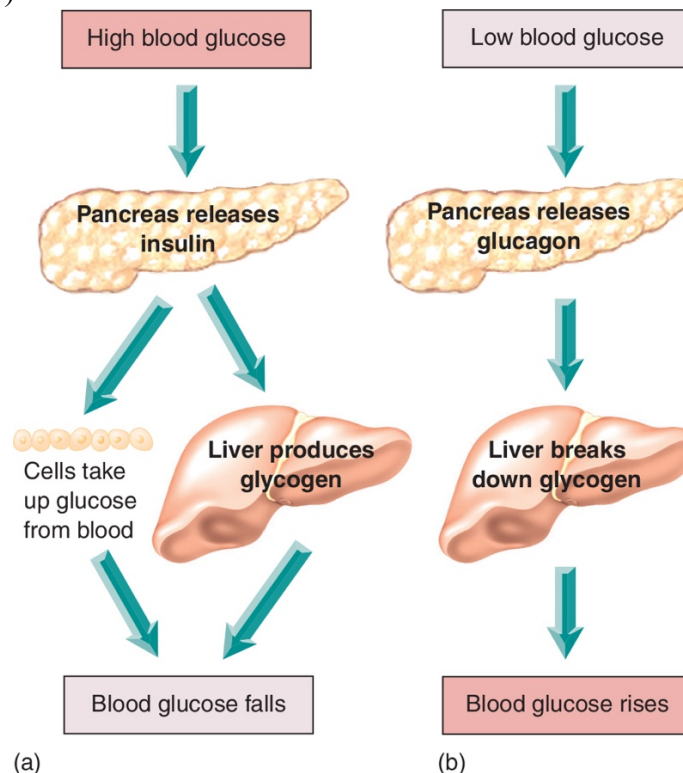


Diabetes

Physiology of Serum Glucose Control

- Serum glucose is maintained within a narrow range by the hormones insulin and glucagon.
- Body prefers to use glucose as primary energy source.
- Normal range: 60–100 mg/dL.
 - Usually tightly regulated by the body to remain between 80–90 mg/dL.
- Two pancreatic hormones contribute to maintaining stable serum glucose levels.
 - Insulin
 - Acts to decrease blood glucose levels
 - Glucagon
 - Acts to increase blood glucose levels
- Following a meal, about two thirds of glucose stored in liver and muscle cells as glycogen (storage form of glucose).
- When glucose levels fall, glycogen broken down in process called glycogenolysis, and glucose is released into bloodstream.
- Physiologic actions of insulin
 - Promotes entry of glucose into cells
 - Promotes for storage of glucose, as glycogen
 - Inhibits breakdown of fat and glycogen
 - Increases protein synthesis
 - Inhibits gluconeogenesis (production of new glucose from noncarbohydrate molecules)



Insulin, glucagon, and blood glucose

- Diabetes mellitus United States:
 - 1 in every 400 children and adolescents has diabetes.
 - 9.4% of all people 20 years or older have diabetes.
 - 25% of all people 65 years or older have diabetes.
 - 1.5 million new cases of adult diabetes are diagnosed each year.

Pathophysiology of Diabetes Mellitus: 3 Types of Diabetes

- Type 1 Diabetes
 - characterized by insufficient insulin synthesis by the pancreas, whereas type 2 diabetes is characterized by insulin resistance in the target cells.
 - Less common form of diabetes
 - 5% to 10% of all patients with the disorder
 - Onset most frequently among children and young adults
 - Results from absolute lack of insulin secretion due to destruction of pancreatic beta cells
 - Destruction may result from combination of autoimmune, genetic, and environmental factors.
 - Produces dangerous and potentially life-threatening condition known as diabetic ketoacidosis (DKA)
 - Insufficient insulin results in fatty acids being used as primary energy source instead of glucose
 - Process produces ketones, which accumulate in blood
 - Insulin therapy required in order to survive
- Type 2 diabetes
 - More common form
 - Representing 90% to 95% of all people with diabetes
 - Characterized by insulin resistance
 - Pancreas may be secreting sufficient amounts of insulin but target cells do not recognize it.
 - Blood glucose levels rise, causing pancreas to secrete even more insulin.
 - Insulin resistance
 - Hypersecretion leads to beta cell exhaustion, and ultimately, to beta cell death
 - Progression of disorder leads to insufficient insulin levels and insulin resistance
 - Risk factors
 - Family history of diabetes
 - Obesity BMI > 35
 - Management of disease
 - Initially treated with PO medications
 - Diet: blood sugars can reduce decrease DM coffee tea yogurt and berries. Dash diet or Mediterranean diet recommended. Use a diabetic dinner plate should have no more than a quarter filled with carbs
 - Exercise 60 minutes a day

