a limb in a standardized position and grading the patient's strength response from 0 to 5, where 0 signifies no muscle activation and 5 means the patient was able to resist maximal pressure.[28] For the therapist to be confident a real change has occurred, the change must be greater than 1 full grade.[28] The MMT has good to excellent test-retest reliability with Cohen's kappa coefficients ranging from 0.63 to 0.98.[28]

Goniometry incorporates the use of a rotating instrument to measure the entire ROM for a joint. The joint is traditionally measured in standardized positions with both active and passive involvement from the patient. The normal ROM for hip abduction is 0° to 45°, however normal ROM decreases with age.[29] For women between the ages of 40 and 59 the age-appropriate range of hip abduction is 0° to 41° and for those age 60 to 74 the range is 0° to 39° (95% CI: 41°-43°; 38°-40°, respectively).[29] When examining the hip abduction ROM of patients with OA, the intra-rater reliability was good (95% CI: ICC 0.94, 0.86-0.98), the inter-rater reliability was poor (95% CI: ICC 0.48, 0.36-0.60), and the minimal detectable change (MDC) was 7.3° (90% CI).[30,31]

The revised Wells' Criteria is a diagnostic tool which employs a clinical prediction rule to determine the post-test probability of a DVT occurring.[32] It utilizes elements of a patient's history and the physical examination and assigns and deducts points based on that data. The total score ranges from -2 to 8 points and this score expresses the clinical probability of a DVT; a high probability is a score greater or equal to 3 points, moderate is 1 to 2 points, and low is less than or equal to 0 points.[32] Inter-rater reliability is good with a kappa score of 0.74 (95% CI: 0.63-0.84).[33] When using only intermittent pneumonic compression devices for

prophylaxis in the hospital, the proposed prevalence for a DVT occurring is 20.3% (95% CI; 17-24).[13] There is a wide variance of negative likelihood ratios (–LR) for individuals in the "low risk" group, with small to moderate values of 0.48 and 0.12 being proposed.[32,34] Assuming a pre-test probability of 20% for a DVT based on prevalence data, available evidence, and patient presentation, a –LR of 0.48 would result in a small shift in the post-test probability of a DVT to 9%. Conversely a –LR of 0.12 would result in a moderate shift to 3%. Receiving a "low risk" score on the Wells Criteria is better at ruling out a DVT with a sensitivity of 78.9% versus ruling in with a specificity of 44.3% (95% CI: 74.2-83.6; 41.3-47.4 respectively).[34]

The 10MWT is a test designed to evaluate short-distance gait speed at either a preferred or quick ambulation pace. The patient is timed with a stopwatch as they complete a 10 meter course with an additional 2 meters on either end to account for acceleration and deceleration. For patients with lower extremity surgery, the MDC is 12.2 seconds or a 28.5% change (95% CI), and the test-retest reliability was good (95% CI: ICC 0.95, 0.93-0.97).[35] Inter-rater reliability has not been examined in patients with lower extremity surgery, but for patients who had a previous stroke and lower extremity dysfunction the inter-rater reliability was good with an ICC of 0.98.[36]

Elements of the Rancho Los Amigos OGA System were used to identify the patient's major gait deviations.[37] Research is limited regarding the psychometric properties of live OGA, however, videotaped OGA has demonstrated moderate to good inter-rater (ICC 0.76) and intra-rater (ICC 0.89, 0.64-0.96) reliability when focused on singular gait deviations.[38]

