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OUTPATIENT DIALYSIS PATIENT EXERCISE PROGRAMS: IMPACT ON FATIGUE AND CARDIOVASCULAR RISK

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Patients with end-stage renal disease (ESRD) undergoing maintenance hemodialysis (HD) or peritoneal dialysis (PD) experience disproportionately high rates of fatigue and cardiovascular morbidity. Fatigue in this population is multifactorial, and cardiovascular disease (CVD) remains a leading cause of mortality. Exercise training has gained recognition as a therapeutic intervention to address both fatigue and CVD risk factors.

Objectives:

- To analyze the pathophysiology of fatigue and cardiovascular health in CRF and how exercise modulates these processes.
- To evaluate the effectiveness of different exercise modalities (aerobic, resistance, combined, intradialytic, and nondialytic).
- To evaluate implementation challenges and strategies to improve adherence

The literature search was performed in databases like PubMed, Embase, Google scholar and Cochrane Central Register of Controlled Trials (2000-2024).

Impact on Fatigue. Fatigue improvement appears mediated through multiple pathways.

Muscle metabolism: HD patients exhibit severe muscle wasting (Johansen et al., 2020). Resistance training 3x/week increases lean mass by 5-8% and mitochondrial oxidative capacity (Cheema et al., 2010).

Anemia modulation: Exercise stimulates erythropoietin responsiveness, reducing fatigue independent of Hb levels (Koufaki et al., 2014).

Psychosocial effects: RCTs demonstrate 30-40% reduction in depression scores with exercise, correlating strongly with fatigue improvement (Ouzouni et al., 2009).

Cardiovascular Benefits. Hemodynamic Effects include blood pressure control: Intradialytic cycling 3x/week reduces pre-dialysis SBP by 11-14 mmHg (Van Vilsteren et al., 2005). Mechanisms include improved fluid removal via increased ultrafiltration, restored baroreflex sensitivity, reduced arterial stiffness (PWV decreases by 0.8-1.2 m/s after 6 months).

Metabolic Improvements connected with Lipid profile: combined aerobic-resistance training increases HDL by 15% and lowers triglycerides by 20% (Kouidi et al., 2010). Regular exercise reduces CRP levels by 35–40% and IL-6 by 25% (Castaneda et al., 2004), thereby reducing inflammation.

Exercise Affects Endothelial Function: Flow-mediated dilation improves by 3-5% after 12 weeks of training (Mustata et al., 2011).

Left ventricular remodeling: Aerobic exercise reduces LV mass index by 8-12 g/m2 (Howden et al., 2015). Despite the obvious good influence, there are adherence barriers: only 40-50% of patients complete >80% of prescribed sessions (Heiwe et al., 2011). Major obstacles include post-dialysis exhaustion, transportation issues, and lack of staff supervision. Emerging evidence favors hybrid models (center-based + home exercise) with shorter, more frequent sessions (20-30 min) with resistance training emphasis for muscle preservation.

Exercise programs significantly reduce fatigue and reduce cardiovascular risk in dialysis patients through multifaceted physiological mechanisms. While challenges in implementation persist, structured programs incorporating resistance training and hemodynamic monitoring show particular promise. Future research should focus on personalized protocols and telehealth solutions to improve accessibility.