Increasing Physical Activity Without Increasing Pain in Diabetic Patients

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STATEMENT OF NEED

Many patients with diabetes experience painful side effects that may prevent them from exercising. In patients with type 2 diabetes who have been counseled to lose weight, it is important that they find exercise options that will aid in weight loss.

Counseling patients should include suggestions for proper physical activity, as regular exercise improves physical fitness, reduces body fat, enhances bone health and helps patients lose or maintain weight loss. Exercise also improves cardiovascular health and glucose control. Physical activity has even been shown to prevent or delay the onset of type 2 diabetes.

Although patients know that physical activity aids in slowing the progression of diabetes and its complications, the threat of increased chronic pain causes frustration. With a prescription for safe exercise options, patients may once again be able to exercise and increase their quality of life.

TARGET AUDIENCE

This activity is designed for primary care physicians, nurse practitioners, diabetes educators and other specialists who treat diabetic patients.

LEARNING OBJECTIVES

After successful completion of this program, the participant should be able to:

- identify reasons that exercise is important for a patient with diabetes;
- list the types of exercise that exist;
- understand the common pain patterns typically seen in patients with diabetes; and
- prescribe the right activity to patients with pain.

METHOD OF INSTRUCTION

Participants should read the learning objectives and CME program in their entirety. After reviewing the material, they must complete the self-assessment test, which consists of a series of multiple-choice questions.

Participants have a choice of completing this activity online by visiting www.DiabeticMCToday.com; getting real-time results at www.CMEToday.net; or by using the print forms following this activity.

ACCREDITATION

This activity has been planned and implemented in accordance with the essentials and standards of the ACCME through the joint sponsorship of The Dulaney Foundation and *Diabetic Microvascular Complications Today*.

DISCLOSURE

In accordance with the disclosure policies of The Dulaney Foundation and to conform with ACCME and FDA guide-

lines, all program faculty are required to disclose to the activity participants: 1) the existence of any financial interest or other relationships with the manufacturers of any commercial products/devices, or providers of commercial services, that relate to the content of their presentation/material or the commercial contributors of this activity; and 2) identification of a commercial product/device that is unlabeled for use or an investigational use of a product/device not yet approved.

FACULTY DISCLOSURE DECLARATIONS

None.

FACULTY CREDENTIALS

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INTRODUCTION

Do you ever treat the patient who says: "I want to be physically active, but I can't because I am in pain"? The typical patient with diabetes indeed has the challenge of creating a physical exercise regimen that is not contraindicated for their condition.

As specialists who treat patients with diabetes, a sizeable portion of our role is to provide adequate diabetes care. Counseling patients and suggesting proper physical activities is an essential component of diabetes care. For those patients who experience pain while exercising, it is even more important that we provide them with a list of activities that are acceptable to participate in. In addition to pain caused from peripheral neuropathy, patients with diabetes commonly experience pain in their spine, shoulders, hips and knees.

WHY EXERCISE?

Generally speaking, regular exercise improves physical fitness, reduces body fat, enhances bone health and helps patients lose weight or maintain their current weight (Table 1). Patients may also notice that their level of stress is reduced when exercise is added to their daily activity, and they have a stronger sense of well being. The cardiovascular health of patients is also improved through regular physical activity: hypertension and blood pressure are lowered, the lipid profile is improved and the heart is strengthened.

Glucose control is often improved in patients with type 2 diabetes when they participate in regular physical activity. Additionally, increased insulin sensitivity often results in patients being able to lower their medication requirements. Physical activity has been shown to delay and even prevent the onset of type 2 diabetes.

Many patients with diabetes understand that adding or increasing physical activity is beneficial to avoid progression of the disease and its complications. However, they may be plagued with chronic pain that increases with activity. There is frustration over the lack of options for physical activity, and a more specific prescription for safe exercise options is one way to avoid this.

PRESCRIBING THE RIGHT ACTIVITY

The steps to prescribing the appropriate physical activity are:

- know the many available physical activity options;
- ask appropriate questions in order to determine potential exercise options in the presence of painful conditions;
- understand the common pain patterns that limit physical activity in patients with diabetes and apply that to appropriate exercise options; and
- state appropriate options for increasing physical activity in spite of pain.

