OUTPATIENT REHABILITATION FOR A PATIENT PRESENTING WITH HIP IMPAIRMENTS

A Doctoral Project
A Comprehensive Case Analysis

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Andrew Milton

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Abstract

of

OUTPATIENT REHABILITATION FOR A PATIENT PRESENTING WITH HIP IMPAIRMENTS

by

Andrew Milton

A 71 year old male patient with right hip osteoarthritis was seen for physical therapy treatment for 10 sessions over the course of five weeks at an outpatient physical therapy clinic. Treatment was provided by a student physical therapist under the supervision of a licensed physical therapist.

The patient was evaluated with goniometry, hand held dynamometry, six-minute walk test, and Western Ontario McMaster Osteoarthritis Index. A plan of care was then established. The main goals for the patient were to improve range of motion, strength, ability to perform functional activities, and tolerance to ambulation. The main interventions used were manual therapy, therapeutic exercise, and body-weight-supported treadmill training.

The patient demonstrated improved range of motion, strength, ability to perform everyday functional activities, and ability to walk outside of home for recreation. The patient was discharged with a home exercise program.

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Chapter 1

General Background

Osteoarthritis (OA) is the most common joint disorder in the United States (US), with as many as 8.0% of the adult population being affected.[1] Osteoarthritis is most common in the weight bearing joints of the knee and hip, causing decreased mobility and pain.[2] Pain is often the result of degeneration of cartilage which normally provides a smooth gliding surface and a cushion between articulating bones, allowing normal joint motion. Osteoarthritis commonly worsens over time, and bones and cartilage experience chronic degeneration. An inflammatory condition is initiated, which causes more pain and perpetuates the physiological damage.[3]

For people with OA early physical therapy intervention is one proposed method of improving patient mobility and quality of life while at the same time delaying the need for surgical intervention. Manual therapy, patient education, and strengthening/flexibility exercises have been suggested to be the most effective treatments for hip OA according to the Clinical Practice Guidelines of the American Physical Therapy Association.[4] When hip OA is severe, surgical intervention (specifically joint replacement) may be required. In the US, from 1992 to 2011 the rate of total hip replacements per 100,000 cases of OA increased by 119%, more than doubling.[5] Furthermore, estimated costs due to hospitalization for hip joint replacements were $13.7 billion in 2009. Osteoarthritis-related costs in the US are expected to reach $100 billion per year by 2020.[6]

Non-modifiable risk factors for the development of hip OA include: age over 50 years, female gender, family history, developmental disorders, biomechanical abnormalities, and previous joint injuries. Modifiable risk factors include: obesity, occupations requiring repetitive movements of the hip joint such as farming, participation in weight-bearing sports, and mechanical abnormalities such as muscle weakness.[7]

Patients with hip OA often initially experience pain that limits their ability to perform activities of daily living. The pain associated with hip OA is commonly described as anterior/lateral hip pain that is deep or aching, and the patient may complain of stiffness that is worse in the morning and at the end of the day. Losses in range of motion (ROM), especially flexion and internal rotation, and decreased hip abduction strength are also associated with hip OA.[4] Radiographs are the gold standard for the diagnosis of hip OA. To identify patients likely to have OA without the use of radiographic imaging, the American College of Rheumatology (ACR) has created clinical prediction rules that indicate the presence of hip OA based on the presence of a cluster of symptoms. The symptoms include: hip pain, hip flexion <115º, hip IR < 15º, or hip pain w IR, morning stiffness of the hip <60 minutes, and age > 50 years.[8]

Five variables have been established in order to identify patients with hip OA likely to demonstrate a favorable response to physical therapy.[9] The five variables include: unilateral hip pain, age of less than or equal to 58 years, pain of greater than or equal to 6/10 on a numeric pain rating scale (NPRS), 40-meter self-paced walk test time of less than or equal to 25.9 seconds, and duration of symptoms of one year or less.[9]

Chapter 2

Case Background Data

Examination – History

The patient was a 71-year-old male experiencing right hip and right knee pain. The patient had been experiencing symptoms for the previous 2-3 years. The patient was diagnosed by an orthopedic surgeon with right hip OA via magnetic resonance imaging and was scheduled for a right total hip arthroplasty over 1 year prior to his physical therapy evaluation. The procedure did not occur due to other health issues that resulted in an elevated risk of surgical complications. The patient then received treatment from a physical therapist over the course of three months. The patient reported improvements in motion and the ability to perform everyday tasks while receiving physical therapy. At the time of the initial evaluation for this case study, the patient's chief complaint was right anterolateral hip pain that was disrupting functional mobility and sleep. The patient's goals were to avoid the necessity of total hip arthroplasty for as long as possible, to be able to walk greater distances without pain, to be able to don and doff shoes/socks with less pain, and to be able to walk a distance of three miles.

