

Significance of Home Health Physical Therapy to Help Seniors with Type II Diabetes Mellitus Related Mobility Issues

Shivangi Chaughule and Isha Bhonde*

Fox Rehabilitation, Jersey City, USA

*Corresponding author

Isha Bhonde, Fox Rehabilitation, Jersey City, USA.

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ABSTRACT

Home health physical therapy plays a crucial role in managing mobility issues in seniors with diabetes. Diabetes-related complications such as peripheral neuropathy, muscle weakness, joint stiffness, and poor circulation can significantly impact an individual's ability to perform daily activities, increasing the risk of falls and disability. This article explores the significance of home-based physical therapy in addressing these challenges through tailored exercise programs, balance training, and functional mobility interventions. By incorporating strength training, gait rehabilitation, and patient education, physical therapists help improve overall mobility, enhance quality of life, and promote independence in diabetic seniors. Additionally, home-based care ensures personalized treatment in a comfortable environment, reducing hospitalizations and improving long-term outcomes. The integration of physical therapy into diabetes management can effectively mitigate mobility impairments and support aging in place for older adults.

What is diabetes mellitus?

The defining feature of diabetes is the presence of hyperglycemia. The most common forms of diabetes are type 1 diabetes, in which an absolute deficiency of insulin ensues consequent to pancreatic beta cell destruction; and type 2 diabetes, in which insulin resistance may lead to hyperglycemia. [1]. Obesity is an important risk factor for type 2 diabetes, and it is on the rise. [2]. **Diabetes mellitus (DM)** is a chronic metabolic disorder characterized by high blood glucose (sugar) levels due to defects in insulin production, insulin action, or both. It is a widespread condition affecting millions of people globally and can lead to severe complications if left untreated.

Types of Diabetes

- » **GESTATIONAL DIABETES** - Glucose tolerance disorder that occurs or is diagnosed for the first-time during pregnancy [3]. Gestational diabetes, which presents in pregnancy, affects 4% to 7% of pregnant women and usually disappears after pregnancy, but there remains a greater tendency for development of the disease at some future time [4].
- » **TYPE 1 DIABETES**- β -cell destruction that leads to an absolute insulin deficiency mostly transmitted immunologically. Checkpoint inhibitor-induced diabetes, LADA (latent autoimmune diabetes in adults): classified as type 1 diabetes.

- » **TYPE 2 DIABETES MELLITUS**- Can range from a predominant insulin resistance with a relative insulin deficiency to a largely secretory defect with insulin resistance. Is often associated with other diseases (e.g. the metabolic syndrome).
- » **OTHER SPECIFIC TYPES OF DIABETES**- Exocrine pancreatic diseases (e.g. pancreatitis, cystic fibrosis, hemochromatosis), Endocrinopathies (e.g. Cushing's syndrome, acromegaly, pheochromocytoma), Medically-chemically induced (e.g. glucocorticoids, neuroleptics, interferon- alpha, pentamidine).

How it affects the body?

Diabetes mellitus impacts multiple organ systems due to chronic high blood sugar (hyperglycemia). It leads to both **short-term** metabolic disturbances and **long-term** complications affecting blood vessels, nerves, and organs.

Effects on the Endocrine System

- **Impaired insulin regulation:** In Type 1 Diabetes (T1DM), the body stops producing insulin. In Type 2 Diabetes (T2DM), insulin resistance develops, making it harder for cells to use glucose.
- **Disrupted hormone balance:** Increased glucagon secretion leads to excessive glucose production by the liver, worsening hyperglycemia.

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Effects on the Cardiovascular System

- **Atherosclerosis:** High glucose damages blood vessel walls, increasing plaque buildup, leading to heart disease, stroke, and high blood pressure.
- **Increased risk of heart attack and stroke:** Poor circulation and inflammation raise the chances of clot formation.
- **Peripheral artery disease (PAD):** Poor blood flow, especially in the legs, increases the risk of ulcers and amputations.

Effects on the Nervous System (Diabetic Neuropathy)

- **Peripheral neuropathy:** Tingling, numbness, or burning pain in hands and feet due to nerve damage.
- **Autonomic neuropathy:** Affects involuntary functions, leading to issues like:
 - o Gastroparesis (delayed stomach emptying, nausea, bloating).
 - o Bladder dysfunction (urinary retention, incontinence).
 - o Orthostatic hypotension (sudden drop in blood pressure when standing).