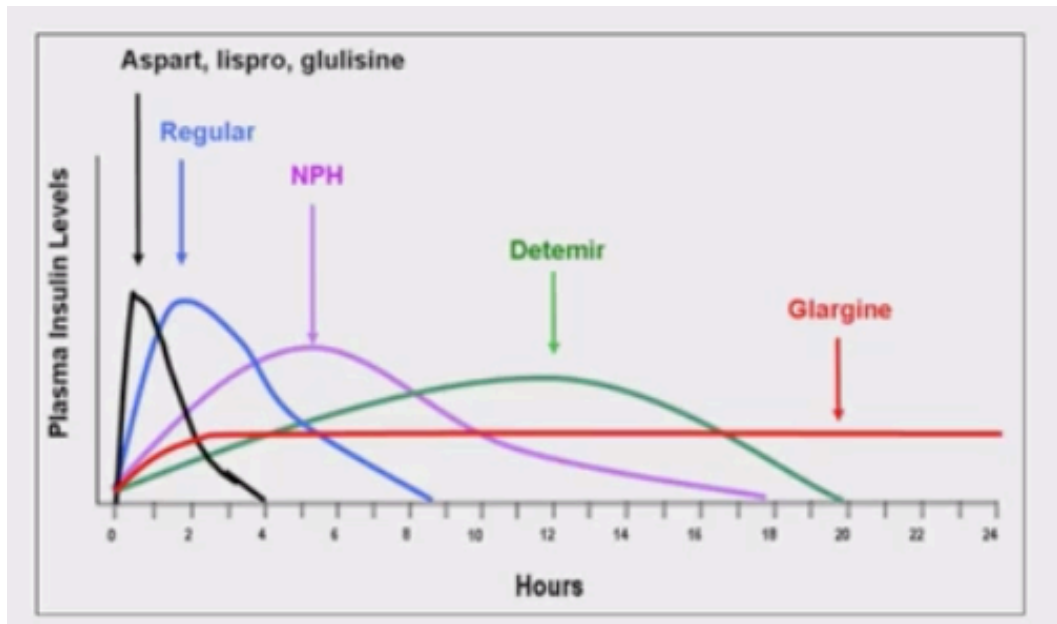
- Most patients with type 2 diabetes do not require insulin administration, at least initially
 - Condition can be managed with oral antidiabetic drugs
 - Loss of beta cells occurs over time and may require insulin administration
- Gestational diabetes
 - Glucose intolerance
 - Onset, or first recognition, during pregnancy
 - Puts woman and fetus at risk
 - Woman at increased risk for diabetes 5 to 10 years after delivery
- Complications of Diabetes Mellitus
 - Serious complications of chronic diabetes include neuropathy, nephropathy, retinopathy, and vascular disease.

Insulin Therapy

- Insulin is the cornerstone of therapy for patients with type 1 and gestational diabetes.
- Insulin Therapy
- Pharmacologic goal for patients with type 1 diabetes is to administer insulin as replacement therapy in normal physiological amounts
- Fundamental principle
 - The right amount of insulin must be available to cells when glucose is present in the blood.
- Doses of insulin are highly individualized for the precise control of blood glucose levels in each patient.
- Primary adverse effect of insulin therapy is overtreatment.
 - Results in hypoglycemia
- Prototype drug: Human Regular Insulin (Humulin R, Novolin R)
 - Therapeutic classification
 - Antidiabetic agent, pancreatic hormone
 - Pharmacologic classification
 - Short-acting hypoglycemic agent
 - Therapeutic effects and uses
 - Monotherapy to lower blood glucose levels in patients with type 1 diabetes
 - In combination with oral antidiabetic agents in patients with type 2 diabetes
 - Emergency treatment of DKA or hyperosmolar hyperglycemic state
 - Gestational diabetes
 - Mechanism of action
 - Insulin decreases blood glucose levels by increasing cellular uptake of glucose and stimulating storage of glucose as glycogen.
 - Inhibits release of glucagon
 - Adverse effects
 - Irritation at injection sites
 - Lipohypertrophy
 - Weight gain
 - Drug interactions

