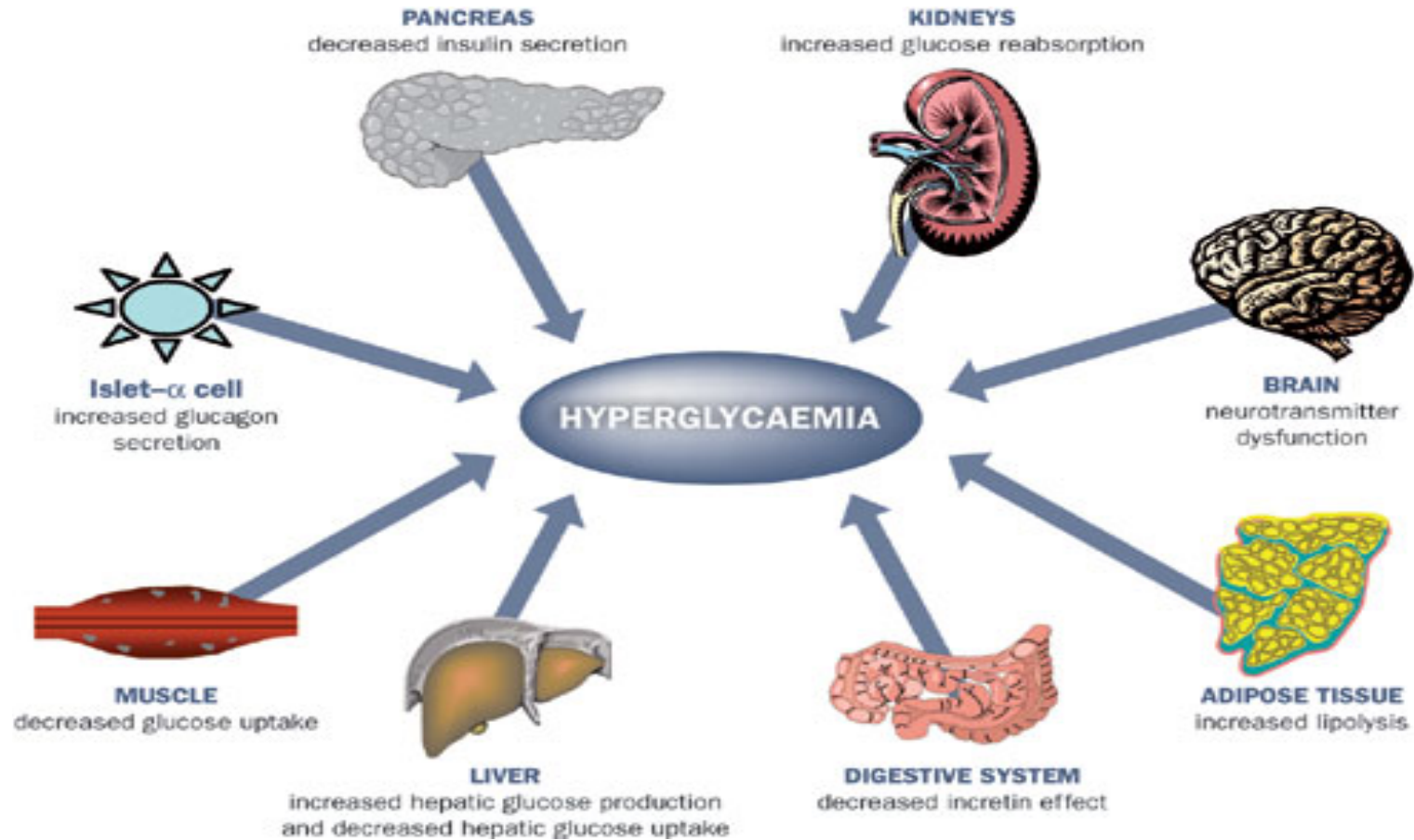


Diabetes Update

Wendy Sanders ARNP

March 7, 2020

Diabetes Progression



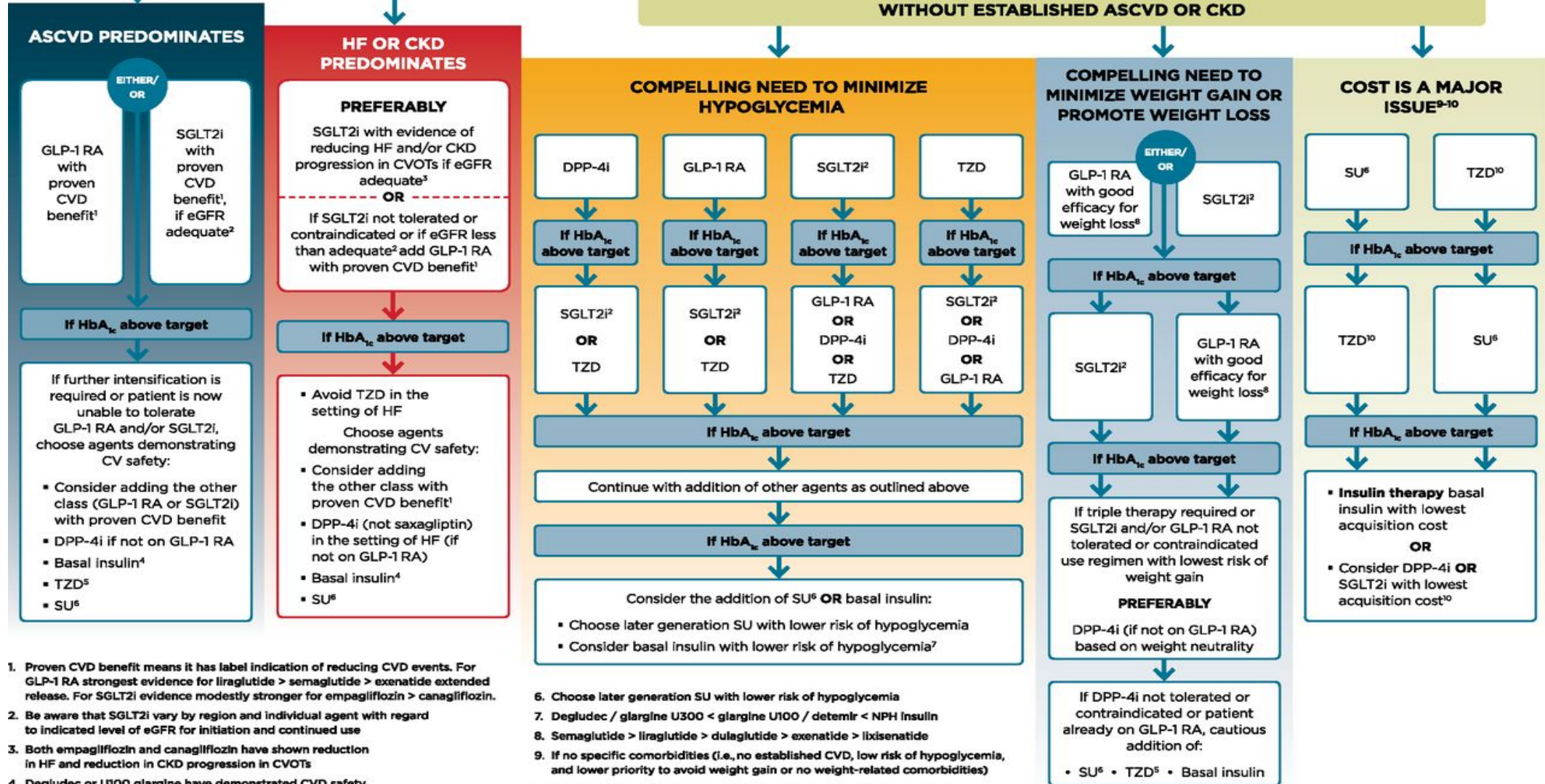
FIRST-LINE therapy is metformin and comprehensive lifestyle (including weight management and physical activity)
 If HbA_{1c} above target proceed as below



