

How Sweet It Is! Management of Diabetes: Diabetes Disease State Management

Mary Lynn McPherson, PharmD, MA, BCPS, CPE

Home Study Webcast

4 Slides Per Page



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ACTIVITY DESCRIPTION

Pharmacists are increasingly providing diabetes disease state management in large numbers. This presentation will pull together all the information in this series through a case-based discussion.

TARGET AUDIENCE

The target audience for this activity is **pharmacists, pharmacy technicians and nurses** in hospital, community, and retail pharmacy settings.

LEARNING OBJECTIVES

After completing this activity, the **pharmacist** will be able to:

- Given a simulated case of a patient at risk for diabetes, or who has pre-diabetes, describe strategies to slow disease progression.
- Given a simulated patient with diabetes, select non-pharmacologic and pharmacologic interventions that aim to control diabetes.
- Develop a monitoring plan and educational plan for a patient with diabetes.

After completing this activity, the **pharmacy technician** will be able to:

- Given a simulated case of a patient at risk for diabetes, or who has pre-diabetes, describe strategies to slow disease progression.
- Given a simulated patient with diabetes, select non-pharmacologic and pharmacologic interventions that aim to control diabetes.
- Develop a monitoring plan and educational plan for a patient with diabetes.

ACCREDITATION

Pharmacy



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ACTIVITY TYPE

Knowledge-Based Home Study Webcast

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Professor, University of Maryland School of Pharmacy

ABOUT THE AUTHOR

Mary Lynn McPherson, PharmD., MA, MDE, BCPS, CPE, CDE is Professor and Executive Director, Advanced Post-Graduate Education in Palliative Care in the Department of Pharmacy Practice and Science at the University of Maryland School of Pharmacy in Baltimore. She also serves as the Program Director for the Online Master of Science and Graduate Certificate Program in Palliative Care through the University of Maryland, Baltimore. Dr. McPherson has a master's degree in Instructional Systems Development, and a second master's degree in Distance Education and e-Learning.

Dr. McPherson has maintained a practice in hospice and palliative care (local and national) and ambulatory care her entire career. Dr. McPherson teaches extensively in the Doctor of Pharmacy curriculum on pain management and end of life care, including didactic and experiential content. She also developed one of the first and few palliative care pharmacy residencies in the U.S.

Dr. McPherson serves on the Board of the Hospice Network of Maryland, and was founding president of the American Society of Pain Educators. McPherson is a Fellow in the American Society of Health-Systems Pharmacists, the American Pharmacists Association, the American Society of Consultant Pharmacists and the American Society of Pain Educators. She is Board Certified in Pharmacotherapy, a Certified Diabetes Educator and a Certified Pain Educator. She has received many honors for her work, including the American Pharmacists Association Distinguished Achievement Award in Specialized Practice, the Maryland Pharmacists Association Innovative Practice Award, and the Maryland Society of Health-Systems Pharmacists W. Purdum Lifetime Achievement Award. Dr. McPherson has received many awards for teaching including the Presidential Citation from the Hospice and Palliative Nurses Association, Professor of the Year many times from the School of Pharmacy, University of Maryland Baltimore Founder's Week Teacher of the Year and the Robert Chalmers Distinguished Educator Award from the American Association of Colleges of Pharmacy. She has written four books, including "Demystifying Opioid Conversion Calculations: A Guide for Effective Dosing," and many book chapters and peer-reviewed articles on pain management, palliative care, and other topics.

FACULTY DISCLOSURE

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How Sweet It Is!
**Management of Diabetes: Diabetes Disease
 State Management**

Faculty: Mary Lynn McPherson, PharmD, MA, BCPS, CPE

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faculty

Mary Lynn McPherson, PharmD, MA, BCPS, CPE
 Professor, University of Maryland School of Pharmacy

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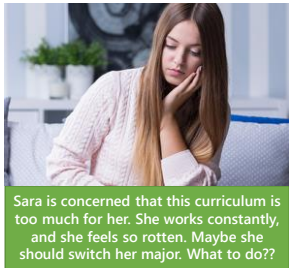
Objectives



- Given a simulated case of a patient at risk for diabetes, or who has pre-diabetes, describe strategies to slow disease progression.
- Given a simulated patient with diabetes, select non-pharmacologic and pharmacologic interventions that aim to control diabetes.
- Develop a monitoring plan and educational plan for a patient with diabetes.
- Introduction to diabetes mellitus.
- Lifestyle modification and diabetes mellitus
- Monitoring diabetes mellitus
- Medication management Part 1
- Medication management Part 2
- Problem solving with diabetes mellitus
- Coping with diabetes mellitus
- Risk reduction and management of complications with diabetes mellitus Part 1
- Risk reduction and management of complications with diabetes mellitus Part 2
- Diabetes disease state management**

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Sara Berkins



- 21 year old student
 - Pre-pharmacy/Biology major
 - 5'5", 120 pounds (usually)
- States she hasn't been feeling well lately
 - Tired, no energy
 - Thirsty ALL the time, drinks a lot of regular soda or orange juice
 - Increased urination (she thinks because of all the soda)
 - Has lost about 5-7 pounds over last two-three weeks

Sara is concerned that this curriculum is too much for her. She works constantly, and she feels so rotten. Maybe she should switch her major. What to do??