- Agents that can produce hypoglycemia
 - Sulfonylureas, meglitinides, beta-adrenergic blockers, salicylates, anabolic steroids, MAOIs, alcohol
 - Dextrothyroxine, corticosteroids, epinephrine or norepinephrine, furosemide, thiazide diuretics
 - Drug interactions
 - ACE inhibitors
 - Many other drugs can influence blood glucose
 - The nurse should consult current drug references.
 - Herbal/Food
 - Potentiate hypoglycemic effect
 - Garlic, chromium, black cohosh, bitter melon, bilberry, ginseng, Potentiate hyperglycemic effect
 - Rosemary, cocoa
 - Insulin glargine is pregnancy category C; other forms of insulin are category B.)
 - Treatment of overdose
 - Concentrated source of glucose (dextrose), such as D5W or glucagon, by parenteral route
-
- Insulin aspart (NovoLog)
 - More rapid onset of action and shorter duration of action than regular insulin
 - Insulin degludec (Tresiba):
 - A newer long-acting insulin analog approved for both type 1 and type 2 diabetes
 - Long duration of up to 42 hours
 - May be taken at any time of day, regardless of meals
 - Insulin detemir (Levemir)
 - Long-acting insulin with a slow onset and dose-dependent duration of action
 - Used to provide basal glycemic control
 - Not injected before meals to control postprandial hyperglycemia
 - Cannot be mixed with any other type of insulin
 - Insulin glargine (Basaglar, Lantus, Toujeo)
 - Recombinant insulin analog
 - Constant, long-duration insulin activity
 - Provides for the maintenance of steady blood levels
 - May also help improve the lipid profiles and A1C levels of type 2 diabetes when added to therapy
 - Given by subcutaneous injection only
 - Insulin Therapy
 - Insulin glulisine (Apidra)
 - 10–15 minute onset and short duration of 3 to 5 hours
 - Given by subcutaneous injection only

- Insulin lispro (Humalog)
 - Rapid-acting analog of regular insulin
 - Helps control the rise in blood glucose brought on by a meal
 - Cannot be given IV; often used with insulin infusion pumps
- Isophane insulin (Humulin N, NPH)
 - Only intermediate-acting insulin
 - Has slower onset of action (1 to 4 hours) than regular insulin
 - Duration of 18 to 24 hours
 - Used to provide a basal level of insulin coverage between meals and at night



Drugs to Treat Type 2 Diabetes

- All medications require some degree of pancreatic insulin secretion.
- Not effective in treating type 1 diabetes
- Treatment goals (AACE)
 - A1C level of 6.5% or less
 - FPG less than 110 g/dL
- If glycemic control is not achieved with monotherapy, a second medication is added.

Drug	Action(s)	Nursing Considerations
Alpha-Glucosidase Inhibitors	Interfere with carbohydrate breakdown and absorption; act locally in the GI tract with little systemic absorption	Common GI effects; hypoglycemia can occur if combined with another oral drug; if this occurs, treat with glucose, not sucrose; take with meals
Biguanides	Decrease production and release of glucose from the liver; increase cellular uptake of glucose; lower lipid levels; promote weight loss	Common GI adverse effects; risk for lactic acidosis (rare); avoid alcohol; low risk for hypoglycemia
Incretin Enhancers	Slow the breakdown of insulin, keeping it circulating in the blood longer; slow the rate of digestion, which increases satiety	Well tolerated; minor nausea, vomiting, and diarrhea; some weight loss is likely; low risk for hypoglycemia
Meglitinides	Stimulate insulin release	Can cause hypoglycemia, GI effects; well tolerated; administer shortly before meals
Sulfonylureas	Stimulate insulin release; decrease insulin resistance	Can cause hypoglycemia, GI disturbances, rash; cross sensitivity with sulfa drugs and thiazide diuretics; possible disulfiram response with alcohol
Thiazolidinediones	Decrease production and release of glucose from the liver; increase insulin sensitivity in fat and muscle tissue	Can cause fluid retention and worsening of heart failure; therapeutic effects take several weeks to develop

Drug	Route and Adult Dose (Maximum Dose Where Indicated)	Adverse Effects
Alpha-Glucosidase Inhibitors		
<u>acarbose (Precose)</u>	PO: 25–100 mg tid (max: 300 mg/day)	<i>Flatulence, diarrhea, abdominal distention</i>
<u>miglitol (Glyset)</u>	PO: 25–100 mg tid (max: 300 mg/day)	<u>Hypoglycemia (tremors, palpitations, sweating)</u>
Biguanide		
<u>metformin immediate release (Glucophage, Riomet) extended release (Fortamet, Glucophage XR, Glumetza)</u>	PO: 500 mg bid or 850 mg once daily; increase to 1000–2550 mg in 2–3 divided doses/day (max: 2.55 g/day) <u>Glumetza</u> : 1000–2000 mg once daily (max: 2 g/day) <u>Glucophage XR</u> : 500 mg once daily (max 2 g/day) <u>Fortamet</u> : 1000 mg once daily (max: 2.5 g/day)	<i>Flatulence, diarrhea, nausea, anorexia, abdominal pain, bitter or metallic taste, decreased vitamin B12 levels</i> <u>Lactic acidosis</u>