The patient had a history of prostate cancer for which he was diagnosed and treated 10 years prior to evaluation, and again five years prior. Treatment consisted of radiation therapy, a prostatectomy, and medication as part of a clinical trial. The clinical trial was ongoing at the time of the initial physical therapy evaluation and throughout the course of care. The patient fractured his fifth lumbar vertebrae in a bicycle accident approximately 15 years ago. The incident did not require surgery and caused no lingering symptoms.

The patient was retired, physically active, and eager to improve his ability to get back to his favorite recreational activities. The patient was not using equipment nor environmental modifications to complete activities of daily living in his home. The patient was participating in

one-hour exercise classes three days per week and occasionally attending twice weekly yoga classes for 30 minutes each. At the time of evaluation, the patient was experiencing right anterolateral hip pain that was intermittent ranging from 0-4/10 on the NPRS and that at times radiated into the anterior-medial thigh and knee where the intensity ranged from 0-3/10. Pain averaged 1/10 throughout the day. The patient was awoken from sleep at least once per night by hip pain, which was relieved by change in position. The patient's symptoms were classified as mild-moderate in severity and as minimal in irritability.

Systems Review

The patient's cardiopulmonary system was impaired; he was experiencing hypertension based a blood pressure reading of 148/96 millimeter mercury recorded with use of sphygmomanometer. The patient was taking medications to control his hypertension. The patient's resting heart rate was measured manually to be 72 beats per minute, and oxygen saturation was 93% per use of an oximeter. The patient's urogenital system was impaired based on patient report of blood in his urine after sitting on his bicycle seat. In relation to this issue, the patient was visiting his oncologist every three months (who related the issue to radiation of the bladder). The patient reported his laboratory tests had shown no signs of cancer for the last two years. The patient's musculoskeletal system was impaired based on patient report. The neuromuscular system was impaired as evidenced by pain with and deviations in gait. The patient described symptoms of tingling in his bilateral lower extremities after periods of inactivity. The patient's integumentary system was not impaired based on observation and patient report. The patient's language, affect, cognition, and learning were not impaired based on observation. The patient did not require support at home for completion of daily activities, but his spouse was available if needed. The patient did not have restrictions moving within his single-story home.

Examination - Medications

Table 1

Medications

MEDICATION	DOSAGE	REASON	SIDE EFFECTS
Amlodipine / NORVASC® (calcium channel blocker)	**10 mg x daily**	**Hypertension**	**Swelling of distal extremities, headache, upset stomach, dizziness, drowsiness, flushing**
Atenolol / TENORMIN® (beta-blocker)	**50 mg x daily**	**Hypertension**	**Dizziness, depression, lightheadedness, tiredness, nausea, diarrhea**
Atorvastatin / LIPITOR® (statin)	**20 mg x daily**	**Dyslipidemia**	**Diarrhea, heartburn, gas, joint pain, memory loss, confusion**
Tamsulosin / FLOMAX® (alpha blocker)	**.8 mg x daily**	**Benign Prostatic Hyperplasia**	**Sleepiness, difficulty sleeping, weakness, back pain, diarrhea, runny/stuffy nose, pressure in face, sore throat/cough/chills/fever, blurred vision, difficulty ejaculating**
***Patient not able to provide info on trial drug for prostate cancer due to nature of clinical trial**			

Chapter 3

Examination – Tests and Measures

The patient's deficits were categorized using the International Classifications of Functioning, Disability and Health Model. Body structure and function limitations were measured with use of goniometer to quantify ROM, and a hand held dynamometer was used to measure strength. Pain was measured using the NPRS. Passive accessory joint mobility of the femoroacetabular joint (FAJ) was assessed with anterior-posterior (AP) glides, posterior-anterior glides (PA), and lateral traction. The six-minute walk test (6MWT) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) were used to measure limitations at the activity level. Participation restrictions were measured based on the patient's report of his ability to participate in exercise classes and walk for extended periods of time without pain. The Global Rate of Change (GROC) scale was used to assess self-reported patient progress each week. A cluster of prognostic factors were used to provide prognostic information for the patient's expected response to physical therapy interventions.[9]

Goniometry is used to measure ROM in order to quantify changes during treatment for patients with joint restrictions.[10] The established minimal detectable change at a 90% confidence level (MDC_{90}) for goniometric measurements in patients with hip OA has been reported as follows: flexion 8.2°, extension 10.5°, internal rotation 7.8°, and external rotation 7.1°.[11] Based on the MDC_{90}, change in a measurement of greater than those previously listed results in 90% confidence that a true change in joint mobility rather than measurement error has occurred.

