OSTEOARTHRITIS (OA) affects approximately 1 out of every 2 adults over age 65 and 85% of those 75 years and older.\(^1\) Approximately 21 million Americans have OA, with healthcare costs for its management in the United States exceeding $60 billion annually.\(^2\) The World Health Organization (WHO) has reported that knee OA is the fourth most important global cause of disability in women, and the eighth most important in men.\(^3\) Knee OA is the most common form of degenerative joint disease, which affects both men and women and has increasing prevalence with advancing age. When considering the aging population of today’s society, the economic burden of this musculoskeletal disorder is increasing at a staggering rate.

The purpose of this report is to highlight the need for exercise interventions in the treatment of knee OA. Exercise can be beneficial for knee OA patients; however, the extent of the role exercise plays is dependent on the stage of disease severity and the age of the patient. This report provides information on the role exercise can play in the treatment of all levels of knee OA severity.

**Pathoetiologic of Knee OA**

Knee OA can involve multiple structures of the joint complex; however, the primary pathological ailment is an alteration in the normal process of articular cartilage degradation and synthesis. This alteration results in erosion of the cartilage, which leads to a decrease in the cushioning of the joint articular surfaces. Concurrently, osteophytes develop at the joint margins and bone cysts develop adjacent to the articular cartilage. With the progression of hyaline cartilage degradation, the arthrokinematics of the joint become altered, which causes abnormal loading patterns and contact pressures on the joint surfaces. Ultimately, this induces chronic joint pain, chronic swelling, joint malalignment, and decreased function.

**Neuromuscular Consequences of Knee OA**

Many patients with knee OA exhibit atrophy of the muscles surrounding the joint, especially in the quadriceps muscle group. Quadriceps atrophy presents two clinical problems: diminished dynamic joint stability and decreased strength. The gradual decline in quadriceps strength seen in knee OA has been attributed in part to arthrogenic muscle inhibition, which is an impairment in the central nervous system’s ability to fully
activate the muscle. The quadriceps muscle group is the primary dynamic stabilizer of the knee joint; active contraction reduces displacement of the tibia on the femur. Therefore, quadriceps atrophy could lead to excessive loading of the knee during activities of daily living that require quadriceps activation for maintenance of knee stability (e.g., level walking, stair climbing). Increased loading can accelerate the degeneration of the joint surfaces and exacerbate joint pain. During gait, an eccentric contraction of the quadriceps muscle is required to attenuate impact loading at the knee articular surfaces. Research has demonstrated a 22–36% lower isokinetic quadriceps peak torque to body weight ratio and a 30–40% lower maximum voluntary contraction in patients with knee OA compared to healthy matched controls.

**Effectiveness of Exercise as an Intervention for Knee OA**

Because muscle weakness plays such an important role in the development of OA, it is increasingly evident that exercise plays a critical role in the management of the condition. Although activity avoidance by knee osteoarthritic patients is common, exercise is an effective nonpharmacological treatment for knee OA. The American College of Rheumatology (ACR) has approved regular exercise as a therapeutic approach for the management of knee OA. Systematic reviews of nonpharmacological interventions have documented the effectiveness of exercise in reducing pain and disability. Evidence suggests that stretching, strengthening, and aerobic exercise decrease pain and improve muscular strength, functional ability, and psychological well-being. Exercise increases muscle endurance, improves proprioceptive acuity, and decreases arthrogenic muscle inhibition of the quadriceps. These benefits can facilitate weight loss in the obese patient, lead to improvements in cardiovascular function, and produce significant increases in self-esteem and self-reported functional capacity. The available research evidence clearly supports implementation of exercise programs for OA patients.

**Exercise Programming for Knee OA**

An exercise program for the knee OA patient should consist of simple, practical, and progressive exercise protocols. These need to be individually designed to accommodate the level of the OA severity, and they must be continually revised to adapt to progression of the patient’s functional capabilities. Exercises will differ in frequency, intensity, and duration, depending on the individuals OA severity. Factors such as age, gender, weight, OA severity, and lifestyle should be considered. It is imperative that knee OA exercise programs should not involve high-impact loading.

Although simple activities are recommended, there are specific exercise goals for patients with knee OA (Figure 1). The exercise program should decrease pain, increase range of motion, increase strength, normalize gait, and improve the ease of daily activities. They should reduce joint stress by attenuating joint forces, improve joint biomechanics, and improve physical fitness level. Research has demonstrated that the benefits of exercise for knee OA patients may go beyond the strengthening of surrounding musculature. There is evidence that regular physical activity may strengthen knee cartilage. Dynamic loading of cartilage has a trophic effect that can cause cartilage to become thicker. Because decreased cartilage thickness is the hallmark pathologic indicator of OA, individuals who regularly engage in physical activity may be less susceptible to its development.

Many randomized trials and systematic reviews have addressed exercise program components for knee OA patients. Currently, there are no widely-recognized guidelines. A review of the available research suggests that the most effective exercise pro-

![Figure 1](Goals of exercise in the treatment of knee OA.)