INJECTABLE MEDICATIONS FOR DIABETES TREATMENT

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Disclosure

- I have had no financial relationship over the past 12 months with any commercial sponsor with a vested interest in this presentation.

Learning Objectives

- Understand the role of injectable medications in diabetes management
- Identify indications for injectable medications in diabetes treatment based on patient factors
- Discuss the benefits and challenges of injectable medications for diabetes

Glucagon-like, peptide-1 agonists

Dulaglutide (Trulicity®)

Exenatide (Byetta®) and extended release (Bydureon® BCise™)

Liraglutide (Victoza®)

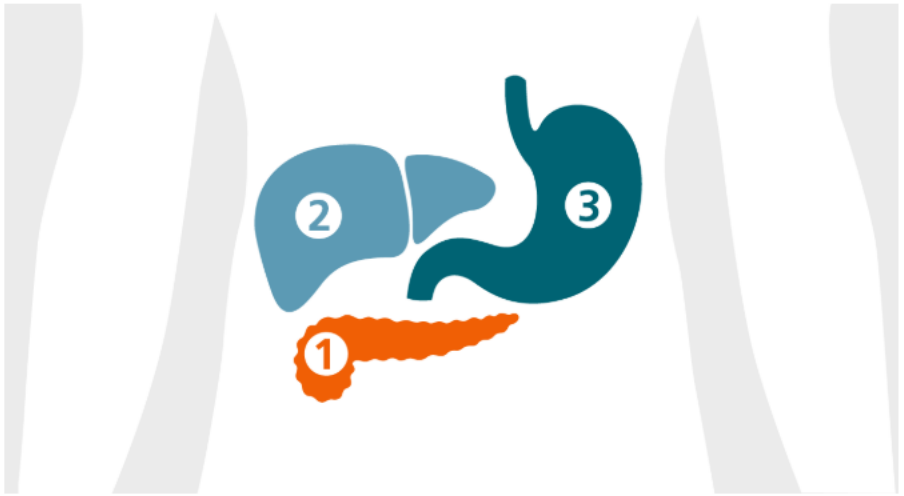
- With insulin degludec (Xultophy 100/3.6®)

Lixisenatide (Adlyxin®)

- With insulin glargine (Soliqua 100/33®)

Semaglutide (Ozempic®)

Glucagon-like, peptide-1 agonists



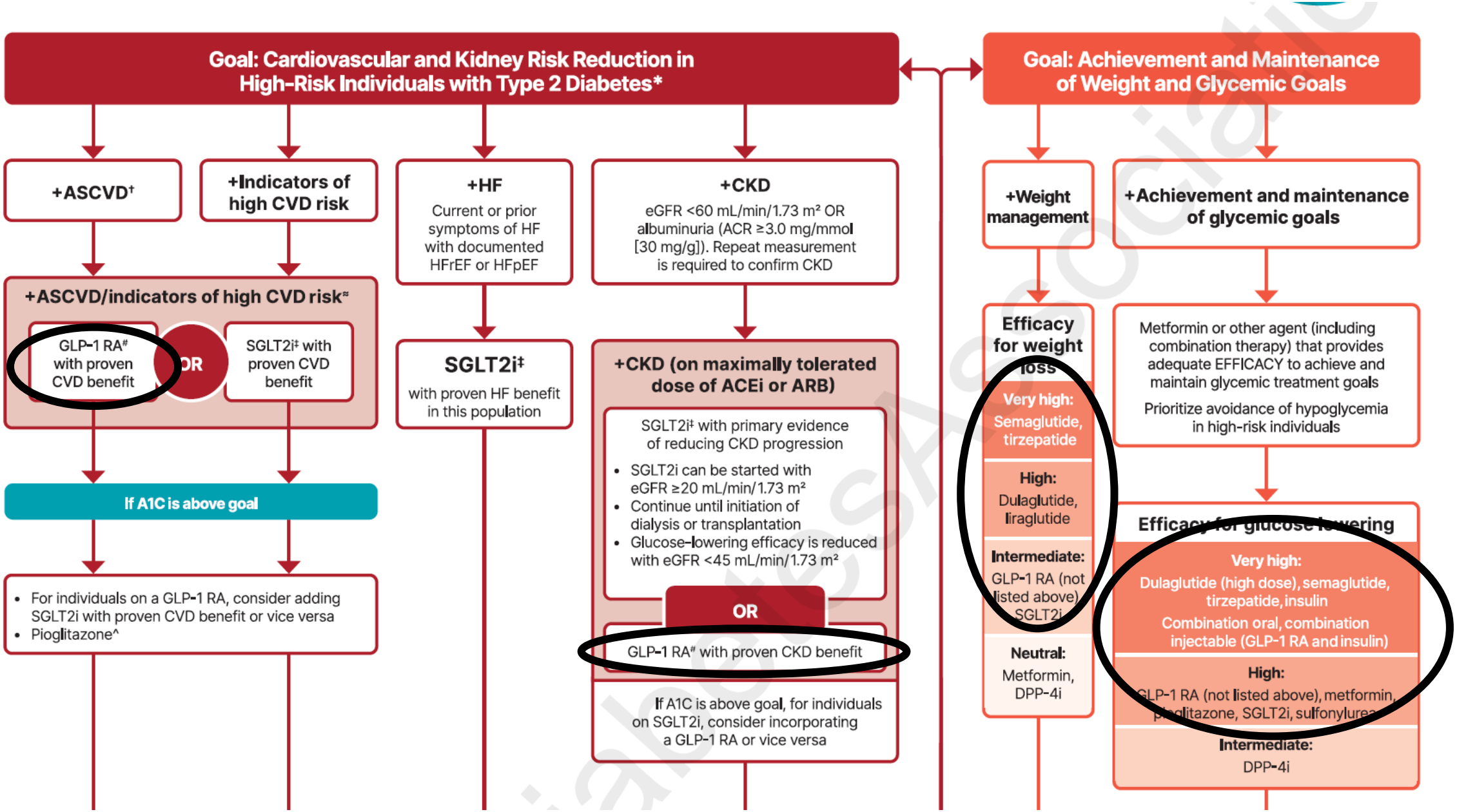
1. Helps your **pancreas** produce more insulin when your blood sugar is high
2. Helps prevent your **liver** from making and releasing too much sugar
3. Slows down food leaving your **stomach**

