CO-MANAGEMENT OF DM WITH PRIMARY CARE: UPDATE IN DM

Heather Fishel
Assistant Professor
University of South Alabama
Department of Internal Medicine
Division of Endocrinology

Disclosure

I have no actual or potential conflict of interest in relation to this presentation.

Epidemiology of Diabetes

- Based on 2019 data, the CDC reports:
  - *37.3 million people of all ages (11.3% of US population) had diabetes*
  - *37.1 million adults aged 18 years or older (14.7% of all US adults) had diabetes*
  - *8.5 million adults aged 18 years or older who met laboratory criteria for diabetes were not aware of or did not report having diabetes*

https://www.cdc.gov/diabetes/data/statistics-report/diagnosed-undiagnosed-diabetes.html

Objectives

- Review screening and diagnostic criteria for diabetes
- Review annual lab surveillance
- Discuss setting glycemic targets for the patient
- Review diabetic medications and dosing
- Discuss updates in diabetic technologies

Who to screen?

- Age 10 years or after onset of puberty in children and adolescents with overweight (BMI >/= 85th percentile) or obesity (BMI >/= 95th percentile) and have 1 or more risk factors for diabetes
- Adults who are overweight/obese + 1 or more risk factor for DM
- All Adults age 35 or older
  - *Repeat in 3 year intervals if screening is normal or has history of gestational DM*
  - *Repeat sooner if symptoms or risk factors change*
- If prior diagnosis of prediabetes, screen annually
- If have HIV, screen with fasting glucose before starting ART, when switching ART and 3-6 months after ART and then annually

Diagnosis Diabetes

- Fasting plasma glucose >/= 126 (must be fasting for at least 8 hours)
- 2-hour plasma glucose >/= 200 during OGTT (75 g glucose load)
- HbA1c >/= 6.5%
- Classic symptoms of hyperglycemia + random plasma glucose >/= 200

***In the absence of unequivocal hyperglycemia, diagnosis requires 2 abnormal test results from the same sample or in 2 separate test samples

Initial Assessment after Diagnosis

- Age
- Cognitive Abilities
- School/Work schedule and conditions
- Eating patterns
- Physical activity
- Financial systems
- Classification of DM/Complications of DM/Comorbidities
- Life expectancy/Pregnancy plans

Lab Assessment

- CMP
- Urine Microalbumin/Creatinine Ratio
- Lipid
- TSH (if has T1DM)
- B12 (if on Metformin)

Annual Visit Assessment

- Co-morbidities
- Macrovascular and Microvascular complication
- Dental
- Eye
- Vaccinations

Verification Code

42022

Setting Glycemic Targets

Estimated average glucose (eAG)

A1C (%)	mg/dL*
5	97 (76–120)
6	126 (100–152)
7	154 (123–185)
8	183 (147–217)
9	212 (170–249)
10	240 (193–282)
11	269 (217–314)
12	298 (240–347)

https://diabetesjournals.org/care/article/45/Supplement_1/S83/138927/6-Glycemic-Targets-Standards-of-Medical-Care-in

Setting Glycemic Targets Continued

Summary of glycemic recommendations for many nonpregnant adults with diabetes

A1C	<7.0% (53 mmol/mol)*#
Preprandial capillary plasma glucose	80–130 mg/dL* (4.4–7.2 mmol/L)
Peak postprandial capillary plasma glucose†	<180 mg/dL* (10.0 mmol/L)

https://diabetesjournals.org/care/article/45/Supplement_1/S83/138927/6-Glycemic-Targets-Standards-of-Medical-Care-in

Simplifying Diabetes for the Patient

Diet

Physical Activity

Medications

Diet

- Per ADA no single diet has been proven to be consistently superior
- In T2DM, aiming for 5% or greater weight loss will provide benefit
- Focus on:
  - *Consuming nonstarchy vegetables*
  - *Minimize added sugars and refined grains*
  - *Choose whole foods over highly processed foods*
- There is currently inadequate research in T1DM to support one eating pattern over another
- Alcohol: For women no more than one drink/day; For men no more than two drinks/day