ESTABLISHED ASCVD OR CKD

NO

WITHOUT ESTABLISHED ASCVD OR CKD



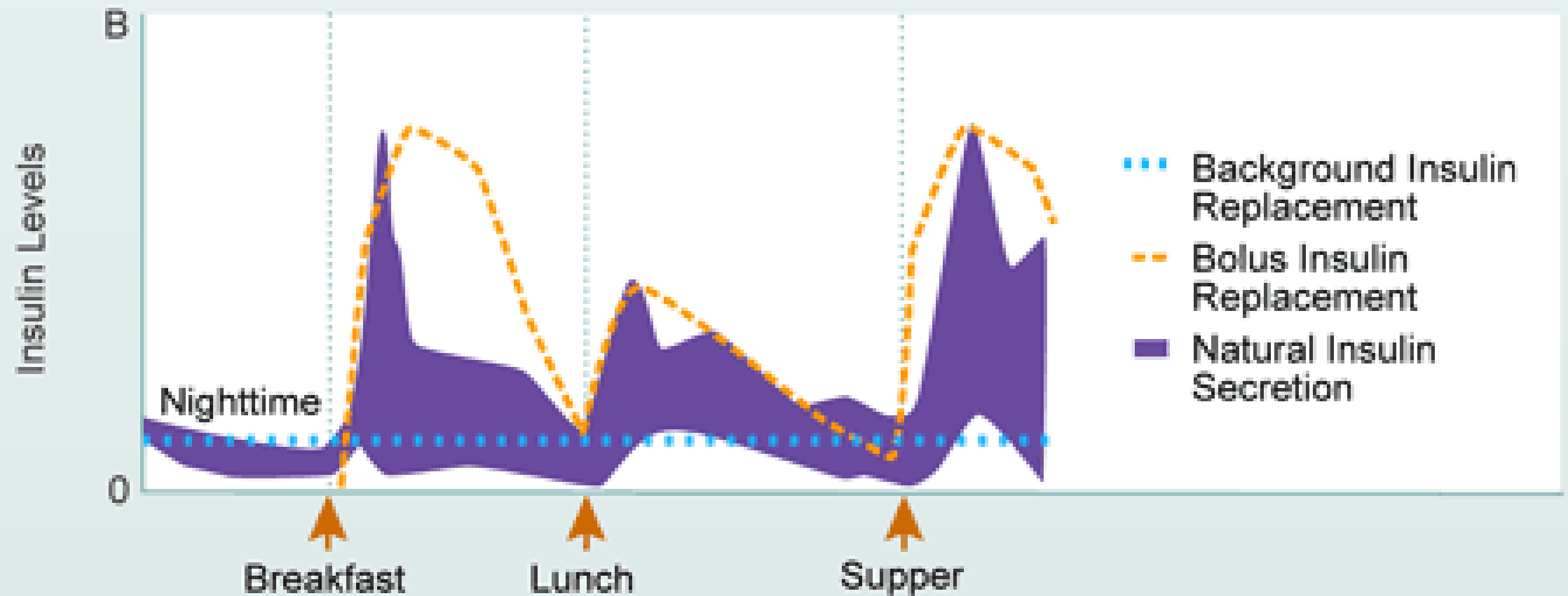
1. Proven CVD benefit means it has label indication of reducing CVD events. For GLP-1 RA strongest evidence for liraglutide > semaglutide > exenatide extended release. For SGLT2i evidence modestly stronger for empagliflozin > canagliflozin.
 2. Be aware that SGLT2i vary by region and individual agent with regard to indicated level of eGFR for initiation and continued use
 3. Both empagliflozin and canagliflozin have shown reduction in HF and reduction in CKD progression in CVOTs
 4. Degludec or U100 glargine have demonstrated CVD safety
 5. Low dose may be better tolerated though less well studied for CVD effects

6. Choose later generation SU with lower risk of hypoglycemia
 7. Degludec / glargine U300 < glargine U100 / detemir < NPH Insulin
 8. Semaglutide > liraglutide > dulaglutide > exenatide > lixisenatide
 9. If no specific comorbidities (i.e., no established CVD, low risk of hypoglycemia, and lower priority to avoid weight gain or no weight-related comorbidities)
 10. Consider country- and region-specific cost of drugs. In some countries TZDs relatively more expensive and DPP-4i relatively cheaper

Diabetes Type 1

- Absence or near absence of Beta cell function
 - No significant amount of natural insulin production
- Requires synthetic insulin administration
 - Multipole daily dose injections
 - Flexible insulin therapy (FIT)
 - Continuous subcutaneous insulin infusion