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Sara's mother MAKES her go to student health

- On physical exam Sara shows dry mucous membranes
- Orthostatic blood pressure
 - Supine 118/78 mmHg
 - Standing 90/60 mmHg
- Labs (fasting):
 - Serum creatinine 0.7 mg/dL
 - BUN 25 mg/dL
 - Fasting plasma glucose 180 mg/dL
 - A1c 7.8%



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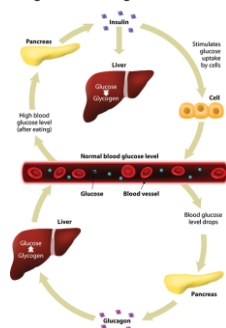
So what is diabetes mellitus?

- "A condition characterized by hyperglycemia resulting from the body's inability to use blood glucose for energy. In Type 1 diabetes, the pancreas no longer makes insulin and therefore blood glucose cannot enter the cells to be used for energy. In Type 2 diabetes, either the pancreas does not make enough insulin or the body is unable to use insulin correctly."
- See more at: <http://www.diabetes.org/diabetes-basics/common-terms/#sthash.OlpR7p0L.dpuf>

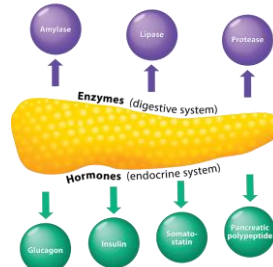
<http://www.diabetes.org/diabetes-basics/common-terms/>

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INSULIN AND GLUCAGON regulate blood glucose levels



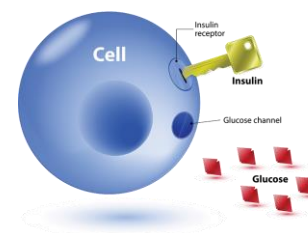
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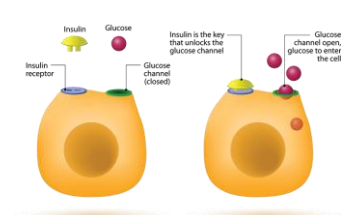
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A closer look at insulin

IMPORTANCE OF INSULIN



HOW DOES INSULIN WORK?



For more information - <https://www.youtube.com/watch?v=OH4z8pW4Mw>

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Criteria for the Diagnosis of Diabetes

FPG $\geq$ 126 mg/dl. Fasting is defined as no caloric intake for at least 8 hours*

OR

2-h PG $\geq$ 200 mg/dl during an OGTT. The test should be performed as described by the WHO, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water*

OR

A1c $\geq$ 6.5%. The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay

OR

In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose $\geq$ 200 mg/dl

**In the absence of unequivocal hyperglycemia, results should be confirmed by repeat testing*

Categories of increased risk for diabetes (prediabetes)

- FPG 100 mg/dl – 125 mg/dl (IFG), OR
- 2-h PG in the 75-g OGTT 140 mg/dl–199 mg/dl (IGT), OR
- A1c 5.7–6.4%

Sara's Blood Glucose Profile:

FPG 180 mg/dl
A1c 7.8%

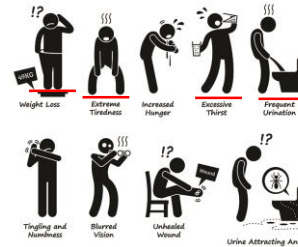


Diabetes Care, Supplement 1, January 2007

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Signs and Symptoms of Hyperglycemia

Diabetes: Signs and Symptoms



Sara has the classic signs and symptoms of hyperglycemia. Also dehydration (poor skin turgor and orthostatic hypotension)

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Type 1 - Type 2 – GDM

Factor	Type 1	Type 2
Age at detection	• Usually young	• Usually older
Speed of onset	• Usually more acute	• Insidious onset
BMI	• Not overweight	• Usually overweight
Insulin status	• Insulin deficiency	• Insulin resistance and/or insulin deficiency
Interventions	• Requires insulin from diagnosis	• Diet and lifestyle modification • Oral medications • Injectable medications
Familial association	• Often random	• Strong family history

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Injectable Insulins

Generic Name	Trade Name	Compatibility	Administration
Rapid Acting			
Insulin aspart	NovoLog	May be mixed with NPH for SQ injection May be given IV (NS, D5, D10)	SQ, IV, pump Administer within 5-10 minutes before a meal.
Insulin glulisine	Apidra	May be mixed with NPH for SQ injection May be given IV (NS)	SQ, IV, pump Administer 15 minutes before a meal or within 20 minutes after starting meal
Insulin lispro	Humalog	May be mixed with NPH for SQ injection May be given IV (NS)	SQ, IV, pump Administer within 15 minutes before or immediately after eating if dosed as a meal-time insulin
Short Acting			
Regular	Humulin R Novolin R	May be mixed with longer-acting insulin for SQ (not conc) May be given IV (NS) (not conc)	Humulin R, Novolin R – IV (not conc) Humulin R, Humulin R (conc), Novolin R – SQ Administer 30-45 minutes before meal

Facts and Comparisons

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Injectable Insulins

Generic Name	Trade Name	Compatibility	Administration
Intermediate Acting			
Insulin isophane (NPH)	Humulin N Novolin N	May be mixed with regular or insulin lispro (not Novolin N)	SQ Typically administered within 30 minutes of a meal; typically given twice daily
Long Acting / Ultra Long Acting			
Insulin degludec	Tresiba	Do not mix or dilute with any other insulin or solution	Once daily dosing, can be administered at any time of the day, at the same time every day
Insulin detemir	Levemir	Do not mix or dilute with any other insulin or solution	Once daily, with evening meal or bedtime. Twice daily dosing – evening dose with evening meal, at bedtime, or 12 hours after morning dose
Insulin glargine	Lantus, Toujeo, Basaglar	Do not mix or dilute with any other insulin or solution	Once daily dosing can be administered at any time of the day, at the same time every day