Hand held dynamometry (HHD) is an alternative method of muscle strength measurement to that of manual muscle testing. Hand held dynamometry is a more cost effective and practical tool than isokinetic dynamometry. Furthermore, HHD has been shown to have a

high correlation to isokinetic dynamometry when measuring isometric strength at the hip and knee, r= .57-.86 ($p < .05$).[12] The MDC at a 95% confidence level (MDC_{95}) for hip strength has been reported to be: flexion 12.1 pounds, abduction 5.2 pounds, external rotation 4.3 pounds, and internal rotation 4.9 pounds.[12] Based on the MDC_{95}, change in a score of greater than listed for each direction results in 95% confidence that a true change in strength rather than measurement error has occurred. These values were established specifically for patients with hip OA.

The NPRS is a measure used to quantify the subjective intensity of pain being experienced by the patient. A scale of 0 – 10 is explained to the patient, 0 being no pain and 10 being the worst pain imaginable. The MDC_{90} was reported to be 2/10 for patients with low back pain.[13,14] Psychometrics have not been established for patients with hip OA using the NPRS.

Passive accessory joint mobility testing is used by physical therapists to assess whether pain and ROM restriction may be the result of impaired joint function.[15] This method has been shown to be effective in discovering joint restrictions for patients with hip OA.[4] There are no psychometric properties associated with the use of passive accessory joint mobility for testing or treatment of patients with hip OA.

The 6MWT is a physical performance measure used to assess a patient's cardiovascular endurance, general gait speed, and ability to ambulate for an extended period of time.[16] Community dwelling adults (age 70-79 years) walked an average of 527 meters (m) while performing the 6MWT.[17] The MDC_{90} for this measure was reported to be 61.34 m.[18] Change in a score of greater than 61.34m results in 90% confidence that a true change in performance rather than measurement error has occurred.[19]

The WOMAC is an outcome measure used to quantitatively assess pain, stiffness, and function in patients with OA of the hip or knee. The questionnaire includes 24 questions and has

the patient rate level of difficulty performing tasks from 0 (low) to 4 (high). The MCID considering the functional subscale exclusively was a decrease of 7.9 points.[20] This psychometric information reflects that with a change in a score of greater than 7.9 points in the physical function subscale, a clinically meaningful change was made.[21] The WOMAC is designed for patients with OA.

The GROC is a tool to monitor a patient's self-reported improvement or decline in status as related to his or her symptoms.[22] The GROC was not used for setting patient-related goals.

The ACR established criteria to provide an alternative method to establish the diagnosis of hip OA that does not involve radiographic imaging. If patients met all three criteria in either of the two clusters (Cluster 1: hip pain, hip flexion <115º, hip IR < 15º, Cluster 2: hip pain w IR, morning stiffness of the hip <60 minutes, age > 50), they were considered to have hip OA.[8] The criteria were found to have a positive likelihood ratio (+LR) of 3.44, and a negative likelihood ratio (-LR) of .19.[8] Based on normative data in the United States, post-test probability when a positive cluster finding is present can be determined to be 25%.

Five variables have been established in order to identify patients with hip OA likely to demonstrate a favorable response to physical therapy.[9] The five variables include: unilateral hip pain, age of $\leq$ 58 years, pain of $\geq$6/10 on a NPRS, 40-meter self-paced walk test time of $\leq$ to 25.9 seconds, and duration of symptoms of one year or less. When none of the variables were present in patients before receiving treatment, the posttest probability of a favorable response was less than 1% and -LR was 0.00. The presence of at least 1 out of 5 predictor variables yielded a high sensitivity value of 0.89-1.00 (95% CI) and a LR+ value of 1.28, representing a negligible shift in probability of a favorable response. Using the 32% pretest probability found by the authors in their sample a posttest probability of success could be calculated to be 38%.

The presence of 3 or more of the 5 predictor variables increased the posttest probability of success to 99% or higher, the +LR to “infinity” (5.66 – “infinity”, with a confidence interval of 95%) and the -LR to .59. This clinical prediction rule had not been validated.

