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Knee Osteoarthritis Rehabilitation Guideline

This rehabilitation program is designed to reduce pain and increase functionality as quickly and safely as possible. It is designed for rehabilitation following diagnosis of knee osteoarthritis (OA). Modifications to this guideline may be necessary dependent on physician specific instruction, severity of pain/symptoms associated with OA, and/or comorbidity of other conditions. This evidence-based knee OA rehabilitation guideline is criterion-based; time frames and visits for each patient will vary depending on many factors including patient demographics, goals, and individual progress. This guideline is designed to progress the individual through rehabilitation to decrease symptoms of OA and allow for patients to continue living with functional independence and participate in active lifestyles. The therapist may modify the program appropriately depending on the individual's goals for activity while managing their OA.

This guideline is intended to provide the treating clinician a frame of reference for rehabilitation. It is not intended to substitute clinical judgment regarding the patient's care, exam/treatment findings, individual progress, and/or the presence of concomitant injuries or complications. If the clinician should have questions regarding progressions, they should contact the referring physician.

General Guidelines

- OA is a progressive condition. The goal of the rehabilitation guideline presented is to slow progression and relieve symptoms of knee OA.
- As OA progresses, patients may experience increased levels of pain associated with exercise/activity. Modifications to program will need to be made accordingly.
- Strength and ROM will vary by patient depending on severity of OA symptoms and/or other comorbidities. Program will need to be adjusted to match the abilities of each individual patient.
- Clinicians should provide consistent encouragement for patients to participate in routinely active lifestyles outside of therapy.
- General recommendation for frequency of treatment is 2 sessions per week for 8 weeks

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PHASE	SUGGESTED INTERVENTIONS	GOALS/MILESTONES FOR PROGRESSION
Phase I ***Minor/Mild OA*** Separation of phases is based off patient ability to participate in exercise. Phase I being the most intense, and II and III becomingly increasingly modified for more severe OA symptoms	***Discuss:*** Important for patients in all three phases • Importance of healthy living - Overweight individuals should be educated about weight loss - Weight control should be of utmost importance for both the clinician and patient for relieving OA symptoms - Recommended consultation with dietician for patients that are overweight - Various dieting methods, finding best fit for patients' lifestyle - Plant-based diets appear to have benefits for both weight loss and anti-inflammation[6] - Routine exercise/activity is critical to slow OA progression • Possible use of assistive devices (canes, walkers, braces, etc.) -Patients in phase II & III more likely to use such devices ***Specific Instructions:*** No exercises are off limits as long as no pain is present during or after the movement. Knee, hip, ankle position is critical during exercises to ensure proper joint loading. ***Suggested Treatments:*** Modalities as indicated: Heat and Ice For comfort/edema control ROM: Passive, AROM, and AAROM within pain tolerance Manual Therapy: joint mobilization, patellofemoral tracking, taping and soft tissue work around knee could all be used as supplemental treatments alongside exercise program[12]. ***Exercise Examples:*** weight and ROM during exercises will vary depending on pain experienced by patient. ***Combine exercises with blood flow restriction training as indicated - Knee, hip, and ankle mobility - Squats (alternative: wall squats) - Seated Leg press - Lunges - Leg extension/curls - Clamshells (banded if tolerable) - Calf raises - Balance work for joint stability (e.g. single leg stands on foam pad) ***Other Activities:*** Anything to promote routine physical activity: Biking, Swimming, Walking, Hiking, Elliptical, etc. • Group exercise/activity classes - Cost effective, and shown to provide better results than individual home programs[8] - Groups improve adherence to exercise program, as well as provide support/education to patients attempting weight loss	***Goals of Phase:*** *preservation of functionality and pain tolerance associated with the affected knee joint* 1. Improve/maintain flexibility/range of motion 2. Improve/maintain dynamic muscle control, balance, and proprioception 3. Build muscle strength, or prevent atrophy in lower extremities 4. Improve FOTO Scores 5. Improve other patient reported outcomes (WOMAC/IPAQ) ***Goals of Phase:*** 1. Body weight reduction of ≥ 5-10% has been shown to significantly reduce functional disability3,4 2. Decrease in body fat % has stronger correlation with decreased OA symptoms than just a decrease in body weight5,6 3. Consultation with dietician recommended to set personal diet and weight loss goals)