The AM-PAC "6-clicks" Inpatient Basic Mobility Short Form can be used as both an outcome measure and a prognostic tool at the ICF activity level. Six functional mobility tasks are assigned points based on the physical therapist's observation of the patient or clinical

judgement of the patient's ability. Scores for each task range from 1 to 4 points, with higher values indicating more function, for a total raw score of 6 to 24 points. The raw score is converted to a scale score which can be used to approximate the degree of functional impairment and provide prognostic value. The functional tasks include turning over in bed, sitting and standing from a chair with arms, transitioning from supine to edge-of-bed, transferring from edge-of-bed to a chair, ambulating in hospital room, and managing 3 to 5 steps with a railing. To determine if future therapy sessions are needed after the initial evaluation a prognostic cut-off scale score of 43.7 has been established, with a positive predictive value of 0.63 and negative predictive value of 0.73.[39] This indicates that 63% of patients below the cut-off needed more than one further visit and 73% above the cut-off needed only one more visit.[39] Another cut-off score of 42.9 predicts discharge location with a positive predictive value of 0.748 and negative predictive value of 0.80, indicating that 75% of patients above the cut-off were discharged home and 80% below the cut-off were discharged to an institutional setting.[40] Internal consistency reliability was good with a Cronbach alpha score of 0.957 (95% CI: 0.956-0.958), and the ceiling and floor effects remained below 20% for initial and final visits indicating good content validity.[39] Test-retest and inter-rater reliability were good (95% CI: ICC 0.91, 0.86-0.95; 0.91, 0.86-0.94, respectively).[41] The MDC is 4.5 points (95% CI), but a MCID has not been established.[41]

Table 2

Examination Data

Measurement Category	Test/Measure Used	Test/Measure Results
BODY FUNCTION OR STRUCTURE		
Pain	National Pain Rating Scale	Rest = 6/10 at L posterolateral hip Activity = 7/10 at L posterolateral hip Acceptable Pain Intensity = 5/10
Strength	Manual Muscle Test	R Hip Abduction = 4/5 (supine) L Hip Abduction = 2-/5 (standardized)
Range of Motion	Goniometry	R Hip Abduction: AROM = 0° – 31°, PROM = 0° – 42° L Hip Abduction: AROM = 0° – 4°, PROM = 0° – 5° Hip flexion, internal rotation, and external rotation not measured, per surgical precautions
Risk for DVT	Wells' Criteria	Wells' Score = -1
FUNCTIONAL ACTIVITY		
Basic Functional Mobility	AM-PAC "6-Clicks" Inpatient Basic Mobility Short Form & Level of Assistance & Ambulation Distance	Total Raw Score = 14/24 Total Scale Score = 38/61 <u>Subscores</u>: Supine bed mobility = Mod A Transition supine-to-EOB = Mod A Transfer sit-to-stand = Min A with FWW Transfer bed-to-chair = Min A with FWW Ambulate 35 ft = Min A, FWW, 1 seated break Manage 3-5 stairs = declined due to pain
Ambulation Speed	10 Meter Walk Test: Fastest Walking Speed	Speed: 0.14 m/s with CGA and FWW
Ambulation Quality	Observational Gait Analysis	The pt had a L lateral trunk lean and an increased reliance on FWW during the tasks of weight acceptance and single limb support. During the periods of loading response and mid stance the pt had a posterior trunk lean. She had a step-to gait pattern.
PARTICIPATION RESTRICTIONS		
Discharge Destination	Discharge Destination	Unable to discharge home due to moderate level of assistance needed for functional mobility and inability to manage stairs.

AM-PAC = activity measure for post acute care; AROM = active range of motion;
CGA = contact guard assist; DVT = deep vein thrombosis; EOB = edge of bed;
FWW = front wheel walker; L = left; Min A = minimum assistance; Mod A= moderate assistance;
PROM = passive range of motion; Pt = patient; R = right.

Chapter 4

Evaluation

Evaluation Summary

The patient was a 58 year-old female who was 8-hours status post left THA. Prior to surgery, the patient was independent with all ADLs, however, due to her left hip pain she ambulated with a cane on her right side and used walls at home for balance. Upon initial examination she presented with impaired pain control, and impaired left hip strength and ROM. Her function during bed mobility, transfers, and stair management was limited, as was her ambulation distance, speed, and quality. Additionally, she required the use of a front wheel walker for safe ambulation and transfers, and she functioned primarily at a minimum to moderate assistance level for mobility. Due to her impairments and limitations she was unable to be discharged home after 1 session of physical therapy.