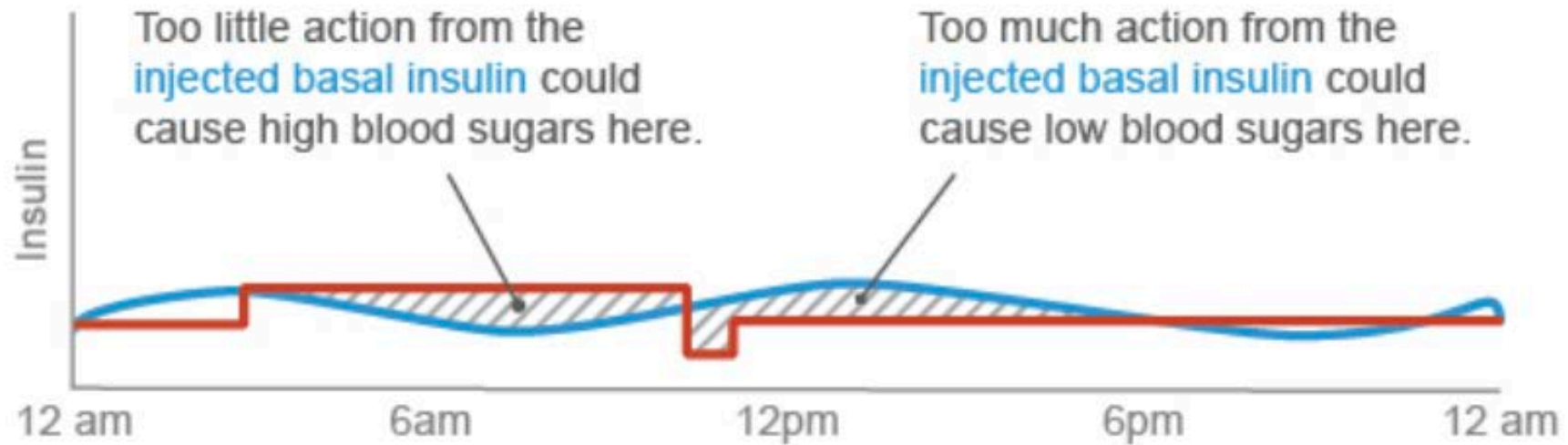
Intensive Insulin Replacement Compared with Natural, Non-diabetic Insulin Secretion



Initial Insulin Dosing

- Total daily dose (TDD): weight (kg) x (.5-.8)
- Basal Insulin- background insulin
 - (TDD/2)
 - Injection: Levemir, Basaglar, Lantus, Tresiba, or Toujeo
 - Per insulin pump: (TDD/2)/24
 - Rapid Acting Insulin: Novolog, Humalog, or Apidra
- Bolus insulin-mealtime and/or correction
 - Insulin to carbohydrate ratio: 450/TDD
 - Correction factor: 1700/TDD

Comparing Basal Insulin From Injections and Insulin Pump



- Injected basal insulin
- The basal insulin this particular person's body needs. The pump can better meet this pattern (profile).



Benefits of Insulin Pump Use



- Increases flexibility in lifestyle
- Predictable insulin delivery
- Precise insulin delivery
 - Ability to accurately deliver .01 of a unit of insulin
- Reducing episodes of hypoglycemia
 - Calculates the correction dose
 - Prevents stacking of insulin
 - Calculates the carbohydrate dose
- Helps manage "dawn phenomenon"
 - May set multiple basal doses

First generation



Very-low-glucose insulin off pump
Pump shuts off when user not responding to low-glucose alarm



Hypoglycemia minimizer
Predictive
Hypoglycemia causes alarms followed by reduction or cessation of insulin delivery below low threshold



Hypoglycemia/hyperglycemia minimizer
Same as #2 but added feature of allowing insulin dosing above high threshold (eg, 200 mg/dL)



Automated basal/hybrid closed loop
Closed loop at all times with meal-time manual assist bolusing



Fully automated insulin closed loop
Manual meal-time bolus eliminated



Fully automated multi-hormone closed loop



Definitions

Continuous Glucose Monitor (CGM)

- FDA approved device that monitors glucose levels real-time and displays them on the patient's phone, a reader device, or the insulin pump.

Glucose Sensor

- part of the CGM that is under the skin that can check glucose levels in the interstitial fluid. Freestyle Libre' has 14-day wear, Medtronic CGM has a 7-day wear, and Dexcom G6 has a 10-day wear.

Transmitter

- Device that is outside of the body that attaches to the glucose sensor
 - through blue tooth technology sends the glucose level from the interstitial fluid to the insulin pump, receiver, or cell phone.