https://www.ozempic.com/why-ozempic/how-ozempic-works.html

Glucose-dependent insulinotropic polypeptide (GIP)/GLP-receptor agonist

- Tirzepatide (Mounjaro®)

https://mounjaro.lilly.com/what-is-mounjaro#how-mounjaro-works



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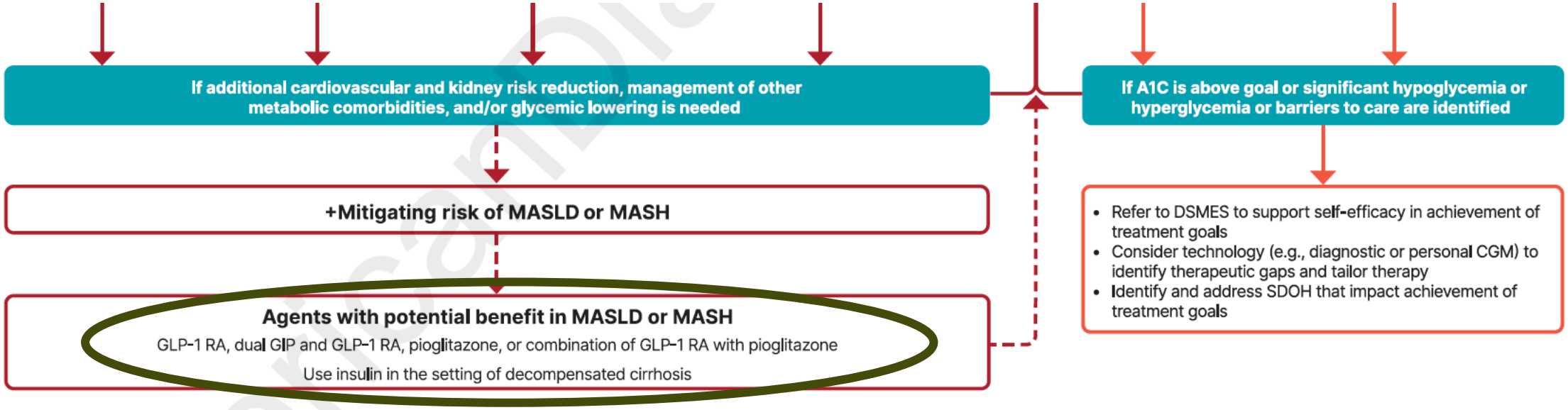

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GLP-1 agonists, GIP/GLP-1 agonists

- Adverse Effects
  - GI effects (diarrhea, nausea)
  - Injection site reactions

Medication	Discontinuation due to adverse effects
Dulaglutide (1.5 mg)	~1 in 15 patients
Exenatide	~1 in 24 patients (Byetta); ~1 in 22 patients (Bydureon Bcise)
Liraglutide (1.8 mg)	~1 in 18 patients
Semaglutide (1 mg)	~1 in 10 patients
Tirzepatide (15 mg)	~1 in 16 patients