Facts and Comparisons



Insulin Action Profiles

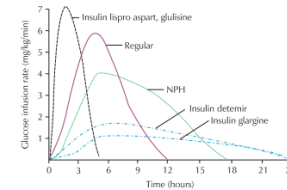


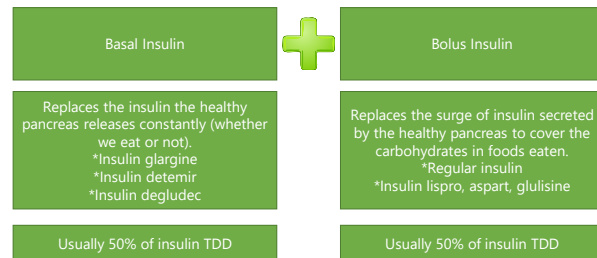
Fig. 1. Activity profiles of different types of insulin. Reprinted with permission from diabetes education online, diabetes teaching center. NPH: neutral protamine hagedom. Copyright © 2009 The Regents of the University of California, all rights reserved, www.deo.ucsf.edu.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3431894/>



Crafting Insulin Regimens – Type 1 DM

- Patients with T1DM are insulinopenic, and require replacement of BOTH:



TDD = total daily dose

<http://www.jalimedline.com/insulin-dosing-made-simple/>



Dosing insulin for Sara

- Sara – 21 year old diagnosed with Type 1 DM
- TDD for most patients with T1DM is 0.5-1 unit/kg/day
- Sara weighs 54.5 kg → (54.5 kg)(0.5 units/kg) = 27 units TDD
- Half of TDD is basal → 13.6 (increase to 14) units insulin glargine in the evening
- Half of TDD is bolus → divide between three meals to start
 - 4 units insulin lispro before each meal
- Sara's initial insulin order is:
 - Insulin glargine 14 units every evening
 - Insulin lispro 4 units 15 minutes before breakfast, lunch and dinner



SMBG reflects which insulin?

Insulin	Time Injected	Period of Activity	SMBG Reflecting Insulin Action
Rapid-acting (lispro, aspart, glulisine)	Before a meal	Covers meal (acts to reduce post-prandial BG)	2 hour post-prandial (also pre-prandial value before next meal, or bedtime)
Short acting (regular)	Before a meal	Between that meal and either the subsequent one or the bedtime snack (if insulin is taken before dinner)	Both after meal before which insulin is injected and before next meal or bedtime snack (if insulin is taken before dinner)
Intermediate acting (NPH)	Before breakfast	Between lunch and dinner	Before dinner
Intermediate acting (NPH)	Before dinner or bedtime	Overnight	Before breakfast
Long acting (glargine or detemir)	Before breakfast OR before dinner, OR half dose at each time	Mostly overnight because rapid- or short-acting insulin overrides its effect during the day	Before breakfast (or bid)

Another way to look at this:

When this glucose is out-of-range	Adjust this insulin
Fasting	Intermediate or long-acting administered with dinner or at bedtime (glargine, detemir, NPH)
Postbreakfast/prelunch	Breakfast bolus of rapid- or short-acting
Postlunch/predinner	Lunch bolus of rapid- or short-acting OR NPH before breakfast
Postdinner/bedtime	Dinner bolus of rapid- or short-acting



Insulin Adjustment Rules of the Road

- Start by adjusting basal insulin – observe FBG in AM
 - Also have patient skip a meal; BG should hold steady
- Educate patient that meals and activities should be relatively stable
- Only adjust insulin doses if a PATTERN of response is observed
- Bolus dosing – teach patient carbohydrate counting
 - Usually 15 grams ~ 1 unit rapid-acting insulin; adjust for fat content
 - Check BG 2 hours after start of meal to assess appropriateness of dose
 - If premeal BG is < 60-70 mg/dL, decrease premeal rapid- or short-acting insulin by 1-2 units
- Correction and anticipatory insulin doses
 - Correction: 1-2 units/50 mg/dL over goal; anticipating – CHO dosing

Adjusting Sara's insulin regimen

- Sara's initial insulin order is:
 - Insulin glargine 14 units every evening
 - Insulin lispro 4 units 15 minutes before breakfast, lunch and dinner
- Assume no room for improvement in diet (very stable/consistent)
- Average BG readings (pattern):
 - Pre-breakfast: 110 mg/dL
 - 2 h PP Breakfast/Pre-lunch: 200 mg/dL
 - 2 h PP Lunch/Pre-dinner: 160 mg/dL
 - Bedtime: 130 mg/dL

Parameter	Target
A1c	< 7.0%
Preprandial capillary plasma glucose	80-130 mg/dL
Peak postprandial capillary plasma glucose	< 180 mg/dL

Adjusting Sara's insulin regimen

When this glucose is out-of-range	Adjust this insulin
Fasting	Intermediate or long-acting administered with dinner or at bedtime (glargine, detemir, NPH)
Postbreakfast/prelunch	Breakfast bolus of rapid- or short-acting
Postlunch/predinner	Lunch bolus of rapid- or short-acting OR NPH before breakfast
Postdinner/bedtime	Dinner bolus of rapid- or short-acting

Average BG readings (pattern):

- Pre-breakfast: 110 mg/dL
- 2 h PP Breakfast/Pre-lunch: 200 mg/dL**
- 2 h PP Lunch/Pre-dinner: 160 mg/dL
- Bedtime: 130 mg/dL

Current regimen:

- Insulin glargine 14 units every evening
- Insulin lispro 4 units 15 minutes before breakfast, lunch and dinner

Adjust to:

- Insulin glargine 14 units every evening
- Insulin lispro 6 units 15 minutes before breakfast
- Insulin lispro 4 units 15 minutes before lunch and dinner



Sara's poor little fingers...