Prescribing exercise options should be based what the patient is physically able to do without harm. It should not be done on the basis of decreasing or eliminating their pain. The aim is to have the patient attempt to exercise with the pain without increasing it.

STRESS TESTING

Before prescribing an exercise regimen, there are some testing recommendations that the American College of Sports Medicine recommends in *Exercise Management for Persons with Chronic Diseases and Disabilities*. Patients with type 1 diabetes who are aged >30 years or patients who have diabetes duration >15 years should have a stress test before starting an exercise program. Stress tests should also be performed in patients with type 2 diabetes who are aged >35 years. Any patient who has a risk of heart disease or other cardiovascular conditions or microvascular/neurological complications should also have a stress test before participating in physical activity.

EXERCISE PRESCRIPTION

Aerobic activities are the most beneficial exercise for people with diabetes and more specifically for those patients with type 2 diabetes. Aerobic exercise may be defined as an exercise/activity lasting ≥10 minutes that employs multiple muscle groups – preferably arms and legs – in a continuous rhythmic movement. Aerobic activities should not make the patient short of breath.

There are several parameters to be taken into consideration when prescribing an exercise plan for patients with diabetes. This includes intensity, frequency, duration and amount of pain. The level of intensity should be based on the patient's stress test results, and patients should exercise

in a range that is fairly comfortable to them. Patients who have not had a stress test should only do low-level physical activities and must have a stress test before increasing their activity level. An acceptable regimen for exercising is 20- to 60-minute sessions between 4 and 7 days a week. If patients are not in adequate shape for a session of this length, they may perform the activity in multiple 10-minute sessions throughout the day to reach their goal exercise time.

WHAT ABOUT PAIN?

A frequent patient concern is that their pain is debilitating. When the joints are compressed, patients may experience more pain. Patients with lower extremity problems tends to have pain with walking, jogging and running. To avoid this, we can prescribe alternate exercises that unweight the joints in people with lower-body painful conditions. This includes activities such as water aerobics, elliptical machines or biking.

In order to prescribe the right exercise for those with low back pain, it is important to understand the difference between lumbar flexion and extension. Flexion, or rounding of the spine, occurs when the body is curled forward. Positions such as sitting and bending forward are examples of flexion. Extension, or arching of the spine, includes walking. As previously mentioned, it is important to first know the physical activity options in order to prescribe a successful exercise plan for the patient with pain.

WALKING

This is the most common exercise because it can be done indoors (Table 2) or outdoors, and the only equipment needed is a good pair of walking or running shoes. Things to take into consideration include level versus hilly terrain and hard versus soft surfaces. Walking is a lumbar extension exercise and it puts compressive forces onto the joints of the lower extremities (LE), so it may not be an appropriate exercise for people with back or LE problems depending on the intensity of their pain.

STATIONARY BIKES

Many patients with upper extremity function normally do well with stationary bikes; they are are fairly inexpensive, quiet, and do not require much space. Weight bearing is limited, which is a protective exercise for people with LE problems such as plantar fasciitis and peripheral neuropathy. People need fair balance to use the bike because they need to get their foot up and over the center bar before they are positioned on the bike. Biking is a lumbar flexion exercise.

EXERCISE VIDEOS AND DVDS

Regardless of the amount of exercise equipment a patient has, mostly everyone has a VCR or DVD player. Exercise videos feature activities such as walking, dancing and sitting exercises. Some patients may not know that sitting videos exist, however they are a great option for those people who have lower extremity disorders. These videos are regular aerobic workouts, but all of the movements are performed while the viewer is sitting.

One great thing about all exercise videos is that patients

TABLE 1. EFFECT OF PHYSICAL ACTIVITY ON NONINSULIN DEPENDENT DIABETES MELLITUS

Main findings	Dose response*	Adjustment for confounder and other comments
0.94 (95% CI, 0.90–0.98) or 6% decrease in NIDDM for each 500 kcal increment	Yes	Adjusted for age, BMI, hypertension history, parental history of diabetes
0.84 (95% CI, 0.75–0.94) for ≥1 time per week vs <1 time per week vigorous activity	No	Adjusted for age, BMI, family history of diabetes, smoking, alcohol consumption, hypertension history, cholesterol history, family of history coronary heart disease
0.71 (95% CI, 0.54–0.94) for ≥1 time per week vs <1 time per week vigorous activity	Yes	Adjusted for age, BMI, smoking, alcohol consumption, reported blood pressure, hypertension history, cholesterol history, parental history of myocardial infarction

Abbreviations: BMI = body mass index (wt [kg]/ht [m]^2); CI = confidence interval.

