Kirsten C. Ward

MS, RCEP, CDE
Physical Activity: The Basics, The Precautions, The Guidelines and More!

Diabetes Health Coach/Consultant
Say Goodbye To Diabetes
Boston, MA

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Objectives:

- Explain the ACSM guidelines for aerobic and strength training for all adults
- State physical activity guidelines for snacking
- State adjustments for insulin and other medications
- Create a physical activity plan for person with diabetes with or without complications

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Disclosure to Participants

- Notice of Requirements For Successful Completion
  - Please refer to learning goals and objectives
  - Learners must attend the full activity and complete the evaluation in order to claim continuing education credit/hours
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General Outline For Today

- Background clinical studies
- Physical activity recommendations
- Blood glucose guidelines during physical activity
- Medication adjustments
- Precautions/Complications

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Benefits for Person with Diabetes

- Improved insulin sensitivity
- Lower blood glucose levels
- Improved glucose uptake
- Improved A1c
- Reduced CV risk factors
- Prevention/delay development of T2
- And more!

Diabetes Care 2016;39:2065–2079 | DOI: 10.2337/dc16-1728

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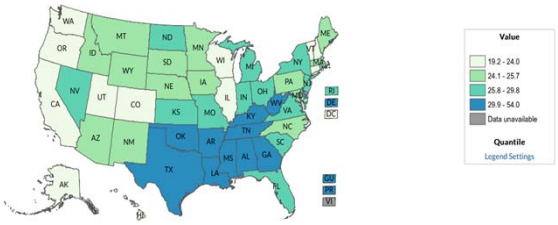
Physical Inactivity in the U.S. in 2017



CDC: Nutrition, Physical Activity, and Obesity: Data, Trends and Maps

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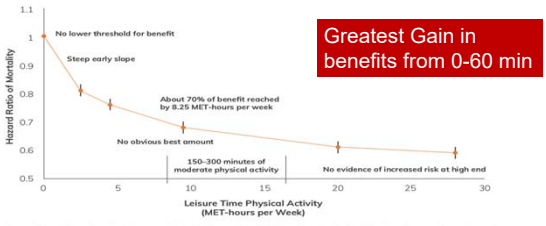
Relationship of Moderate to Vigorous Physical Activity to All Cause Mortality



Greatest Gain in benefits from 0-60 min

Source: Adapted from data found in Moore SC, Patel AV, Matthews CE. Leisure time physical activity of moderate to vigorous intensity and mortality: a large pooled cohort analysis. PLoS Med. 2012;9(11):e1001335. doi:10.1371/journal.pmed.1001335.

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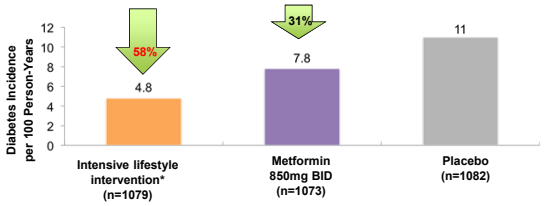
DPP Review

Diabetes Prevention Program (N=3234)



*Goal: 7% reduction in baseline body weight through low-calorie, low-fat diet and ≥150 min/week moderate intensity exercise .

IGT, impaired glucose tolerance; T2D, type 2 diabetes.

DPP Research Group. *N Engl J Med*. 2002;346:393-403.

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Look AHEAD Lifestyle Benefits:

- More significant weight loss & improvements in fitness
- Improved glycemic control
- Significantly more people reach 3 ADA goals for A1c, BP and lipids
- Improved BP & lipid levels
- Less sleep apnea, depression & liver fat

Diabetes Spectrum 2017 Aug; 30(3): 166-170

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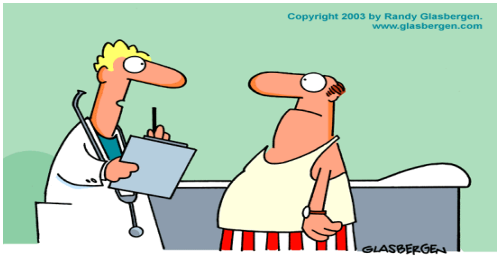

"What fits your busy schedule better, exercising one hour a day or being dead 24 hours a day?"