- Sara reports for her regular clinic visit
- Her only complaint is her really sore finger tips from BG testing. What are your options?
- She is VERY invested in tight BG control
- Alternate site testing
- Freestyle Libre - <https://www.freestylelibre.us/>
 - Continuous (interstitial) glucose monitoring
 - Remains at site for 10 days
 - Glucose checked every minute, records every 15 min
 - Stores up to 8 hours of glucose data



One year later... (going to Honolulu!)

Baltimore-Washington Intl (United States) Time	Insulin Schedule	Honolulu Intl (United States) Time
25-03-201822:00	Night before flight, normal dose of Long-acting background insulin	25-03-201816:00
26-03-201807:35	Test your blood glucose levels before take off.	26-03-201801:35
08:35	Take-off. Fast-acting meal-time insulin with in-flight meal	02:35
12:30	Test your blood glucose levels.	06:30
16:30	Test your blood glucose levels.	10:30
19:06	Flight Lands - Duration : 8 hours, 31 minutes	13:06
20:00	Test your blood glucose levels.	14:00
22:00	1/2 normal dose of Long-acting background insulin	16:00
27-03-201801:00	Test your blood glucose levels.	26-03-201819:00
04:00	1/2 normal dose of Long-acting background insulin	22:00
27-03-201812:00	Test your blood glucose on waking.	27-03-201806:00
16:00	Test your blood glucose levels.	10:00
28-03-201804:00	Normal full once daily dose of Long-acting background insulin	27-03-201822:00

Flight plan:
Leaving DC at 8:35 am on March 26
Flight is 10.5 hours long
Lands in Honolulu at 1:06 pm on March 26



VoyageMD.com



Belinda Collins

- 43 year old woman, presents for semi-annual physical with PCP
- Belinda is 5'3", weighs 305 pounds
- 2 episodes of vulvovaginal candidiasis
- History of gestational diabetes x 2
- On routine blood testing, the following is discovered:
 - FPG 120 mg/dL
 - A1c 6.2%
- What's the scoop?



Diagnosis	A1c (percent)	Fasting plasma glucose (FPG)*	Oral glucose tolerance test (OGTT)* ^b	Random plasma glucose test (RPG)*
Normal	below 5.7	99 or below	139 or below	
Prediabetes	5.7 to 6.4	100 to 125	140 to 199	
Diabetes	6.5 or above	126 or above	200 or above	200 or above

<https://www.niddk.nih.gov/health-information/diabetes/overview/tests-diagnosis>



Prevention of delay of Type 2 DM (ADA)



- At least annual monitoring for the development of DM
- Refer to an intensive behavioral lifestyle intervention program
 - Modeled on Diabetes Prevention Program
 - To achieve and maintain 7% loss of initial body weight
 - Increase moderate-intensity physical activity (such as brisk walking) to at least 150 minutes/week
- Technology-assisted tools including internet-based social networks, distance learning, and mobile applications that incorporate bidirectional communication may be useful elements of effective lifestyle modification to prevent diabetes

Diabetes Care 2018;41(Suppl. 1):S51-S54



Diabetes Prevention Program



- Patients with pre-diabetes from 27 clinical centers in the US
 - 3,234 study participants; 45% from minority groups

Group	Intervention	Outcome
Lifestyle	Intensive training in diet, physical activity, behavior modification (with motivational counseling)	Reduced risk of developing T2DM by 58% Patients ≥ 60 years old reduced risk by 71% 5% of patients/year developed T2DM
Metformin	Metformin 850 mg twice daily plus information on diet/exercise (no motivation counseling)	Reduced risk of developing T2DM by 31% Least effective in those ≥ 45 years old and BMI ≥ 35 (≥ 60 pounds overweight) 7.8% of patients/year developed T2DM
Placebo	Placebo twice daily plus information on diet/exercise (no motivation counseling)	11% of patients/year developed T2DM

Weight loss was shown to be the main predictor of reduced risk for developing diabetes in this study.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5868811/diabetes_prevention_program_applications/DPP_S08.pdf



Nutrition Therapy



- “Just tell me what to eat!”
- Individualized eating plan (MNT)
 - Dietitian with experience in diabetes
 - A1c reduction by:
 - 0.3-1% with T1DM
 - 0.5-2% with T2DM
 - Entire team should be able to recommend general nutrition principles and be supportive of implementation
- Mediterranean, Dietary Approaches to Stop Hypertension (DASH) and plant-based diets are examples of healthful eating patterns



Diabetes Care 2017;40(Suppl. 1):S33-S43



Healthiest Diets



- **Mediterranean Diet** is abundant in fruits, vegetables, whole grains, legumes and olive oil. It features fish and poultry—lean sources of protein—over red meat, which contains more saturated fat. Red wine is consumed regularly but in moderate amounts.
- The **DASH diet** is a lifelong approach to healthy eating that's designed to help treat or prevent high blood pressure (hypertension). The **DASH diet** encourages you to reduce the sodium in your **diet** and eat a variety of foods rich in nutrients that help lower blood pressure, such as potassium, calcium and magnesium.
- It's a **diet based** on fruits, vegetables, tubers, whole grains, and legumes; and it excludes or minimizes meat (including chicken and fish), dairy products, and eggs, as well as highly refined foods like bleached flour, refined sugar, and oil.