*A dose-response relationship requires more than 2 levels of comparison. In this column, "No" means that there were more than 2 levels of comparison but no dose-response gradient was found; "Yes" means that there were more than 2 levels and a dose-response gradient was found.

Source: Physical Activity and Health: A Report of the Surgeon General. Accessed at http://www.cdc.gov/nccdphp/sgr/prerep.htm

TABLE 2. WALKING ON A TREADMILL

Before getting on: Before you get on the treadmill, experiment with the controls. Speed it up, slow it down, increase and decrease the incline and test the emergency off button.

Posture: Shoulders back, head up and slightly forward, chin up and abdominals tight. Look forward, not down at your feet.

Stride length: Relax and maintain the normal stride you would use when walking on the ground. Do not chop your steps.

Where you are: It is important to pay attention to where you are on the treadmill. Do not drift sideways or allow yourself to go to the back of the belt.

Make it a habit: Set a specific time of day, set a specific number of minutes and make it routine.

Source: American College of Sports Medicine

can dictate the amount of time they work out. If they get a 55-minute video, they can stop it when they are experiencing pain or fatigue and come back to the video later in the day. If patients are able to perform exercises while standing, they can touch a chair for additional support and balance. If they do not have a sitting video, they can use a standing video and complete the motions sitting down.

ELLIPTICAL

Elliptical machines are great adjuncts to exercise programs because they cause less impact than walking. Those patients with hip, knee, patellar or foot problems who cannot walk may be able to use the elliptical machines. Handles assist in balancing the patient on the apparatus.

NUSTEP

NuStep machines resemble a recliner. The arms and the feet move in a reciprocal pattern, and it is very comfortable for most people. There is almost no impact to the joints during movement. The people with the worst hip, knee or foot problems can use the machine, which is a lumbar flexion exercise.

WATER EXERCISES/SWIMMING

Water exercise is becoming popular, and one large benefit to this type of exercise is the decreased impact it implies on the body. Water aerobics and swimming unweight the joints from the chest down. Aerobics in the water does not require balance, however it also does not improve balance.

Keep in mind that some patients may not feel comfortable wearing a bathing suit, however, patients may wear a T-shirt and shorts. They can also participate in classes that involve other people with the same build. Patients who have open wounds or acute cardiac conditions should not participate in water activities. Additionally, water may hide the symptoms of hypoglycemia.

EXERCISE PROGRAMS THROUGH CLUBS

These programs provide options for physical activity. Patients can alter the intensity, and programs are available for all age groups. Clubs have a variety of equipment, so patients can use multiple pieces of cardio machines in one workout session. This may be done if their painful condition allows. Patient comfort may be an issue, however, because some patients may be embarrassed to work out in front of other people. Other people may enjoy the socialization and peer support that club settings offer.

RESISTANCE EXERCISE

Resistance exercise is an option to increase physical activity. Balance is improved when lower body exercises are done, and they may be done without weightbearing to the joints. Those patients with lower body pain may greatly benefit from resistance training. Blood sugars come down with resistance activity – sometimes very quickly – and patients must be aware of that. There is also bone benefit.

PHYSICAL THERAPY

Although the above exercises are not expected to decrease pain, patients with pain who have exhausted exercise options may benefit from physical therapy. Chronic pain programs may be helpful in assisting education of better functioning with pain. Supervision at these sessions will help patients become more confident in performing the exercises on their own.

LIMITATIONS TO ACTIVITIES

Pain limits the activities of patients with diabetes. Although problems such as neck pain, rotator cuff and other shoulder problems, hip and knee pain and arthritis can debilitate patients, this article will focus on lower back, vascular claudication problems and lower extremity/foot complications.

A general rule to remember is that diagnosis of pain and/or complications is not as critical as how the body responds to physical activity. That is what patients need help with: choosing an activity that is not going to worsen their pain. The activity should be comfortable and accommodate their pain.

