



Dia-BEAT-it: How to Safely Get Your Patients with Diabetes Moving

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Presenter Disclosure Information

- Primary Care Advisory Board for the American Diabetes Association
- AAPA/ASEPA liaison to ADA
- Editorial Board, *Clinical Diabetes*



Learning Objectives

Identify the American Diabetes Association **recommendations for exercise** for individuals with diabetes and prediabetes



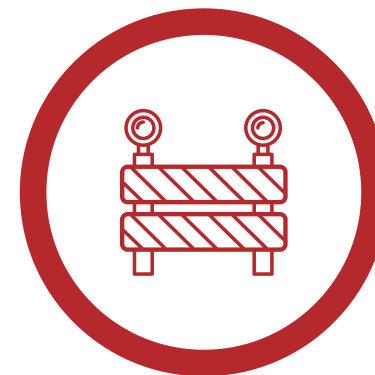
Identify common medications that effect participation in exercise for people with diabetes

Identify special considerations for patients with **complications**



Examine the effect of insulin & blood glucose levels on exercise for people with diabetes

Determine and address **barriers** to physical activity



Discuss **behavioral strategies** for starting and maintaining an exercise program using SMART goal setting



Types of exercise and physical activity



Aerobic
exercise



Resistance
exercise



Flexibility
exercises



Balance
exercises

Benefits of exercise and physical activity





Benefits of Aerobic Exercise

T1D and T2D:



**Lower cardiovascular
and overall mortality
risks**

T2D:



**Reduces A1C, triglycerides,
blood pressure, and insulin
resistance**



Benefits of Resistance Exercise

Improvements in:



Muscle mass



Bone mineral density



Body composition



Insulin sensitivity



Strength



Blood pressure



Physical function



Lipid profiles



Mental health



Cardiovascular health

J Cardiol 2011;58:173–180
Med Sci Sports Exerc 2011;43: 1334–1359
Diabetes Res Clin Pract 2009;83:157–175

Insulin Action and Physical Activity

- Acutely, aerobic exercise increases muscle glucose uptake up to fivefold through insulin-independent mechanisms. After exercise, glucose uptake remains elevated by insulin-independent (2 h) and insulin-dependent (up to 48 h) mechanisms if exercise is prolonged
- Improvements in insulin action may last for 24 h following shorter duration activities (20 min) if the intensity is elevated to near-maximal effort intermittently.
- Regular aerobic training increases muscle insulin sensitivity in individuals with prediabetes and type 2 diabetes in proportion to exercise volume



Flexibility and balance training

- Flexibility and balance exercises are especially important for older adults with diabetes
- Balance training can reduce falls risk by improving balance and gait, even when peripheral neuropathy is present

American Diabetes Association. 5. Facilitating behavior change and wellbeing to improve health outcomes: Standards of Medical Care in Diabetes 2020. Diabetes Care 2020;43(Suppl. 1):S48–S65



Effect of Exercise on Glucose Control



- Improves A1C by ~0.57%
- Adults with type 2 diabetes should ideally perform both aerobic and resistance exercise training for optimal glycemic and health outcomes.

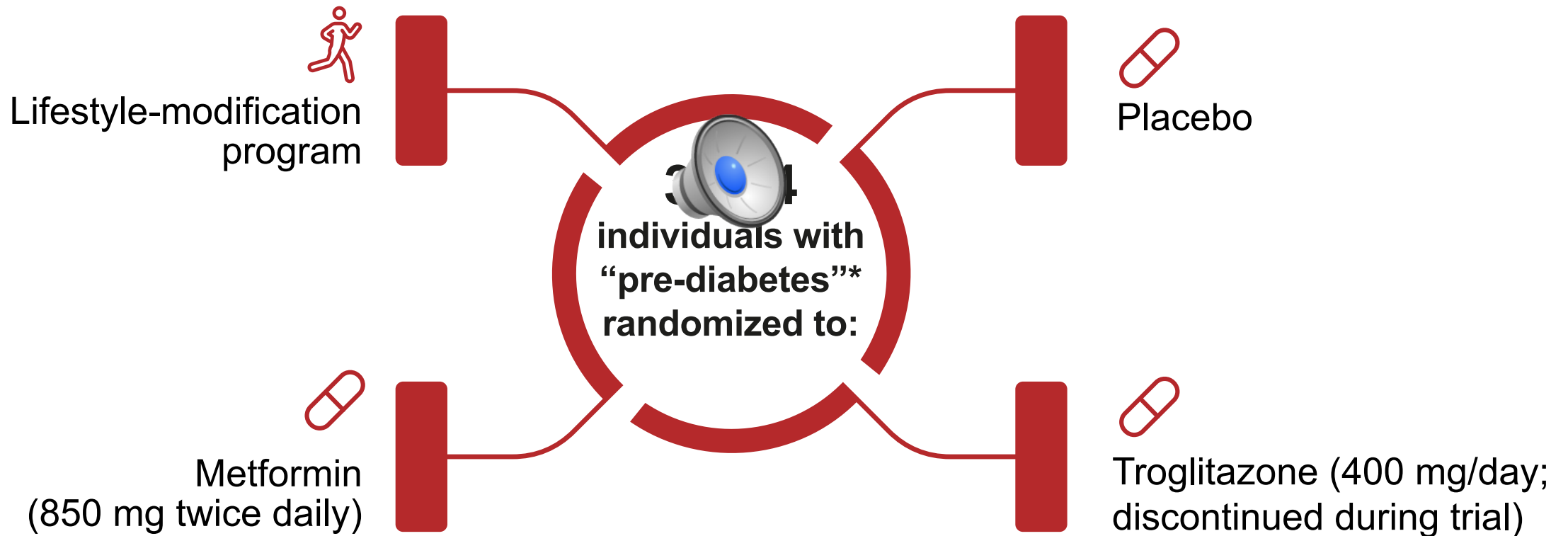
JAMA 2011;305:1790–1799
Sports Med 2014;44:487–499
JAMA 2010;304:2253–226
American College of Sports Medicine 2018.