Table 2

Examination Data

BODY FUNCTION OR STRUCTURE		
Measurement Category	Test/Measure Used	Test/Measure Results
Hip active ROM	**Goniometry**	**Flexion: R 0-92 º L 0-105 º** **Extension: R 0-6 º L 0-11 º** **IR: R 0-2 º L 0-14 º** **ER: R 0-35 º L 0-36 º** **Abduction: R 0-4 º L 0-25 º**
Hip passive ROM	**Goniometry**	**Flexion: R 0-99 º L 0-106 º** **Extension: R 0-10 º L 0-15 º** **IR: R 0-5 º L 0-18 º** **ER: R 0-45 º L 0-41 º** **Abduction: R 0-19 º L 0-29 º**
Hip strength	**Hand Held Dynamometry**	**Flexion: R 27.4 lbs L 58.7 lbs** **Extension: R 36.9 lbs L 44.6 lbs** **IR: R 28.0 lbs L 29.8 lbs** **ER: R 19.5 lbs L 31.0 lbs** **Abduction: R 34.0 lbs L 36.5 lbs**
Pain	**NPRS**	**Pain in R hip is 1/10 on average but during ambulation is 3/10 after 6 min**
Joint mobility	**Passive accessory joint mobility assessment with NPRS**	**Pain was relieved during lateral distraction of R hip joint in FADIR and FABER positions. An increase in hip extension ROM was observed during the PA glide**
FUNCTIONAL ACTIVITY		
Measurement Category	Test/Measure Used	Test/Measure Results
Ambulation tolerance	**6MWT**	**420.6 m (1,380 ft)**
Self-rated function	**WOMAC PF**	**13/85 = 15.3% impaired**
PARTICIPATION RESTRICTIONS		
Measurement Category	Test/Measure Used	Test/Measure Results
Decreased tolerance to daily walks with spouse	**Patient Report**	**Patient not able to walk to the river and back home (3 miles)**

6MWT: six-minute walk test , avg: average, º: degrees, FABER: Flexion-Abduction-External Rotation, FADIR: Flexion-Adduction-Internal Rotation, ft: feet, GROC: global rate of change scale, L: left, lbs: pounds, NPRS: numeric pain rating scale, m: meters, PA: Posterior-anterior, R: right, ROM: range of motion, WOMAC PF: Western Ontario McMaster Osteoarthritis Index Physical Function Subscale

Chapter 4

Evaluation

Evaluation Summary

The patient was a 71-year-old male who presented to the clinic with the goal of decreasing right hip pain and disability. The patient was found to have significant decreases in both active and passive right hip ROM in directions of flexion, extension, internal rotation, external rotation, and abduction. When testing the patient's ROM and strength, pain reproduction in the presence of joint resistance was judged to be a contributing factor to the patient's ROM impairments. The patient demonstrated decreased strength in directions of flexion, extension, internal rotation, external rotation, and abduction. Results from 6MWT confirmed the patient's decreased walking endurance.

Diagnostic Impression

The patient's presentation was consistent with the medical diagnosis of hip OA based on both clusters defined by the ACR. Deficits in ROM and pain caused limited ability to complete daily activities such as walking, putting on shoes and socks, and bending to the floor. Difficulty performing these activities along with the patient's body structure and function impairments restricted his participation in exercise classes and evening walks with his spouse.

G-Codes

Current with modifier: G8978 CK – 20-40% impaired

Goal with modifier: G8979 – 1-20% impaired

Based on WOMAC

Prognostic Statement

The patient presented with one of the five positive prognostic variables for a favorable response to physical therapy intervention: unilateral hip pain.[9] The presence of certain patient

qualities set the stage for positive outcomes including realistic goals for the 10 sessions of physical therapy, high level of motivation to adhere to instruction and home exercises, and a commitment to live a healthier lifestyle. The chronicity of the symptoms lasting over a year, self-selected gait speed of less than 1.6 m/s, age $\geq$ 58 years, and pain less than 6/10 on NPRS are all negative prognostic factors for responding favorably to physical therapy intervention.[9] Furthermore, the presence of co-morbidities provided a barrier to the patient's ability to achieve population-based norms for ROM, strength, and walking endurance. The co-morbid conditions present in this patient included hypertension, obesity, history of radiation for prostate cancer and prostatectomy.

Since the patient was significantly limited in ROM and strength, small improvements would likely provide the patient with improved mobility and the ability to participate in activities he had been missing. Compliance with his HEP would be important for maintaining improvements.

