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Bone Health & Osteoporosis FOUNDATION™

Healthy Bones, Build Them for Life

March 4, 2024

How Exercise Helps Prevent Diabetes & Bone Loss

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What We Will Cover

- What are prediabetes, type 1 diabetes, and type 2 diabetes?
- Diabetes, osteoporosis, and fractures
- How can exercise help with diabetes and osteoporosis?
- Are there special considerations for safety with exercise?
- What are your questions?

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What are prediabetes, type 1 diabetes, and type 2 diabetes?

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Prediabetes, Type 1 diabetes, and Type 2 diabetes

Prediabetes	Type 2 diabetes	Type 1 diabetes
High blood glucose	Onset often older but now kids and teens, too	Onset often younger
Also called "categories for increased risk of diabetes"	Often overweight/ obese	Often slender
	Meal planning, exercise, oral meds, insulin (not dependent on exogenous insulin)	Must have exogenous insulin*; also, meal planning and exercise *must use to survive
	Often strong family history	Not strong family history
	Insulin deficiency and resistance	Autoimmune disorder
	Was Adult/NIDDM/II	Was Juvenile/IDDM/I

How many people have diabetes?

- 38.4 million Americans (11.6%) (2021)
  - 29.7 million dx and 8.7 million undiagnosed
- 2 million Americans have type 1 diabetes
- 29.2%, or 16.5 million seniors (age 65 and older); diagnosed and undiagnosed
- 97.6 million adults with pre-diabetes (2021)
  - Statistics About Diabetes | ADA, accessed February 1, 2024.

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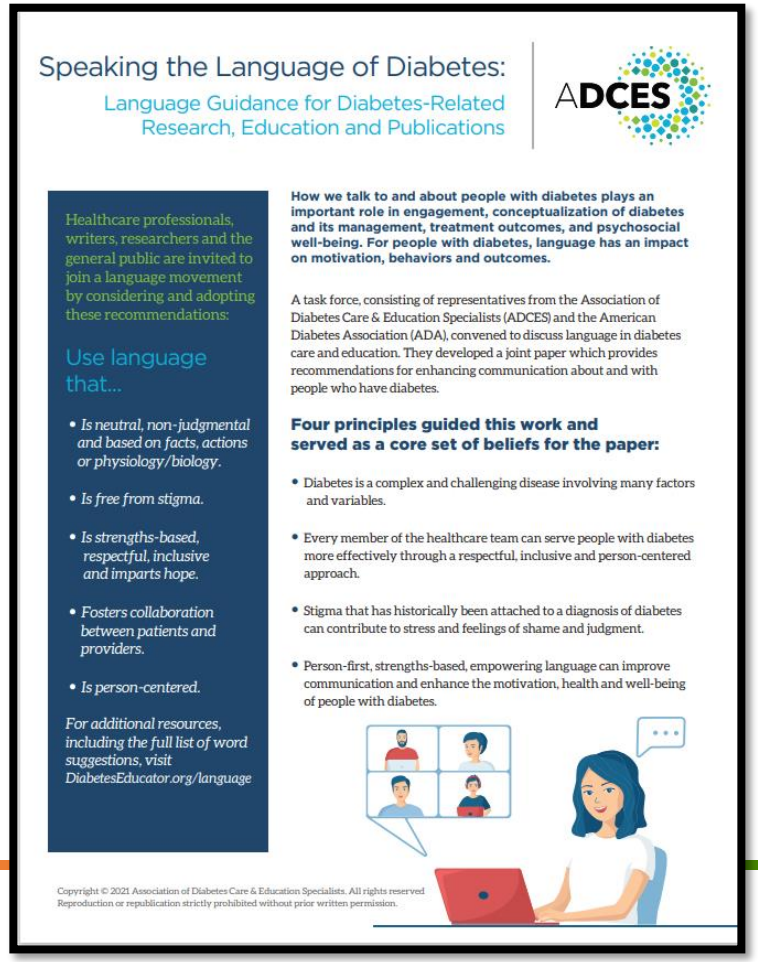
Speaking the Language of Diabetes

- Not “a diabetic”…or any of the other judgey stuff!
- Think about this for osteoporosis, too.
- Use person-centered, non-judgmental language
  - Speaking the Language of Diabetes. ADCES at https://www.diabeteseducator.org/docs/default-source/practice/educator-tools/HCP-diabetes-language-guidance.pdf?sfvrsn=8 Accessed March 3, 2024.



Speaking the Language of Diabetes:

Language Guidance for Diabetes-Related Research, Education and Publications

ADCES

Healthcare professionals, writers, researchers and the general public are invited to join a language movement by considering and adopting these recommendations:

Use language that...