Evidence on Structured Exercise Programs



Prevention of Diabetes: Diabetes Prevention Program (DPP)



*elevated fasting and post-load plasma glucose
DPPRG. Reduction in the Incidence of Type 2 Diabetes with Lifestyle Intervention or Metformin. NEJM, 2002;346(6):393-403.

DPP: Reduction in incidence of diabetes compared to usual care group

Reduction in incidence of diabetes compared to usual care group

Metformin
(850 mg
twice daily)



31%

Lifestyle-
modification
program



58%

LOOK AHEAD Trial

- Largest randomized trial evaluating lifestyle intervention in older adults with T2D
- The intensive lifestyle intervention group targeted weight loss of at least 7% through:
 - a modest dietary energy deficit
 - at least 175 min/week of unsupervised exercise.



Results – LOOK AHEAD Trial

- Major cardiovascular events - the same in both groups
- The intensive lifestyle intervention group achieved significantly greater sustained improvements in:



Weight loss, cardiorespiratory fitness, blood glucose control, blood pressure, and lipids with fewer medications



Sleep apnea



Less severe diabetic kidney disease and retinopathy



Depres



Sexual dysfunction



Urinary incontinence



Knee pain



Better physical mobility maintenance and quality of life



Lower overall health care costs

The only prescription with unlimited refills.



Regular exercise (150 minutes per week) lowers risk of developing heart disease, high blood pressure, diabetes, stroke, and Alzheimer's disease. What prescription medication can say all that?

Learn more about the health benefits of exercise at www.exerciseismedicine.org



Support for the Exercise is Medicine® Global Initiative is Provided By:



Managing Complications of Diabetes



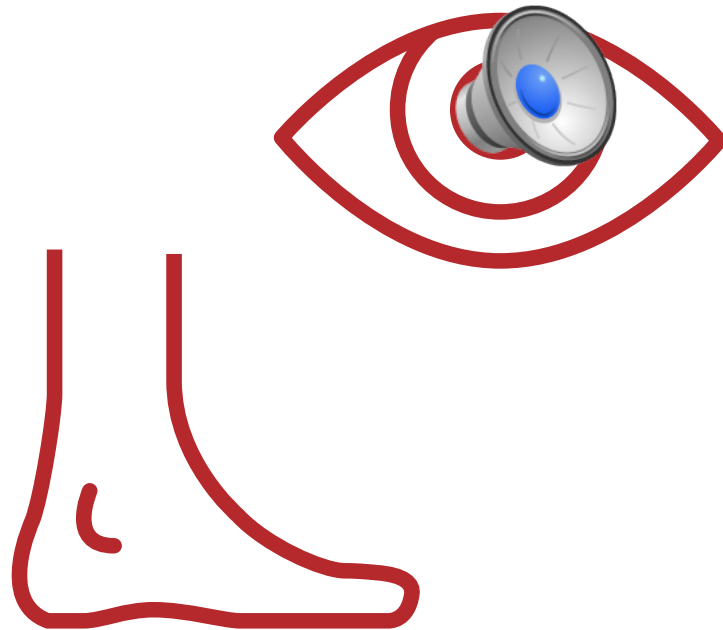
Pre-participation evaluation

- Generally unnecessary for asymptomatic individuals prior to beginning low- or moderate-intensity physical activity not exceeding the demands of brisk walking or everyday living.
 - No current evidence suggests that any screening protocol beyond usual diabetes care reduces risk of exercise-induced adverse events in asymptomatic individuals with diabetes



Managing physical activity with health complications

- Physical Activity/Exercise and Diabetes: A Position Statement (2016)
Table 5 demonstrates exercise considerations for diseases related to diabetes.