Effects on the Kidneys (Diabetic Nephropathy)

- **Glomerular damage:** High sugar damages kidney filters, leading to protein leakage in urine (proteinuria).
- **Chronic kidney disease (CKD):** Over time, diabetes can lead to kidney failure, requiring dialysis or transplantation.

Effects on the Eyes (Diabetic Retinopathy)

- **Damage to retinal blood vessels:** Can cause vision problems, including:
 - o Blurry vision.
 - o Retinal hemorrhages.
 - o Blindness in severe cases.
- **Increased risk of cataracts and glaucoma.**

Effects on the Skin and Immune System

- **Slow wound healing:** High glucose impairs white blood cell function, increasing infection risk.
- **Higher susceptibility to infections:** Fungal (e.g., candidiasis), bacterial (e.g., cellulitis), and urinary tract infections are more common.
- **Diabetic foot ulcers:** Poor circulation and nerve damage make minor injuries worse, increasing the risk of amputations.

Effects on the Digestive System

- **Gastroparesis:** Slow stomach emptying leads to nausea, bloating, and vomiting.
- **Diarrhea or constipation:** Due to nerve damage in the intestines.

Effects on the Reproductive System

- **Men:** Erectile dysfunction due to nerve and blood vessel damage.
- **Women:** Irregular menstrual cycles, higher risk of polycystic ovary syndrome (PCOS), and complications during pregnancy (gestational diabetes).

How does physical therapy help manage diabetes?

Physical therapy plays a crucial role in managing diabetes by improving **glucose control, reducing complications, and enhancing overall quality of life.** Regular physical activity and

therapeutic exercises improve **insulin sensitivity, circulation, and mobility**, which are essential for individuals with diabetes.

Aerobic Exercises

Short-term aerobic exercise training improves insulin sensitivity in adults with T2D, paralleling improved mitochondrial function [5]. Meta-analyses and systematic reviews have confirmed that regular aerobic exercise training improves glycemia in adults with T2D, with fewer daily hyperglycemic excursions and 0.5-0.7% reductions in hemoglobin A1C [6-10].

Types of aerobic exercises include-

- Walking (Brisk Walking)-** One of the safest and most accessible exercises. Increases insulin sensitivity and lowers blood sugar levels after meals.
- Cycling-** Low-impact exercise that improves circulation and leg strength. Beneficial for those with diabetic foot complications.
- Swimming & Water Aerobics-** Offloads the joints, making it ideal for overweight individuals or those with arthritis. Improves cardiovascular endurance.
- Running & Jogging-** Effective for weight loss and improving heart health. Should be done with proper footwear to prevent diabetic foot injuries.
- Dancing & Zumba-** Engaging and fun way to burn calories and improve glucose metabolism. Helps reduce stress and improve coordination.

Resistance Training Exercises

Resistance exercise training in adults with T2D typically results in 10-15% improvements in strength, bone mineral density, blood pressure, lipid profiles, skeletal muscle mass, and insulin sensitivity [11]. Combined with modest weight loss, resistance training may increase lean skeletal muscle mass and reduce A1C three-fold more in older adults with T2D compared to a calorie-restricted, non-exercising group that lost skeletal muscle mass [12]. A recent meta-analysis of resistance exercise suggests that high-intensity training is more beneficial than low-to-moderate-intensity training for overall glucose management and attenuation of insulin levels in adults with T2D [13].

Types of Resistance Training includes: -

- Bodyweight Exercises (No Equipment Needed)-**
 - Squats → Strengthens legs and improves lower body stability.
 - Lunges → Enhances balance and leg strength.
 - Push-ups → Builds upper body and core strength.
 - Planks → Improves core stability and posture.
- Resistance Band Exercises-**
 - Seated Leg Press (using resistance band) → Improves leg strength.
 - Bicep Curls & Tricep Extensions → Strengthens arm muscles.
 - Shoulder Press & Lateral Raises → Enhances shoulder mobility and posture.
- Free Weight Exercises (Dumbbells, Kettlebells, Barbells)-**
 - Deadlifts & Squats → Build lower body and core strength.
 - Bench Press & Rows → Strengthen chest, back, and arms.

- c. Overhead Press & Lateral Raises → Improve upper body strength.

IV. Machine-Based Strength Training (For Gym Workouts)-

- a. Leg Press, Leg Curl, & Calf Raises → Strengthen lower body muscles.
- b. Lat Pulldown & Seated Row → Improve back and shoulder strength.
- c. Chest Press & Shoulder Press → Enhance upper body endurance.