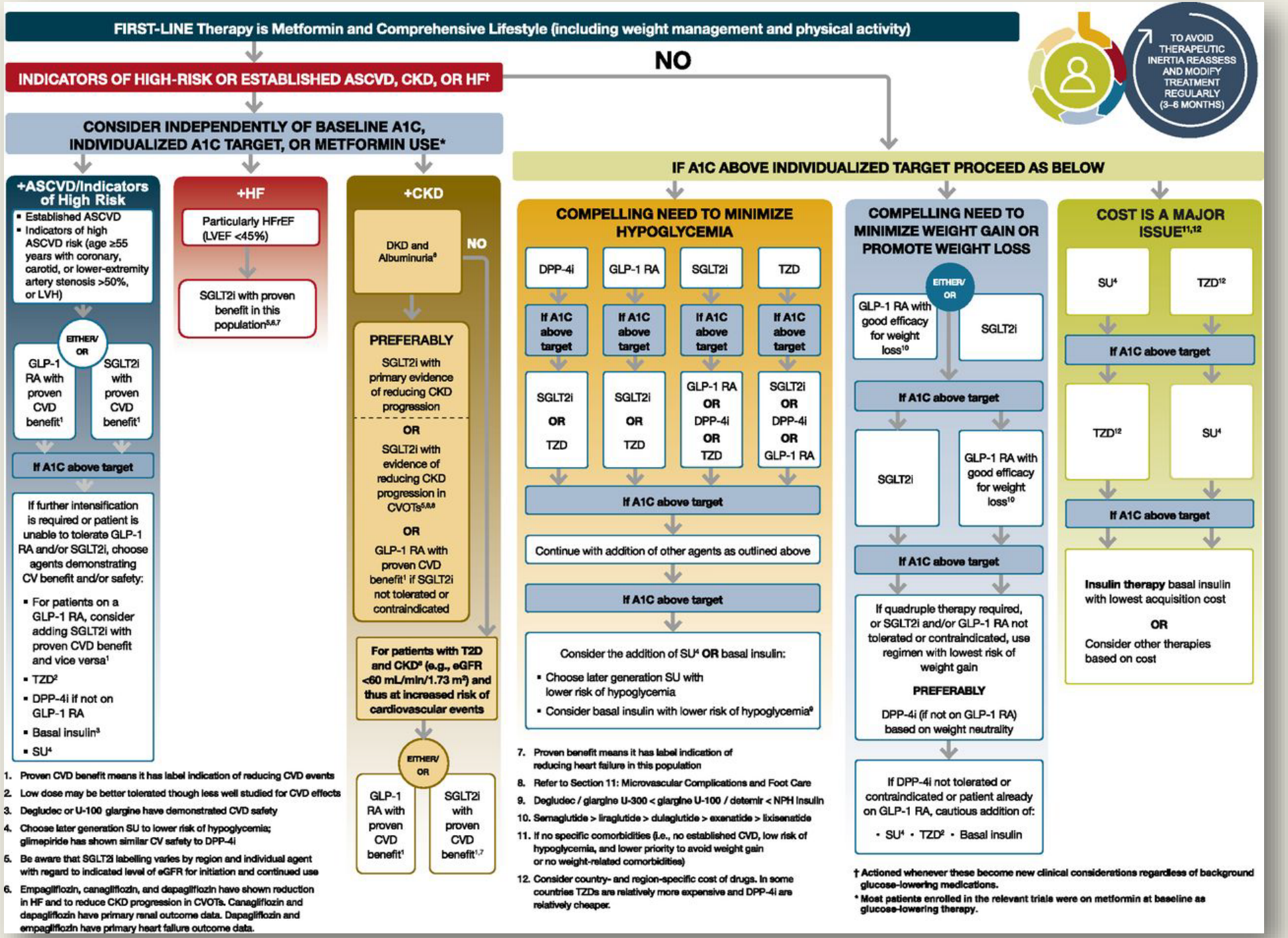
https://diabetesjournals.org/care/article/45/Supplement_1/S60/138923/5-Facilitating-Behavior-Change-and-Well-being-to

Physical Activity

- Children and Adolescents: 60 minutes/day or more of moderate/vigorous-intensity aerobic activity with vigorous muscle-strengthening and bone-strengthening activity at least 3 days/week
- Adults: 150 minutes of moderate/vigorous-intensity aerobic activity per week, spread out over 3 days

https://diabetesjournals.org/care/article/45/Supplement_1/S60/138923/5-Facilitating-Behavior-Change-and-Well-being-to

Meds for T2DM



Classes of Diabetic Medications

- Metformin
- Sulfonylureas
- Thiazolidinediones (TZDs)
- Glucagon-like Peptide-1 Receptor Agonist (GLP-1 RA)
- Dipeptyl Peptidase-4 Inhibitors (DDP-4 Inhibitors)
- Sodium-glucose Cotransportor-2 Inhibitors (SGLT-2 Inhibitors)
- Insulin

Metformin

- 1st line therapy in T2DM
- Mechanism: inhibits gluconeogenesis, improves insulin sensitivity
- Cost: $4 list
- Can be used to treat T1DM and T2DM
- Consider current GFR and heart failure status
- Side Effects: Diarrhea

Sulfonylureas

- Examples: Glipizide, Glimepiride, Glyburide
- Mechanism: closes potassium channel in beta-cell to cause depolarization, triggering insulin release via influx of calcium
- Cost: $4-13
- Side Effects: hypoglycemia and weight gain