Diabetes Comorbidities: Cardiac

- Coronary Artery Disease & Post-MI
 - All exercises are okay – graded exercise programs essential
 - consider cardiac rehabilitation
- Exertional angina
 - Some exercise-induced ischemia can be masked in patients with diabetes.
 - Carry nitroglycerin
 - Consider keeping heart rate at least 10 bpm below exercise-related angina.
- Hydration & diuretics
- Hypertension
 - Avoid Valsalva activities
 - Exercise-induced hypotension can occur in certain medications.
 - Beta-blockers



Diabetes Comorbidities: Nerve Disease

- Peripheral neuropathy
 - Regular aerobic exercise may prevent onset or delay the progression (T1DM and T2DM).
 - Foot care important to discuss
 - Avoid weight-bearing exercise on unhealed ulcers
- Local foot deformity
 - Choose exercises that reduce plantar pressures and ulcer risk.
- Foot ulcers/amputations
 - Avoid weight bearing with unhealed ulcers




Diabetes Comorbidities: Nerve Disease

- Autonomic Neuropathy
 - Postural hypotension: Avoid rapid postural changes
 - Delayed gastric emptying Exercise-related hypoglycemia
 - Altered thermoregulation: dehydration during exercise a potential
 - Blunted heart rate response: Use rates of perceived exertion



Diabetes Comorbidities: Renal Disease

- Avoid vigorous exercise day before collection of urine for albuminuria
- No specific recommendations for res  tions even if receiving dialysis.
- Exercise improves the quality of life and does not accelerate progression of kidney disease.
- Patients with abnormal Hgb/Hct, Ca²⁺, K⁺, Mg levels due to exercise should be carefully monitored and repleted.

Diabetes Comorbidities: Retinopathy

- Mild to moderate nonproliferative retinopathy
 - No limitations for exercise except powerlifting for moderate proliferative.
- Severe nonproliferative or unstable proliferative retinopathy
 - Nothing that elevates blood pressure
 - Avoid vigorous exercise, jumping, jarring, head down exercises, Valsalva
 - No exercise with a vitreous hemorrhage



Diabetes Comorbidities: Orthopedics

- DM predisposes to carpal tunnel syndrome, metatarsal fractures, Charcot foot (neuropathy-related joint disorders), adhesive capsulitis (shoulder injury).
- Care should be given with warm up and cool down [C].
- Flexibility training [C].
- If Charcot foot, avoid exercises that increase pressure on plantar aspect of foot.



ADA's Recommendations



Reducing sedentary time

- In people with or at risk for developing type 2 diabetes, extended sedentary time is also associated with poorer glycemic control and clustered metabolic risk
- All adults, and particularly those with type 2 diabetes, should decrease the amount of time spent in daily sedentary behavior. **B**



Ann Intern Med 2015;162:123–132

American Diabetes Association. 5. Facilitating behavior change and wellbeing to improve health outcomes: Standards of Medical Care in Diabetes 2020. Diabetes Care 2020;43(Suppl. 1):S48–S65

Reducing sedentary time

- Prolonged sitting should be interrupted with bouts of light activity every 30 min for blood glucose benefits, at least in adults with type 2 diabetes. **C**



Ann Intern Med 2015;162:123–132

American Diabetes Association. 5. Facilitating behavior change and wellbeing to improve health outcomes: Standards of Medical Care in Diabetes 2020. Diabetes Care 2020;43(Suppl. 1):S48–S65

Physical activity recommendations

- Most adults with type 1 **C** and type 2 **B** diabetes should engage in 150 min or more of moderate- to vigorous-intensity aerobic activity per week, spread over at least 3 days/week, with no more than 2 consecutive days without activity. Shorter durations (minimum 75 min/week) of vigorous-intensity or interval training may be sufficient for younger, more physically fit individuals.
- Adults with type 1 **C** and type 2 **B** diabetes should engage in 2–3 sessions/week of resistance exercise on nonconsecutive days.
- Flexibility training and balance training are recommended 2–3 times/week for older adults with diabetes. Yoga and tai chi may be included based on individual preferences to increase flexibility, muscular strength, and balance. **C**

Exercise as a vital sign

- Kaiser Permanente partnership with American College of Sports Medicine:



- On average, how many days per week do you engage in moderate-to-vigorous physical activity?
- On average, how many minutes do you engage in physical activity at this level?