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Physical Activity Recommendations:

How much exercise is recommended (regardless of having diabetes)?

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What is The Difference?

Exercise	Physical Activity
•Biking/Spinning •Walking/Running •Swimming •Weight training •Zumba	• Gardening • Cleaning • Mowing the lawn • Shoveling snow • Construction work • Manual labor • Pedometers/Fitbit…

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2019 ADA Lifestyle Management: Standards of Medical Care in Diabetes

- Children and adolescents with T1, T2, or Pre-DM should do 60 min/day of moderate or vigorous aerobic activity

AND

- Strengthening activities 3x/week

Diabetes Care 2019;42(Suppl. 1):S46–S60 | https://doi.org/10.2337/dc19-S005

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2019 ADA Lifestyle Management: Standards of Medical Care in Diabetes

- T1 & T2 Adults: Should do aerobic activity of moderate to vigorous intensity 150 min or more/week over at least 3 days.

OR

- Vigorous-intensity or interval training of 75 min/week

AND

- 8-10 strength training exercises, 8-12 repetitions, twice (2-3x) a week

Diabetes Care 2019;42(Suppl. 1):S46–S60

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2019 ADA Lifestyle Management: Standards of Medical Care in Diabetes

AND

- Decrease sedentary behavior
- Flexibility & balance training 2-3x/week

Diabetes Care 2019;42(Suppl. 1):S46–S60

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Sedentary Behavior

- All adults (esp. type 2) should decrease the amount of time spent in daily sedentary behavior
- Prolonged sitting should be interrupted with light activity every 30 min
- The above two recommendations are additional to, and not a replacement for, increased structured exercise and incidental movement

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Components of Fitness/ Exercise Program

1. Cardio-respiratory function
2. Musculoskeletal fitness
3. Flexibility
4. Balance
5. Speed

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Progression of Fitness/ Exercise Program (FITT Principle)

1. Frequency
2. Intensity
3. Time (duration)
4. Type of exercise
5. Progression

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Target Heart Rate/RPE

1. 220-Age (60%-80%)
   - 220-40 = 180 * 60%=108
   - 80%= 144
   - (108-144 bpm target)
2. RPE: Rating of perceived exertion
3. Talk Test

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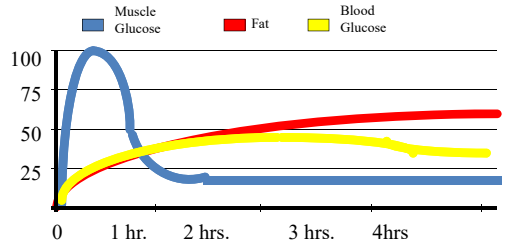
Energy Sources During Exercise



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Exercise is…

The Golden Key!

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Exercise Programming:

Health/ Improve BG 	Lose/Maintain Weight 
3-5x/week	5-6x/week
20-30 min	45-60 min

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Review: What is The Definition of Hypoglycemia (NO PA)?

- Blood Glucose less than 70 mg/dL
- Treat with the rule of 15
  - 15 grams of carb every 15 min, re-check BG

Diabetes Care 2019;42(Suppl. 1):S61–S70

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Review: What are Some of the Signs of Hypoglycemia?

Headache
Dizziness
Sweatiness
Confusion
Weakness / shakiness
Hunger
Tachycardia
Paleness

Diabetes Care 2019;42(Suppl. 1):S61–S70

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Who is NOT at Risk for Exercise Induced Hypoglycemia? People Who take:

- GLP1/Incretin Mimetic
- DPP-4s
- SGLT2 Inhibitors
- Biguanides
- Thiazolidinediones
- Alpha-glucosidase Inhibitors

Diabetes Care 2016;39:2065–2079 | DOI: 10.2337/dc16-1728 #AADE19

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Who IS at Risk for Exercise Induced Hypoglycemia? Those who:

- Have T1
- Use insulin:
  - Rapid/Short acting
  - Intermediate
  - Long acting
- Use Sulfonylureas
- Use Meglitinides
- Combo Medications

Diabetes Care 2016;39:2065–2079 #AADE19

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Potential Risk of Hypoglycemia:

- Autonomic neuropathy – requires careful supervision and progression of fitness program (blunted HR, BP, and hypoglycemia awareness)
- Gastroparesis – erratic impact on BG which may be exacerbated by exertion
- Beta blockers – may "mask" the symptoms of hypoglycemia