Discharge Plan

The patient was expected to be discharged to continue living independently at home with a home exercise program in order to continue improvement and maintain progress toward his goals.

Chapter 5

Plan of Care-Goals and Interventions

Table 3

Evaluation and Plan of Care

	PLAN OF CARE		
PROBLEM	Short Term Goals (Anticipated Goals) (3 weeks)	Long Term Goals (Expected Outcomes) (5 weeks)	Planned Interventions Interventions are Direct or Procedural unless they are marked: (C) = Coordination of care intervention (E) = Educational intervention
BODY FUNCTION OR STRUCTURE IMPAIRMENTS			
Decreased R hip AROM	Increase R hip flexion AROM from 92 to 95 º	Increase R hip flexion AROM to 100 º	To improve AROM & PROM R hip flexion: (MT) Started with hip 90 º. flexion performed caudal glide w/ belt around proximal thigh. Began with grade III- while assessing change in sx's. Progressed to grade III and IV if/when symptoms diminished. Performed 2x/week, 30 sec mobilizations x 3 reps. Supine knee to chest stretch, held 30 sec each side, performed reps once per day.
	Increase R hip extension AROM from 6 to 10 º	Increase R hip extension AROM to 15 º	To improve AROM & PROM R hip extension: (MT) Patient prone, PA mobilization grade III- with belt around distal thigh and hands at proximal thigh, 2x/week, 30 sec mobilizations x 3 reps. Standing hip extension stretch 2x/week, 20 sec x 3 reps, progressed to prone with L foot on ground and R leg on table in extension for 3 min introduced slight tilt of table for further extension.
	Negligible improvement expected in the short term	Increase R hip ER AROM to from 35 to 40 º	To improve AROM & PROM R hip ER: (MT) Patient supine, lateral glides with belt grades III-, and III in FABER position up to point of pain/resistance. 2x/week, 30 sec

			mobilizations x 3 reps. Progressed by moving R leg further into FABER position while performing mobilization, and increasing grade of mobilization to III when pain lessened. Supine, achieved FABER position with R ankle on left thigh, hold for 30 sec, increase to 2-3 reps.
	Increase R hip IR AROM from 2 to 5 º	Increase R hip IR AROM to 10 º	To improve AROM & PROM R hip IR: (MT) Patient supine, lateral glides with belt grade III- and III in FADIR position up to point of pain/resistance. 2x/week, 30 sec mobilizations x 3 reps. Progressed by moving R leg further into FADIR position while performing mobilization.
	Increase R hip abduction AROM from 4 to 7 º	Increase R hip abduction AROM to 10 º	To improve AROM & PROM R hip abduction: (MT) Hip abduction with inferior mobilization grade III- were performed in long axis traction 1x/week for 4 sets of 30 sec. Progressed by moving R leg further into hip abduction while performing mobilization. Exercises focused on moving leg through full ROM, including Thera band resisted side-stepping.
Decreased R hip PROM	Negligible improvement expected in the short term	Increase R hip flexion PROM from 99 to 105 º	(MT): Manual Therapy was implemented to improve PROM as indicated above.
	Increase R hip extension PROM from 10 to 12 º	Increase R hip extension PROM to 15 º	(E) Educated patient as to the importance of moving joint through ROM frequently to prevent further losses of ROM.[4] Explain to patient the basic anatomy and pathophysiology of intra-articular adhesions in lay terminology.
	Increase R hip IR PROM from 5 to 7 º	Increase R hip IR PROM to 10 º	