Coleman, K.J. et al. (2012). Initial validation of an exercise “Vital Sign” in electronic medical records. *Medicine & Science in Sports & Exercise*. 2071-2076.

Sallis, R.E. (2016). The call for a physical activity vital sign in clinical practice. *The American Journal of Medicine*, 129(9), 903-905.

Key Points

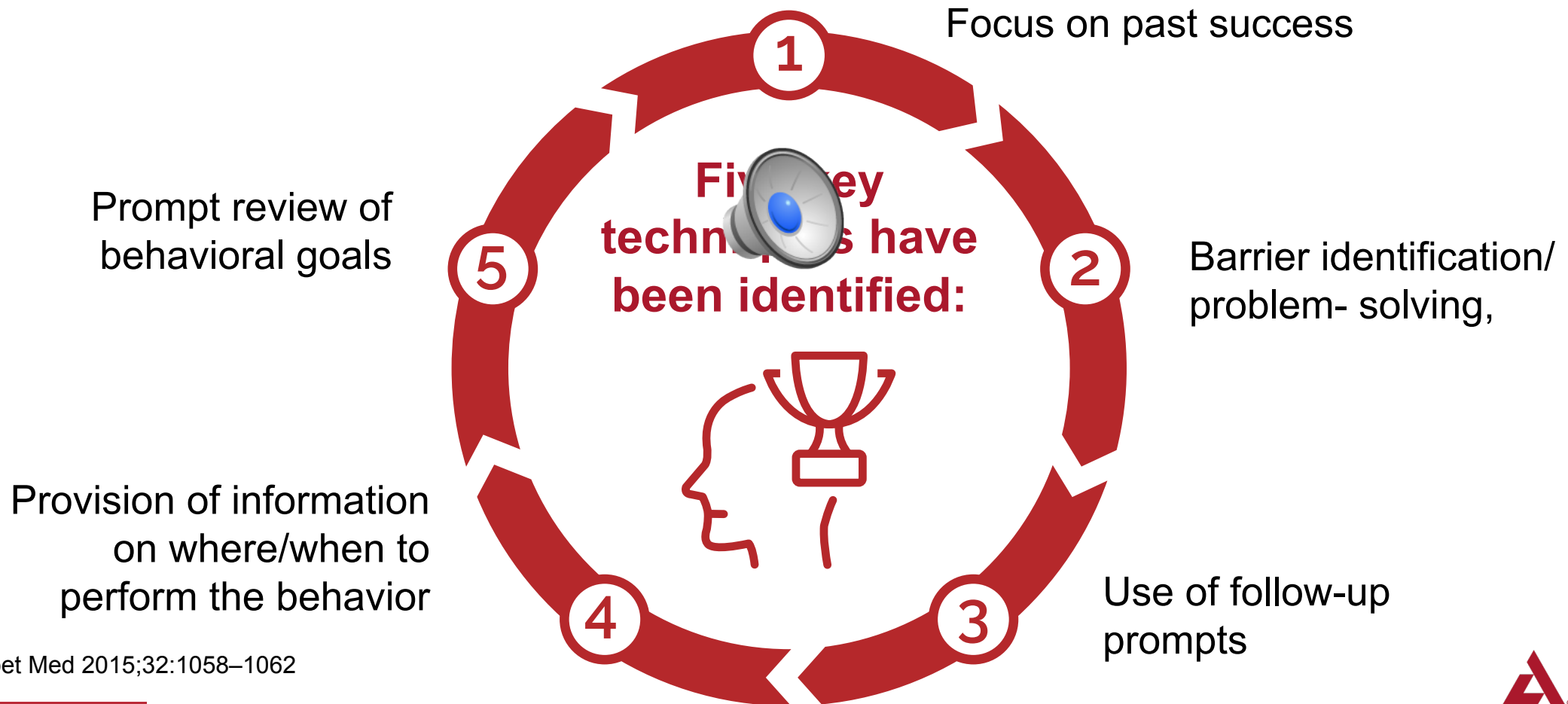
- Reduce sedentary time
- Light activity every 30 minutes for sedentary sitting.
- No more than 2 days of rest between exercise to increase insulin action.



