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Out-Patient Physical Therapy Rehabilitation Management of a Patient with a Degenerated Knee Resulting in Total Joint Arthroplasty

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Out-Patient Physical Therapy Rehabilitation Management of a Patient with a Degenerated Knee Resulting in Total Joint Arthroplasty

by

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This Scholarly Project, submitted by Charles A. Long, PT in partial fulfillment of the requirements for the Degree of Doctor of Physical Therapy from the University of North Dakota, has been read by the Advisor and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

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Signature(s) Charles A. Longo PT

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ABSTRACT

Abstract:

Total knee arthroplasty (TKA) surgery is a common procedure performed for those patients seeking a return of knee function after substantial degeneration of the tibiofemoral joint. The TKA procedure is becoming increasingly popular as degenerative changes to the knee joints occurs at a younger age. The United States is facing an increasingly aging workforce. It is anticipated that there will be increasingly more members of the workforce seeking rehabilitation following TKA with goals of returning to work. The purpose of this article is to describe the implementation of physical therapy in the recovery of a patient with degenerative joint disease of the knee and subsequent TKA. The patient was a younger worker attempting to return to the workforce. This case report describes the post-surgical physical therapy from immediately after the operation until the patient was able to walk comfortably at home and care for himself. The final goal of being able to return to work was yet to be achieved at the conclusion of this patient care episode due to the discontinuation of physical therapy by the referring physician. An increased utilization of physical therapy in addition to a stronger role of physical therapy in the direction of care may have resulted in a more complete rehabilitation and better functional outcome including a safe and productive return to work.

Key Words:

total knee arthroplasty, osteoarthritis, knee function, physical therapy.

CHAPTER I

INTRODUCTION

Osteoarthritis (OA), also called degenerative joint disease (DJD), is a progressive "wear and tear" disease of the joints. Risk factors for developing OA include heredity, weight, age, gender, trauma, repetitive stress injuries, and high impact sports.[1] Some illnesses such as gout, and other risk factors such as poor posture, poor aerobic condition, and muscle weakness increase the risk for OA.[1] Of these risk factors age, weight, and history of joint trauma appear to be most significant. The condition of OA deteriorates articular cartilage, removing the protective cushion between bones. As the articular cartilage is lost the joint space between the bones narrows, which is easily noted on radiographs. As the cartilage thins, becoming grooved and fragmented, the surrounding bones react by becoming thicker, growing outward and forming spurs. The synovium becomes inflamed and thickens. Over time the joint changes allow the bone ends to rub against each other and wear away, causing further joint deformity. All of this causes normal activity to become increasingly painful and difficult.[1] Symptoms can range from mild to disabling. Patients will often complain of joint stiffness, inflammation, and pain or dull ache that increases gradually over time. The pain is usually worse in the morning and may feel better with a little activity, but becomes increasingly severe throughout the remainder of the day. Patients often report having too much pain or a sense of joint instability preventing them from performing desired

activities such as sustained standing, walking for any distance, climbing stairs or any higher level of activity.

An estimated 67 million (25%) adults aged 18 years and older will have physician-diagnosed arthritis by the year 2030, and 25 million adults (9.3%) will report arthritis-attributable activity limitations.[2] The majority of total knee arthroplasties (TKA) performed in the United States are performed due to OA. The frequency that TKAs are being performed is increasing. In 1998 there were 266,000 TKAs performed in the United States. In 2004 there were over 475,000 TKAs performed.[1] Based on data from a 2003-2005 National Health Interview Survey, an estimated 46.4 million (21.6%) adults currently have self-reported doctor-diagnosed arthritis and 18.9 million (8.8%) adults report physical limitations due to arthritis. This foreshadows an explosion of adults who will require TKAs due to limitations in activity caused by arthritis.

The United States' work force is aging as a whole as well as individually. Results from a 2002 survey show that 69 percent of older workers plan to work in some capacity during their retirement years.[3] It is expected that there will be more members of the workforce undergoing TKAs with the expectations of returning to the workforce with sufficient function in their new knee to tolerate their work environment. This may be creating a higher expectation of function following total knee arthroplasty than has typically been expected. This case study reviews a worker with post traumatic OA of his knee. He had two episodes receiving physical therapy for his OA, following initial onset of pain and following arthroscopy, before receiving a TKA. It appears that patients are going to be expecting a higher level of function following TKA than they have in the

past, and as occurred in this case. Changes in patient expectations will require changes in the provision of therapy. For this to occur, physical therapists may need to advocate for changes in physician referral patterns and third party payer systems.