<https://www.forksoverknives.com/plant-based-primer-beginners-guide-starting-plant-based-diet/>
<http://www.mayoclinic.org/healthy-lifestyle/nutrition-and-healthy-eating/in-depth/dash-diet/art-20048456>
http://www.eatingwell.com/nutrition/healthy/weight-loss/diet-plan/year_5_dash_mediterranean_diet_plan



Eyes on the Prize!



- Modest weight loss can delay the progression from pre-diabetes to diabetes, and to the management of type 2 diabetes mellitus
- Sustained reduction of 5% of initial body weight → reduce the need for glucose-lowering medications
- For some patients (very obese), > 5% weight loss is necessary to achieve these results
- Shoot for 500-750 kcal/day energy deficit
 - 1200-1500 kcal/day for women
 - 1500-1800 kcal/day for men



Diabetes Care 2017;40(suppl 1):S33-S43



Meal Planning Approaches



- Choose your foods – Exchange Lists for Diabetes
 - Exchange one for another based on equal nutritional value
- Carbohydrate Counting – basic or advanced
 - For consistency
 - For insulin dosing
- The Plate Method
- Menus (ADA – “Month of Meals”)
- Reading food labels
- Eating out!



Physical Activity



- Children and adolescents with T1 or T2DM or prediabetes should engage in:
 - 60 minutes/day or more of moderate to vigorous intensity aerobic activity
 - Vigorous, muscle-strengthening and bone-strengthening activities included at least 3 days/week
- Most adults with T1 or T2DM should engage in:
 - 150 minutes or more of moderate-to-vigorous intensity activity per week, spread over at least 3 days/week, with no more than 2 consecutive days without activity
 - Shorter duration (75 min/week) may be sufficient for younger/more physically fit
 - 2-3 sessions/week of resistance exercise on nonconsecutive days
 - Decrease amount of time spent in daily sedentary behavior
 - Prolonged sitting should be interrupted every 30 minutes for BG benefits, particularly in T2DM
 - Flexibility training and balance training recommended 2-3 times/week for older adults with DM. Yoga, tai chi may be included as desired.

Diabetes Care 2017;40(suppl 1):S33-S43



Types of Exercise



- Aerobic Exercise
 - Brisk walking
 - Riding a bicycle
 - Swimming
 - Rowing
 - Jogging or running
 - Tennis or racquetball
 - Dancing
- Resistance Activity
 - Weight lifting with dumbbells or free weights
 - Weight-lifting machines
 - Resistance bands or tubes
 - Certain types of calisthenics
 - Moving your body weight for resistance such as abdominal crunches, push-ups, toe raises

Warm-up before exercising
Stretch as part of your cool-down when your muscles are already warmed up

AADE Diabetes Education Curriculum: Guiding Patients to Successful Self Management



Other Considerations before Jumpin' in Jack!

- Medical clearance
- Hydration
- Foot safety
- Medical identification
- Preventing hypoglycemia or hyperglycemia
- Physical activity and monitoring
- Glucose check before or after
- Physical activity and insulin
- Physical activity and diabetes medications
- Timing of physical activity



AADE Diabetes Education Curriculum: Guiding Patients to Successful Self Management



So you've got prediabetes.....hmmm...

- Manage your (pre)diabetes – **ABCs**
 - **A** for the A1c, **B** for blood pressure, **C** for cholesterol, **S** for stop smoking
- Follow your prediabetes meal plan
- Make physical activity part of your daily routine
- Take your medication
- Check your blood glucose levels
 - Know what to do if your blood glucose gets too high, or too low
- Work with your health care team / document your care
- Cope with your diabetes in a healthy way

<https://www.niddk.nih.gov/health-information/diabetes/overview/managing-diabetes>



I'm just not MOTIVATED!



I'm just not MOTIVATED!

- "What's one thing you find really hard for you to do in taking care of your prediabetes?"
 - Exercising
 - Sticking to meal plan
 - Taking medications as directed
 - Monitoring blood glucose
 - Foot care as instructed
 - Keeping doctor's appointments



Is this behavior WORTH it?

AADE Diabetes Education Curriculum, Module 6



Decisional Balance Analysis



- Being with an open question about the status quo for the target behavior

- **"Tell me what you like about not following a recommended meal plan."**

- "I like the feeling of wild abandon, that I can eat whatever and where I want. I love the spontaneity.
- I LOVE bar food – chicken wings, pizza, fried mozzarella sticks. I feel good when I eat those foods.
- My friends like those foods too, and if I want to be with my friends, that's how we roll."



Diabetes Spectrum 2016;19(1):5-11

freeCE

Decisional Balance Analysis



- Address the other side of the problem.