Diagnostic Impression

The patient's age, prior medical history, surgical report, and imaging report were all consistent with the medical diagnosis of severe OA of the left hip. Additionally, her post-surgical impairments and activity limitations were consistent with a posterolateral THA. The patient had limitations at all 3 levels of the ICF model. Her impairments of decreased strength, decreased ROM, and increased pain contributed to the patient's limited ambulation speed, distance, and quality, as well as to her limited functional mobility. These limitations further restricted the patient's ability to be discharged home as she would have needed increased assistance in that environment. Her Wells' Criteria score of -1 indicated she had a low risk of developing a DVT, and the proposed –LRs allowed for a small to moderate shift from pre-test (20%) to post-test (3% to 9%) probability of developing a DVT.

Prognostic Statement

When considering length of stay, the patient's relatively young age, white race, normal BMI, and normal pre- and post-operative lab values were all positive prognostic factors favoring reduced length of stay. Her multiple comorbidities and single marital status were negative prognostic factors favoring increased length of stay, however, she had maintained a strong relationship with her ex-husband which would likely reduce the risk posed from being divorced and single.[17,18,20] While the patient's history of smoking and depression were both prognostic factors increasing her risk for post-operative complications, her normal BMI and normal hemoglobin levels reduced her risk.[14-16] The patient did possess several negative prognostic factors increasing her risk for post-operative pain, including current symptoms of depression and severe anxiety, female sex, and presence of pre-operative pain.[21]

In summary, the patient's positive prognostic factors favoring shorter length of stay and decreased risk of complications outweighed her negative prognostic factors. The patient would likely experience higher than normal acute post-operative pain due to her prognostic risk factors, however, her acute pain was unlikely to increase her risk for chronic post-surgical pain.[22] During this short period of care the patient was expected to make improvements in her ability to perform functional activities and reach her home discharge goal.

Discharge Plan

The patient was expected to be discharged to her ex-husband's home with supervision from her ex-husband and her daughter. She was to remain there for 2 weeks with a home exercise plan and a front wheel walker before returning to her own home containing 14 stairs with a railing.

Chapter 5

Plan of Care-Goals and Interventions

Table 3

Evaluation and Plan of Care

PROBLEM	PLAN OF CARE		
	Short Term Goals (by 2nd session)	Long Term Goals (by 3rd session or discharge)	Planned Interventions Interventions are Direct or Procedural unless they are marked: (C) = Coordination of care intervention (E) = Educational intervention
BODY FUNCTION OR STRUCTURE IMPAIRMENTS			
Increased pain in L posterolateral hip as measured by NPRS.	Decrease pain during activity from 7/10 to 6/10 (14% decrease).	Decrease pain during activity from 7/10 to 5/10 (28% decrease). MCID = 35% reduction[25]	Provide cryotherapy for 15 min post-treatment session using ice pack on pt's incision site. (E) Review benefits of cryotherapy and encourage pt to ice incision site 1-2 more times/day for 15 minutes each. (C) Coordinate with nursing to premedicate pt prior to each physical therapy session. Report pt's pain level to nursing after each session.
Decreased muscle strength of hip abductors as measured by MMT.	No change expected.	Increase L hip abduction strength from 2-/5 to 3-/5. MDC = 1 full grade[28]	Utilize gait training and transfer training at the activity level to improve hip abduction strength through functional movements. Changes in strength were expected to occur via neural adaptation and pain reduction. (E) Educate pt on use of HEP to support functional movements.
Decreased ROM of L hip abductors as measured by goniometry.	No change expected.	Increase abduction AROM from 0° – 4° to 0° – 12°, and PROM from 0° – 5° to 0° – 14°. MDC_{90} = 7.3°[30]	Utilize gait training and transfer training at the activity level to improve hip abduction ROM through functional movements.
DVT risk, as measured by Wells' Criteria.	Maintain low risk of DVT with a score of ≤ 0 points.	Maintain low risk of DVT with a score of ≤ 0 points.	Apply pneumatic compression devices to lower extremities after each session to assist with venous return when pt is stationary. Therapeutic exercises (see above) will also encourage venous return. (E) Summarize benefits of venous return for prevention of thromboembolic events.