Literature Review

Following TKA, patients typically present with edema, pain, limited range of motion and decreased strength restricting them from performing their desired activities. In the *Guide to Physical Therapist Practice,* the use of modalities, manual therapy, exercise and gait training for goals of reducing edema, control of pain, increasing range of motion, increasing strength, and re-integration back into the work force are discussed.[4] In *Clinical Electrotherapy*, the authors discussed the optimum frequencies for reduction of edema and pain control with the use of electrical stimulation.[5] Others have also found electrical stimulation to be beneficial in the strengthening of the quadriceps muscle following knee surgeries.[6, 7, 8] Within one month after TKA, many patients continue to display substantial weakness in the quadriceps muscle.[9] Continued weakness in the quadriceps has been associated with poor recruitment of the muscle rather than atrophy or inhibition due to pain.[9] Electrotherapy, an effective modality for pain relief and muscle re-education, is readily available in most therapy departments providing a wide variety of types of units, options and availabilities. There are a wide variety of exercises that can be used to increase strength, increase range of motion, and develop return of function. It is the role of the physical therapist to determine which exercise program most optimally serves the patient. *Therapeutic Exercise* reviewed optimum strengthening with the exercise program to be established.[10] Loss of function is a primary reason for

seeking a TKA. There are several tools available to assess level of function including the Lower Extremity Activity Scale (LEAS).[11] The LEAS scale has demonstrated reliability ($p<0.0001$), as compared to the WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index) or pedometer measures, and is easier to use.[11]

CHAPTER II

CASE DESCRIPTION

A forty-five year old construction worker presented to the physical therapy clinic with knee dysfunction. The patient reported injuring his left knee twenty years previously with what he described as a bad sprain. In retrospect, it appears to have been a partial tear of the anterior cruciate ligament. The patient reported having periodic aches and pains in his knee from that time on, which did not significantly disturb his level of activity. A recent change in job tasks for the patient resulted in ladder climbing and more standing on cement floors. After the change in work tasks, the patients symptoms of pain and swelling in his knee increased. The increased signs and symptoms eventually prevented him from tolerating most dynamic activities involving the use of his left knee. His lower extremity function on the Lower Extremity Activity Scale (LEAS) was ranked at 7/18.

The patient saw his local physician, complaining of swelling and pain in his left knee, restricting him from performing work activities. The physician referred the patient for physical therapy with a working diagnosis of knee pain. The patient was also scheduled to see the orthopedic physician for recommendations of treatment options. The physical therapy evaluation concurred with the diagnosis of degenerative osteoarthritis in the left knee. Electrical stimulation for edema reduction and motor retraining were initiated in conjunction with home training on the use of ice and exercise.

The exercise program included isometric quad strengthening and progression toward isotonic strengthening of the thigh muscles as the joint tolerated. Over a two week period of treatments, the patient displayed a reduction of edema and pain. The lower extremity function ranking on the LEAS improved to 8/18. This indicates that he was now able to walk longer distances than one or two blocks allowing him to enter into the community, but he was still restricted in being able to ambulate long distances. He reported that when he attempted dynamic movements of his knee, similar to the working environment, the pain and swelling returned. At the end of four treatments over two weeks into this episode of care, the patient reported decreased pain and swelling while at rest. The patient indicated he was starting to show return of function, but deficits in work performance remained. The patient was evaluated by the orthopedic physician at this time. Arthroscopic debridement was scheduled and physical therapy was discontinued by the physician.