LOW BACK

Pain in the lower back (Table 3) tends to be central, unilateral or bilateral and may radiate into the buttocks or lower extremities. People with this type of pain normally experi-

TABLE 3. DIFFERENTIAL DIAGNOSIS OF LOW-BACK PAIN

Condition	Diagnostic Keys
Discogenic	
Annulus fibrosis tear	Isolated low-back pain; normal neurologic exam
Herniated nucleus pulposus	Sudden-onset back and leg pain; usually prior episodes of back pain; flexion-rotation injury typical; pain aggravated by flexion, sitting or Valsalva's maneuver and relieved by extension; positive straight-leg raising test; >95% L4-5 or L5-S1; may have leg pain only with far lateral disk herniations
Musculoligamentous	
Lumbar strain or sprain	Localized low-back pain from acute traumatic injury or repetitive overload; painful muscle spasm and limited range of motion
Myofascial pain syndrome (MSP)	Regional (MPS) or widespread (FM) pain syndrome with tender 'trigger' points; and fibromyalgia (FM) radiation to buttocks or legs; associated fatigue, poor sleep, and paresthesias common
Posterior Element	
Facet syndrome (facet joint impingement or arthropathy)	Local paralumbar pain and tenderness from forceful extension-rotation injury; pain aggravated by extension; nonradiating pain or pain referred to buttock and thigh; confirmation by fluoroscopic facet injection
Spondylolysis (stress fracture of pars interarticularis)	Repetitive hyperextension injury; pain worse with extension and relieved by flexion; bone scan and SPECT positive
Spondylolisthesis (anterior slip)	Bilateral pars defects; usually L-5 on S-1; palpable step-off; with or without neurologic symptoms
Spinal Stenosis	
Central canal stenosis	Age >55 years; back and buttock pain exacerbated by walking or standing and relieved by sitting or flexion; radiating pain, numbess or weakness to lower extremities
Foraminal stenosis	Above symptoms in unilateral dermatomal distribution
Medical	
Osteomyelitis	Similar to diskitis but in older population
Malignancy	Age >50 years; pain unrelieved by position change or rest; night pain; fever, malaise, and weight loss; history of malignancy
Abdominal aortic aneurysm	Age >50 years; abdominal and back pain; pulsatile abdominal mass
Endometriosis	Female ages 15-45 years; cyclic back pain and pelvic pain
Prostatitis	Male >30 years; dysuria; back and perineal pain
Sacroiliac Joint	
Sacroiliac joint (SIJ) dysfunction	Lumbosacral pain with radiation to buttocks, groin, or thigh; SIJ tenderness; confirmation by fluoroscopic SIJ injection

Source: Drezner JA, Herring SA, et al. Managing Low-Back Pain: Steps to Optimize Function and Hasten Return to Activity. *The Physician and Sports Medicine.* 2001;29: No 8.

ence their pain while either sitting or walking; it is not typical for them to have their pain in both positions.

VASCULAR CLAUDICATION

Symptoms for vascular claudication pain resemble lumbar pathology symptoms. However, pain from this complication steadily increases with activity and decreases almost immediately with rest. If a patient is experiencing only distal symptoms, it is not typically a lumbar problem. Lumbar pain generally radiates from the back distally.

Foot complications are probably the most prevalent source of pain that patients with diabetes complain of. Plantar fasciitis is one common cause of foot pain, and the location of pain is specific – the medial aspect of the plantar surface of the heel. Patients with plantar fasciitis complain of worsened pain with walking. Furthermore, they feel the most foot pain in the foot with their first steps of the day.

Perhaps the most debilitating foot complication is peripheral neuropathy, a fairly bilateral complication that tends to feel worse at night. The person with peripheral neuropathy may experience pain, tingling, numbness or weakness in the feet. Walking may still be an option for exercise, but only if the patient feels comfortable with the pain during the activity. If a person with peripheral neuropathy can walk for exercise, their pain tolerance may improve.