Drug	Route and Adult Dose (Maximum Dose Where Indicated)	Adverse Effects
Incretin Mimetics (GLP-1 Receptor Agonists)		
<u>albiglutide (Tanzeum)</u>	Subcutaneous: 30–50 mg once weekly	<i>Nausea, vomiting, diarrhea, headache, nervousness</i>
<u>dulaglutide (Trulicity)</u>	Subcutaneous: 0.75–1.5 mg once weekly	
<u>exenatide (Bvetta)</u>	Subcutaneous: 5–10 mcg bid 60 min prior to morning and evening meals	<u>Hypoglycemia (tremors, palpitations, sweating), antibody formation, pancreatitis, CKD</u>
<u>liraglutide (Victoza)</u>	Subcutaneous: 0.6–1.8 mg once daily, any time of day	<u>(exenatide), thyroid tumors (liraglutide, albiglutide)</u>
<u>lixisenatide (Adlyxin)</u>	Subcutaneous: 10–20 mcg once daily prior to morning meal	

Drug	Route and Adult Dose (Maximum Dose Where Indicated)	Adverse Effects
Incretin Enhancers (DPP-4 Inhibitors)		
<u>alogliptin (Nesina)</u>	PO: 25 mg once daily	<i>Headache, upper respiratory and urinary tract infections</i>
<u>linagliptin (Tradjenta)</u>	PO: 5 mg once daily	
<u>saxagliptin (Onglyza)</u>	PO: 2.5–5 mg once daily	<u>Hypoglycemia (tremors, palpitations, sweating), anaphylaxis, peripheral edema, exfoliative dermatitis, Stevens–Johnson syndrome</u>
<u>sitagliptin (Januvia)</u>	PO: 100 mg once daily	
Meglitinides		
<u>nateglinide (Starlix)</u>	PO: 60–120 mg tid, 1–30 min prior to meals	<i>Flulike symptoms, upper respiratory infection, back pain</i>
<u>repaglinide (Prandin)</u>	PO: 0.5–4 mg bid–qid, 1–30 min prior to meals (max: 16 mg/day)	<u>Hypoglycemia (tremors, palpitations, sweating), anaphylaxis, pancreatitis</u>

Drug	Route and Adult Dose (Maximum Dose Where Indicated)	Adverse Effects
Sulfonylureas, First Generation		
<u>chlorpropamide (Diabinese)</u>	PO: 100–500 mg/day (max: 750 mg/day)	<i>Nausea, heartburn, dizziness, headache, drowsiness</i>
<u>tolazamide (Tolinase)</u>	PO: 100–500 mg 1–2 times/day (max: 1 g/day)	<u>Hypoglycemia (tremors, palpitations, sweating), cholestatic jaundice, blood dyscrasias</u>
<u>tolbutamide (Orinase)</u>	PO: 250–1500 mg 1–2 times/day (max: 3 g/day)	
Sulfonylureas, Second Generation		
<u>glimepiride (Amaryl)</u>	PO: 1–4 mg/day (max: 8 mg/day)	<i>Nausea, heartburn, dizziness, headache, drowsiness</i>
<u>glipizide (Glucotrol)</u>	PO: 2.5–20 mg 1–2 times/day (max: 40 mg/day)	<u>Hypoglycemia (tremors, palpitations, sweating), cholestatic jaundice, blood dyscrasias</u>
<u>glyburide (DiaBeta)</u> <u>glyburide micronized (Glynase)</u>	PO: 1.25–10 mg 1–2 times/day (max: 20 mg/day) PO: 0.75–12 mg 1–2 times/day (max: 12 mg/day)	
Drug	Route and Adult Dose (Maximum Dose Where Indicated)	Adverse Effects
<u>Thiazolidinediones</u>		
<u>pioglitazone (Actos)</u>	PO: 15–30 mg/day (max: 45 mg/day)	<i>Upper respiratory infection, myalgia, headache, edema, weight gain</i>
<u>rosiglitazone (Avandia)</u>	PO: 4–8 mg 1–2 times/day (max: 8 mg/day)	<u>Hypoglycemia (tremors, palpitations, sweating), hepatotoxicity, bone fractures, heart failure, MI</u>
Miscellaneous Drugs		
<u>bromocriptine (Cycloset)</u>	PO: 0.8–4.8 mg/day upon awakening	<i>Nausea, fatigue, dizziness, vomiting, and headache</i> <u>Hypotension, psychosis, drowsiness</u>
<u>canagliflozin (Invokana)</u>	PO: 100 mg once daily (max: 300 mg/day) taken before first meal	<i>Female genital mycotic infections, urinary tract infection, and <u>nasopharyngitis</u></i>
<u>dapaqliflozin (Farxiga)</u>	PO: 5–10 mg once daily in the morning, with or without food	<u>Hypotension, CKD, hyperkalemia, hypoglycemia</u>
<u>empagliflozin (Jardiance)</u>	PO: 10–25 mg once daily in the morning, with or without food	