- *Is neutral, non-judgmental and based on facts, actions or physiology/biology.*
- *Is free from stigma.*
- *Is strengths-based, respectful, inclusive and imparts hope.*
- *Fosters collaboration between patients and providers.*
- *Is person-centered.*

For additional resources, including the full list of word suggestions, visit DiabetesEducator.org/language

How we talk to and about people with diabetes plays an important role in engagement, conceptualization of diabetes and its management, treatment outcomes, and psychosocial well-being. For people with diabetes, language has an impact on motivation, behaviors and outcomes.

A task force, consisting of representatives from the Association of Diabetes Care & Education Specialists (ADCES) and the American Diabetes Association (ADA), convened to discuss language in diabetes care and education. They developed a joint paper which provides recommendations for enhancing communication about and with people who have diabetes.

Four principles guided this work and served as a core set of beliefs for the paper:

- Diabetes is a complex and challenging disease involving many factors and variables.
- Every member of the healthcare team can serve people with diabetes more effectively through a respectful, inclusive and person-centered approach.
- Stigma that has historically been attached to a diagnosis of diabetes can contribute to stress and feelings of shame and judgment.
- Person-first, strengths-based, empowering language can improve communication and enhance the motivation, health and well-being of people with diabetes.

Problematic	Preferred	Rationale
Diabetic (as an adjective); diabetic foot; diabetic education; diabetic person. "How long have you been diabetic?"	Foot ulcer; infection on the foot; diabetes education; person with diabetes. "How long have you had diabetes?"	• Focus on the physiology or pathophysiology. • "Diabetic education" is incorrect (education doesn't have diabetes). • Put the person first and avoid using a disease to describe a person.
Diabetic (as a noun). "Are you a diabetic?" Non-diabetic; normal.	Person with/who has diabetes. "Do you have diabetes?" Person without/who doesn't have diabetes.	• Avoid labeling someone as a disease. There is much more to a person than diabetes. • The opposite of "normal" is "abnormal"; people with diabetes are not abnormal.
Compliant/compliance; non-compliant/non-compliance. Adherent/non-adherent; adherence/non-adherence.	Engagement; participation; involvement; medication taking "She takes insulin whenever she can afford it."	• These terms imply doing what someone else wants, i.e., taking orders. In diabetes care, people make choices in their own self-management. • Focus on facts and strengths. What are they doing well and how can we build on it?
Control (as a verb or an adjective) controlled/uncontrolled; well controlled/poorly controlled. Control (as a noun)/glycemic control; glucose control; poor control/good control; bad control; tight control.	Manage "She is checking blood glucose levels a few times per week." A1C Blood glucose levels/targets; glycemic target/goal; glycemic stability/variability; time in range or within target range.	• Control is virtually impossible to achieve in a disease where the body no longer does what it's supposed to do. • Use words/phrases that emphasize what the person is doing or doing well. • Focus on physiology/biology and use neutral words that don't judge, shame or blame. • Define what "good control" means in factual terms and use that instead.
Obese (as an adjective) obese person or a person with an excessive BMI. "The obese man on the bus."	When speaking in general or when someone's preference is unknown, 'higher weight or larger person/people is preferred language. "The higher-weight man on the bus." or "A larger man is on the bus."	• Medical terms including obesity pathologizes the body. Use factual, non-stigmatizing weight descriptors such as higher weight, larger body, plus size or if required BMI>X.
Overweight or ideal weight (as an adjective). Descriptors like "preferred" or "desired" weight patients. "Your preferred weight is..." or "Your ideal weight is..."	"Your weight is..." or "Your BMI is X" or" Your BMI is >X..."	• These terms are judgmental and convey a false belief that there is a single, universal weight that prevents illness. It does not account for the individual's personal or health goals. • In professional literature, this implies weight is under voluntary control and implicitly encourages magical thinking by clinicians and patients.