ACTIVITY LIMITATIONS			
Decreased awareness of posterior hip precautions.	Pt will be able to recall all assigned hip precautions.	Pt will safely manage hip precautions during ambulation and transfers.	(E) Instruct pt on posterior hip precautions as dictated by surgeon and hospital protocol. Provide written list of hip precautions for reference and educate pt on importance of maintaining hip precautions during ambulation and transfers. (C) Coordinate with family members to assist with maintaining hip precautions. <u>Posterior Hip Precautions</u>: • No hip internal rotation past midline • No hip adduction past midline • No hip flexion past 90° • Weight bearing as tolerated
Pt unaware of HEP.	Pt will be able to recall HEP.	Pt will be safe and independent with HEP .	Provide pt with pictorial and written instructions for HEP. Instruct pt on proper form for each exercise and provided corrections and cues as needed. <u>Therapeutic Exercise</u>: 3 sets, 10 repetitions, daily; ankle pumps, glute squeezes, quad set, heel slides, short arch quad. (E) Discuss HEP and reinforce how pain should remain at or around baseline during the exercises. (E) Educate pt on benefits of movement for increasing blood flow to promote tissue healing, and maintaining strength and ROM. (E) Encourage patient participation in hospital and encouraged pt to continue exercises until their first outpatient physical therapy appointment 5 days post-surgery. (C) Coordinate with care management team for transitional planning and confirm the pt's first outpatient physical therapy appointment.

Decreased ability to perform functional activities as measured by the AM-PAC. <u>Subscores</u>: Required Mod A for supine bed mobility. Required Mod A to transition supine-to-EOB. Required Min A to transfer sit-to-stand. Required Min A to transfer bed-to-chair. Required Min A with FWW and 1 seated break, when ambulating 35 feet. Decreased ability to ambulate greater than 35 feet as measured by gait distance. Pt unable to manage steps due to pain in L hip.	No change expected. ……... ……... ……... ……... ……... ……... ……...	Improve AM-PAC raw score from 14/24 to 19/24. MDC_{95} = 4.5 raw points[41] Improve to independent. Improve to S. Improve to S, with use of FWW. Improve to S, with use of FWW. Improve to S with FWW and no seated break, for 35 feet. Increase ambulation distance from 35 feet to 180 feet with FWW and S. Pt able to manage 4 stairs with L side railing and SBA.	AM-PAC score should improve with application of HEP, gait training (see below), and transfer training (see below). Instruct pt on proper task-specific body mechanics during bed mobility and transfers. Instruct on safe stair management and use of FWW for curb steps. Provide verbal and tactile cueing to maintain hip precautions and safety. Utilize 3 repetitions of each activity each session and progressively decrease assistance during activity. Consideration taken for pt's history of multiple spinal fusions and her prior transfer technique. (E) Advise pt to use railing and have another person assist her with FWW if managing multiple steps. Advise pt to keep her current FWW downstairs and her extra FWW upstairs once she back living with 14 stairs. (E) Educate pt on benefits of ambulation and encourage pt to ambulate with nursing once in the evening. (C) Coordinate with family members to provide safe supervision during ambulation and stair management. (C) Coordinate with nursing to encourage pt to ambulate a short distance in the evening with SBA and FWW.
Decreased ambulation speed as measured by the 10MWT.	No change expected.	Increase ambulation speed by 30%, with FWW and SBA. MDC_{95} = 28.5% change[35]	Provide ambulation training with FWW and assistance as needed. Improvements in gait quality and increasing ambulation distance should lead to improvements in gait speed.

