

2022 Annual Diabetes Update: Providing Insight Into Evolving Treatment Options

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Financial Disclosure

- I have had no financial relationship over the past 24 months with any commercial sponsor with a vested interest in this presentation.

Pharmacist learning objectives

- Summarize recent updates to the 2022 ADA Guidelines
- Differentiate which medications for type 2 diabetics that maybe more beneficial compared to others
- Educate patients on CGM data & how to it relates to clinical practice

Technician Learning objectives

- Identify correct brand/generic names for diabetic medications
- List which diabetic medications for type 2 diabetics can benefit patients with multiple co morbidities
- Recognize the difference among continuous monitors

Overview

- 37.3 million Americans have diabetes
 - 11.3% of U.S. population
- 96 million American adults have prediabetes
 - 38 % of U.S. population

Screening

- Begin at age 35
- Better individualization in monitoring for people with prediabetes
- Need for recommending an intensive lifestyle behavior change program for overweight and obese individuals

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Estimated Average Glucose (eAG)

A1c %	Mg/dL
5	97
6	126
7	154
8	183
9	212
10	240
11	269
12	298

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Glycemic recommendations for many non pregnant adults with diabetes

- A1c
 - < 7% -without significant hypoglycemia
- Pre-prandial capillary plasma glucose
 - 80-130 mg/dL
- Peak post prandial capillary plasma glucose
 - <180 mg/dL

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Less stringent A1c goals

- May be appropriate for patients with
 - Limited life expectancy
 - Where harms of treatment are greater than benefits
- Example
 - A1c <8%

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Individualizing glycemic targets

- Risk potentially associated with hypoglycemic and other drug adverse effects
- Disease durations
- Life expectancy
- Important comorbidities
- Established vascular complications
- Patient preference
- Resources and support system

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Pharmacologic approaches to Glycemic treatment

- Metformin
- Sodium- glucose cotransport 2 inhibitor (SGLT-2i)
- Glucagon-like peptide-1 receptor agonist (GLP-1 RA)
- Dipeptidyl peptidase-4 inhibitors (DPP-4)
- Thiazolidinediones
- Sulfonylureas (2nd generations)
- Insulin
 - Human insulin
 - Analogs

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Type 2 diabetes

- Result of eight organ defects
 - Pancreatic beta cells
 - Pancreatic alpha cells
 - Liver
 - Muscle
 - GI tract
 - Adipose tissue
 - Brain
 - Kidneys

13 First Line therapy based on

- Comorbidities
- Patient centered treatment factors
- Management needs

14 GLP-1 RA and SGLT-2i

- Can be used as first line treatment with or without metformin for people who have or at high risk for
 - Atherosclerotic cardiovascular disease (ASCVD)
 - Heart failure
 - Chronic kidney disease (CKD)

15 GLP-1 RA and SGLT-2i

- Recommend for use in people when striving for
 - Weight loss
 - Minimizing hypoglycemia risk
- Regardless of ASCVD risk

16 ASCVD

- History of acute coronary syndrome
- Myocardial infarction (MI)
- Stable or unstable angina

17 Patients at high risk for ASCVD

- End organ damage
- Left ventricular hypertrophy
- Retinopathy
- Multiple CV risk factors
 - Hypertension
 - Smoking
 - Dyslipidemia
 - Obesity

18 CKD or diabetic kidney disease

- People with reduced estimated glomerular filtration rate (eGFR)
- Presence of albuminuria
- Or both

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Glip-1 RA

- A1c reduction
 - 0.7-2.3%
- Target 5 of the 8 organ defects
 - Pancreatic beta cells
 - Pancreatic alpha cells
 - Liver
 - GI tract
 - Brain

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GLP-1 RA

- GLP-1 agonist analog
 - Dulaglutide
 - Liraglutide
 - Semaglutide
- GLP-1 agonist mimetic
 - Exenatide (twice daily)
 - Exenatide (once weekly)
 - Lixisenatide

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ASCVD benefit

- Dulaglutide
- Liraglutide
- Semaglutide
 - Subcutaneous

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Benefits in renal effects (DKD)

- Dulaglutide
- Liraglutide
- Semaglutide
- Benefit via albuminuria outcomes
- Lixisenatide and Exenatide
 - Renally cleared
 - Cannot be used at GFR <30 mL/min/1.73 m²

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(GLP-1) agonist and glucose-dependent insulinotropic polypeptide (GIP) agonist

- "twincretin"
- Tirzepatide (Mounjaro)
- Mechanism of Action
 - increases insulin secretion in response to elevated glucose, decreases glucagon secretion, slows gastric emptying
- Dosing
 - Initially : 2.5 mg subcutaneously once weekly
 - Max Dose : 15 mg subcutaneously once weekly