The following month, the patient received arthroscopic debridement of his left knee. Two weeks after the arthroscopy, the patient was seen for follow-up by his orthopedic physician. Residual complaints of pain and swelling in the patient's knee resulted in a physical therapy referral. The orthopedic physician recommended using heat, and referred the patient to physical therapy with a diagnosis of post-arthroscopic synovitis. Re-evaluation demonstrated a decrease in the LEAS scale to 6/18. The patient was treated with electrical stimulation with settings for edema reduction as well as for motor training, ice, and range of motion exercises. For edema reduction, a bi-phasic wave form with continuous pulses of a 120 microsecond wave with 40 microsecond interphase, at 80 cycles per second (Hz) for 30 minutes.[5,6,7] Intensity was set at "light

sensation". For motor training the following settings were used: "Russian" wave form incorporating a 50 Hz pulse rate with a 2500 Hz carrier wave, for 8 seconds contracting, 16 seconds rest, 2 seconds ramping up and down, for a total of 30 to 50 sets as the patient tolerated, and at an intensity as strong as the patient tolerated.[5,6,7] A total of six visits over a two week period ensued. During this time the patient worked into a home exercise program beginning with active range of motion through the range that the patient was able to perform comfortably, and progressing to strengthening exercises as his knee was able to demonstrate tolerance. Light activities of walking and periodic stair climbing were well tolerated without exacerbation of knee pain or swelling. The patient's lower extremity function as ranked on the LEAS was 8/18. After the two weeks of physical therapy he was seen for follow-up by his orthopedic physician. Physical therapy recommendations were to continue the physical therapy interventions and slowly progress the client to optimal function. Surprisingly, although the client had yet to regain full return to function, the orthopedic physician felt the patient was ready to be discontinued from physical therapy.

Nine months following his previous episode of care, this patient was again referred to physical therapy. The patient reported that he had attempted to return to work but again became restricted in function due to a return of pain and swelling in his knee. The patient was re-evaluated by the orthopedic physician resulting in a cemented TKA on 12/19/05. He had a short acute hospital stay of three days and returned home. Since the surgery, the patient reports contacting his local physician due to the pain and significant swelling in his knee. The local physician twice aspirated the knee in the week previous to the first physical therapy visit. Ten days after the operation, the patient was seen by

the orthopedic physician and referred to physical therapy with recommendations for treatment three times a week for three weeks to increase range of motion and decrease pain, but no strengthening other than straight leg raises. At the initial visit the patient displayed range of motion from -21 degrees extension to 63 degrees of flexion. Of primary concern was an area inferior and medial to the knee that was warm, discolored dark red and distended. Girth measurements were taken of both legs using a cloth tape measure with centimeter gradations. (See Table 1.) The circumferential measurements were used to monitor improvement or regression of the atypical swelling. It was noted that he was presenting with apparent atrophy of the muscles of his left thigh, which would actually cause a decrease in the measured difference from one leg to the other due to the swelling.

Table 1 Circumferential measurements of the knee ten days after total knee arthroplasty (measurements are reported in cm).

Location: to patella	5 cm above	Supra-patella	Mid-patella	Infra-patella	Tibial tubercle	5 cm below	10 cm below
Left	40.1	40.9	41.6	41.5	37.5	35.6	33.3
Right	40.0	37.6	38.1	35.3	32.9	33.3	33.7

The patient was walking with crutches with a rigid knee and a guarded, antalgic gait pattern on level surfaces. He still had staples in the surgical incision with a gauze dressing covering the incision site. No significant drainage or odor was noted. The patient had an obvious strength deficit in the involved leg, with quadriceps strength of 2/5 and hamstring strength of 3/5. He was unable to straight leg raise, but was able to hold the foot off the mat isometrically with 30 degrees of flexion at the knee. The patient

reported that his pain was typically controlled at "minimal" with the pain medication Lortab 5/500, a combination tablet with 5 mg of hydrocodone and 500 mg of acetaminophen. He reported taking 1 to 2 tablets every 4 to 6 hours as prescribed. His lower extremity function ranking on the LEAS scale was now 5/18. The patient's primary complaints were limited range of motion, decreased strength, edema, use of medications for pain control, limited function of his knee, and limited gait.

Assessment:

The Nagi Disablement Model[4] was used to correlate findings with goals and treatment options. (See Table 2.) The Nagi Disablement Model assesses active pathology, impairment, functional limitation, and disability. (See Table 2.) When correlating this schema to the presentation of the patient's evaluation and primary complaints, the active pathology was degenerative joint disease of his left knee, the impairment was the pain, edema, limited range and weakness related to being status post total knee arthroplasty. A functional limitation was the difficulty walking related to poor stance tolerance, poor knee mobility and poor tolerance to weight bearing. Finally, the client's disability is reflected by his inability to tolerate required work activities of standing, walking, negotiating stairs, climbing or carrying.