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Phase II ***Moderate OA***	***Specific Instructions:*** No exercises are off limits, but limitations due to pain will be more frequent than in Phase I, adjust protocol as needed. ***Suggested Treatments:*** Modalities as indicated: Heat and Ice For comfort/edema control ROM: Passive, AROM, and AAROM within pain tolerance Manual Therapy: joint mobilization, patellofemoral tracking, taping and soft tissue work around knee could all be used as supplemental treatments alongside exercise program[12]. ***Exercise Examples:*** weight and ROM during exercises will vary depending on pain experienced by patient. ***Combine exercises with blood flow restriction training as indicated - Knee, hip, ankle mobility - Half squats - Wall squats - Seated leg press - Leg Extension/Curls - Straight leg raises - Calf Raises - Balance exercises w/ foam pad (single or double-legged) - Hip adduction/abduction (side-lying leg raises, fire hydrants, clamshells, etc.) ***Other Activities:*** Biking, Swimming, Walking, Hiking, Elliptical, etc.	***Goals of Phase:*** *preservation of functionality and pain tolerance associated with the affected knee joint* 1. Improve/maintain flexibility/range of motion 2. Improve/maintain dynamic muscle control, balance, and proprioception 3. Build muscle strength, or prevent atrophy in lower extremities 4. Improve FOTO Scores 5. Improve other patient reported outcomes (WOMAC/IPAQ)

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Phase III ***Severe OA***	***Specific Instructions:*** Patients in this phase will be very limited in regard to resistance training. Promote any type of physical activity that does not cause pain. Healthy eating habits become more critical as physical function is hindered greatly from the progression of OA. Preparation for knee arthroscopy for patients with very advanced symptoms. ***Suggested Treatments:*** Modalities as indicated: Heat and Ice For comfort/edema control ROM: Passive, AROM, and AAROM within pain tolerance Manual Therapy: joint mobilization, patellofemoral tracking, taping and soft tissue work around knee could all be used as supplemental treatments alongside exercise program[12]. ***Exercise Examples:*** weight and ROM during exercises will vary depending on pain experienced by patient. ***Combine exercises with blood flow restriction training as indicated - Knee, hip, and ankle mobility - Quad sets (add straight leg raise if pain is not present) - Seated marches - Pillow squeeze between legs (sitting in chair or lying down on side) - Side lying straight leg raise - Sit to stand - Step ups - Hip adduction/abduction (side-lying leg raises, fire hydrants, clamshells, etc.) - **Any exercises from phase I & II can be utilized if patient does not experience pain during or after movement** ***Other Activities:*** Biking, Swimming, Walking, Elliptical	***Goals of Phase:*** *preservation of functionality and pain tolerance associated with the affected knee joint* 1. Improve/maintain flexibility/range of motion 2. Improve/maintain dynamic muscle control, balance, and proprioception 3. Build muscle strength, or prevent atrophy in lower extremities 4. Improve FOTO Scores 5. Improve other patient reported outcomes (WOMAC/IPAQ)

***Further information on blood flow restriction training:

Literature states that in order to achieve optimal gains in muscle mass and strength, individuals must train at capacities greater than 60% of their one repetition maximum (1-RM)[13,14]. Training at such high intensities for patients with OA can be a challenge due to the stress applied to their affected joint(s). Interventions utilizing blood flow restriction, in combination with low-load resistance training (≈20-40% 1-RM), have been shown to achieve similar results for muscle hypertrophy as interventions using high resistance training methods[9,10,11]. The ability to achieve high-intensity results from a low-intensity program provides great opportunity for use in rehabilitation protocols for patients with OA. A small handful of studies have specifically compared high and low intensity programs with/without the use of BFR, in the treatment of OA, and the results have been promising for demonstrating the efficacy of BFR in OA rehab. Ferraz et al. has conducted the most complete study comparing these training methods. In this 12-week training study, the results showed significant improvements in strength and WOMAC scores for the high intensity and low intensity w/ BFR groups when compared to the low intensity group. The low intensity w/ BFR group was the only group to see significant improvements in the pain and stiffness subscales of the WOMAC, while it is important to note that the high intensity group lost 4 participants to knee related pain experienced during training[2]. BFR training continues to show great potential in rehabilitation programs for OA patients and should be looked at as a viable method for building/preserving muscle mass.

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