Trade-Name Drug	Generic Drug Combination	Route and Adult Dose (Maximum Dose Where Indicated)
<u>Actoplus Met</u>	pioglitazone/metformin	PO: 15 mg/500–850 mg bid (regular release) or 15–30 mg/1000 mg once daily (extended release)
<u>Avandamet</u>	rosiglitazone/metformin	PO: 4 mg/1000 mg daily in divided doses
<u>Duetact</u>	pioglitazone/glimepiride	PO: Start with 30 mg/2 mg once daily (max: 45 mg/8 mg daily)
<u>Glucovance</u>	glyburide/metformin	PO: 1.25–5 mg/250–500 mg once or twice daily with a meal (max: 20 mg/2000 mg daily)
<u>Janumet</u>	sitagliptin/metformin	PO: Starting dose 50 mg/500 mg bid (regular release) or 100 mg/1000 mg once daily (extended release) (max: 100 mg/2000 mg/day)
<u>Jentadueto</u>	linagliptin/metformin	PO: 2.5 mg/500–1000 mg bid (regular release) or 5 mg/1000 mg once daily (extended release) with meals

Trade-Name Drug	Generic Drug Combination	Route and Adult Dose (Maximum Dose Where Indicated)
<u>Kazano</u>	alogliptin/metformin	PO: 12.5 mg/500 mg bid with meal
<u>Oseni</u>	alogliptin/pioglitazone	PO: 25 mg/15 mg once daily with or without food
<u>PrandiMet</u>	repaglinide/metformin	PO: 1 mg/500 mg bid, 15 min before meals (max: 10 mg/2500 mg daily)
<u>Qtern</u>	dapaqliflozin/saxagliptin	PO: 10 mg/5 mg once daily with morning meal
<u>Syniardy</u>	empaqliflozin/metformin	PO: 12.5 mg/1000 mg bid with meals (regular release) or 25 mg/2000 mg once daily with morning meal (extended release)

* Dosage levels are determined individually according to patient response and glycemic laboratory results.

Biguanides

- Metformin (Glucophage) is the only drug in this class.
 - Preferred drug for managing type 2 diabetes due to effectiveness and safety
- Antidiabetic Drugs for Type 2 Diabetes
- Prototype drug: Metformin (Glucophage, Glumetza, others)
 - Therapeutic classification
 - Antidiabetic drug
 - Pharmacologic classification
 - Biguanide
 - Therapeutic effects and uses
 - Lowers blood glucose levels in patients with type 2 diabetes who are unable to control glucose levels by diet and exercise

- Off-label to treat women with polycystic ovary syndrome
- Mechanism of action
 - Reduces blood glucose levels by reducing gluconeogenesis, thereby suppressing hepatic production of glucose
 - Decreases intestinal reabsorption of glucose and increases the cellular uptake of glucose
- Adverse effects
 - GI-related effects
 - Nausea, vomiting, abdominal discomfort, metallic taste, diarrhea, anorexia, moderate weight loss
 - Headache
- Adverse effects
 - Dizziness
 - Agitation
 - Fatigue
- Black box warning
 - Lactic acidosis
- Contraindications/precautions
 - Severe CKD
 - Heart failure, liver failure, history of lactic acidosis
 - Concurrent serious infection
 - Any condition that predisposes patient to hypoxemia
- Contraindications/precautions
 - 2 days prior to, and 2 days after, receiving IV radiographic contrast
 - Anemia, diarrhea, vomiting, dehydration, fever, gastroparesis, GI obstruction
 - Older adults
 - Hyperthyroidism, pituitary insufficiency, trauma
 - Pregnancy and lactation
- Drug interactions
 - Alcohol
 - Captopril, furosemide, nifedipine
 - IV radiographic contrast
 - Amiloride, cimetidine, digoxin, dofetilide, midodrine, morphine, procainamide, quinidine, ranitidine, triamterene, trimethoprim, vancomycin
- Drug interactions
 - Use with other antidiabetic drugs potentiates hypoglycemic effects
- Herbal/Food
 - Vitamin B₁₂ and folic acid
 - Garlic and ginseng
- Pregnancy category B
- Treatment of overdose
 - Hemodialysis
- Antidiabetic Drugs for Type 2 Diabetes

- Prototype drug: Repaglinide (Prandin)
 - Therapeutic classification
 - Antidiabetic drug
 - Pharmacologic classification
 - Meglitinide
 - Therapeutic effects and uses
 - Lowers blood glucose levels in patients with type 2 diabetes as an adjunct to diet and exercise
 - Mechanism of action
 - Lowers glucose levels by stimulating insulin release from pancreatic beta cells

Thiazolidinediones

- Reduce blood glucose by decreasing insulin resistance and inhibiting hepatic gluconeogenesis
- Hypoglycemia does not occur with this class.
- Antidiabetic Drugs for Type 2 Diabetes
- Prototype drug: Rosiglitazone (Avandia)
 - Therapeutic classification
 - Antidiabetic drug
 - Pharmacologic classification
 - Thiazolidinedione