Table 2 Nagi disablement model upon initial outpatient therapy

Nagi Schema	Active Pathology	Impairment	Functional limitation	Disability
Current Patient	DJD of (L) knee	s/p TKA with pain, edema, limited range and weakness.	Walking difficulty related to stance, mobility and tolerance to weight bearing.	Unable to tolerate standing, walking, stairs, climbing and carrying activities for return to work.
Goals	Functional knee usage.	Increase (L) knee ROM. Increase strength. Reduce edema. Control pain.	(L) knee Ext. of 0 deg. Flex of 110 deg. Strength of 4/5 hams and quads. Pain controlled with periodic pain meds of not needing more than one a day.	The patient will be able to walk at a functional rate with equal and balanced stride without device over level, uneven and stairs while carrying light objects without instability. Able to return to work without exacerbation of pain or edema. (Score of 11 on LEAS.)
PT intervention	Physician referral for PT	Modalities, manual therapy and home program for ice/heat, med review, and exercises for ROM and strength	Modalities, manual therapy and home exercises for ROM and strength. Also: gait training, closed chain exercises.	Modalities, manual therapy and home exercises for ROM and strength. Gait training, closed chain exercises. Also: Patient education on self restriction/progression on exercises and activities. Recommendations/contacts with WSI case manager.

Goals:

Using the disablement model and previously described status, the following overlapping goals were established. 1) For the active pathology of degenerative joint disease of his left knee: The patient will have functional usage of his (L) knee by the time of discharge from physical therapy. 2) For the impairment of pain, edema, limited range and weakness: The patient will increase his left knee range of motion, increase the strength of his (L) quads and hamstrings, reduce edema to minimal, and control pain by the time

of discharge from therapy. 3) For the functional limitation of walking difficulty related to poor stance tolerance, poor knee mobility and poor tolerance to weight bearing: The patient will increase his left knee extension to 0 degrees, increase his left knee flexion to 110 degrees or greater, increase the strength to 4/5 of the hamstrings and quadriceps, and have his pain controlled with periodic pain medications of no more than one a day by the time of discharge from physical therapy. 4) For the disability of his inability to tolerate standing, walking, negotiating stairs, climbing or the carrying activities required for his return to work: The patient will be able to walk at a functional rate with equal and balanced stride without device over level, uneven and stairs while carrying light objects without instability; will demonstrate the ability to return to work without exacerbation of pain or edema; and will have function in his (L) knee correlating to a score of 11 on the LEAS by the time of discharge from physical therapy estimated in four months.

Prognosis and Plan of Care

Extending the Nagi Schema from the goals with the information obtained in the evaluation, a plan of treatment was established. This was correlated with research evidence to validate the treatment that was decided would be the most beneficial for this patient. Mizner et al[9] found that patients who had undergone total knee arthroplasty experienced a profound loss of quadriceps strength, marked failure of voluntary muscle activation, and a decrease in quadriceps cross-sectional area.[9] The current patient was presenting with quadriceps weakness with grade 2/5 strength and muscle atrophy consistent with previously published findings.[9] Fransen, McConnell and Bell found that strengthening can be effective in controlling pain and improving function in patients with

OA of the knee.[12] Durmus, Alayli and Canturk found that electrical stimulation can enhance quadriceps strengthening of an osteoarthritic knee.[8] More importantly, increasing the knee strength of a patient with OA translated into decreased pain and increased function. Therefore, to enhance muscle strengthening, this patient received modalities of electrical stimulation and ice, manual therapy of joint mobilization and stretching, and patient education involving gait training and home exercises for range of motion and strength as well as self restriction/progression on exercises and activities.