	Increase R hip abduction PROM from 19 to 21 º	Increase R hip abduction PROM to 25 º	(E) HEP: In addition to the list of home exercises the patient performed every morning, which he received from a physical therapist 1 year prior: Patient performed standing hip extension stretch for 30 sec x 10 reps per day. Patient progressed in HEP stretching via instruction to increase duration of hold >30 sec per stretch.
Decreased R hip strength	Increase R hip flexion strength from 27 to 33 lbs	Increase R hip flexion strength to 40 lbs	To improve R hip flexion strength: Because hip flexion strength was limited by pain past 90 º, MT to increase pain-free ROM addressed this issue. Patient performed supine knee to chest 2 x 10 reps each side 1x/day with >3 sec holds, progressed to 3 x 10 reps.
	Increase R hip extension strength from 36 to 41 lbs	Increase R hip extension strength to 46 lbs	To improve R hip extension strength: MT interventions performed to increase pain-free ROM. Prone isometric contractions with verbal and tactile cues to engage gluteal muscles, AROM "lift and hold" for 10 sec x 5 reps, 1x/day. Progressed to standing step-back lunges 2 x 10 reps.
	Increase R hip ER strength from 19 to 22 lbs Increase R hip IR strength from 28 to 30 lbs	Increase R hip ER strength to 25 lbs Increase R hip IR strength to 35 lbs	To improve R hip ER & IR strength: MT interventions performed to increase pain-free ROM. Side-lying clam shell exercise, 1x/day, 2 sets of 10 reps each side, increase to 3 sets when able.
	Negligible improvements expected in the short term	Increase R hip abduction strength from 34 to 40 lbs	To improve R hip abduction strength: Standing R hip abduction w/ slight extension 1x/day, 10 reps x 2 sets. Progressed to Side-step exercises with green Thera band resistance tubing around ankles 10 feet x 6 reps each direction. HEP included these exercises.

ACTIVITY LIMITATIONS			
Ambulation tolerance	Increase tolerance to ambulation with a 6MWT 480 m	Increase tolerance to ambulation with a 6MWTof 540 m	To improve ambulation tolerance: BWSTT, increasing time and walking speed on treadmill, while progressively decreasing support (33 lbs to 0 lbs), with RPE consistently less than 14/20.
Decreased ability to complete everyday physical functions	Increase ability to complete everyday physical functions with WOMAC PF score of 9/85 points	Increase ability to complete everyday physical functions with a decrease in WOMAC PF score of 6/85 points	Interventions addressing body structure and function deficits in ROM and strength were designed to contribute toward the patient achieving goals at the activity level. (E) The patient was educated to importance of active and healthy lifestyle, weight loss, and attendance of exercise classes.
PARTICIPATION RESTRICTIONS			
Decreased tolerance to daily walks with spouse	Increase tolerance to a 20 min walk on treadmill with RPE score of 13/20 and $\leq$ 15 lbs of body weight support	Increase tolerance to a 20 min walk on treadmill with RPE score of 13/20 and $\leq$ 5 lbs of body weight support	Interventions listed at the body structure & function level, as well as at the activity level addressed participation level goals

6MWT: six-minute walk test , Abd: abduction, AROM: active range of motion, avg: average, º: degrees, E: education, ER: external rotation, Ext: extension, FABER: Flexion-Abduction-External Rotation, FADIR: Flexion-Adduction-Internal Rotation, F: flexion, ft: feet, GROC: global rate of change scale, HEP: home exercise program, IR: internal rotation, L: left, lbs: pounds, m: meters, min: minutes, MT: manual therapy, PA: Posterior-anterior, PROM: passive range of motion, R: right, reps: repetitions, ROM: range of motion, RPE: rating of perceived exertion, sec: seconds, sx: symptoms, WOMAC PF: Western Ontario McMaster Osteoarthritis Index Physical Function Subscale

Plan of Care – Interventions

See Table 3.

Overall Approach

Initial visits focused on restoring active and passive ROM of the patient's right hip, enhancing function, as well as providing patient education in attempt to help the patient gain confidence and motivation to return to avoided activities at home. Due to the patient's mild-moderate severity and minimal irritability of symptoms, treatment was focused on regaining ROM and strength immediately. Manual therapy was used to increase the patient's ROM, specifically for movements required to perform daily activities and ambulate further without pain. The most recent clinical practice guidelines published by the Journal of Orthopedic and Sports Physical Therapy served as a basis for treatment selection.[4] Body-weight supported treadmill training was a novel intervention provided as part of an Institutional Review Board approved case series which attempted to assess the benefit of the intervention on gait endurance and other clinical outcomes as part of a multimodal treatment approach.

The patient was scheduled twice per week for a duration of five weeks, equaling 10 visits. The patient was encouraged to participate in exercise classes and live an overall healthier lifestyle. The HEP was an important part of rehabilitation, and the patient was assigned specific exercises to regain strength and improve function.

PICO question

For a 71-year-old man with hip OA (P), is BWSTT as a supplement to traditional physical therapy intervention (I) more effective than traditional physical therapy intervention alone (C) for improving functional abilities and relieving symptoms of hip OA (O)?