- **"And what about the not-so-good things about not following a meal plan?"**

- Well, I sure won't lose any weight, and my blood glucose won't get any better.
- My prediabetes will get worse, and I'll get diabetes. I'll probably have to start taking medications.
- Then the diabetes can get worse, and I may get complications or even die!
- I really want to see my children grow up and have grandchildren one day. If I continue down this path I don't think that's going to happen."



Diabetes Spectrum 2016;19(1):5-11

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Decisional Balance Analysis



- **What are the costs of continuing with your current behavior?**

- "I don't like how fast food makes me feel after eating it – a little nauseated, and it gets pretty expensive.
- I do worry about my children. They're already overweight, and I don't want them getting diabetes too. I hear diabetes is becoming prevalent in children, especially when they are overweight."

- **What are the costs of following your recommended meal plan?**

- "Well the time involved in planning meals, and preparing them. I do like my spontaneity, and if I follow the plan I'll have to figure things out ahead of time, go to the grocery store, pack my lunch each day, cook each night.
- And buying good quality food at the grocery store is expensive too!"

Diabetes Spectrum 2016;19(1):5-11

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How can we get Belinda on the right path?



- S – Specific; not vague
- M – Measurable; you can measure it (how much, how often)
- A – Attainable; challenging but not out-of-reach
- R – Realistic; given person's situation, can it be done?
- T – Timeline; short term, for next week or two



AADE Diabetes Education Curriculum: Monitoring

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Vernell Carter

- 62 year old woman
- Presents to PCP complaining of feeling tired all the time, no energy
- Says her "get up and go, got up and went"
- She's 5'4", weighs 190 pounds
- BP 148/94 mmHg (145/92 on repeat)
- Lipid panel: TC 220 mg/dl, TG 260 mg/dl, HDL 28 mg/dl, LDL 140 mg/dl
- Fasting plasma glucose 190 mg/dl; repeat FPG 178 mg/dl, A1c 8.4%
- Works as a secretary at a manufacturing plant; no consistent physical activity
- She has a history of hypertension and dyslipidemia



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Criteria for the Diagnosis of Diabetes

FPG $\geq$ 126 mg/dl. Fasting is defined as no caloric intake for at least 8 hours*

OR

2-h PG $\geq$ 200 mg/dl during an OGTT. The test should be performed as described by the WHO, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water*

OR

A1c $\geq$ 6.5%. The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay

OR

In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose $\geq$ 200 mg/dl

**In the absence of unequivocal hyperglycemia, results should be confirmed by repeat testing*

Categories of increased risk for diabetes (prediabetes)

- FPG 100 mg/dl – 125 mg/dl (IFG), OR
- 2-h PG in the 75-g OGTT 140 mg/dl–199 mg/dl (IGT), OR
- A1c 5.7–6.4%

Vernell's BG Results:
FPG 178 mg/dl; 190 mg/dl
A1c 8.4%

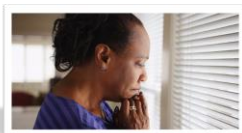


Diabetes Care, Supplement 1, January 2017

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Vernell is not a happy woman

- Vernell is very disturbed to hear she is being diagnosed with T2DM
- Both her brother and sister have T2DM
 - Brother s/p amputation
 - Sister has CKD stage 4 from diabetes

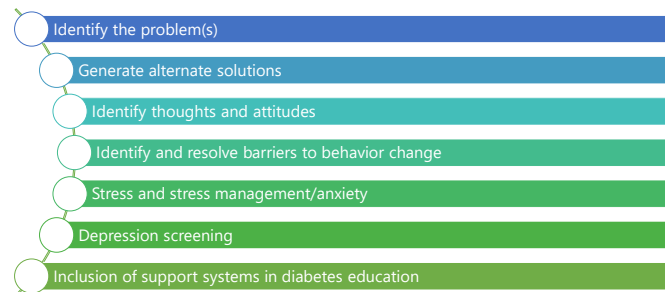


Vernell is very worried about coping with this diagnosis. Coping is the psychological attempt to restore order after a disruption has occurred in one's life. Being diagnosed with diabetes, and grappling with the challenges of living with this diagnosis are quite disruptive.



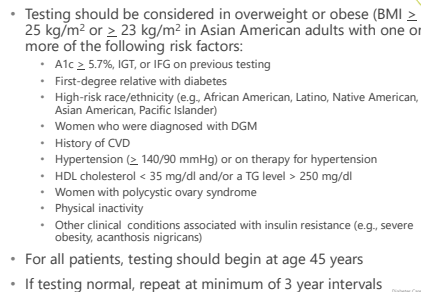
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Diabetes Coping Skills Training



AADE Diabetes Education Curriculum, Module 6

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The diagram illustrates the pathophysiology of Type 1 and Type 2 Diabetes Mellitus. It is divided into three horizontal panels. The top panel, labeled 'Healthy', shows a yellow pancreas on the left and a target cell on the right. An arrow labeled 'Insulin' points from the pancreas to the cell. The cell has blue dots (glucose) outside and inside, and a blue Y-shaped receptor on its surface. The middle panel, labeled 'Type 1', shows a yellow pancreas on the left. An arrow points from the pancreas to the right, but it is crossed out with a large red 'X'. Above the arrow is the word 'Glucose' and blue dots. To the right is a target cell with a blue Y-shaped receptor. The bottom panel, labeled 'Type 2', shows a yellow pancreas on the left. An arrow labeled 'Insulin' points from the pancreas to the right. Above the arrow is the word 'Glucose' and blue dots. To the right is a target cell with a blue Y-shaped receptor. A red 'X' is placed over the receptor. Below the cell, text reads 'Cells fail to respond to insulin properly'.