Thiazolidinediones (TZDs)

- Example: Pioglitazone, Rosiglitazone
- Mechanism: increase insulin sensitivity in peripheral tissues; binds PPAR-gamma nuclear transcription factor, which regulates fatty acid storage and glucose metabolism
- Cost: $9-100
- May be helpful in fatty liver disease
- Side Effects: weight gain, edema and must be used with care in patient's with heart failure, negative impact on bone

Glucagon-like Peptide -1 Receptor Agonist (GLP-1 RA)/Glucose-dependent Insulinotropic Polypeptide

- Examples: Liraglutide/Victoza, Dulaglutide/Trulicity, Semaglutide/Rybelsus/Ozempic, Tirzepatide/Mounjaro
- Mechanism: increases insulin secretion in presence of elevated blood sugar, delays gastric emptying, decreases glucagon secretion
- Cost: expensive without insurance
- Helpful in weight loss, may be used in fatty liver disease
- Indicated in patients with CAD (ACCORD TRIAL)
- Contraindicated: Medullary Thyroid Cancer, Pancreatitis
  - *Use with caution in patients with gastroparesis*
- Side Effects: nausea, vomiting, pancreatitis

Dipeptyl Peptidase-IV Inhibitors (DDP-4 Inhibitors)

- Examples: Alogliptin, Linagliptin, Saxagliptin, Sitagliptin
- Mechanism: Prolongs incretin hormone activity, increase insulin synthesis and release from pancreatic beta cells and reduces glucagon secretion from pancreatic alpha cells
- Cost: expensive without insurance
- Weight neutral
- Consider GFR, h/o pancreatitis, heart failure

Sodium-glucose Cotransporter-2 Inhibitors (SGLT-2 Inhibitors)

- Example Empagliflozin, Canagliflozin, Dapagliflozin
- Mechanism: inhibits glucose reabsorption in proximal tubule of kidney
- Cost: varies
- Indications: Heart Failure and CKD
  - *Must watch blood pressure*
  - *Consider GFR*
- Other considerations: h/o foot amputations, h/o UTI/yeast infections, possibility of DKA

Initial Selection of Medication

- Type 1 Diabetes: Insulin
- Type 2 Diabetes:
  - *Look at HbA1c, cardiovascular risk, hypoglycemic risk, effects of body weight, side effects, cost, patient preference*
    - If HbA1c >/= 1.5% above target, start with dual combination therapy
    - If HbA1c >/= 10%, patient will need insulin therapy

Choosing Medications Based on Coverage

- Fasting
  - *Metformin, SGLT-2 inhibitors, Long-acting Insulin*
- Prandial
  - *Metformin, Sulfonylureas, Pioglitazone, GLP-1 RA, DDP-4 inhibitors, Short-acting insulin*

Caveats to Insulin

- Storage of Insulin
- Injection Site
- Changing of Pen Needles
- Timing of Insulin Administration

Types of Insulin

- Fast-acting Insulin (Mealtime/Correction)
  - *Lispro/Humalog/Novolog*
  - *Novolin-R*
- Intermediate Insulin
  - *Novolin-N*
- Long-acting Insulin (Basal Insulin)
  - *Detemir (Levemir)*
  - *Glargine (Lantus/Toujeo)*
  - *Degludec (Tresiba)*
- Mixed Insulins
  - *Novolin 70/30*
  - *Novolog 70/30*
  - *Humalog 50/50; 75/25*
- Inhaled Insulin

Mechanism of Action of Insulin

Main types of insulin preparations				
Type	**Onset**	**Peak**	**Duration**	**Comments**
Rapid-acting insulin analogue	5-15 min	30-60 min	2-5 hr	Can be injected at the start of a meal
Short-acting (soluble/regular insulin)	30 min	1-3 hr	4-8 hr	Usually injected 15-30 minutes before a meal. Clear solution
Intermediate or long-acting insulin (isophane or zinc insulin)	1-2 hr (NPH, Lente) 2-3 hr (Ultralente)	4-8 hr 4-8 hr	8-12 hr (NPH) 8-24 hr (Ultralente)	Used to control glucose levels between meals. May be combined with short-acting insulin
Long-acting insulin analogue	30-60 min	No peak	16-24 hr	Usually taken once daily

Dosing Insulin

- Total Daily Insulin Requirements: = 0.4-1 unit/kg/day
  - *50% basal*
  - *50% prandial insulin*
- Dose prandial insulin on meal size (example: small, medium, large dose)

- REMEMBER THIS IS JUST A STARTING POINT AND TO FACTOR IN CURRENT GLYCEMIC CONTROL, DIET AND PHYSICAL ACTIVITY.