Intervention

Treatment was begun with electrical stimulation using four electrodes in a cross pattern across the knee joint with biphasic current at 100 Hz, 80 microseconds for 30 minutes[5], during which he also received cold packs for 15 minutes. Following this he was given mobilization to his knee. Anterior tibio-femoral glides with extension stretches were performed, and posterior tibio-femoral glides along with assisted flexion stretches. Grade III patellar mobilizations were initiated to improve patello-femoral mobility. Active-assisted knee flexion and extension range of motion movements were initiated to improve the overall range of motion. Range of motion exercises were continued until he began to develop fatigue and increased discomfort. He was unable to perform straight leg raises independently requiring minimal to moderate assistance from the physical therapist. He was instructed on a home exercise program of quad sets, to progress to straight leg raises when able; he was to continue with "heel slides" and was instructed on how to self assist with a belt. He was also instructed to use cold packs at home for ten minutes, two or more times per day.

At the second visit, the patient was slightly improved with mild increases in joint range of motion and decreases in pain and edema. Subsequent interventions continued similar to the initial treatment of electrical stimulation and exercises with the addition of gait training activities emphasizing heel strike, knee extension during swing phase, and weight bearing during stance phase. Two days after his second treatment and two days before his third visit, the patient reported an onset of increased pain and edema, as well as decreased range of motion. He was able to tolerate treatment as before. He had an appointment scheduled with his orthopedic physician for staple removal, and a status report was sent with him. Return communication from the physician was that therapy could be continued, and strengthening would be allowed. The patient was seen for a total of seventeen visits through February 20, 2006, during which he was weaned from modalities and progressed into an independent exercise program. He did report several more episodes of exacerbations, sudden brief onsets of pain, swelling, and reduced range, during the time he was receiving therapy.

Outcomes at Discharge

At the last visit, the patient was able to achieve 110 degrees of flexion and 0 degrees of extension, following a warm-up and passive stretching. He was able to straight leg raise with terminal knee extension and displayed a grade 3+/5 strength of quadriceps and hamstrings. Pain was reported as being moderate, occasionally taking one of his Lortab medications in a day, or taking a couple acetaminophen 500 mg tablets. He was able to walk on level surfaces without devices with a near normal but slightly slowed and slightly guarded gait. Also, he was able to climb stairs with reciprocating

gait if using a handrail. His left knee circumferential measurement at the mid-patella was 40.5 centimeters and at the tibial tuberosity was 36.5 centimeters. These showed an improvement of approximately one cm, but a continued presence of edema by about 2 to 3 cm. His lower extremity function ranking on the LEAS score was 9/18. He continued with periodic exacerbations of pain, edema, and restricted range.

On February 21, 2006, 64 days after the total knee arthroplasty surgery, the patient was re-evaluated by the orthopedic physician. A status report was presented to the physician, with physical therapy recommendations to continue treatments. After the appointment the patient presented a prescription from the physician to discontinue physical therapy and continue an independent exercises program.

CHAPTER III

DISCUSSION/REFLECTION

The aging of the workforce combined with the obesity epidemic in America is expected to cause a dramatic increase in the number of TKAs that will be performed. These patients will have expectations of higher functional outcomes than have been characteristically expected in the past. This patient had an uncharacteristically rapid progression from onset of knee pain, to arthroscopic debridement, to TKA. As a "younger than retirement aged" worker, this patient presented expectations of higher functional outcomes than have been characteristically seen. Although he was able to report significant relief of symptoms, and the patient was beginning to demonstrate early measurable improvements using a scale of function, this patient was discontinued from physical therapy by his orthopedic physician at each of his three episodes before reaching his goal of returning to work. It is of note that the patient was functioning at a level that would allow him to live safely at home and in the community, scoring 8 or 9 on the LEAS. This is the functional level previously expected of someone receiving a TKA. He was not functioning at a level that would allow him to return successfully to work, at a score of 10, 11 or 12 on the LEAS.

This patient was seen for three episodes of care over the course of 14 months. During the first episode, the patient presented with OA. He had redness, pain, swelling, weakness, and was not able to tolerate work activities. He was seen for physical therapy treatment and began to show improvement. Literature suggests that strengthening can be as effective as pain

medications in controlling pain in patients with OA of the knee.[12] The patient had a weak knee from an old history of trauma and was just starting to be able to tolerate strengthening when he was discontinued from physical therapy. Perhaps an extended episode of physical therapy intervention may have allowed him to return to work, may have allowed him to avoid arthroscopic debridement, or prepared him with a stronger knee to be able to recover more easily or completely from the arthroscopic debridement. Perhaps more clearly identifying the goals with the patient, and perhaps presenting the patient's goals more clearly to the physician may have allowed us to extend his rehab to accomplish the goals in a non-invasive, non-surgical manner.