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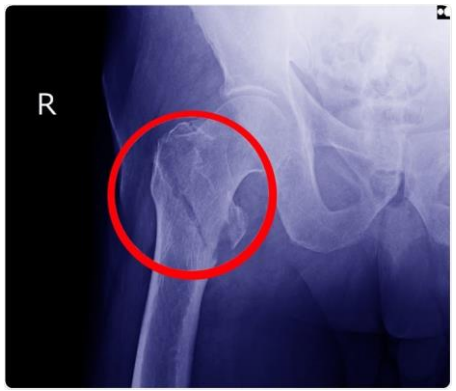
Diabetes, osteoporosis, and fractures

Diabetes, osteoporosis, and fractures

- T1D and fracture
  - ↑ incidence T1D long recognized
    - Hip fracture risk ↑ T1D; 7- to 12-fold
  - ↑ prevalence low BMD, a risk factor for osteoporosis/fracture



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Diabetes, osteoporosis, and fractures

- Pre-diabetes and fracture
  - Higher BMD, lower prevalence of osteopenia/osteoporosis at the femoral neck, higher prevalence of hip fracture
  - ↑ risk of hip fracture begins in prediabetes and increases in T2D with duration of diabetes
- T2D and fracture
  - BMD normal or greater than normal
  - ↑ incidence hip, proximal humerus, foot fractures (in women > 65 yrs)
  - Hip fracture in post-menopausal females T2D ↑ risk of (almost double); incidence ↑ with longer duration T2D

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Conditions, diseases and medications related to diabetes that can contribute to osteoporosis and fracture

Lifestyle factors		
Alcohol abuse	Excessive thinness	Excess vitamin A
Frequent falling	High salt intake	Immobilization
Inadequate physical activity	Low calcium intake	Smoking (active or passive)
Vitamin D insufficiency/deficiency		
Genetic diseases		
Cystic fibrosis	Ehlers-Danlos	Gaucher's disease
Hemochromatosis	Hypophosphatasia	Hypophosphatemia
Marfan syndrome	Menkes steely hair syndrome	Osteogenesis imperfecta
Parental history of hip fracture	Porphyria	Homocystinuria
Hypogonadal states		
Anorexia nervosa	Androgen insensitivity	Female athlete triad
Hyperprolactinemia	Hypogonadism	Panhypopituitarism
Premature menopause (< 40 years)	Turner's and Klinefelter's syndromes	
Endocrine disorders		
Obesity	Cushing's syndrome	Diabetes mellitus (types 1 and 2)
Hyperparathyroidism	Thyrotoxicosis	
Gastrointestinal disorders		
Celiac disease	Bariatric surgery	Gastric bypass
Gastrointestinal surgery	Inflammatory bowel disease including Crohn's disease and ulcerative colitis	Malabsorption syndromes
Pancreatic disease	Primary biliary cirrhosis	
Hematologic disorders		
Hemophilia	Leukemia and lymphomas	Monoclonal gammopathies
Multiple myeloma	Sickle cell disease	Systemic mastocytosis
Thalassemia		
Rheumatologic and autoimmune diseases		

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Office of the Surgeon General (US). Rockville (MD): Office of the Surgeon General (US); 2004. PMID: 20945569.

Conditions, diseases and medications related to diabetes that can contribute to osteoporosis and fracture

Lifestyle factors
- Frequent falling
- Inadequate physical activity

Genetic factors
- Cystic fibrosis

Endocrine disorders
- Obesity
- Type 1 and 2 diabetes

Gastrointestinal disorders
- Celiac disease
- GI surgery/ bariatric surgery/ gastric bypass

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Office of the Surgeon General (US). Rockville (MD): Office of the Surgeon General (US); 2004. PMID: 20945569.

Medication, diabetes, and osteoporosis

- Initiation denosumab associated with ↓ risk of T2D
  - Denosumab may have added benefits for glucose metabolism, consider for those with prediabetes

- Thiazolidinediones (pio- and rosiglitazone) associated with ↑ risk of fx

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Diabetes, osteoporosis, and fractures

- ↑ risk of fractures likely multi-factorial
  - Bone quantity (T1D) and quality (pre-DM, T1D and T2D)
    - Increased fall risk
    - Peripheral neuropathy
    - Visual impairments
    - Hypoglycemia
    - Orthostatic hypotension
    - Polypharmacy

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Risk factors for falls

- Falls occur in ~1/3 adults ≥ 65 yrs, ↑ with age
- Falls are the leading cause of injury-related ED visits and hospitalizations (>90%) and fall deaths
- 1° and 2° fracture prevention should include fall risk assessment

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Conditions, diseases and medications that can contribute to falls and fractures

Medical risk factors

- Poor vision
- Previous fall
- Orthostatic hypotension
- Impaired transfers and mobility
- Medications that cause dizziness or sedation (narcotic analgesics, anticonvulsants, psychotropics)

Neurological and musculoskeletal risk factors

- Poor balance
- Weak muscles/sarcopenia
- Gait disturbances
- Reduced proprioception

Psychological risk factors

- Anxiety
- Depression
- Fear of falling

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How can exercise help with diabetes and osteoporosis?