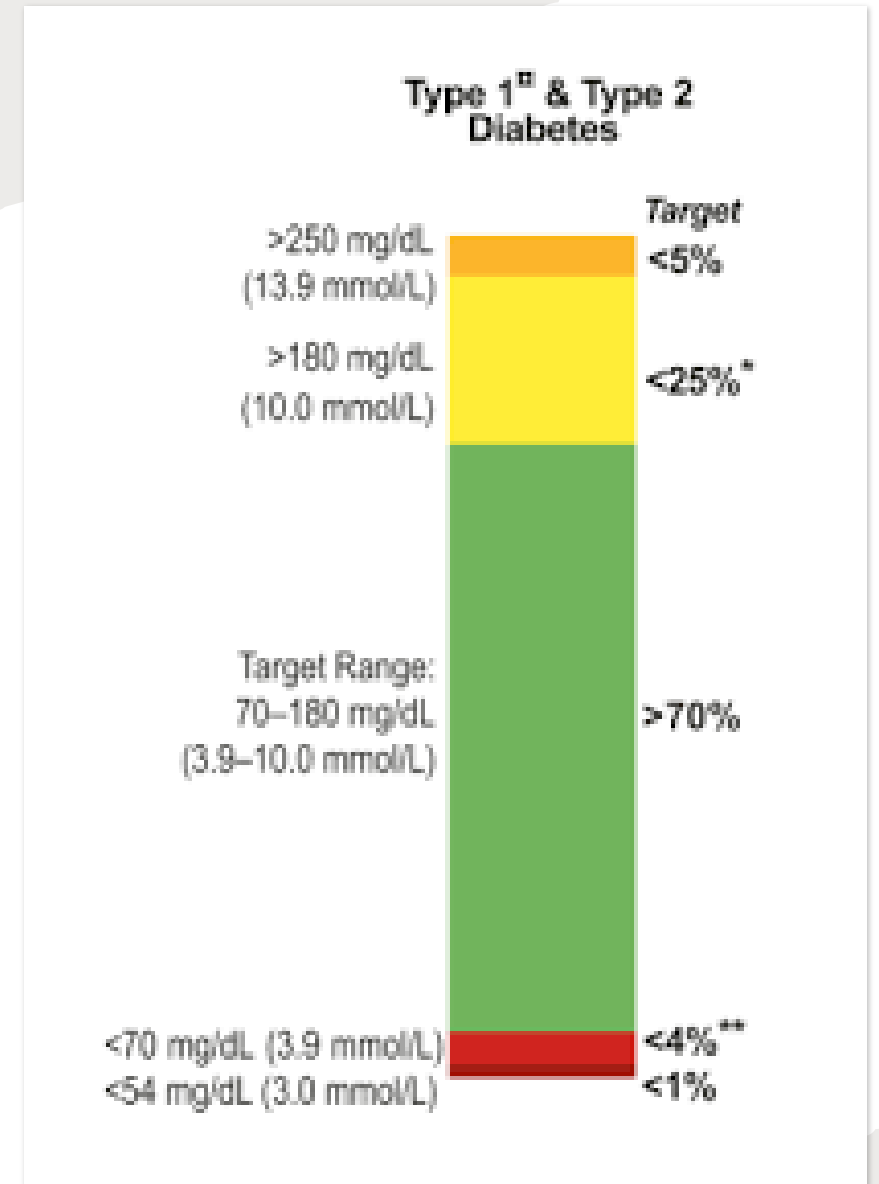
Receiver

- Device that is not attached to the body which displays the CGM glucose levels



Goals of Therapy

- Glucose targets ranges (ADA 2019)
 - >70% readings in the 70-180 mg/dL range
 - <25% readings greater than 250 mg/dL
 - <4 % readings less 70 mg/dL
 - Standard Deviation of glucose levels <45



Continuous Glucose Monitor (CGM) and Insulin Pump Safety Precautions

- (x) Denotes should not be exposed to magnetic fields and radiation of the specific diagnostic procedure
- * pump and CGM receiver may also be disconnected and placed behind a protective shield in the room

Diagnostic Procedure	CGM	Insulin Pump	Advice	Guidelines
MRI	x	x	If possible, do not bring CGM receiver/sensor or insulin pump into the room where procedure being conducted*	Teflon/plastic infusion set for insulin pump may remain in place. Metal infusion sets must be removed (Sure-T)
CT	x	x	Consider body part to be scanned. Place pump site and/or CGM site in area that will not be scanned to prevent exposure*	If infusion site on same area of body that needs to be scanned, then Teflon/plastic infusion set for insulin pump may remain in place. Metal infusion set must be removed (Sure-T) If CGM is not on the area that needs to be scanned may leave CGM in place.
Electro-Cautery	x	x		
Diathermy Treatments	x	x		
Direct X-ray	x	x	Lead Apron to completely cover CGM sensor/transmitter and insulin pump	If protected by lead apron may leave both insulin pump and CGM in place
Bone Density	x	x	Lead Apron to completely cover CGM sensor/transmitter and insulin pump	If protected lead by apron may leave both insulin pump and CGM in place
X-Ray Body Fluoroscopy (Cardiac Catheterization; Nuclear Stress Test; Pacemaker, AICD Placement)	x	x	Lead Apron to completely cover CGM sensor/transmitter and insulin pump	If protected by lead apron may leave both insulin pump and CGM in place

Indications for CGM in Inpatient Setting

- High risk for hypoglycemia
- DM type 1
- Frail
 - Renal Failure
 - Poor Nutrition
 - > 65 yrs.
- Multiple daily injections
- COVID-19
- Steroid induced hyperglycemia
- Moderate hyperglycemia >200 mg/dL

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Questions?