Updates in Diabetes Technology

- Continuous glucose monitors
  - *Dexcom*
  - *Freestyle Libre*
  - *Medtronic Guardian*
- InPen
- Hybrid Pumps
  - *Tandem with Control IQ*
  - *Omnipod 5*
  - *Medtronic 670 G*

Continuous Glucose Monitors

- Measures blood sugar in interstitial fluid up to every 5 minutes and alerts patient with BG is very high or trending toward low BG levels
- Can be used to guide nutrition, physical activity, adjusting medications
- Requires training in application, phone apps and most enable the ability to share data with clinician
- Measurements can be affected by high-dose vitamin C and hypoxemia
- Most insurance companies require patient to be on insulin therapy


dexcom
6.1
1
2

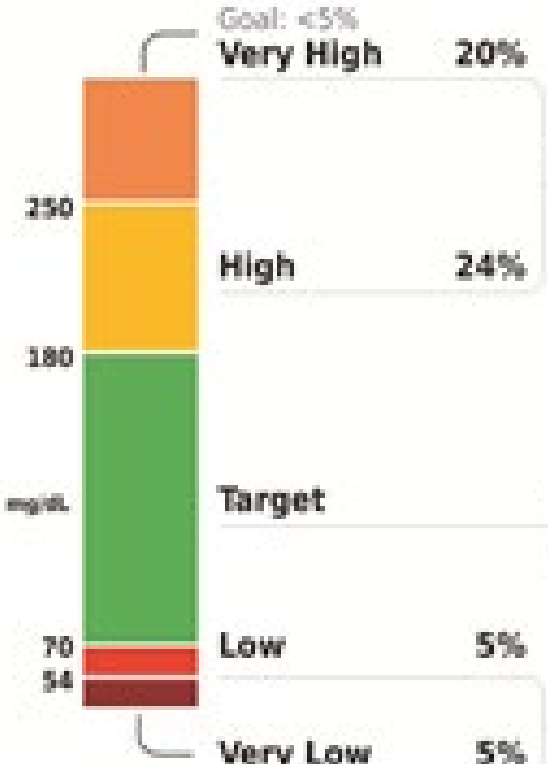

10:23pm
Ends in 13 days
112
mg/dL
350
250
150
50
2pm
6pm
10pm
FreeStyle Libre


137
mg/dL
4 minutes ago
Medtronic

AGP Report: Continuous Glucose Monitoring

Time in Ranges

Goals for Type 1 and Type 2 Diabetes



Very High	20%	
High	24%	44% Goal: <25%
Target		46% Goal: >70%
Low	5%	
Very Low	5%	10% Goal: <4%

Each 5% increase is clinically beneficial

Each 1% time in range = ~15 minutes

Test Patient DOB: Jan 1, 1970

14 Days: August 8–August 21, 2021

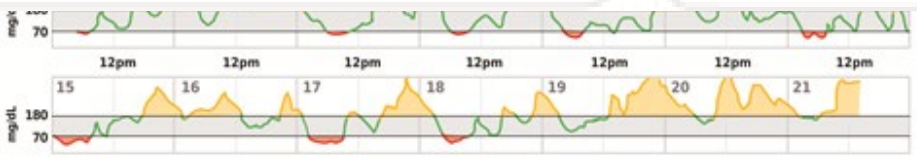
Time CGM Active: 100%

Glucose Metrics

Average Glucose ..... **175 mg/dL**
Goal: <154 mg/dL

Glucose Management Indicator (GMI) **7.5%**
Goal: <7%

Glucose Variability **45.5%**
Defined as percent coefficient of variation
Goal: ≤36%



In Pen/Smart Pen

- Smart pen which can recall dose amounts and timing
- Some can be programmed to calculate insulin dosing
- Can give ½ unit dosing

Insulin Pumps

- Patient must have the ability to problem-solve:
  - *Recognize when pump is not functioning and correctly manage DM with backup plan*
  - *Ability to carb count*
  - *Handle device accessories*
  - *Sick day management*
- Allow more individualized basal insulin setting

Pod shown without the necessary adhesive.

Basics of Diabetes Care

- Establishing habits
  - *Checking blood sugars*
  - *Consistency and timing of medications*
- Managing sick day BG levels
- Hypoglycemic management
  - *Rule of 15*

Addressing Barriers to Care

- Financial
  - *Changing insurance*
  - *Patient care assistance programs*
  - *NPH and Novolog are both over the counter at Walmart*
- Supplies
  - *DME companies (e.g. Valentines, Advantage, Southeast Diabetes)*

Review

- Diabetes is a disease, which is increasing in prevalence and requires proper screening and diagnosis
- Establishing good baseline education in diet, physical activity and proper use of medications is key to guiding patients in management
- Advances in technology can be helpful in management of diabetes

QUESTIONS