This randomized control trial provides level Ib evidence to support the benefits of BWSTT compared to a control group that walked without body weight support on a treadmill.[23]

The sample used in the study consisted of 25 patients. The patients included in the study had knee OA, were an average age of 76 years, and 40% of them were male. Treadmill training sessions were 20 minutes each, and were performed two times per week for six weeks. The authors utilized similar outcome measures that were used for the patient in this case, including: the 6MWT, a rating of perceived exertion, the NPRS, and heart rate monitoring. Researchers followed the guidelines of the American Geriatrics Society to set the intensity of exercise at low to moderate and monitored by having the patient remain between 40% and 60% of the maximum heart rate, and self-rate from 12 to 14 on rating of perceived exertion scale which was mounted on the wall in front of the treadmill.[24] A waist harness and overhead mounting system similar to that used in this case study was used in this trial.

The authors of this study concluded that BWSTT provided an enhanced exercise capacity compared to the control group which ambulated on the treadmill with no body-weight support. The BWSTT group had significant improvements compared to the control group in walking speed (.57 km/h), distance (48 m), and stride length variability.[23] No difference in average pain during treatment sessions was found between the two groups, and average heart rate was controlled to maintain exercise in a moderate aerobic fitness level.

The ability to train the cardiovascular system and increase endurance and tolerance to walking with less pain is optimal. Some of the potential benefits of BWSTT are reduced risk of falling, less pain, and adjustable amount of load through the affected weight-bearing joint.[25]

This study did not directly answer the question presented because it did not include any other physical therapy intervention to either group, such as manual therapy or therapeutic exercise. However, it is a very applicable study because it provided a protocol for BWSTT for a population that nearly matches the patient in this case project. The patient described in this case would have met inclusion criteria and could have been included in the study if he had knee OA

rather than hip OA. At this time, there are no studies available assessing a BWSTT protocol with patients who have hip OA. While the decision to use BWSTT for the patient encounter had already been established by the clinical instructor and physical therapy student in this case study, the study by Watanabe et al. provided guidance for dosing and potential outcomes.

Chapter 6

Outcomes

Table 4

OUTCOMES				
BODY FUNCTION OR STRUCTURE IMPAIRMENTS				
Outcome Measure	Initial	Follow-up (DC)	Change	Goal Met? (Y/N)
R hip AROM (goniometry)	**Flexion: 92º Ext: 6º IR: 2º ER: 35º Abd: 4º**	**Flexion: 102º Ext: 6º IR: 11º ER: 38º Abd: 18º**	**Flexion: +10º Ext: 0º IR: +9º ER: + 3º Abd: +14º**	**Y MDC= 8.2º N MDC= 10.5º Y MDC= 7.8º N MDC= 7.1º Y MDC= 5.0º**
PROM (goniometry)	**Flexion: 99º Ext: 10º IR: 5º ER: 45º Abd: 19º**	**Flexion: 105 º Ext: 10º IR: 19º ER: 43º Abd: 18º**	**Flexion: + 6º Extension: 0º IR: +14º ER: -2º Abd: -1º**	**N MDC= 8.2º N MDC= 10.5º Y MDC= 7.8º N MDC= 7.1º N MDC= 5.0º**
R hip Strength (HHD)	**Flexion: 27.4 lbs Ext: 36.9 lbs IR: 28.0 lbs ER: 19.5 Abd: 34.0 lbs**	**Flexion: 60.7 lbs Ext: 48.9 lbs IR: 42.3 lbs ER: 42.1 Abd: 61.4 lbs**	**Flexion: +33.3 lbs Ext: +12 lbs IR: +14.3 lbs ER: +21.6 lbs Abd: +27.4 lbs**	**Y MDC= 12.1 lbs Y MDC =not established Y MDC= 4.9 lbs Y MDC= 4.3 lbs Y MDC= 5.2 lbs**
ACTIVITY LIMITATIONS				
Outcome Measure	Initial	Follow-up (DC)	Change	Goal Met ? (Y/N)
6 MWT	**420.6 m (1,380 ft)**	**410.8 m (1,348 ft)**	**-9.8 m (-32 ft)**	**N MDC= 61.3 m**
5x Sit to Stand	**10.5 sec**	**9.9 sec**	**-0.6 sec**	**N MDC= 1.5 sec**
WOMAC PF	**13/85**	**5/85**	**-8**	**Y MCID= 7.9**
PARTICIPATION RESTRICTIONS				
Outcome Measure	Initial	Follow-up (DC)	Change	Goal Met? (Y/N)
Tolerance to daily walks	**20 min, RPE 13/20, 33 lbs body weight support**	**20 min, RPE 13/20, 0 lbs body weight support**	**-33 lbs of body weight support**	**Y**
***GROC**	**n/a**	**+5**	**+5**	**MCID= 3**
*Not used for goal setting. Collected for case series project data collection Abd: abduction, º: degrees, ER: external rotation, Ext: extension, ft: feet, HHD = Hand held dynamometer, IR: internal rotation, lbs: pounds, m: meters, MCID: minimal clinically important difference, MDC: minimal detectable change, min: minutes, RPE: rating of perceived exertion, sec: seconds, WOMAC PF: Western Ontario McMaster Osteoarthritis Index Physical Function Subscale				