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Tirzepatide

- Benefits
 - Weight loss
 - up to 25 pounds (11.2 kg) with maximum dose in patients with type 2 diabetes
- Special considerations
 - May delay oral contraceptive absorption
 - Non – oral method
 - IUD , Ring, Etc.
 - Adding a barrier contraceptive for four weeks after initiation or a dosage increase

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SGLT-2i

- Canagliflozin
- Dapagliflozin
- Empagliflozin
- Ertugliflozin

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Cardiovascular (CV) protective effects

- Reduce risk of CV death in people with type 2 diabetes and established CVD
 - Canagliflozin
 - Empagliflozin
- Risk reduction in hospitalization in adults with heart failure
 - Canagliflozin
 - Dapagliflozin
 - Empagliflozin
- Slowing the progression of kidney damage from albuminuria, stabilize long term eGFR, and decrease incidence of dialysis
 - Canagliflozin
 - Dapagliflozin
 - Empagliflozin

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Dapagliflozin

- Indications
 - Chronic kidney disease
 - Heart failure with reduced ejection fraction
- Dosing
 - 5-10 mg by mouth daily

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Empagliflozin

- Indications
 - Heart failure
 - Reduced ejection fraction
 - Preserved ejection fraction
- Dosing
 - 10-25 mg by mouth daily

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Reduced kidney function and SGLT-2i

- Renal and cardio protective effects still retained all the way down to 20 ml/min/1.73 m²
- FDA Labeling contraindicated once eGFR <30 or 45 ml/min/1.73 m²
 - Decline glucose lowering effect
 - Less ability to pump out glucose
- eGFR < 45 ml/min/1.73 m²
 - Dapagliflozin
- eGFR < 30 ml/min/1.73 m²
 - Canagliflozin
 - Empagliflozin

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Cardiovascular disease and risk management

- American College of Cardiology (ACC)
 - GLP-1 RA and SGLT-2i use in conjunctions with other traditional guideline based preventative medical therapies for blood pressure, lipids, and glycemia and anti platelet therapy
 - SGLT-2i with proven benefit in people with or without type 2 diabetes and established heart failure in order to prevent worsening of heart failure and CV death

31 Cardiovascular disease and risk management

- American Heart Association /American Stroke Association
 - Treatment for people with ischemic stroke or TIA who have type 2 diabetes should include glucose lowering agents with proven CV benefit
 - GLP-1 RA should be added to metformin independent of A1C

32 DPP-4 inhibitors

- Alogliptin
- Linagliptin
 - No renal dose adjustment required
 - 5 mg daily
- Saxagliptin
 - Potential risk for Heart failure
- Sitagliptin

33 Insulin

- Basal insulin
- Prandial insulin
- Combo injectable therapy

34 Basal Insulin

- Long-acting basal analogs
 - U-100 glargine
 - Detemir
- Longer acting basal analogs
 - U-300 insulin glargine
 - Degludec (U-100 or U-200)
 - Lower risk hypoglycemia compared to u-100 glargine when used in combo with other oral agent s
- Initial dosing
 - 0.1-0.2 units/kg/day or
 - 10 units daily

35 Insulin glargine –yfgn U-100

- Biosimilar to insulin glargine
- Branded Semglee-yfgn and Unbranded insulin glargine-yfgn
 - Interchangeable with Lantus

36 Overbalarization

- Basal dose > 0.5 units /kg/day
- Not at goal
 - Additional agent is needed
- Signs of overbalarizations
 - High bedtime- morning or post-preprandial glucose differential
 - Hypoglycemia (aware or unaware)
 - High variability

37 Prandial insulin

- Lispro
 - U-100
 - U-200
- Lispro –aabc
 - U-100
 - U-200
- Glulisine
- Aspart
- Inhaled insulin
- Human regular
 - U-100
 - U-500

38 Prandial insulin

- Initial dosing for type 2 diabetics
 - 4 units or
 - 10 % of the amount of basal insulin at the largest meal with the greatest postprandial excursion

39 Combination injectable therapy

- Premixed insulin products
 - NPH/ Regular 70/30
 - Lispro 50/50
 - Lispro 75/25
 - Aspart 70/30
- Premixed insulin/ GLP-1 agonist
 - Glargine/Lixisenatide (Iglarixi)
 - Degludec/liraglutide (IDegLira)

40 Cost / Adherence

- Commercial patients
 - Combo products
 - Copay cards/ Electronic vouchers
- Medicare patients
 - Combo products
 - Insulin savers program
 - Patient assistance

41 Continuous Glucose Monitors (CGM)

- Real time CGM
- Intermittently scanned CGM
- Professional CGM

42 Real time CGM

- Measure and store glucose levels continuously without prompting
- Examples
 - Dexcom G6

43 Intermittently scanned CGM

- Measure glucose levels continuously but require scanning for storage of glucose values
- Examples
 - Libre 14 day
 - No alarm or alert system
 - Libre 2
 - Alarm system