Exercise to prevent/delay type 2 diabetes

- The Diabetes Prevention Program (DPP)
  - Intensive behavioral lifestyle intervention modeled from the DPP
  - Goal is to lose and maintain 7% of initial body weight and increase **moderate-intensity physical activity** (such as brisk walking) to **at least 150 min/wk**
- DPP demonstrated 3-year decrease in onset of type 2 diabetes by 58%!

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Physical Activity Guidelines: Prevention/Delay of T2D

Frequency	Varied depending on the individual's needs/preferences
Intensity	Moderate intensity (subjectively described as "moderate")
Type	Not specific but example is brisk walking
Time (duration)	At least 150 min/week at moderate intensity, can be divided into segments from 5 or 10 minutes or more
In addition	Combine with weight loss and maintenance of 7% of initial body weight

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Physical Activity Guidelines: Treatment of T2D

Aerobic	
Frequency	3-7 days/week, without taking more than 2 days in a row off
Intensity	Moderate to vigorous intensity (subjectively described as “moderate” to “very hard”)
Type	Prolonged, rhythmic activities such as walking, running, cycling, swimming, or interval training
Time (duration)	At least 150 min/week at moderate to vigorous intensity Adults able to run steadily at 6 miles/hour for 25 min, may complete 75 min/week of vigorous activity to provide similar benefits (cardioprotective and metabolic)

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Physical Activity Guidelines: Treatment of T2D

Aerobic	
Progression	-A greater emphasis should be placed on vigorous intensity aerobic exercise if fitness is a primary goal of exercise and not contraindicated by complications -Both High Intensity Interval Training (HIIT) and continuous exercise training are appropriate activities for most individuals with diabetes

For bone health: focusing on weightbearing/ impact exercises to promote bone health

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Physical Activity Guidelines: Treatment of T2D

Resistance	
Frequency	2-3 days/week (every other day)
Intensity	Moderate (should max out at 15 repetitions) to Vigorous (should max out at 6-8 repetitions)
Type	Resistance machines, free weights, exercise bands, bodyweight exercise
Time (duration)	8-10 exercises 1-3 sets 10-15 repetitions to near fatigue per set

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Physical Activity Guidelines: Treatment of T2D

Resistance	
Progression	-Beginning training intensity should be moderate, involving 10-15 reps per set, with increases in weight or resistance undertaken with a lower number of repetitions (8-10) only after the target number of reps per set can consistently be exceeded -Increase in resistance can be followed by a greater number of sets and finally by increasing training frequency

Lines up with the recommendations for bone health

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PA Guidelines: Children with T1D, T2D, or Pre-diabetes

Frequency	Every day
Intensity	Moderate or vigorous
Type	Aerobic activity
Time (duration)	60 minutes or more
Include	**Vigorous muscle-strengthening and bone-strengthening activities** ≥3 days per week

For bone health: vigorous muscle-strengthening and bone-strengthening activities

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PA Guidelines: Flexibility and Balance for Older Adults

Frequency	2-3 times per week
Examples	Yoga and tai chi

For fracture prevention: balance exercise such as tai chi

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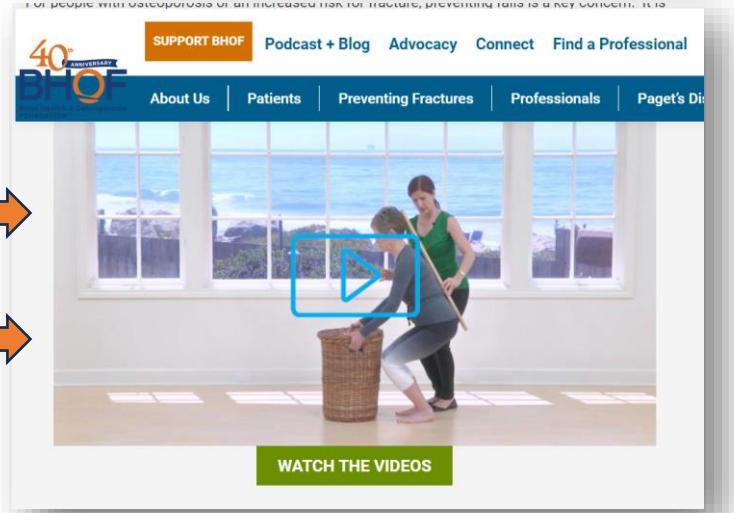
Are there special considerations for safety with exercise?

Safety

- Safety with diabetes-CV and other complications

Safety

- PT/OT/exercise specialists
- Balance
- Posture and body mechanics
- Educate safe movements to avoid fractures
- Home safety



Questions?

Thank you!

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