Alpha-Glucosidase Inhibitors

- Block enzymes in the small intestine are responsible for breaking down complex carbohydrates into monosaccharides.
- Hypoglycemia may occur when these drugs are combined with insulin or a sulfonylurea.
- Prototype drug: Acarbose (Precose)
 - Therapeutic classification
 - Antidiabetic drug
 - Pharmacologic classification
 - Alpha-glucosidase inhibitor

Incretin Therapies

- Incretin therapies offer a different approach to treating type 2 diabetes.
- Glucagon-like peptide (GLP-1) acts rapidly to produce:
 - Increased amount of insulin secreted by pancreas
 - Decreased amount of glucagon secreted by pancreas
 - Delayed gastric emptying
 - Decreased food intake
- Two groups
 - Activating GLP-1 receptor
 - Inhibiting dipeptidyl peptidase 4 (DPP-4)
- Incretin Therapies
- Prototype drug: Sitagliptin (Januvia)

- Therapeutic classification
 - Antidiabetic drug
- Pharmacologic classification
 - DPP-4 inhibitor, incretin enhancer

Diabetic Drugs

Metformin:

- MOA:
 - Decreases hepatic glucose production
 - Decreases intestinal absorption of glucose
 - Improves insulin sensitivity
- Side Effects:
 - GI Upset
 - Diarrhea
 - Nausea
 - Vomiting
 - Weight gain/loss
 - Lactic acidosis
- Precautions:
 - Black box warning: Risk of lactic acidosis resulting in death. Risk factors include renal impairment, concomitant use of certain drugs (e.g. topiramate), > 65 years old, excess alcohol intake.
- Contraindications
 - Hypersensitivity
 - chronic heart failure
 - metabolic acidosis with or without coma
 - diabetic ketoacidosis (DKA)
 - severe renal disease
 - abnormal creatinine clearance resulting from shock
 - septicemia
 - myocardial infarction
 - lactation
- Nursing Considering:
 - This is the preferred 1st line treatment for clients with T2DM
 - Clients may need to be titrated up on this medication to mitigate adverse effects
 - Avoid in chronic kidney disease (eGFR < 45)
- Common Key Generics (Brand)
 - Metformin (Glucophage)

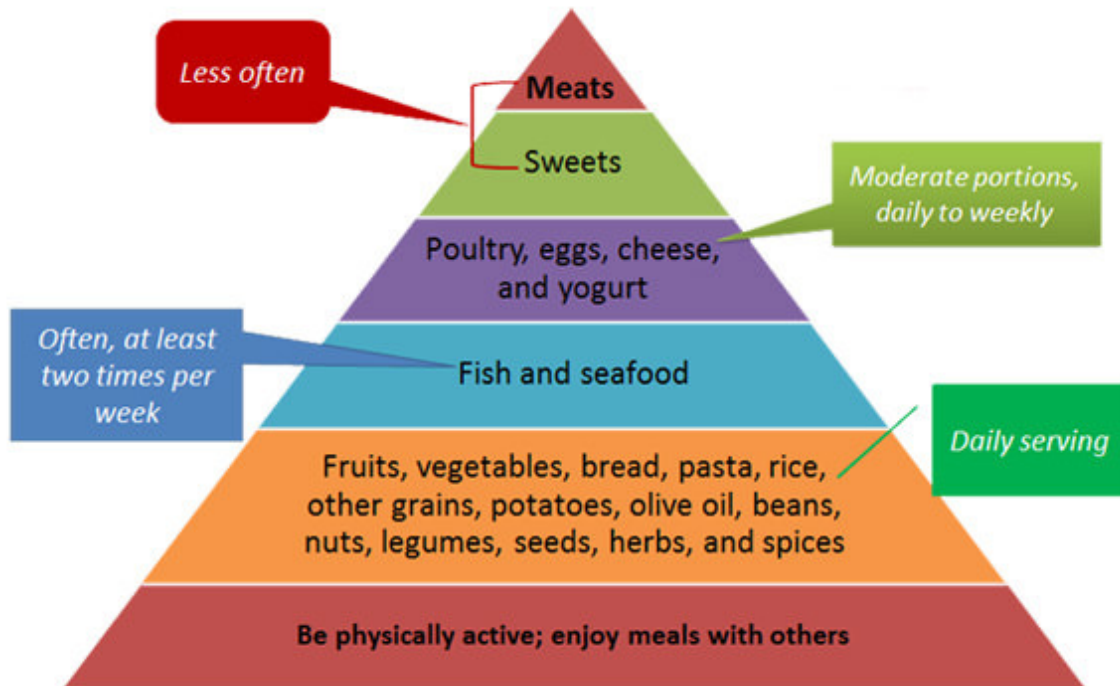
Sulfonylurea

- MOA:
 - Stimulates insulin release in pancreatic beta cells
- Side Effects:

