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Physical Activity and the Type 2 Diabetic Patient

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Why Should Exercise Be Recommended for Individuals with Type 2 Diabetes?

Individuals with type 2 diabetes have significantly greater risk for cardiovascular disease (CVD) and mortality than their non-diabetic counterparts.¹ This is due partly to chronic hyperglycemia itself, and also to the clustering in type 2 diabetes of additional risk factors for CVD including insulin resistance, abdominal obesity, low levels of high-density lipoprotein (HDL) cholesterol, and inflammation [reflected in C-reactive protein, interleukin-6 (IL-6) and tumor necrosis factor α (TNF α)].² However, population-based studies have shown that more frequently active and/or aerobically fit type 2 diabetic individuals have a much lower risk of CVD, cardiovascular death and overall

mortality compared to their more unfit, sedentary counterparts.³⁻⁶ Exercise is also an important part of secondary prevention, improving aerobic capacity and health-related quality of life in individuals recovering from cardiac events.⁷

“...more frequently active and/or aerobically fit type 2 diabetic individuals have a much lower risk of CVD, cardiovascular death and overall mortality compared to their more unfit, sedentary counterparts...”^{3,6}

What Are the Current Recommendations for Exercise In Type 2 Diabetes?

A recent randomized controlled trial showed that a combination of aerobic and resistance exercise can significantly improve several cardiovascular risk factors in type 2 diabetic

individuals, to a greater extent than either type of exercise alone.⁸ Combined exercise programs have reduced waist circumference, HbA1c, total cholesterol, low-density lipoprotein (LDL) cholesterol, triglycerides, systolic and diastolic blood pressure and have increased insulin sensitivity, fat-free mass and HDL cholesterol in type 2 diabetic individuals.⁸⁻¹⁰

These findings have led to the recommendation that diabetic individuals perform both aerobic and resistance exercise on a regular basis. At least 150 minutes of moderate intensity aerobic activity (50 to 60% of maximal aerobic capacity (VO₂max)) or 90 minutes of vigorous (>60% VO₂max) aerobic activity should be performed per week.⁸ A day's exercise need not be performed in a single session, but can be accumulated throughout the day in bouts lasting at least 10 minutes each. Resistance exercise, such as weight lifting, should be performed at least three times per week at a moderately high intensity (8 repetitions of the maximum weight that can be lifted 8 times (8 RM)) and should include exercises targeting all major muscle groups. Individuals who have never performed resistance training or are returning after a long break should receive instruction and periodic supervision by a qualified exercise specialist. Previous concerns related to the safety of resistance training have generally been alleviated by studies showing that even vulnerable cardiac patients can benefit from properly-performed resistance training without the occurrence of adverse events.¹¹

Practical Considerations for Physical Activity

Blood Glucose

While general guidelines exist for pre-existing blood glucose levels, regular testing before, during and after activity will help ensure safety in patients taking insulin or insulin secretagogues (medications that increase insulin levels). Insulin secretagogues include sulfonylureas (e.g. glyburide, gliclazide, glimepiride) and meglitinides (repaglinide, nateglinide). Prior to exercise if glucose is measured at, or lower than, 5 mmol/L and has been showing a decreasing trend in a patient taking insulin or an insulin secretagogue, extra carbohydrate before exercise may be required.¹² For patients with type 2 diabetes, there is no specific high glucose level at which exercise should be considered contraindicated if the patient is feeling well. However, if the

patient is not feeling well and fasting glucose is over 15 mmol/L or non-fasting glucose is over 20 mmol/L, we would suggest deferral of exercise. Patients with this degree of hyperglycemia should also be asked to consult their diabetes care providers for advice on improving their glucose control.

Carbohydrate Consumption and Medication Adjustments

As hypoglycaemia is less common during exercise in type 2 than in type 1 diabetic individuals, consuming extra carbohydrate before, during or after bouts of moderate exercise lasting less than 90 minutes is usually unnecessary. Patients taking insulin or sulphonylureas may need to reduce the doses of these medications on days when physical activity is planned, and ensure that medication is not exerting its peak action during the exercise session. Knowing the exact amounts to adjust these medications may require some trial and error while maintaining careful glucose monitoring until the appropriate reductions are determined. It is also recommended that patients avoid injecting insulin near muscle groups that will be used during activity.¹²

What Factors Can Affect Physical Activity Practices In Type 2 Diabetic Individuals?

Physical Barriers

Higher body weight has been associated with lower physical activity levels in individuals with type 2 diabetes.¹³ The prevalence of osteoarthritis, especially of the knee, is also more common in overweight sedentary individuals in comparison to normal weight counterparts. While osteoarthritis and excess weight can both lead to difficulty, discomfort, and even injury while performing exercise, regular activity has been shown to reduce joint pain and improve quality of life in individuals with these conditions.¹⁴ Those with joint pain should be encouraged to exercise within the limits of this pain, which may involve performing non weight-bearing activities such as cycling or swimming. Resistance training should also be encouraged for this group as improved strength in the muscles around painful joints can improve mobility and decrease pain.¹⁴

Mild diabetic retinopathy should not interfere with the performance of physical activity. If a patient has untreated severe non-proliferative, or proliferative retinopathy, vigorous aerobic

activity should not be commenced until several months after the retinopathy has been treated. These individuals should still be encouraged to participate in light to moderate exercise such as walking or swimming.