Decreased quality of gait as seen from live OGA. Increased L lateral trunk lean and increased reliance on FWW during weight acceptance and single limb support. Increased posterior trunk lean during loading response and mid stance. Step-to gait pattern.	No change expected.	Improve gait quality with pt demonstrating a step-through gait pattern 100% of the time, and minimal cues for trunk position during L weight acceptance and single limb support.	Progressively decrease amount of assistance and transition from a step-to gait pattern to a step-through gait pattern. Use tactile and verbal cues to equalize limb weight bearing, and improve her ability to keep trunk midline during L weight acceptance and single limb support. (E) Educate pt on importance of safe ambulation to prevent falls and to prevent further injury to other body areas due to gait deviations. (E) Discuss use of FWW to manage WBAT.
PARTICIPATION RESTRICTIONS			
Unable to discharge home.	No change expected.	Pt able to be discharged home with family.	Improving the pt's activity limitations and incorporating the following education and coordination, should result in a discharge home. (E/C) Consult with pt and family about home environment the pt will initially return to. Discuss any temporary modifications needed to maintain safety in the home during ambulation or transfers. Determine LOA the family can provide.

AM-PAC = activity measure for post acute care; AROM = active range of motion;
CGA = contact guard assist; DVT = deep vein thrombosis; EOB = edge of bed;
FWW = front wheel walker; HEP = home exercise program; L = left; LOA = level of assistance;
MCID = minimal clinically important difference; MDC = minimal detectable change;
MI = modified independence; Min A = minimum assistance; Mod A= moderate assistance;
MMT = manual muscle strength; m/s = meters per second; NPRS = numeric pain rating scale;
OGA = observational gait analysis; PROM = passive range of motion; Pt = patient; R = right;
ROM = range of motion; S = supervision; SBA = stand by assist;
WBAT = weight bearing as tolerated; 10MWT = 10 meter walk test

Plan of Care – Interventions

See Table 3

Overall Approach

A collaborative interdisciplinary and impairment-based approach was taken in this plan of care, as well as use of the best available evidence since a clinical practice guideline regarding post-THA physical therapy does not currently exist.[24,42,43] The patient was seen for a total of 3 physical therapy sessions over 2 days, beginning about 8 hours after surgery was initiated. Task-specific training and the overload principle were used to improve function and ambulation at the activity level, so that at the participation level she could be safely discharged home with her family as soon as possible. The repeated tasks performed at the activity level likewise helped to address the body structure and function impairments of decreased strength and ROM. The patient's family was included in the plan of care as the patient planned to be discharged home.

PICOT question

For a female with a history of OA [P], is gait training on the day of THA surgery [I] more beneficial than delayed training [C] for shortening the length of stay in the hospital [O]?

The effects of an accelerated physical therapy protocol post-THA on length of hospital stay, muscle strength, ROM, and gait quality were examined in a randomized controlled trial (RCT).[42] The experimental group (EG) differed from the control group (CG) only by timing and frequency of gait training. Both groups received bed rest education, performed supine and seated exercises, and received analgesia, but the EG began gait training on the day of surgery versus the day after as in the CG. The primary outcome measures were length of stay, goniometry, MMT, and the Merle d'Aubigné and Postel score, which consisted of mobility, gait, and pain outcomes. At discharge, both groups showed significant within-

group improvement in pain and a decreased gait quality, but only the EG showed improvement for ROM and strength. Meaningful between-group differences in favor of EG were seen for length of stay (3 days versus 4 days) and muscle strength, indicating an accelerated gait program was more effective than a delayed program at discharge. No difference between groups was found for ROM, mobility, gait, pain, or adverse events.

The applicability to this patient case was high when considering age, sex, diagnosis, surgery type, and surgical approach. The patient was within the study's age range, although she was 6 years younger than the mean, and 46% of the participants were female. All participants had a previous diagnosis of OA and received a posterior surgical approach, which matched the history of this patient. In contrast to this patient, the study participants had their surgeries in Brazil, initial testing was done pre-operatively, and the EG was seen 3 times a day. Inpatient protocols differ from country to country, which limits how results are applied to a hospital in the United States. Additionally, the applicability of within-group differences decreased as the patient in this case study was limited to twice a day sessions and pre-operative testing was not offered.