Discharge Statement:

The patient was a 71-year-old male who presented to the clinic with right hip and knee pain. The patient participated in 10 physical therapy sessions over the course of five weeks for treatment of right hip OA. Restoration of right hip ROM and strength were targeted with use of manual therapy, therapeutic exercise, and BWSTT. Treatment was focused on assisting the patient to achieve his goals related to everyday functional activities and participation in healthy hobbies and lifestyle. Measurable increases were made in right hip active and passive ROM in directions of flexion, internal rotation, and abduction. Statistically significant strength improvements were made in all directions as measured by HHD. Strength and ROM for many movements improved to become comparable between the right and left sides. The patient improved his ability to walk on the treadmill for 20 minutes with fewer signs of his previous antalgic gait pattern. Weight support given while walking on the treadmill decreased over the five weeks from 33 pounds (13%) to zero pounds (0%). Improvement was shown in functional mobility as demonstrated by the final WOMAC physical function subscale which changed from 13/85 (15%) to 5/85 (6%). The patient did not increase his walking distance during the 6MWT, but verbalized feeling much more confident walking for six minutes and believed he performed much better on the test. The patient showed the ability to perform all exercises independently. The patient was discharged home and instructed to continue exercises to maintain improvements made during the course of treatment.

DC G-Code with modifier: *G8979 – 1-20% impaired based on WOMAC*

Chapter 7

Discussion

The patient demonstrated improvements and met goals at the body structure and function level, activity level, and participation level. The patient improved in ability to perform functional activities as measured by the WOMAC. However, goals at the activity level to increase walking endurance were not met as measured by the 6MWT. Strength improvements achieved by the patient during the course of treatment likely contributed positively to functional abilities such as walking without antalgic gait as well as improving the patient's outlook on his condition.[26] Furthermore, increases in hip abduction strength likely contributed to the decreased level of pain the patient experienced with walking by dissipating joint impact forces.[4]

The first half of each treatment session focused on manual therapy and specific therapeutic exercises. I feel that these complemented each other and led to better outcomes and increased performance on the treadmill. The second half of each treatment session consisted of BWSTT, during which the patient showed the ability to walk without an antalgic gait pattern and walk a further distance than he had been able to prior to his initial evaluation. Even when body-weight support was minimal, the patient seemed to have confidence in the body-weight support system and walked with ease for twenty minutes towards the end of the five week course of treatment. Therefore, the BWSTT program seemed to have a positive psychological effect as well as the physical effect by unloading the right hip joint, and would serve as a viable option for similar patients in the future.

The patient reported that he felt quite a bit better compared to the beginning of the course of care, as measured by a +5 score on the GROC. The patient lost 12 pounds of body weight throughout the five weeks, addressing a personal goal for the patient. Beyond the

increase in strength, ROM and aerobic activity, this weight loss could be due in part to the education and encouragement given to the patient to be active and live a healthier lifestyle.

The patient described in this case had symptoms that were fairly typical of others with hip OA. Manual therapy techniques aimed to increase ROM in directions of the largest deficits were effective and should be used for patients with similar deficits. Criteria and prognostic variables defined by the ACR can be used for similar patients due to their strong psychometric properties. The approach involving manual therapy, exercise, and BWSTT can be used for similar patients with modifications made by the physical therapist based on patients' needs and deficits.

Further evidence on the effect of BWSTT for patients with hip OA will be useful in preparing a specific protocol. The patient in this case was progressed based on patient preference and tolerance, and observation of quality of gait by the physical therapist. More research in this field will establish a consistent and standardized method of progression on the treadmill for similar patients.

The physical therapy student recognized that for patients with similar presentations in the future, different participation-level short and long term goals (such as those presented in Chapter 5 Table 3) should be written. The goals written were not addressing restriction at the participation level, but rather the activity level. Example of an appropriate short-term participation level goal would be to walk 1 mile with his spouse without a rest break in 3 weeks.

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