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Nocturnal Hypoglycemia/Lag Effect

- More common in type 1 DM
- Usually between 6-15 hours (48 hours potential)
- Treatment Suggestions
  - Decrease insulin dose
  - Check BG overnight
  - Use CGM

Diabetes Care 2016;39:2065–2079

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Blood Glucose Guidelines During Physical Activity

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Pre-Exercise BG Guidelines

- General Target: **90-250 mg/dL or 126-180 mg/dL**
  - What is the starting BG?
  - What is the intensity?
  - What is the duration?
  - What is the type of activity?

Diabetes Care 2016;39:2065–2079
The Lancet Review Jan 23 2017;1-14

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Pre-Exercise Hyperglycemia Guidelines

- **Type 1**:Caution BG values >250 mg/dL
  - Unexplained hyperglycemia: **NO EXERCISE**
  - Check for ketones
    - positive ketones (blood>1.5mmol/L) = **NO**
    - positive ketones (urine>2+ - 4.0mmol/L) = **NO**
    - BG 250-350 mg/dL (trace-mild ketones) **Proceed with caution**
- **Type 2**: BG values > 400 mg/dL = NO EXERCISE

Diabetes Care 2016;39:2065–2079
The Lancet Review Jan 23 2017;1-14

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Post-Exercise BG Guidelines

- Individualize For Each Person:
  - OA: Above **90 mg/dL (**)**
  - Insulin: Above **110 mg/dL (**)**
  - High BG after EX….

**General suggestions to be individualized

Goal: Prevent Hypo!

www.joslin.org

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Medication Adjustments

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Exercise & Insulin

Inject Less!

- Individualize
- Think about the peak action
  - Rapid/Short acting insulin (adjust 90 min within mealtime)
  - Intermediate/Long acting insulin
- Should person inject into the working muscle?
- What about adjusting oral agents for type 2?
- Start slowly

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Insulin Adjustment Options

- Reduce pre-meal bolus…
  - When PA within 90 min of bolus
  - Mild intensity aerobic, 30-60 min (↓25-50%)*
  - Moderate intensity aerobic, 30-60 min (↓ 50-75%)*
  - Heavy intensity aerobic (↓ 75%)*
  - Intense aerobic/anaerobic (no reduction)

Diabetes Care 2016;39:2065–2079

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Insulin Adjustment Options

- Temporary Basal (pre, during, post)
  - Instead of Bolus/In addition to Bolus
  - Start with ↓ 30%-50% 1-2 hours pre-PA
  - MDI – Adjust night before or morning
  - Consider intensity, duration
- Un-tethered option
- Disconnect/Suspend

Diabetes Care 2016;39:2065–2079

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Other Considerations

- Consider CGM directional arrows
- Cumulative effect of PA

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Insulin Pump Options

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Snacking Suggestions (Individualize):

30 Min: 15-30 grams of CHO

60 Min: 15-30 grams of CHO
+ 7-8 grams of PRO

60+ Min: 15-30 grams of CHO
+ Adjust the Insulin

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Snacking Suggestions (Individualize):

Pre-Ex Blood Glucose	CHO Suggestions
<90 mg/dL	**15-30 g of fast-acting CHO PRIOR to starting PA**
90-150 mg/dL	CHO at start of PA
150-250 mg/dL	Delay CHO until BG <150mg/dL

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Adjust Insulin or Snack?

Insulin
- Planned
- To Lose/Maintain weight
- To improve control

Snacks
- Long duration activity
- Unplanned

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Precautions/ Complications

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Precautions

- Scope of Practice
- Complications (Neuropathies)
- Exercise tolerance test (stress test)

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Refer to MD/DO When Person Has:

- Erratic glycemic control
- Not been appropriately evaluated
- Severe complications (acute or chronic)

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Exercise & Retinopathy:

	Considerations	Recommendations
Mild to Moderate Non-proliferative	•Limited/No Risk	•Annual eye exam •Moderate: avoid increasing BP

Diabetes Care 2016;39:2065–207

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Exercise & Retinopathy:

	Considerations	Recommendations
Severe NPDR and Unstable NPDR	•Risk vitreous hemorrhage •Risk retinal detachment	•Avoid raising BP •Avoid PA with impact •Avoid Valsalva •Avoid head below waist

Diabetes Care 2016;39:2065–207

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Exercise & Peripheral Neuropathy

- Recommendations:
  - Proper foot care
  - Consider non-weight bearing w/ local foot issues
  - Ulcer/Charcot Foot: No weight bearing

Diabetes Care 2016;39:2065–2079

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Exercise & Autonomic Neuropathy

- Risks & Recommendations:
  - Postural hypotension: avoid quick postural changes
  - Altered thermoregulation: avoid overheating, stay hydrated
  - Cardiac autonomic neuropathy: MD clearance/ETT, RPE
  - Gastroparesis: hypoglycemia harder to treat

Diabetes Care 2016;39:2065–2079

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Exercise & Nephropathy

- Microalbuminuria:
  - PA does not accelerate
  - More PA may moderate progression
- Albuminuria or nephropathy:
  - Start at low intensity & volume

Diabetes Care 2016;39:2065–2079

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Exercise & Nephropathy

- End Stage:
  - Start low intensity & volume
  - monitor electrolytes if PA during dialysis

Diabetes Care 2016;39:2065–2079

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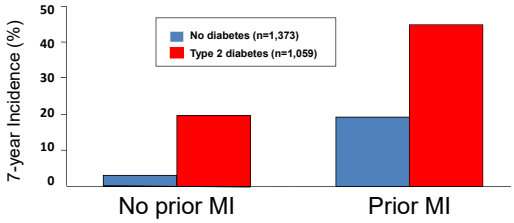
Incidence of Myocardial Infarction In People with Type 2 Diabetes



Haffner SM et al. *N Engl J Med.* 1998;339:229-234

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2015 ACSM Pre-Exercise Health Screening & Evaluation

- No more risk-factor assessment
- Recommend anyone with DM who is sedentary should obtain medical clearance (even low intensity)
- Adopted three factor review:
  1. The Individual's current physical activity level
  2. Presence of signs or symptoms CVD, metabolic, renal disease
  3. Desired exercise intensity

MSSE: November 2015, Volume 47, Issue 11 –p2473-2479

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Take Home Messages

- Individualize
- Move more!
- Interrupt sedentary behavior

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Diabetes Training Camp.com

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Most Importantly…Have Fun!



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Thank You!

Contact Info:

Kirsten Ward, MS, RCEP, CDE

info@saygoodbyetodiabetes.com

https://forms.aweber.com/form/26/2031173626.htm

617-329-1950

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CVD Risk Factors:

- Age
- Gender
- Heredity
  - Race; MI prior to age 55
- High blood pressure (≥140/90 mmHg)
- High cholesterol (>200 mg/dl)
  - LDL >160 mg/dl
  - HDL <35 mg/dl
- **Physical inactivity**
- Obesity
  - >30% of body weight
  - BMI >30 kg/m^2
- Diabetes
- Smoking
- Fibrinogen (clotting factor)
- C-reactive protein
- Left Ventricular Hypertrophy (LVH)
- Cocaine use

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Typical Activities Intensity Levels

<3.0 METs or <4 kcal/min	3-6 METS or 4-7 kcal/min	>6 METS or >7 kcal/min
Walking 1-2mph	Walking 3-4 mph	Fast Walking
Biking <50W	Biking <10mph	Biking >10mph
Golf w/ Cart	Golf w/out Cart	
•Cleaning •Mowing The Lawn (sitting)	•General cleaning •Mowing (powered)	•Mowing (manual)

JAMA, 273 (5) Feb 1,1995. 402-407

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Pregnancy

Benefits:

- Reduce risk of
  - preeclampsia
  - C-section
  - Excessive weight gain
- Improve CV health

Recommendations:

- Pre-Existing DM: Any type of PA prior to and during
- At risk for gestational: 20-30 min of moderate-intensity on most or all days of week

Diabetes Care 2016;39:2065–2079

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The word on avoiding "active sites" for injecting…

Michael Berger, MD:

"this recommendation turned out to be quite useless and, in fact, potentially dangerous: exercise-induced hypoglycemia cannot be avoided by simply changing the insulin injection site."

(ADA, Handbook of Exercise in Diabetes) DATE

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