Another consideration with peripheral neuropathy is decreased sensation. Proper socks, shoes, daily foot inspections and meticulous foot care are essential to decrease the risk of problems including infection and amputation. If a person has lost their protective sensation due to peripheral neuropathy, they may need to consider exercise that places less stress on the feet, such as the stationary bicycle, elliptical, NuStep, sitting exercise video or water exercise. Those with peripheral neuropathy who participate in a water program should wear water shoes in the pool to protect their feet.

Charcot foot is also a debilitating complication. The patient with Charcot foot should not be placed on a walking exercise regimen. It is contraindicated, as it heightens the risk of ulceration. Patients with acute Charcot foot or open foot wounds are extremely limited as far as exercise options, but they may still use a stationary bike, NuStep or do water, sitting or resistance exercises.Balance should be taken into consideration when you are discussing diabetes complications. Although it is not painful, it still limits a patient's exercise options.

DETERMINING THE CAUSE OF PAIN

To determine if a patient's symptoms are lumbar, lower extremity or vascular problems, there are several easy tests one can do. Have patients sit upright on a bike, which is an extension position. While the patient is pedaling – a vascular system movement – ask them to assess the feeling in their legs. If they are experiencing their usual symptoms, it may be either a vascular or lumbar complication. Ask patients to change their position so they are flexed forward. If their symptoms disappear, the conclusion may be made that it is a lumbar problem. If the symptoms stay the same or progress, then it is a vascular problem. When muscle activity causes pain, it is usually a vascular complication.

The second test is called the shopping cart sign. Simply ask a patient what their normal posture is like while they are pushing a shopping cart. If walking upright causes LE symptoms but they get relief of back and LE pain when they lean onto the cart for support – placing the lumbar spine into flexion – it is typically a lumbar complication. Because they are still walking while they are pushing the cart and their muscles are in use, the vascular supply is still being engaged. These tests may be used to determine if it is reasonable for patients to walk as a form of exercise.

ASK QUESTIONS, PRESCRIBE EXERCISE

During each patient assessment, a few questions to ask are:

- What activities do you feel most limited in, sitting or walking?
- What things are hard for you to do that you could normally do if you didn't have this pain?
- What makes your pain worse?
- What makes your pain better?

After patients answer the questions, apply their functional limitations to an exercise program. Pay special attention to the mode and specific movements of the exercise, the surface, whether the exercise is performed standing or sitting and also the equipment needed for the exercise. Based on these things, an appropriate exercise plan can be established.

If patients experience unbearable pain during exercise, they should change positions or alter the exercise so that it may be complete. Patients need not quit the exercise program unless it becomes harmful to their condition.

It is important to monitor patient progress and ensure that pain is not getting worse. This program is aimed at providing patients with exercise options that can be performed with pain. If pain stays the same, that is what we are aiming for. If pain is lessening, that is a bonus.

As a general overview to prescribe exercise to patients with diabetes who experience pain, remember these steps:

- look at exercise options;
- recognize the pain pattern that the patient is experiencing;
- sense what type of exercise(s) are reasonable for the patient while thinking about their needs; and
- prescribe appropriate exercise plan and follow-up with the patient. ■

Kemmis K. Diabetes, Exercise, and Pain: Increasing Activity Without Increasing Pain. Presented at the American AssociKemmis K. Diabetes, Exercise, and Pain: Increasing Activity Without Increasing Pain. Presented at the American Association of Diabetes Educators 32nd Annual Meeting and Exhibition. August 10-13, 2005. Washington DC.

CME QUESTIONS

Circle the most appropriate answer in the "ANSWER SECTION" on the following page.

1. Regular exercise
a. improves physical fitness
b. improves cardiovascular health including hypertension and blood pressure
c. worsens glucose control when physical activity is not performed every day
d. a and b
e. all of the above

2. In addition to pain caused from peripheral neuropathy, patients with diabetes commonly experience pain in their
a. hips and knees
b. elbows
c. shoulders
d. a and b
e. a and c

3. It is important to understand the common pain patterns that limit physical activity before applying it to an appropriate exercise regimen.
a. true
b. false

4. Which of the following patients should have a stress test before starting an exercise program
a. patients with type 2 diabetes aged <40 years
b. patients with a diabetes duration <15 years
c. patients with a diabetes duration >15 years
d. patients with type 1 diabetes aged >20 years