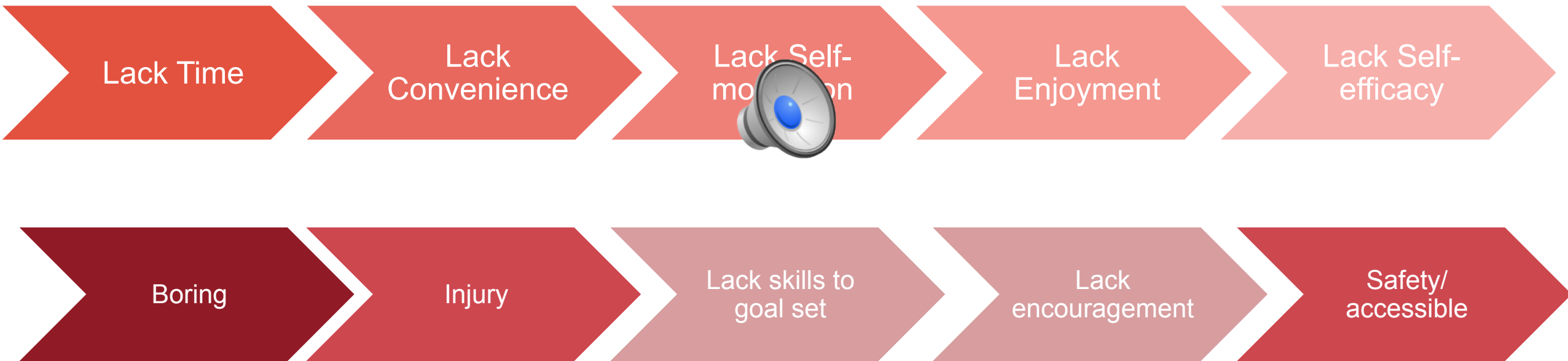
Behavioral Change



Behavior-Change Strategies

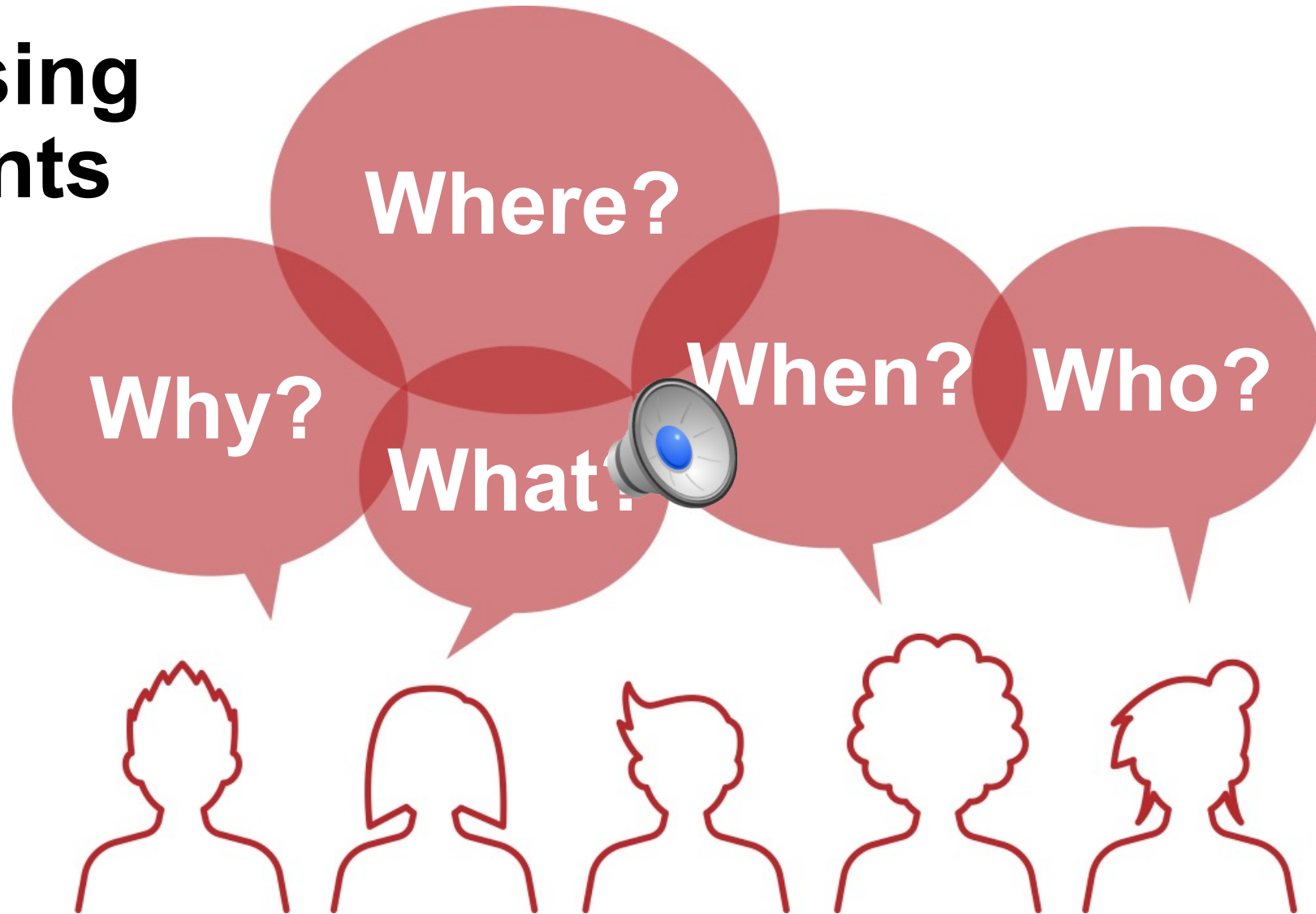


10 Reasons Why Adults Do Not Exercise





Advising Patients



Why

- Discuss the short and long-term health and quality of life benefits of beginning an exercise program.



Provide Options

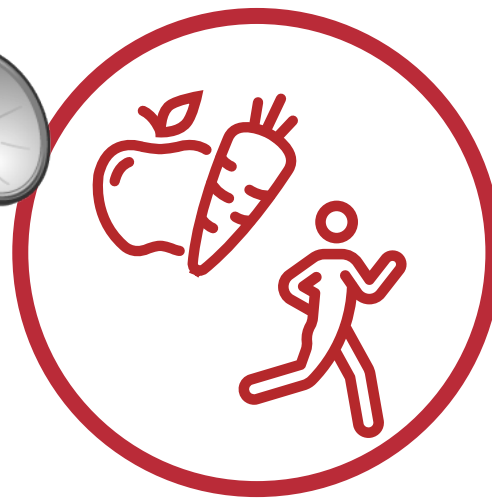
After providing information about why to exercise, provide options from which the patient can choose:



Do Nothing



Medication



Diet/
Exercise



Meds/Diet/
Exercise

What?

- What type of exercise?
- What level of exertion?
- How long? How often?



Activity Level

Intensity can be described in two ways:

Absolute Intensity:

Expressed in METS - 1 MET is equivalent to the resting metabolic rate or the energy expenditure while awake and sitting quietly

Relative Intensity:

Is specific to your level of fitness and based off of your maximum capability of work. For example, a percentage of your maximum heart rate or oxygen uptake, both of which are signs of fitness.

Moderate = 3-6 METS: walking briskly; raking the yard

Vigorous = >6 METS: jogging or running; strenuous fitness class



Activity Level

- Heart Rate - 60-80% of max heart rate (220-age).
- Talk Test –
 - Moderate-intensity aerobic activity: can talk, but not sing, during the activity.
 - Vigorous-intensity activity: generally cannot say more than a few words without pausing for a breath.



Where?

- Where are you going to exercise?



When?

- What days?
- What time of day?