GLP-1 agonists, GIP/GLP-1 agonists

- Advantages
  - Weight loss
  - Most are given once weekly
  - A1c reduction
  - Low risk of hypoglycemia when used as monotherapy
  - Reduces postprandial glucose
  - Cardiovascular benefit (some)
  - Renal benefit (some)

GLP-1 agonists, GIP/GLP-1 agonists

- Disadvantages
  - Injectable
  - Cost
  - Warnings about gallbladder disease (low risk) and pancreatitis (unclear association)
  - Contraindicated in patients with personal or family history of medullary thyroid cancer or patients with multiple endocrine neoplasia type 2
  - Rapid glycemic improvement associated with diabetic retinopathy complications

GLP-1 agonists, GIP/GLP-1 agonists

- Patient Education
  - Nausea
  - How to inject
  - Storage
  - Delayed doses

GLP-1 agonists, GIP/GLP-1 agonists

- Place in Therapy
  - Patients with established ASCVD or at high risk
  - Patients with renal disease
  - Patients with a compelling need to minimize hypoglycemia
  - Patients with a compelling need to minimize weight gain or promote weight loss

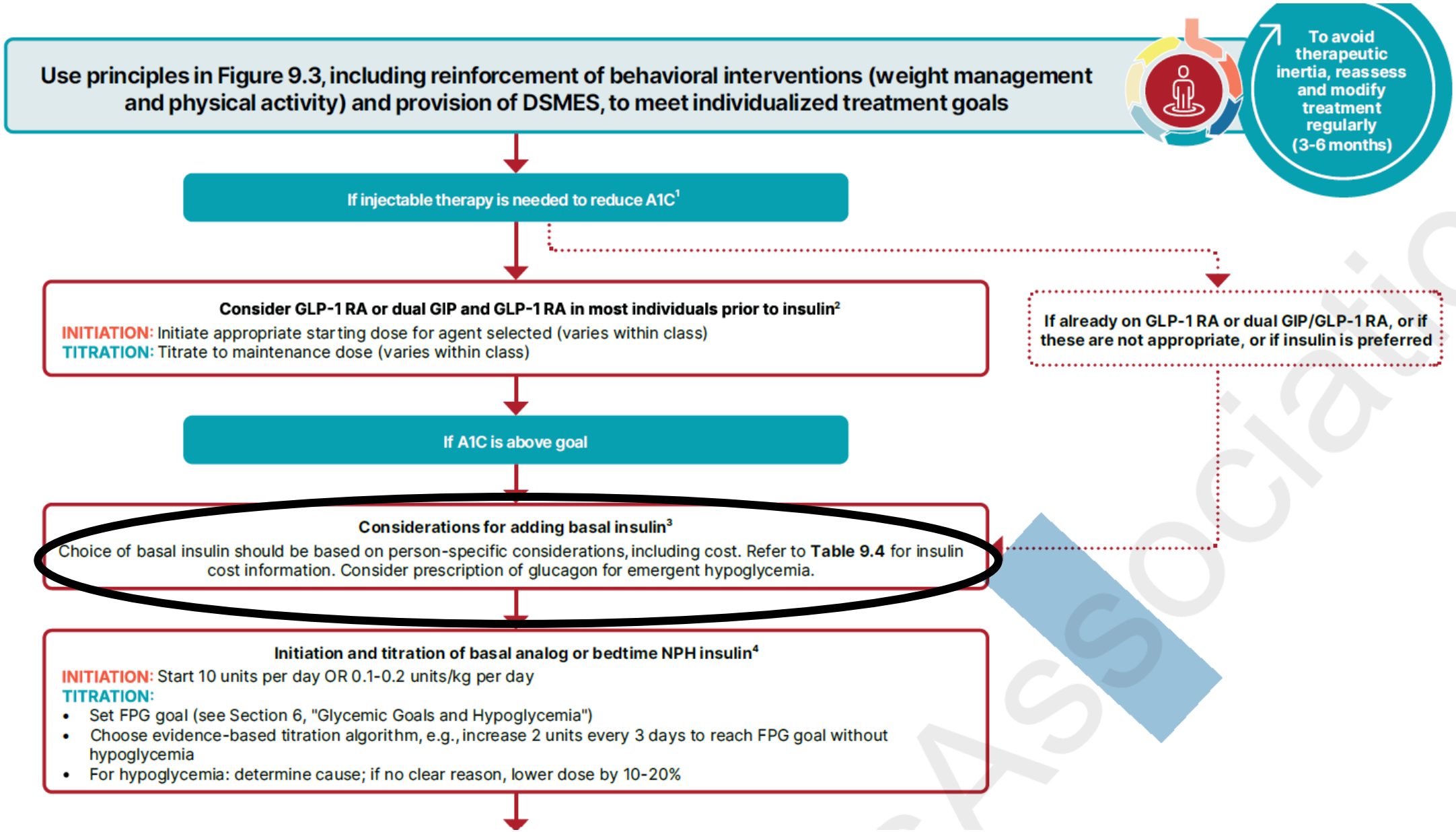
Agent	Equivalent Dose						
Exenatide	5 mcg	10 mcg					
Exenatide XR			2mg				
Lixisenatide	10 mcg	20 mcg					
Liraglutide	0.6mg	1.2mg	1.8mg				
Dulaglutide		0.75mg	1.5mg	3mg	4.5mg		
Semaglutide (oral)	3mg	7mg	14mg				
Semaglutide (subcut)		0.25mg	0.5mg		1mg	2mg	
Tirzepatide			2.5mg			5mg	7.5mg, 10mg, 12.5mg, 15mg