During the second episode, the patient presented following arthroscopic debridement with synovitis. He had redness, pain, swelling, weakness, and was not able to tolerate work activities. Occasionally patients recover well following arthroscopy, being seen for minimal or no physical therapy intervention, and able to return to work after a short period of recuperation with rest at home. This patient was unable to achieve these goals independently, possibly due to prior existing OA. This patient was again seen for physical therapy treatment and began to show improvement. Again, perhaps an extended episode of physical therapy intervention may have allowed him to return to work, may have allowed him to avoid TKA, or prepared him with a stronger knee to be able to recover more easily or completely from the TKA. Again, perhaps more clearly identifying the patient's goals may have allowed us to continue further with rehabilitation. Although the standard practice of this third party payer is to allow physical therapy only under the referral of a physician, if the physician wasn't accepting of these goals perhaps the patient's third party payer would have accepted them, had they been presented with them. A couple of months of out patient physical therapy is certainly less expensive than paying

for a TKA. The average cost of a hospital stay for a TKA in 2005 was $36,000.[1] This patient's third party payer was billed $1,372 for the 17 visits to physical therapy during the two months following his TKA. Perhaps more complete rehabilitation at any of the three episodes could have reduced further deterioration of the patient's knee, allowed him to return more successfully to work, and at an over all lower cost to the third party payer.

For the third episode of physical therapy care, the patient presented following a TKA. He had redness, pain, swelling, weakness, and was not able to tolerate work activities. This patient was again seen for physical therapy treatment and began to show improvement. After normalizing range of motion but before achieving full strength and functional ambulation, the physical therapy was discontinued by the patient's orthopedic physician. The LEAS was used to measure function in each of the patient's episodes of physical therapy care.[11] There are other functional scales available that may be more appropriate at times, but it was determined that the LEAS most clearly demonstrated the patient's functional status. Perhaps the LEAS could have been presented to the physician along with where the patient was functioning on the scale. His current status compared to his goal status could have then been presented to the physician more clearly. Perhaps this may help physicians recognize that workers with goals of returning to work will need to continue their rehab further than what has been previously expected.

APPENDIX

APPENDIX A

Total Knee Arthroplasty Basic Exercise Routine

Ankle Pumps: With your leg relaxed, pull your toes up toward your knee, then point your toes down. Repeat, moving through full range.

Heel Slides: While lying down, slowly bend your knee by sliding your heel until a stretch is felt. If you need help bending you can place the loop of a belt or a rolled up sheet around your foot, so you can help pull.

Hamstring Sets: Similar to Heel Slides but instead of sliding your heel up, dig your heel into the bed. You should feel the muscle in the back of the thigh working.

Quad Sets: While lying down on a bed or the floor, place a small towel roll under your knee so your knee is almost straight. Tense the muscles on top of the thigh (quadriceps) by pushing the knee down into the towel. Hold for 5 to 10 seconds.

Short Arc Quads: Similar to Quad Sets, but use a larger roll such as a coffee can or ball under the knee. Straighten the knee by tightening the quad, keeping the back of the knee on the roll.

Straight Leg Raises: Similar to Short Arc Quads. Have the opposite knee bent, and tighten the abdominal muscles to support the low back. Keeping the knee locked straight, lift the foot 6 to 12 inches off the bed.

Standing Step Exercises

Lift Ups: Stand close to a step or stool, lift your foot up onto the step. Watch so your knee bends lifting your foot forward, and not swinging out to the side.

Glides: Stand with your foot up on a step or stool. Slowly rock forward, bending the knee. With the knee bent, place weight onto your bent knee like you are going to step up.

Stance: Stand with your good foot up on the step, involved leg down. Stand up straight with your involved knee straight, feeling your leg solid underneath you.

APPENDIX B

Lower Extremity Activity Scale*

Please read through each description given below, pick the ONE description that best describes your regular daily activity and put a check in that box (Check only one box).