Recommendations for Specific Types of DM



Prediabetes

- Structured lifestyle interventions that include at least 150 min/week of physical activity and dietary changes result in weight loss of 7% are recommended for prediabetes (Diabetes Prevention Program) [A].




Type 1 Diabetes

- Physical activity should be recommended to all [B].
- To maintain euglycemia, may need to adjust carbohydrate and/or insulin doses [B].
- Frequent blood glucose checks should occur [B].
- Consider insulin pumps and continuous glucose monitoring during physical activity to help manage blood glucose and monitor for hypoglycemia [C].



Type 1 Diabetes - Continued

- Biphasic hypoglycemia
 - During bout
 - Later onset of hypoglycemia – especially during sleep and >24 h later.
- May need to make adjustments anywhere from 25-75% of insulin requirements.
 - Basal reduction may be needed if longer bouts of exercise.
- Support your patients particularly adolescent and pediatric patients.

Suggested Carbohydrate intake based on blood glucose pre-exercise for T1DM

<90 mg/dL	Ingest 15-30g prior to activity. May need to eat during exercise if prolonged due to hypoglycemia.
90-150 mg/dL	Ingest carbohydrates depending on intensity of exercise
150-250 mg/dL	No extra carbohydrates needed
250-350 mg/dL	Test for ketones and avoid exercise if ketonuria because intense exercise can initially exaggerate hyperglycemia.
>350 mg/dL	Consider corrective insulin correction prior to exercise. Do not exercise if positive for ketonuria.



Adapted from ACSM/ADA Guidelines for Exercise, 2016.