- Hypoglycemia: These medications stimulate the release of insulin regardless of glucose intake. Taking alongside insulin dramatically increases hypoglycemic risk.
- Weight gain
- Sulfa allergies
- Photosensitivity
- Precautions:
 - Sulfa moiety contained in these compounds – avoid these medications in clients with sulfa allergies
 - Increased risk of hypoglycemia in clients with chronic kidney disease
- Nursing Considering:
 - Hypoglycemia is less common with glipizide
 - Use with caution in clients on insulin
 - Use with caution in clients with “sulfa allergies”
 - Use with caution in clients with severe renal disease
 - Common Key Generics (Brands)
 - Glyburide (Glynase)
 - Glipizide (Glucotrol)
 - Glimepiride (Amaryl)

RAPID	Humalog or Lispro	< 15 min	60-90 min	3-5 hrs	<ul style="list-style-type: none"> • Inject 10-15 min before mealtime • Typically used in conjunction with longer-acting insulin.
	Novolog or Aspart	< 15 min	60-120 min	3-5 hrs	
	Apidra or Glulisine	< 15 min	60-90 min	1-2.5 hrs	
SHORT	Regular (R) Humulin, Actrapid or Novolin	30-60 min	2-5 hrs	6-8 hrs	<ul style="list-style-type: none"> • Inject at least 20-30 minutes before mealtime
	Velosulin	30-60 min	2-3 hrs	2-3 hrs	
INTERMEDIATE	NPH (N)	1-2 hrs	4-12 hrs	18-24 hrs	<ul style="list-style-type: none"> • Commonly used twice daily • Often combined with rapid- or short-acting insulin
	Lente (L)	1-2.5 hrs	3-10 hrs	18-24 hrs	
LONG	Ultralente (U)	30 min- 3 hrs	10-20 hrs	20-36 hrs	<ul style="list-style-type: none"> • Covers insulin needs for 24 hrs • If needed, often combined with rapid- or short-acting insulin
	Lantus or Glargine	1-1.5 hrs	No Peak	20-24 hrs	
	Levemir or Detemir	1-2 hrs	6-8 hrs	Up to 24 hrs	
PRE-MIXED	Humulin 70/30	30 min	2-4 hrs	14-24 hrs	<ul style="list-style-type: none"> • Combination of intermediate- and short-acting insulin • Commonly used twice daily before mealtime
	Novolin 70/30	30 min	2-12 hrs	Up to 24 hrs	
	Novolog 70/30	10-20 min	1-4 hrs	Up to 24 hrs	
	Humulin 50/50	30 min	2-5 hrs	18-24 hrs	
	Humalog 75/25	15 min	30 min-2.5 hrs	16-20 hrs	