☐ 1. I am confined to bed all day. (1)
☐ 2. I am confined to bed most of the day except for minimal transfer activities (going to the bathroom, etc.) (2)
☐ 3. I am either in bed or sitting in a chair most of the day. (3)
☐ 4. I sit most of the day, except for minimal transfer activities, no walking or standing. (4)
☐ 5. I sit most of the day, but I stand occasionally and walk a minimal amount in my house. (I may rarely leave the house for an appointment and may require the use of a wheelchair or scooter for transportation.) (5)
☐ 6. I walk around my house to a moderate degree but I don't leave the house on a regular basis. I may leave the house occasionally for an appointment. (6)
☐ 7. I walk around my house and go outside at will, walking one or two blocks at a time. (7)
☐ 8. I walk around my house, go outside at will and walk several blocks at a time without any assistance (weather permitting). (8)
☐ 9. I am up and about at will in my house and can go out and walk as much as I would like with no restrictions (weather permitting). (9)
10. I am up and about at will in my house and outside. I also work outside the house in a:
- ☐ minimally (10)
- ☐ moderately (11)
- ☐ extremely active job (12)

(Please check the best description of your work level.)

11. I am up and about at will in my house and outside. I also participate in relaxed physical activity such as jogging, dancing, cycling, swimming:
- ☐ occasionally (2-3 times per month) (13)
- ☐ 2-3 times per week (14)
- ☐ daily (15)

(Please check the best description of how often you participate in this activity.)

12. I am up and about at will in my house and outside. I also participate in vigorous physical activity such as competitive level sports:
- ☐ occasionally (2-3 times per month) (16)
- ☐ 2-3 times per week (17)
- ☐ daily (18)

**Actual score obtained is specified in parentheses at end of whichever statement is chosen.*

Appendix C

Examination & Intervention Algorithm

Total Knee Arthroplasty Algorithm

Patient presents 3 or more days post-operative.

Patient receives physical therapy evaluation, including assessment for the following expected problems:

I. Pain:
- Use of pain visual analog scale
- Review use of pain medications.

II. Edema:
- Minimal, Moderate, Severe.
- Use of girth measurements for monitoring.

III. Limited Flexion:
- Goniometric measurements.

IV. Limited Extension:
- Goniometric measurements.

V. Limited strength:
- Straight Leg Raise – Terminal knee extension measurements.
- Assess muscle strength.

VI. Limited Function:
- LEAS score.
- Gait analysis.
- Berg balance score.
- Tinnetti Assessment.

VII. Complications:
- Signs of infection.
- Signs of deep vein thrombosis.
- Other.

Establish Patient Goals.

General surgical recovery considerations:

Early rehabilitation phase general goals:

Allow healing.
Watch for complications.
Progressively increase range of motion as tolerated.
Very light strengthening.

Mid rehab phase goals:

(Continue to monitor post-operative knee.)
Increase range to toward full extension and 110^0 flexion.
Progressively increase strengthening as tolerated.
Gait/function training.

End rehab phase goals:

(Continue increasing range until achieved.)
(Continue increasing strength.)
Endurance training.
Progress gait/function training.
Proprioception training.

Establish a plan of treatment according to the assessment results, using the algorithm as a guide and modify according to the general surgical recovery considerations. Progress the patient in their rehab according to the following:

I. Pain:

Use visual analog pain scale, Review use of pain medications.

1. Is pain controlled?

No: Consider pain medication usage, consider physician/medication review.
Consider use of modalities, E. Stim. for pain control.
Review/instruct on use of ice/elevation.
After treatments, after home exercises, 2 to 4 times a day.
Review for pain-causing activities.

Yes: Consider scheduling prn medications to coordinate with treatments.
Review/instruct on use of ice, elevation prn.
Consider after treatments and 1 to 2 times a day.

II. Edema:

Minimal, Moderate, Severe.
Use of girth measurements for monitoring.

1. Is edema minimal/reducing?
   To be expected.
   Review on use of ice/elevation prn.

2. Is edema moderate?
   Instruct on edema reduction techniques.
   Review on use of ice/elevation after treatments, after home exercises, and 1 to 2 times a day.