Type I diabetes

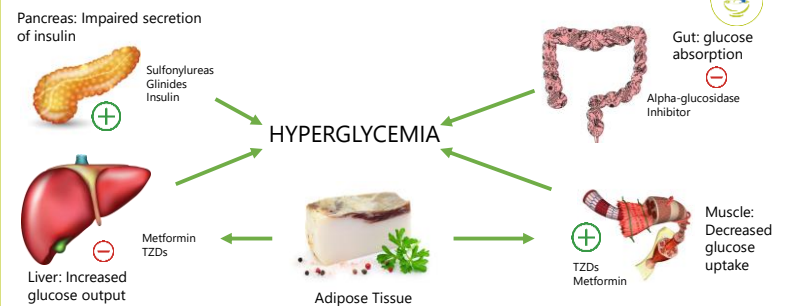
Type II diabetes

● Glucose Y Insulin Y Insulin receptor



- Goal adjustment:
 - More or less stringent glycemic goals may be appropriate for individual patients.
 - Goals should be individualized based on duration of diabetes, age/life expectancy, comorbid conditions, known CVD or advanced microvascular complications, hypoglycemia unawareness, and individual patient considerations.
 - Postprandial glucose may be targeted if A1c goals are not met despite reaching preprandial glucose goals
 - Postprandial glucose measurements should be made 1-2 h after the beginning of the meal, generally peak levels in patients with diabetes.

Diabetes Care 2018;41(Suppl. 1):S55-S64



Comparison



	Metformin	SU	TZD	DPP-4 Inhib	SGLT2 Inhib	GLP-1 Agon	Insulin
Efficacy	High	High	High	Intermed	Intermed	High	Highest
Hypo risk	Low	Mod	Low	Low	Low	Low	High
Weight	Neutral/loss	Gain	Gain	Neutral	Loss	Loss	Gain
Side effects	GI/Lac Acid	Hypogly	Edema, HF, fx	Rare	GU, dehydr	GI	Hypogly
Costs	Low	Low	Low	High	High	High	Variable

Putting it all together



- Step 1 – Lifestyle modification + metformin
 - If metformin contraindicated/not tolerated, use a second-line agent
- Step 2*
 - Metformin plus **SU**
 - Metformin plus **TZD**
 - Metformin plus **DPP-4 inhibitor**
 - Metformin plus **SGLT2 inhibitor**
 - Metformin plus **GLP-1 receptor agonist**
 - Metformin plus **basal insulin** (A1c > 10%)



* Consider empagliflozin or liraglutide with ASCVD

Diabetes Care 2018;41(Suppl. 1):S73-S85

Putting it all together – Step 3



- **Metformin + SU +...**
 - TZD or DPP-4-I or SGLT2-I or GLP-1-RA, or basal insulin
- **Metformin + TZD+ ...**
 - SU or DPP-4-I or SGLT2-I or GLP-1-RA or basal insulin
- **Metformin + DPP-4 inhibitor + ...**
 - SU or TZD or SGLT2-I or basal insulin
- **Metformin + SGLT2 inhibitor + ...**
 - SU or TZD or DPP-4-I or basal insulin
- **Metformin + GLP-1-receptor agonist + ...**
 - SU or TZD or basal insulin
- **Metformin + basal insulin + ...**
 - TZD or DPP-4-I or SGLT2-I, or GLP-1-RA



Cardiovascular Disease



- Blood pressure
 - Measure at every routine visit
 - If elevated, confirm BP on a separate visit
- Lipid panel
 - At the time of diagnosis (if not taking a statin), every 5 years thereafter



Diabetes Care 2017; 40(Suppl 1):S48-S6

Microvascular, Neuropathic, Foot Care

- At least annually, assess urinary albumin and eGFR
- Retinopathy screening
 - At time of diagnosis and every 2 years
- Diabetic peripheral neuropathy – assess annually
 - Assessment is for distal symmetric polyneuropathy
 - Careful history
 - Assessment of either temperature or pinprick sensation, vibration sensation
 - 10-g monofilament testing to identify feet at risk of ulceration and amputation
- Foot care – careful examination



Diabetes Care, Supplement 1, January 2017



Other metabolic goals

Parameter	Goal	Comments
Blood pressure	SBP < 140 mmHg and DBP < 90 mmHg	• < 130/80 mmHg may be appropriate for individuals with CVD • 120-160/80-105 mmHg suggested for pregnant patients with DM and chronic HTN

Age	ASCVD	Recommendations for statin therapy/intensity or combination treatment
< 40 years	No	• No recommendation for statin intensity/combination treatment
	Yes	• High statin intensity (consider additional agents for LDL-C $\geq$ 70 mg/dl)
$\geq$ 40 years	No	• Moderate statin intensity
	Yes	• High statin intensity (consider additional agents for LDL-C $\geq$ 70 mg/dl)

Diabetes Care 2018;41(Suppl 1):S86-S104



Recommendations for BP Control

- > 120/80**
 - Lifestyle intervention – weight loss if overweight
 - DASH diet, $\downarrow$ sodium, $\uparrow$ potassium, $\downarrow$ EtOH, $\uparrow$ activity
- $\geq$ 140/90**
 - Lifestyle intervention
 - Prompt initiation /titration of antihypertensives
- $\geq$ 160/100**
 - Lifestyle intervention
 - Prompt initiation /titration of two antihypertensives