5. In order to be considered an aerobic activity, the exercise/activity must last
a. 10 minutes
b. 20 minutes
c. 30 minutes
d. duration does not matter, as long as you are moving it is aerobic

6. An acceptable regimen for exercising is 5- to 60-minute sessions between 3 and 5 days a week.
a. true
b. false

7. Walking is a
a. Lumbar extension exercise that puts compressive forces onto the joints
b. Lumbar extension exercise that takes compressive forces off of the joints
c. Lumbar flexion exercise that puts compressive forces onto the joints
d. Lumbar flexion exercise that takes compressive forces off of the joints

8. A good exercise option for a patient who has peripheral neuropathy is
a. stationary bicycle
b. elliptical
c. NuStep
d. sitting exercise video
e. all of the above

9. An appropriate exercise plan can be established for those with pain by paying attention to which of the following
a. time of day the exercise is performed
b. specific movement of the exercise
c. a and b
d. none of the above

10. Patients should alter the exercise program if it becomes too painful.
a. true
b. false

REGISTRATION/EVALUATION FORM: INCREASING PHYSICAL ACTIVITY

To obtain AMA/PRA category 1 credit, you must:

- Read the learning objectives and the CME article and complete the self-assessment test.
- Photocopy and complete this registration/evaluation form and record your test answers in the Answer Section below.
- Send the Registration/Evaluation form to **The Dulaney Foundation, PO Box 44408, Phoenix, AZ 85064, or fax to 602-508-4893.**
- Retain a copy of your test answers. Your answer sheet will be graded, and if you achieve a passing score of 70% or better, you will receive a CME credit letter awarding AMA/PRA category 1 credit within 4 weeks. If you do not achieve a passing score, you will be notified and offered the opportunity to complete the activity again.

ANSWER SECTION

Circle the best answer for each question on page 45.

1. A B C D E	2. A B C D E	3. A B	4. A B C D	5. A B C D
6. A B	7. A B C D	8. A B C D E	9. A B C D	10. A B

REGISTRATION FORM

First name _____ Last name _____ Degree (MD, PhD) _____

Specialty _____

Institution or practice name _____

Address _____

City _____ State _____ Zip Code _____ Country _____

Telephone _____ Fax _____ E-mail address _____

The processing fee has been underwritten by an educational grant from Eli Lilly and Company.

I attest that I have completed this activity as designed and I am claiming ____ (up to 1 credit) AMA/PRA category 1 credit.

Signature _____ Date _____

Credit for this activity is available until Nov. 30, 2006.

The planning and execution of useful and educationally sound continuing education activities are guided in large part by input from participants. Please assist us in evaluating the effectiveness of this activity and make recommendations for future educational offerings by completing this evaluation form. Your response will help ensure that future programs are informative and meet the educational needs of all participants. Please note: CME credit letters and long-term credit retention information will only be issued upon receipt of this completed evaluation. Thank you for your cooperation.

OBJECTIVES

After successful completion of this program, you should be able to:

• identify reasons that exercise is important for a patient with diabetes	5	4	3	2	1
• list the types of exercise that exist	5	4	3	2	1
• understand the common pain patterns typically seen in patients with diabetes	5	4	3	2	1
• prescribe the right activity to patients	5	4	3	2	1

(Please circle the number that is most accurate; 5 represents strongly agree and 1 represents strongly disagree.)

OVERALL EVALUATION

• The information presented increased my awareness/understanding of the subject.	5	4	3	2	1
• The information presented will influence how I practice.	5	4	3	2	1
• The information presented will help me improve patient care.	5	4	3	2	1
• The faculty demonstrated current knowledge of the subject.	5	4	3	2	1
• The program was educationally sound and scientifically balanced.	5	4	3	2	1
• The program avoided commercial bias or influence.	5	4	3	2	1
• Overall, the program met my expectations.	5	4	3	2	1
• I would recommend this program to my colleagues.	5	4	3	2	1

(Please circle the number that is most accurate; 5 represents strongly agree and 1 represents strongly disagree.)

- If you anticipate changing one or more aspects of your practice as a result of your participation in this activity, please provide a brief description of how you plan to do so: _____
- Please provide any additional comments pertaining to this activity (positive and negative) and suggestions for improvements: _____

_____