In a separate RCT by Okamoto et al.[43], the authors drew similar conclusions when examining the effects of early mobilization on a larger sample size than the previous study. Of the 126 participants, 40% were female, all had a BMI less than 30 kg/m^2, all received a THA due to hip OA, and the average age was 62 years old. Length of stay, readiness for discharge, and readmission rate were assessed, and the only variable changed between groups was the timing of mobilization. The authors concluded that at any given time point the EG individuals mobilized on day of surgery were 1.8 times more likely to be discharged than those in the CG, who mobilized the day after surgery (95% CI: 1.22-2.67). The RCT was most appropriate in regards to age, BMI, diagnosis, and surgery type, but the location of the RCT in Australia

reduced its applicability to this patient. Limitations were apparent as the authors did not evaluate within-group differences and plan of care descriptors were lacking.

While the two articles lacked PEDro scores, their randomization efforts and narrow CIs allowed them to be labeled as Level 1B evidence. Exclusion criteria for both studies were minimal, thus increasing their external validity while decreasing internal validity. Bias reduction was attempted by blinding patients and the researchers performing the evaluations and determining readiness for discharge.

The patient's primary goal was to return home to her family as quickly as possible, thus a plan of care focused on shortening the inpatient length of stay was utilized. A shorter stay was anticipated given the patient's high motivation, moderate irritability, and the results from both RCTs.[42,43] When considering the strengths and limitations of the articles, and the patient's circumstances, early mobilization on the day of surgery may have been the best evidence available to achieve the patient's goals.

Chapter 6

Outcomes

Table 4

Outcomes

OUTCOMES				
Outcome Measure	Initial	Follow-up (DC)	Change	Goal Met?
BODY FUNCTION OR STRUCTURE IMPAIRMENTS				
NPRS	Rest = 6/10 Activity = 7/10	Rest = 5/10 Activity = 7/10	Rest = 17% change Activity = 0% change (*MDC not met*)	No
MMT	L Hip Abduction = 2-/5	L Hip Abduction = 3-/5	+ 1 full grade	Yes
Goniometry	<u>L Hip Abduction</u>: AROM = 0° – 4° PROM = 0° – 5°	<u>L Hip Abduction</u>: AROM = 0° – 10° PROM = 0° – 15°	<u>L Hip Abduction</u>: AROM = + 6° PROM = + 10°	 No Yes
Wells' Criteria	Wells' = -1 = low risk	Wells' = -1 = low risk	No change	Yes
ACTIVITY LIMITATIONS				
AM-PAC & LOA with…	Raw score = 14/24 Scale score = 38/61	Raw score = 18/24 Scale score = 44/61	+ 4 points raw score & decreased LOA	No Yes
bed mobility	Mod A	S		No
supine-to-EOB	Mod A	SBA		No
sit-to-stand	Min A with FWW	S with FWW		Yes
bed-to-chair	Min A with FWW	S with FWW		Yes
ambulation	Min A with FWW, 1 seated break, 35 ft	S with FWW, no breaks, 186 ft	+ 151 feet	Yes
step management	Unable due to pain.	4 stairs with L ascending rail, SBA		Yes
10MWT	<u>Speed</u>: 0.14 m/s, CGA with FWW	<u>Speed</u>: 0.35 m/s, SBA with FWW	+ 0.21 m/s (41.1% change)	Yes
Ambulation Distance & LOA	35 feet, 1 seated break, FWW, and Min A	186 feet, no break, FWW, and S	+ 151 feet	Yes
PARTICIPATION RESTRICTIONS				
Discharge Destination	Unable to discharge home due to Mod A needed for functional mobility and inability to manage stairs.	Able to discharge home due to mobility only requiring S and FWW, and ability to manage multiple stairs.	Discharged home to family.	Yes

AM-PAC = activity measure for post acute care; EOB = edge of bed; FWW = front wheel walker; L = left; LOA = level of assistance; Min A = minimum assistance; Mod A= moderate assistance; MMT = manual muscle strength; m/s = meters per second; NPRS = numeric pain rating scale; PROM = passive range of motion; S = supervision; SBA = stand by assist; 10MWT = 10 meter walk test.