V. Functional Training & Core Workouts-

- a. Medicine Ball Throws & Kettlebell Swings → Improve dynamic movement and metabolism.
- b. Stability Ball Exercises → Enhance core strength and balance.

Flexibility Training

Flexibility exercises, including stretching, yoga, and mobility drills, play a crucial role in diabetes management. Exercises that enhance joint flexibility are highly beneficial for health and well-being in older adults with T2D. Limitations to joint mobility, resulting in part from glycation occurring with normal aging, may be accelerated by hyperglycemia [14]. While stretching exercises increase range of motion and flexibility [15], they generally do not impact glycemia unless undertaken as part of another PA such as yoga [16]. Flexibility exercises, alone or in combination with resistance training, has been shown to improve joint range-of-motion in individuals with T2D and facilitates participation in activities that require flexibility [15]. Moreover, flexibility training is generally low-intensity and easier to perform, thereby providing one possible entry into a more physically active lifestyle for less fit and older adults [17]. Full-Body Static Stretches like Hamstring Stretch (Leg Flexibility), Quadriceps Stretch (Thigh & Hip Flexibility), Calf Stretch (Ankle & Foot Mobility), Chest & Shoulder Stretch (Upper Body Mobility). Dynamic Stretches like Arm Circles, Leg Swings, Neck Rolls, Torso Twists.

Balance Exercises

Many lower body and core resistance exercises double as balance training [18]. Power training undertaken by adults with T2D can improve overall body balance [19]. Balance exercises may reduce the risk of falls by improving balance and gait, even in adults with peripheral neuropathy [20,21]. At-home balance exercises may reduce risk of falls even without significant changes in leg strength in older adults with T2D at increased risk for falls [21]. Balance exercises are essential for individuals with diabetes, particularly those with diabetic neuropathy, muscle weakness, or an increased fall risk. These exercises help improve stability, coordination, and posture while reducing the likelihood of injuries and falls.

When To Exercise

Overall, most studies have shown that postprandial exercise provides better glucose control by attenuating acute glycemic spikes, and greater energy expenditure postprandially reduces glycemia regardless of exercise intensity or type, with a longer duration (≥45 min) providing the most consistent benefits [22].

Precautions To Be Taken While Exercising

- o **Monitor Blood Sugar Levels Before, During, and After Exercise.** Check blood glucose levels before starting

exercise. Safe range: 100-250 mg/dL. Below 100 mg/dL: Eat a small snack (carbohydrates + protein) to prevent hypoglycemia. Above 250 mg/dL: Avoid intense exercise if ketones are present, as it can worsen hyperglycemia. Monitor during and after exercise, especially if exercising for a prolonged duration.

- o **Stay Hydrated-** Drink water before, during, and after exercise to prevent dehydration. Avoid high-sugar drinks unless treating low blood sugar.
- o **Wear Proper Footwear & Inspect Feet Regularly-** Choose well-fitted, cushioned shoes to prevent foot injuries and pressure sores. Always wear moisture-wicking socks to prevent blisters and infections. Check feet before and after exercise for cuts, sores, or blisters (due to neuropathy).
- o **Avoid High-Impact Exercises if You Have Neuropathy or Joint Issues-** Neuropathy can cause numbness and poor balance, increasing the risk of falls. Choose low-impact exercises such as: Walking, Swimming, Cycling, Chair exercises. Avoid jumping, running, or high-intensity movements if at risk of foot injuries.
- o **Warm-Up & Cool Down Properly-** Always warm up for at least 5-10 minutes with gentle movements to prevent injury. Cool down gradually to avoid a sudden drop in blood pressure. Be Cautious of Hypoglycemia (Low Blood Sugar)- Symptoms of hypoglycemia (low blood sugar) include Dizziness, Shakiness, Sweating, Confusion. Always carry a quick-acting carbohydrate (e.g., glucose tablets, fruit juice, hard candy) in case of low blood sugar.
- o **Avoid Overexertion & Exercise at the Right Time-** Exercise at a consistent time daily, preferably after meals to maintain stable blood sugar. Avoid exercising on an empty stomach or late at night, as it can cause low blood sugar during sleep. Listen to your body – if you feel dizzy, fatigued, or unwell, stop immediately.
- o **Be Mindful of Cardiovascular Strain-** If you have heart disease, avoid overexertion, and monitor for symptoms such as: Chest pain, Shortness of breath, Excessive fatigue. Follow a moderate-intensity exercise routine as recommended by a doctor or physical therapist.
- o **Modify Exercises Based on Individual Needs-** If you have joint pain or arthritis, opt for gentle stretching and resistance exercises. If balance is an issue, use a stable surface or assistance when exercising.
- o **Consult a Healthcare Professional Before Starting Exercise-** Get medical clearance from a doctor or physical therapist, especially if you have: Uncontrolled diabetes, Severe neuropathy, heart disease or high blood pressure, Diabetic foot ulcers.