Suggested Pre-Meal Insulin Reduction Prior to Exercise within 90 minutes after insulin administration

Intensity	30 minute Duration	60 minute Duration
Mild Aerobic	-25%	-50%
Moderate Aerobic	-50%	-75%
Heavy aerobic	-75%	*not assessed, as exercise intensity cannot be sustained for 60 minutes.



Adapted from ACSM/ADA Guidelines for Exercise, 2016.

Gestational Diabetes – The Do's

- There are no guidelines specifically for GDM by ADA/ACSM.
- The American College of Obstetricians & Gynecologists generally recommends exercise and physical activity be maintained throughout pregnancy.
- Key is to maintain hydration and glucose.
- Thermoregulatory consideration important.
- Encourage warm-up and cool-down.



Physical Activity/Exercise and Diabetes: A Position Statement of the American Diabetes Association published in 2016.
<http://care.diabetesjournals.org/content/diacare/39/11/2065.full.pdf>

Brown, J., Ceysens G., & Bouvain M. (2017). Can exercise, for women with gestational diabetes, improve outcomes for mother and baby? *Cochrane Review*. Retrieved from:
<https://www.cochrane.org/CD012202/PREG-can-exercise-women-gestational-diabetes-improve-outcomes-mother-and-her-baby>


Gestational Diabetes – The Don'ts

- Absolute contraindications include disease states that could cause prematurity such as gestational hypertension, preeclampsia, ruptured membranes, persistent vagina bleeding, placenta previa.
- Avoid contact sports and activity that increases risk of falling.
- Avoid supine position after first trimester.
- Terminate exercise bout if: vaginal bleeding, dizziness, headache, chest pain, decreased fetal movement.



Gestational Diabetes: Cochrane Review 2017

11 trials of 638 pregnant women determined the following:

- Exercise lowers fasting and post-prandial blood glucose levels.
- Outcomes for pregnant women with GDM may not change but the effect of exercise may persist after birth. 
- GDM who want to exercise should discuss with their health professional.

All Types of Diabetes

- ADA recommends close monitoring of glucose pre-, during, and post-exercise
- Always keep glucose supplements on hand
- Encourage warm-up and cool-down exercises.
- Pre- and post-foot checks with education on proper fitting shoes
- Replace any fluid and electrolyte deficits.



Minimizing Adverse Events

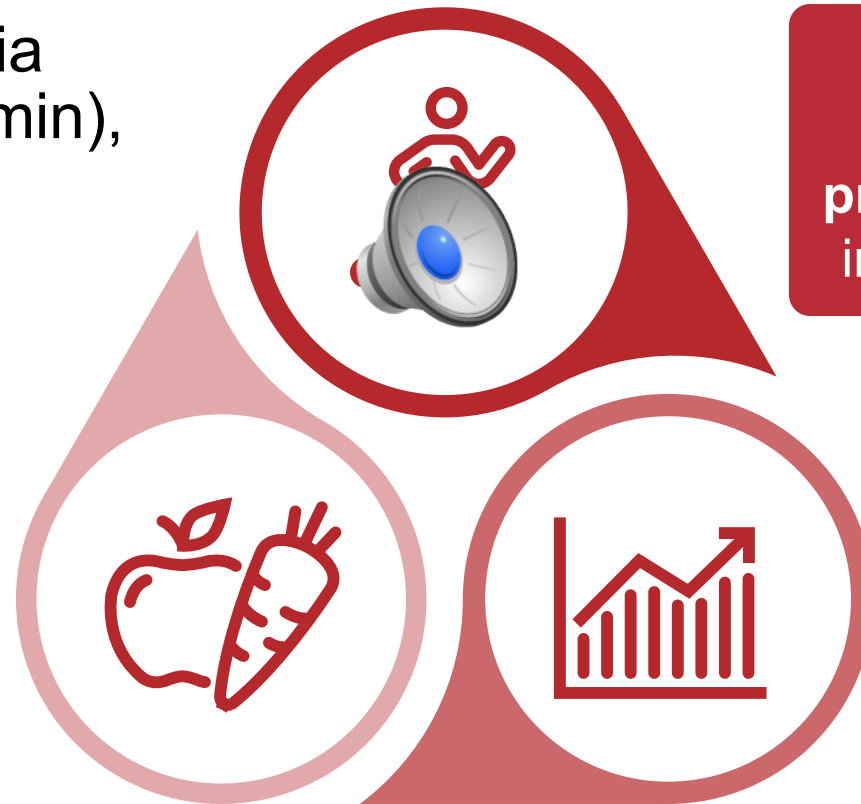
- Basal reduction of insulin may be needed if nocturnal hypoglycemia occurs [C].
- Caution with medications besides insulin that can cause hypoglycemia [C].
- Exercise-induced hyperglycemia is most common in T1DM; insulin administration or lower intensity aerobic exercise can mitigate [C].