Discharge Statement:

The patient was seen at an inpatient facility for a total of 3 sessions over the course of 2 days following a left THA procedure due to severe hip OA. During the initial visit the patient presented with impaired pain control, muscle strength, ROM, and decreased awareness of her posterior hip precautions. Her functional mobility, gait speed, and gait quality were also impaired, and she was limited to ambulating short distances.

Interventions incorporated task-specific and functional training to best prepare the patient for a home discharge. She was provided a home exercise program with specific instructions regarding dosage, to continue building on her improvements. The patient and her family worked closely with the care coordinator and physical therapist to provide the patient with a new front wheel walker and confirm the patient had an outpatient physical therapy session scheduled for after discharge.

Upon discharge the patient met many of her goals. She had improved ambulation speed and exceeded the MDC. She achieved 5 of her 6 task-specific functional goals and her strength and passive range of motion both improved enough to meet the MDCs. Her pain control goals were not achieved. She had a short 2-day length of stay at the hospital, which fulfilled her goal to discharge from the hospital as soon as possible. The patient was discharged to her ex-husband’s home with outpatient physical therapy, along with a plan to return to her own home in 2 weeks.

Chapter 7

Discussion

During the initial visit, about 8 hours after surgery, the patient required too much assistance with functional tasks to consider discharging home, however, over the course of 3 sessions she managed to improve her functional independence and reach her goal of a home discharge. This was partially due to the extensive support she had from her ex-husband and her daughter during and after her inpatient stay; her daughter remained at the hospital all day to attend her second and third physical therapy sessions. I would have expected to see more improvements with bed mobility and transfers given the amount of repetitions done during her sessions, however, this may have been due to her high pain levels at rest and during activity.

Hospital and surgeon protocol in this patient case encouraged discharge the day after surgery, but had the patient remained in the hospital for a longer period of time I would have liked to incorporate pain neuroscience education. This patient's history with chronic pain in multiple body regions and her higher than average levels of pain during inpatient rehabilitation make her pain experience more distinctive and less applicable to future patients receiving THA. Her surgeon's request for pain medications to be managed by a pain management team both before and after discharge allowed me to focus my initial therapeutic interventions on functional mobility. While medicinal management of pain is not under my scope of practice, I have the training and capability to explain the proposed mechanisms behind pain science. Given her history, pain education may have been beneficial to the patient, particularly if she never received this introduction in other healthcare disciplines.

Many of the measures and interventions employed during this patient case could be used for future patients undergoing a THA. The only outcome measure that was tailored to accommodate patient circumstances was the MMT, as discussed above. The other measures

and interventions were deigned to encompass a wide range of patient presentations, although the psychometrics presented in this case study would be best applied to patients after THA due to OA. It is to be expected for patients undergoing a total knee arthroplasty, or a THA due to a hip fracture or avascular necrosis, to present in a different manner, thus the psychometrics may not apply to those populations. The patient's functional deficits and gait deviations reflected what typically occurs after a THA, while her pain history, relatively younger age, and her access to a supportive family made her presentation rather distinctive. Although the patient's discharge destination was not unusual after a THA, her focused motivation to return home as soon as possible required consideration of patient circumstances to support this primary goal.

Currently, there is a lack of evidence for specific interventions applied during the inpatient stay immediately after a THA. Much of the existing evidence is either deprived of intervention details or the focus is on outpatient phases of recovery. This may be due in part to the interdisciplinary influence on inpatient goals which allows the specifics of physical therapy treatment to be overlooked. After THA, the short time frame of inpatient rehab may be too brief to effectively measure change in traditional outcome measures. Consequently, research may then be more biased toward outpatient goals, especially since the vast majority of THA recovery takes place outside the hospital. The shortage of evidence provides a unique opportunity for future researchers to explore the effectiveness of physical therapy interventions in this setting, which would certainly prove beneficial to patients like the one presented here. Scientific research, clinical expertise, and patient values and circumstances are key components for achieving optimal patient outcomes. In this case study an appreciation for each element was upheld and as a result the patient demonstrated meaningful functional improvement and was safely discharged from the hospital within a short period of time.

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