3. Is edema severe?
   Consider notifying physician.
   Consider use of modalities, E. Stim. for edema reduction.
   Delay aggressive ROM, strengthening.
   Instruct on edema reduction techniques.
   Review on use of ice/elevation after treatments, after home exercises, and 2 to 4 times a day.

III. Limited Flexion:

Goniometric measurements.

1. Is flexion less than 90^0?
   Strong emphasis on obtaining flexion range of motion.
   Consider use of modalities, heat to quads prior to manual therapy.
   Extra precaution for burns, incision.
   Posterior tibial glide joint mobilization, patella mobilization.
   Flexion stretch, home exercise program.
   Self passive stretch.
   Assisted stretches during therapy.
   Incorporation of available range into activities.

2. Is flexion available to 90^0 but less than 110^0?
   Continue to work towards increasing flexion.
   Posterior tibial glide joint mobilization, patella mobilization.
   Active and passive stretch.
   Use of bike.
   Home exercise program.

3. Is flexion available to 110^0 or greater?
   Continue to work towards increasing flexion, but decreased emphasis.
   Focus on incorporation of flexion into function.

IV. Limited Extension:

Goniometric measurements.

1. Is extension less than -10^0?
   - Strong emphasis on obtaining extension range of motion.
     - Consider use of modalities, heat to hams prior to manual therapy.
       - Precaution for burns.
     - Anterior tibial glide joint mobilization.
     - Extension stretch, home exercise program.
       - Self passive stretch.
       - Assisted stretches during therapy.
       - Incorporation of available extension into activities.

2. Is extension -3^0 to -10^0?
   - Continue to work towards increasing extension.
   - Anterior tibial glide joint mobilization.
   - Active and passive stretch.
     - Home exercise program.

3. Is extension more than -3^0?
   - Continue to work towards increasing extension to 0^0, but decreased emphasis.
   - Focus on incorporation of extension into gait.

V. Limited Strength:

Straight Leg Raise – Terminal knee extension measurements, MMT

1. Is patient <u>unable</u> to maintain available extension during SLR?
   - Require use of assistive device for ambulation.
   - Consider use of E. Stim. – parameters for mm strengthening, focus on quads.
   - Instruct/review home exercise program.
   - Begin/continue isometric quad and hams.
     - Perform assisted isometric quads.
   - Progress to AROM exercises.
   - Strengthening exercises performed in the department as patient tolerates.

2. Is patient <u>able</u> to maintain TKE during SLR?
   - Progress home exercise program with resistive exercises.
     - Progress away from isometrics and into RROM, hams and quads.
     - Progress with closed chain resistive exercises as tolerated.
   - Strengthening exercises performed in the department as patient tolerates.
   - May progress away from assistive device if gait is stable.

VI. Limited Function:

LEAS score.
Gait analysis.
Berg balance score.
Tinnetti Assessment.

1. Patient is unable to walk without device with a stable gait.
   Progress in strengthening. (See above)
   Watch for pain control. (See above)

2. Toe clearance during swing phase of gait is insufficient.
   Check knee flexion. (See above)
   Check hamstring strength. (See above)
   Ride exercise bike.
   Gait training.
   Rockerboard exercises
   Step "lift-up" exercises

3. Patient is unable to stand erect with extended knee during stance phase of gait.
   Check knee extension. (See above)
   Check quad strength. (See above)
   Gait training.
   Rockerboard exercises.
   Step "stance" exercises.

4. Patient is unable to demonstrate dynamic stable gait.
   Progress with dynamic gait activities.
   Progress with endurance training.
   Progress with strength training.
   Progress with stair training.
      "Step down" exercises – able to slowly descend stairs.

VII. Complications:

Signs of infection.
Signs of deep vein thrombosis.
Other

1. Are there indications of infection?
   (red, pain, swelling, hot, drainage, odor)
   Notify/refer back to physician.
   Instruct/review use of ice.

   a. Signs/symptoms are mild, and physician notified.
      Proceed rehab with caution.

   b. Signs/symptoms are significant or unable to contact physician.
      Hold treatment.

2. Are there indications of deep vein thrombosis?
   (Homan sign positive, lower leg pain, ankle swelling)
   Hold treatment.
   Notify physician.

3. Are there other complicating factors of which the physician should be notified or for which treatment should be held or delayed?

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