44 Professional CGM

- Abbott Freestyle Libre pro
- Dexcom G6 Pro
- Medtronic I pro 2
- Clinic owns device compared to patient owned
- Worn for a week to two weeks
- Can be blinded or Un-blinded

45 Professional CGM

- Abbott Freestyle Libre pro
 - Blinded
 - Worn for 14 days
- Dexcom G6 pro
 - Blinded or un-blinded
 - Worn for 10 days
- Medtronic I pro 2
 - Blinded
 - Worn 6 days
 - Needs to be calibrated 3-4 times a day

46 CGM Terminology

- Average glucose level
- Glucose or glycemic variability (GV)
- Glucose management indicator (GMI)
- Time in range (TIR)
- Time above range (TAR)
- Time below range (TBR)

47 Average glucose level

- an average glucose values over a specified period of time (e.g., days, overnight, fasting, postprandial). Average glucose level is used to calculate glucose management indicator.

48 Glucose or glycemic variability (GV):

- Fluctuation in blood glucose throughout the day
- Goal
 - 36% or less
 - Stable glucose levels

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Glucose management indicator (GMI):

- Provides approximate A1c level over a shorter period of time

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Time in range (TIR)

- Percent of readings and time measured glucose values fall within the specified target range (e.g., 70 to 180 mg/dL)
- TIR may be expressed as a percentage of time or in hours per day
- Goal
 - 70% for most patients

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Time above range (TAR)

- Percent of readings and time measured glucose values fall above 180 mg/dL
- Goal
 - Less than 25% for most patients
 - Level 1 (high): TAR with glucose values between 181 and 250 mg/dL
 - Level 2 (very high): TAR with glucose values greater than 250 mg/dL
 - Goal < 5%

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Time below range (TBR)

- percent of readings and time measured glucose values fall below 70 mg/dL
- Goal
 - Less than 4%
 - Level 1: TBR with glucose values between 54 and 69 mg/dL
 - Level 2: TBR with glucose values less than 54 mg/dL
 - Goal: < 1%

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AGP Report

24 Feb 2022 - 23 Mar 2022
 13 days
 70.0% TIR (28.0h)

Glucose Range

High (180 mg/dL)	28.0% (28.0h)
Low (70 mg/dL)	22.0% (22.0h)
Target Range (70-180 mg/dL)	47.0% (47.0h)

Average Glucose
 172 mg/dL

Glucose Management Indicator (GMI)
 7.5%

Glucose Variability
 49.5%

Glucose Variability (CV)
 49.5%

AGP - A Summary of Glucose Control

AGP is a summary of glucose control over the report period, with metrics (TIR) and other parameters shown as % occurring in a single day.

Glucose Range

180 mg/dL
 120 mg/dL
 80 mg/dL
 40 mg/dL

Time
 0:00 3:00 6:00 9:00 12:00 3:00 6:00 9:00 12:00

Glucose Management Metrics

Monday Tuesday Wednesday Thursday Friday Saturday

0:00 3:00 6:00 9:00 12:00 3:00 6:00 9:00 12:00

Battelino T, Danne T, Bergenstal RM, et al. Clinical targets for continuous glucose monitoring data interpretation: 2019

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Interfering substances for glucose readings

- Glucose oxidase monitors
 - Uric acid
 - Galactose
 - Xylose
 - Acetaminophen
 - L-DOPA
 - Ascorbic acid
- Glucose dehydrogenase monitors
 - Icodextrin (used in peritoneal dialysis)

55 Learning Assessment Questions

56 Pharmacist Questions

- Which of the following medications should not be considered as a first line treatment options?
 - A: Empagliflozin
 - B: Sitagliptin
 - C: Semaglutide
 - D: Metformin

57 Answer

- B: Sitagliptin

58 Pharmacist Questions

- What would be the best treatment options for a type 2 diabetic already on metformin with CKD, heart failure and an A1c of 8.4?
 - A: Pioglitazone
 - B: Glipizide
 - C: Dapagliflozin
 - D: Linagliptin

59 Answer

- C: Dapagliflozin

60 Pharmacist Questions

- What is the time in range goal for patients using continuous glucose monitors?
 - A: 75%
 - B: 65%
 - C: 80%
 - D: 70%

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Answer

- D: 70%

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Technician Questions

- What is the generic name for Mounjaro?
 - A Exenatide
 - B: Tirzepatide
 - C: Semaglutide
 - D: Dulaglutide

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Answer

- B: Tirzepatide

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Technician Questions

- T/F Dulaglutide is beneficial for diabetics with cardiovascular disease

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Answer

- True

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Technician Questions

- T/F : Dexcom G6 needs to scanned 3 separate times throughout the day?

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Answer

- False

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Questions ?