Home Health Pt in T2dm

Home health physical therapy (HHPT) plays a crucial role in helping seniors with Type 2 Diabetes Mellitus (T2DM) manage mobility issues by providing personalized, accessible, and effective rehabilitation within the comfort of their homes. Many seniors with T2DM experience muscle weakness, joint stiffness, balance deficits, and nerve damage (diabetic neuropathy), which can severely limit their ability to walk, perform daily activities, and maintain independence. Due to these challenges, traveling to outpatient clinics can be difficult, making in-home therapy a more convenient and practical solution. A home health physical therapist evaluates the senior's functional limitations,

home environment, and safety risks to design an individualized exercise program that improves strength, flexibility, balance, endurance, and mobility while also preventing complications such as falls, foot ulcers, and cardiovascular decline.

A key benefit of HHPT is fall prevention and balance training, as diabetic neuropathy often leads to poor sensation in the feet, postural instability, and increased fall risk. Through targeted exercises, PTs help improve proprioception, leg strength, and coordination, enabling seniors to navigate their homes safely. Additionally, strength training and endurance exercises are essential in combating muscle loss and fatigue, both of which are common in diabetic seniors due to poor glucose metabolism. By incorporating low-impact aerobic activities, resistance training, and functional mobility exercises, HHPT not only enhances mobility but also helps regulate blood sugar levels, contributing to better diabetes management.

Furthermore, flexibility and joint mobility exercises are incorporated to address stiffness and pain caused by conditions like diabetic arthropathy and frozen shoulder, ensuring seniors can move more freely with less discomfort. Physical therapists also educate seniors and caregivers on safe movement strategies, home modifications, and diabetic foot care to prevent complications such as pressure ulcers and infections. Since diabetes is closely linked to cardiovascular health, HHPT includes gentle cardiovascular conditioning to improve circulation and reduce the risk of heart disease, a common comorbidity in T2DM patients.

Overall, home health physical therapy offers a holistic, patient-centered approach that enhances strength, balance, mobility, and overall quality of life for seniors with T2DM. By delivering care in a familiar, safe, and supportive environment, HHPT empowers seniors to regain independence, reduce the risk of complications, and continue performing daily activities with greater ease and confidence.

Conclusion

In conclusion, home health physical therapy (HHPT) is a vital intervention for seniors with Type 2 Diabetes Mellitus (T2DM) who face mobility challenges due to complications such as muscle weakness, diabetic neuropathy, joint stiffness, balance deficits, and cardiovascular limitations. By bringing skilled therapy services directly to the patient's home, HHPT eliminates transportation barriers and provides a safe, comfortable, and personalized rehabilitation experience. Through a comprehensive approach that includes strength training, flexibility exercises, balance retraining, endurance conditioning, and functional mobility training, home health physical therapy helps seniors regain their ability to perform daily tasks, maintain independence, and reduce their risk of falls and injuries. Additionally, because diabetes increases the likelihood of foot ulcers, infections, and poor circulation, HHPT incorporates education on foot care, proper movement techniques, and home safety modifications to prevent complications that could lead to hospitalization or long-term disability.

Beyond improving mobility, HHPT plays a crucial role in blood sugar regulation and cardiovascular health by encouraging safe and structured physical activity, which enhances insulin sensitivity and overall metabolic function. The one-on-one care

provided by physical therapists ensures that exercises are adapted to the patient's individual needs, medical history, and home environment, making the rehabilitation process both effective and sustainable. Furthermore, therapists educate both patients and caregivers on strategies to manage diabetes-related symptoms, prevent complications, and maintain an active lifestyle, fostering long-term health benefits. By addressing the unique mobility concerns of seniors with T2DM, home health physical therapy not only enhances physical function and quality of life but also promotes greater confidence, safety, and independence, allowing seniors to age in place with dignity and improved well-being.

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