Management of Food and Insulin With Physical Activity

To prevent hypoglycemia during prolonged (>30 min), predominantly aerobic exercise:


Additional carbohydrate intake



Blood glucose concentrations should always be checked prior to exercise undertaken by individuals with type 1 diabetes.

And/or reductions in insulin are typically required.

Medications & Exercise for Diabetes

- Insulin
 - Deficiency can cause hyperglycemia → Ketoacidosis
 - Excess can lead to hypoglycemia
 - Always have carbs available and dose appropriately insulin 
- Insulin secretagogues
 - Exercise induced hypoglycemia can occur
 - Reduce dose on exercise days?
- SGLT-2 inhibitors
 - Orthostatic hypotension
- Metformin, thiazolidinediones, GLP1RA, DPP4-inhibitors, SGLT2-inhibitors safe for exercise

Medications & Exercise for Diabetes Comorbidities

- Anti-epileptics
 - Dizziness
- Statins
 - Hypoglycemia unawareness
 - Myalgias
 - Reduced maximal exercise capacity
- Beta Blockers
 - Hypoglycemia unawareness and unresponsiveness
 - May reduce maximal exercise capacity
- Diuretics
 - Risk dehydration



Considerations for Elderly & Pediatrics



Older Adults

- Aging effects physical function & exercise performance
- Osteoarthritis, osteoporosis and fracture risk, sarcopenia and increased falls/frailty are unique challenges.
- Joints become less flexible with age and changes in the body's connective tissues combined with arthritis and hyperglycemia put increased stress on joints during physical activity.
- Regular activity can help joint pain.
- Consider risk of falls, polypharmacy, and orthostasis when giving exercise advice.



Youth

- Important in all types of diabetes and prevention!
- Optimal peak bone mass
- Hypoglycemia risk – lowered in team sport activities such as sprinting



Goal Setting

- SMARTER goals
 - Specific
 - Measureable
 - Achievable
 - Realistic
 - Time-Oriented
 - **Evaluate!**
- Monitor fitness using devices[C].



Exercise Prescription and Referral Form



Clinic Address:
Tel:
Fax:
Email:

Name : _____ NRIC: _____ Age : _____

Date : _____ Risk Level LOW MODERATE HIGH

Referral to Health Fitness Professional :

Address: _____

Appointment Date: _____

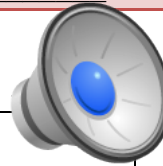
Exercise Goals : _____

Medical Conditions :

- Hypertension Dyslipidaemia
 Obesity Diabetes Mellitus
 Others _____

Medications: _____

RX: Aerobic Exercise :



Type			
How many times a week			
Intensity / target heart rate			
Number of minutes each day			
Total number of minutes per week			

Resistance Exercise: _____

Others: _____

Remarks/Special Precautions: _____

Physician Signature & Name : _____



Name: _____ Date: _____

Aerobic Activity

Type: Walk Run Swim Bike Other_____

Frequency (days/week): 2 3 4 5 6 7

Intensity: Light (A Casual Walk) Moderate (Walk) Vigorous (Jogging or Running)



Time (minutes/day): 10 20 30 60 60 or more

Steps/day: 2,500 5,000 7,500 10,000 More than 10,000

Strength Training

- Muscle strengthening should be done at least two days per week
- Exercise should be done to strengthen all major muscle groups: legs, hips, back, chest, abdomen, shoulder, arms
- For each exercise, 8-12 repetitions should be completed
- Examples include bodyweight exercise (e.g. push-ups, lunges), carrying heavy loads, and heavy gardening

Physician Signature: _____

Summary

- Regular exercise may prevent or delay type 2 diabetes development
- Exercise improves blood glucose control in type 2 diabetes, reduces cardiovascular risk factors, contributes to weight loss, and improves well-being
- Prolonged sitting should be interrupted
- Most adults with diabetes should engage in 150 min or more of moderate-to-vigorous intensity activity weekly, spread over at least 3 days/week, with no more than 2 consecutive days without activity.



Resource

- American Diabetes Association. 5. Facilitating behavior change and wellbeing to improve health outcomes: Standards of Medical Care in Diabetes 2020. Diabetes Care 2020;43(Suppl. 1):S48–S65
- Physical Activity/Exercise and Diabetes: A Position Statement of the American Diabetes Association - Diabetes Care 2016;39:2065–2079 | DOI: 10.2337/dc16-1728
- <http://www.exerciseismedicine.org>