Insulin/GLP-1 Combination Drugs

- Products:
  - Insulin degludec/liraglutide (Xultophy 100/2.6®)
  - Insulin glargine/lixisenatide (Soliqua 100/33®)
- Advantages
- Place in Therapy

Insulin

- Rapid-Acting: insulin lispro (Humalog®), insulin aspart (NovoLog®), insulin glulisine (Apidra®), insulin aspart (Fiasp®)
- Short-Acting: regular (Humulin® R, Novolin® R)
- Intermediate-Acting: NPH (Humulin® N, Novolin® N)
- Long-Acting: insulin glargine (Basaglar®, Lantus®, Toujeo®)
- Ultra Long-Acting: insulin degludec (Tresiba®)



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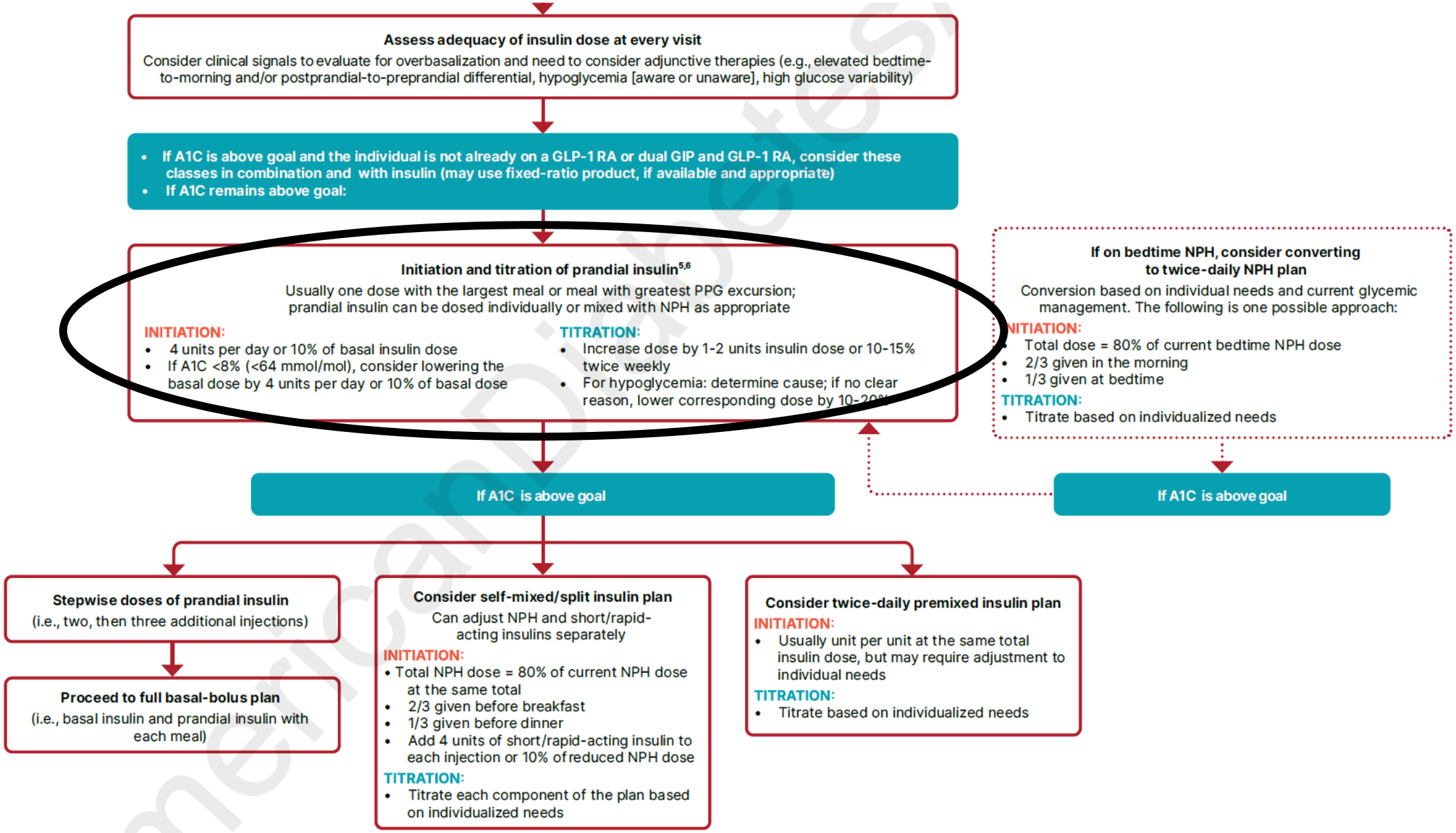