Both peripheral and autonomic neuropathy may cause difficulty in performing certain types of activity and could increase the risk of exercise-related injuries.¹⁶ Peripheral neuropathy in type 2 diabetic individuals increases the risk of skin breakdown and infection, as well as the risk of Charcot joint destruction, due to decreased sensation in the extremities. For this reason, non weight-bearing activities (swimming, bicycling, rowing) have usually been recommended for these individuals. However, a recent randomized trial¹⁷ showed that a 12-month walking intervention did not increase the risk of foot ulceration in the exercise group as compared to controls. All patients in this trial received regular foot care. Regardless of the activity performed, feet should be checked frequently for blisters, sores, or signs of infection. Where autonomic neuropathy is suspected, screening for cardiac ischemia is recommended before increasing the intensity of physical activity, as the risk of coronary disease is high in such individuals. Supervision during exercise should be recommended at least initially, as there is also the risk of postural hypotension, impaired thermoregulation and unpredictable carbohydrate delivery from gastroparesis.¹⁶

Type 2 diabetic individuals with known CVD, or those who are middle-aged and older and have additional cardiac risk factors, should not be discouraged from physical activity but should rather be encouraged to start with short periods of low-intensity exercise. The duration and intensity of activity can be increased gradually within the patient's level of comfort and ability. Individuals with relative physical contraindications will benefit greatly from supervision by a qualified exercise specialist or personal trainer to ensure appropriate training progressions and exercise techniques at all times especially when physical activity involves any form of resistance training (free weights, weight machines). A recent large trial¹⁸ showed that supervised, facility-based aerobic and resistance training plus physical activity counseling resulted in significant improvements in multiple cardiac risk factors in type 2 diabetic individuals over a one-year period compared to physical activity counseling alone.

Psychological Barriers

Motivational barriers, often related to the patient's own belief in their ability to perform physical activity may interfere with regular exercise participation. For diabetic patients with co-morbidities, this can be especially complicated as their own perceptions of their condition (whether severe or not from a clinical standpoint) can act as a psychological barrier.¹³ Ensuring that exercise initiation is performed with expert instruction and supervision will assist in overcoming this by providing patients with the motivation, confidence and skills necessary to progress.¹⁹ Where possible, patients should be provided with one-on-one or group counseling in order to have exercise programs tailored to their individual needs, abilities, preferences and equipment availability.

“Ensuring that exercise initiation is performed with expert instruction and supervision will assist in overcoming this by providing patients with the motivation, confidence and skills necessary to progress.”

Setting specific goals, that are measurable, attainable, realistic and timely (S.M.A.R.T.) at the outset should help maintain motivation by allowing patients to see their progress and gain confidence from it.²⁰ For this reason, resistance exercise, alone or in combination with aerobic exercise, may be more motivating in this population as increases in the number of repetitions or sets performed as well as the amount of weight lifted are easily measured. In addition, encouraging patients to participate in activities and/or sports that they enjoy or where they will receive social and moral support from others may be beneficial in overcoming some of their aversion to exercise.

Socioeconomic Barriers

In some cases, patients who are physically able and mentally willing to take part in physical activity can be challenged by socioeconomic factors. For those in lower socioeconomic strata gym memberships and organized physical activity programs can be prohibitively expensive, although many community facilities offer reduced fees for lower-income people. Walking, while easy and inexpensive is only feasible if there is a safe place in which to do it. In certain cultures, beliefs regarding the ideal shape, or restrictions on social contact with the opposite sex, may

prove to hinder both the motivation and ability to undertake physical activity, especially for women. Studies of type 2 diabetic individuals have also shown that women have lower adherence rates to physical activity programs than men, indicating that additional support and encouragement may be necessary for female patients.¹³

If properly motivated and supervised, however, most type 2 diabetic individuals should be able to exercise safely and effectively. Practitioners should be prepared to understand all potential barriers for each patient individually, and be equipped to suggest methods to move forward in spite of them. Appropriate instruction and supervision will be a very strong asset in all stages of patient exercise management.

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The Essence of Balance – Nutrition Considerations for Cardiac Rehabilitation Participants with Diabetes

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Good eating habits are one of the cornerstones in the prevention and management of both cardiovascular disease (CVD) and diabetes.^{1, 2} Coexistence of both conditions adds a

heightened complexity that requires some expert guidance to ensure optimal nutrition.³ It is well documented that having diabetes increases the risk of dying from CVD.⁴ Cardiovascular