Diabetes Care 2018;41(Suppl 1):S86-S104



Treatment of Hypertension

- Initial BP between **140/90** and **160/100** mmHg
 - Lifestyle management
 - Albuminuria present – ACE I or ARB
 - Albuminuria not present – ACE I, ARB, CCB, Diuretic
- Initial BP **$\geq$ 160/100** mmHg
 - Lifestyle management
 - Start two agents
 - Albuminuria present – Start ACE I or ARB AND CCB or Diuretic
 - No albuminuria – Start 2 of 3: ACE I or ARB; CCB; Diuretic

Diabetes Care 2018;41(Suppl 1):S86-S104



Lipid Management



- Lifestyle modification
- Weight loss
- Reduction of saturated fat, trans fat, cholesterol intake
- Increase of dietary n-3 fatty acids, viscous fiber, and plant stanols/sterols intake
- Increased physical activity
- Intensify efforts with TG > 150 mg/dl, and/or HDL < 40 mg/dl for men or < 50 mg/dl for women



Diabetes Care 2018;41(Suppl 1):S86-S104.



Lipid Management



Age	ASCVD	Recommended statin intensity and combination treatment
< 40 years	No	None
	Yes	If LDL-C $\geq$ 70 mg/dl despite maximally tolerated statin dose, consider adding additional LDL-lowering therapy (such as ezetimibe or PCSK9 inhibitor)
$\geq$ 40 years	No	Moderate
	Yes	If LDL-C $\geq$ 70 mg/dl despite maximally tolerated statin dose, consider adding additional LDL-C lowering therapy (such as ezetimibe or PCSK9 inhibitor)

ASCVD Risk Factors include: LDL-C $\geq$ 100 mg/dl, HTN, smoking, chronic kidney disease, albuminuria, family history of premature ASCVD

Diabetes Care 2018;41(Suppl 1):S86-S104.



Lipid Management



High-intensity statin therapy (lowers LDL-C by $\geq$ 50%)	Moderate-intensity statin therapy (lowers LDL-C by 30-50%)
Atorvastatin 40-80 mg	Atorvastatin 10-20 mg
Rosuvastatin 20-40 mg	Rosuvastatin 5-10 mg
	Simvastatin 20-40 mg
	Pravastatin 40-80 mg
	Lovastatin 40 mg
	Fluvastatin XL 80 mg
	Pitavastatin 2-4 mg

Diabetes Care 2018;41(Suppl 1):S86-S104.



Vernell – Treatment Plan



- Lifestyle – medical nutrition and physical activity plan
- Counseling, emotional support
- Glycemic control
 - Metformin 500 mg po q12h; titrate
 - Step 2 – no ASCVD; add any second agent
- Blood pressure
 - Lisinopril 10 mg po qd
- Lipids
 - Atorvastatin 10 mg po qd
- ASA daily (75 mg if desired)



Adobe 135635087



Questions?



Exam Questions:

1. Which of the following is a correct diagnostic criteria for diabetes?
 - a. Fasting plasma glucose ≥ 126 mg/dl
 - b. A1c $\geq 6.5\%$
 - c. 2 hour post-prandial ≥ 200 mg/dl
 - d. A and B are correct
 - e. A, B and C are correct
2. Aspart would be classified as which type of insulin?
 - a. Rapid-acting
 - b. Short-acting
 - c. Intermediate-acting
 - d. Long-acting
3. A patient who is 58 years old, has an overweight, apple-build, hypertension and dyslipidemia is probably which type of diabetes?
 - a. Type 1
 - b. Type 2
 - c. Gestational diabetes
 - d. You must get a C-peptide level to determine
4. Insulin regimens for patients with type 1 diabetes consist of which of the following?
 - a. Only bolus doses before meals
 - b. Only a continuous infusion of insulin
 - c. A basal (continuous infusion or long-acting insulin) plus bolus doses
 - d. None of the above are correct
5. If a patient's blood glucose is elevated in the morning before breakfast, which insulin should be adjusted?
 - a. Pre-breakfast rapid-acting insulin
 - b. Pre-lunch rapid-acting insulin
 - c. Pre-dinner rapid-acting insulin
 - d. Evening dose of long-acting insulin

6. A continuous glucose monitor sample glucose from which source?
 - a. Blood
 - b. Sweat
 - c. Interstitial fluid
 - d. Tears

7. Which of the following diets is NOT one recommended as part of medical nutrition therapy to manage diabetes?
 - a. Mediterranean diet
 - b. DASH diet
 - c. Atkins diet
 - d. Diet based on fruits, vegetables, tubers, whole grains and legumes

8. Which of the following tools may be used to motivate patients to change behavior?
 - a. Decisional balance analysis
 - b. Financial balance sheet
 - c. Lie detector test
 - d. Cultural beliefs survey

9. Which of the following is the blood pressure goal for people with diabetes, per the American Diabetes Association?
 - a. < 110/70 mmHg
 - b. < 120/80 mmHg
 - c. < 130/85 mmHg
 - d. < 140/90 mmHg

10. Which of the following is a HIGH intensity statin regimen?
 - a. Atorvastatin 20 mg po qd
 - b. Rosuvastatin 40 mg po qd
 - c. Pravastatin 40 mg po qd
 - d. Simvastatin 20 mg po qd