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Rapid-Acting Insulin

Insulin	Dosing	Duration
Insulin lispro (Admelog, Humalog)	Inject within 15 minutes before or immediately after meal	3 to5 hours
Insulin aspart (Novolog)	Inject within 5-10 minutes before a meal	3 to 5 hours
Insulin aspart (Fiasp)	Inject at start of meal, or within 20 minutes after start of meal	3 to 5 hours
Insulin glulisine(Apidra)	Inject within 15 minutes before meal, or within 20 minutes after start of meal	3 to 5 hours
Insulin lispro-aabc (Lyumjev)	Inject within 20 minutes after start of meal	Up to 5 hours

Rapid-Acting Insulin

- Dosed 1-3 times per day (or more) before a meal
- Patient Education
  - When to inject
  - Storage
  - Clear and colorless

Short-Acting (Regular) Insulin

- Products: regular (Humulin® R—100 units/mL and 500 units/mL, Novolin® R)
- Onset: about 30 minutes
- Duration: varies—about 8 hours (longer for the 500 units/mL)
- Dosed 1-3 times per day before a meal
- Patient Education:
  - Inject about 30 minutes before the meal
  - Storage
  - Clear and colorless

Intermediate-Acting (NPH) Insulin

- Products: NPH (Humulin® N, Novolin® N)
- Onset: 90 minutes
- Duration: up to 24 hours
- Dosed 1-2 times daily
- Patient Education:
  - Storage
  - Cloudy
  - Potentially how to mix insulins

Long-Acting Insulin

- Products: insulin glargine (Basaglar®, Lantus®); insulin glargine-yfgn (Semglee®)
- Duration: about 24 hours (depends on the product)
- Dosed 1-2 times per day
- Patient Education:
  - Storage
  - Not to mix with other insulins
  - Clear and colorless

Insulin Glargine (Toujeo®)

- Dosage form: 300 units/mL pen
- Duration: > 24 hours
- Dosing: once daily; may take at least 5 days to see maximum effect
- Patient Education:
  - Storage
  - Delayed effect with first doses
  - Clear and colorless

Ultra Long-Acting Insulin

- Product: insulin degludec (Tresiba®)
- Duration: At least 42 hours
- Dosed once daily
- Consider for patients with:
  - Severe or nocturnal hypoglycemia with different basal insulin
  - Hypoglycemia risk factors
  - Adherence problems
- Patient Education
  - Storage
  - Clear and colorless

Premixed Insulin

- Products
  - NovoLog® 70/30 (70% insulin aspart protamine/30% insulin aspart)
  - Humalog® Mix 75/25 (75% insulin lispro protamine/25% insulin lispro)
  - Humalog® Mix 50/50 (50% insulin lispro protamine/50% insulin lispro)
  - Humulin® 70/30 (70% NPH/30% regular)
  - Novolin® 70/30 (70% NPH/30% regular)
- Place in therapy

Insulin

Advantages

- Essentially no dose limit
- Variety of insulin options
- A1c lowering ability

Disadvantages

- Hypoglycemia risk
- Weight gain

Place in Therapy for Insulin

- Basal Insulin (Long and Ultra Long Acting)
- Bolus Insulin (Rapid and Short Acting)

References

- American Diabetes Association Professional Practice Committee. Introduction and Methodology: Standards of Care in Diabetes-2025. Diabetes Care. 2025 Jan 1;48(1 Suppl 1):S1-S5. doi: 10.2337/dc25-SINT. PMID: 39651982; PMCID: PMC11635031.
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QUESTIONS