Monitoring Blood sugar while on Insulin



Food List for Diabetes

								How to use the Nutrition Place Mat
Write your meal or daily targets for each food choice in the section below. Plan your meals by choosing foods you like from this Food List for Diabetes.								
Starch & Bread	Fruit	Milk	More Carbs	Vegetables	Meat	Fat	Free Foods	<ol style="list-style-type: none"> Develop an individualized meal plan with your Registered Dietitian, Nurse, Physician or Health Educator. Write your meal plan targets in the space below the food pictures. For your upcoming meal or snack, circle the food item on the list that you will eat. To stay on your meal plan, eat only the total number of items allowed. When your meal is completed, simply wipe off the laminated Nutrition Place Mat with a tissue! Use the Nutrition Place Mat to help follow healthy nutrition guidelines and portion control. The food pictures will help you visualize well-balanced meals!
<ul style="list-style-type: none"> Bagel, 4 oz, 1/4 Beans, dry, cooked, 1/2 cup Bread, 1 slice Cereal, cooked, 1/2 cup Cereal, unseasoned, 3/4 cup Com, 1/2 cup Crackers, snack, 4-5 English muffin, 1/2 Hamburger or Hot Dog Bun, 1/2 Pancakes, 4" across, 1/4" thick, 1 Pasta, cooked, 1/3 cup Pasta, cooked, 1/2 cup Pita, 6" across, 1/2 Poppcorn, plain, unbuttered, 3 cups Potato, 1/2 medium Potato, mashed, 1/2 cup Rice, cooked, 1/3 cup Squash, winter, cooked, 1 cup Tortilla or taco shell, 6" across, 1 Waffle, 1 small square 	<ul style="list-style-type: none"> Apple, 1 small Apricots, 4 whole Banana, 1 small Blackberries/Blueberries, 3/4 cup Canned fruit in juice or water, 1/2 cup Dried fruit, 1/4 cup Fruit juice, 1/3 to 1/2 cup Grapefruit, 1/2 large Grapes, 17 small Kiel, 1 Mango, 1/2 small Melon, 1 cup cubes Nectarine, 1 small Orange, 1 small Peach, medium, fresh, 1 Pear, large, fresh, 1/2 Pineapple, fresh, 3/4 cup Raisins, 2 Tbsp Raspberries, 1 cup Plums, 2 small Strawberries, 1-1/4 cup, whole Tangerines, 2 small 	<ul style="list-style-type: none"> Buttermilk, 1 cup Evaporated skim, 1/2 cup Goat's milk, 1 cup Low fat or non fat, 1 cup Nonfat, dry, 1/3 cup Soy milk, 1 cup Yogurt, plain, sugar-free, fat-free, 2/3 cup Yogurt, low fat, artificially sweetened, 3/4 cup 	<ul style="list-style-type: none"> Cake, no icing, 2" square, 1 piece Casseroles or hot dish, 1/2 cup Chili, 1/2 cup Cookies, 2 small Cupcake, frosted, 1/2 Doughnut, glazed, 1/2 medium Fruit juice bar, 1 Ginger snaps, 3 Ice cream, 1/2 cup Maple syrup, honey or table sugar, 1 Tbsp Muffin, large 1/5 Nondairy frozen yogurt, 1/3 cup Pizza, 12" thin crust, 1/8 Potato chips, 9 to 13 Pudding, sugar-free, 1/2 cup Soup, broth, milk, or bean based, 1 cup Spaghetti or pasta sauce, canned, 1/2 cup Tortilla chips, 9 to 13 Vanilla wafers, 5 	<ul style="list-style-type: none"> Asparagus Beets Broccoli Cabbage Carrots Cauliflower Celery Green Beans Greens (collard, kale, mustard, spinach) Mixed vegetables, (without corn, peas or pasta) Mushrooms Onions Pea pods Peppers Salad greens (lettuce, spinach) Tomatoes Tomato juice Turnips Zucchini 	<ul style="list-style-type: none"> MEAT Beef, 1 oz. Chicken, no skin, 1 oz. Fish, 1 oz. Ham, 1 oz. Lamb, 1 oz. Pork, 1 oz. Seafood, 1 oz. Veal, 1 oz. MEAT SUBSTITUTES Cottage cheese, 1/4 cup Cheese, 1 oz. Egg, 1 Egg substitute, plain, 1/4 cup Egg whites, 2 Peanut butter, 2 Tbsp Salmon, water packed, 1/4 cup Tampiki, 1 oz Tofu, 1/2 cup Tuna, 1 oz 	<ul style="list-style-type: none"> Avocado, med., 2 Tbsp Bacon, 1 slice (20 slt) Butter, stick, 1 tsp Cream cheese, regular, 1 Tbsp Cream cheese, low fat, 1-1/2 Tbsp Cream, half & half, 2 Tbsp Margarine, regular, 1 tsp Margarine, reduced-fat 1 Tbsp Mayonnaise, regular, 1 tsp Mayonnaise, reduced fat, 1 Tbsp Oil, 1 tsp Peanuts, 10 nuts Peanut butter, 1/2 Tbsp Salted dressing, regular, 1 Tbsp Salted dressing, reduced fat, 2 Tbsp Sour cream, regular, 2 Tbsp Sour cream, reduced-fat, 3 Tbsp 	<ul style="list-style-type: none"> UNLIMITED USE Bouillon & broth Club soda Coffee or tea Sugar-free soft drink Gelatin dessert, sugar-free Lemon Juice Mustard Nonstick cooking spray Popcorn, sugar-free Spices Sugar substitutes Tobacco sauce Tonic water, sugar free Vinegar LIMIT 3, and spread intake throughout day! Candy, hard, sugar-free, 1 candy Coconut powder, unseasoned, 1 Tbsp Cornstarch, fat-free 1 Tbsp Oil, poly, med., 1-1/2 Jam or jelly, low sugar or egg, 1 to 2 tsp Mayonnaise, fat-free, 1 Tbsp Salsa, 1/4 cup Sour cream, fat-free, 1 Tbsp Soy sauce, 1 Tbsp Syrup, sugar-free, 2 Tbsp Taco sauce, 1 Tbsp Yogurt, 6 Tbsp 	
<small>1 serving contains approximately C=18, P=3, F=2, and averages 80 calories.</small>	<small>1 serving contains approximately C=16, P=0, F=2, and averages 80 calories.</small>	<small>1 serving contains approximately C=16, P=8, F=2, and averages 100 calories.</small>	<small>1 serving contains approximately C=18, P=2, F=2, and averages 25 calories.</small>	<small>1 serving contains approximately C=11, P=2, F=1, and averages 25 calories.</small>	<small>1 serving contains approximately C=11, P=2, F=1, and averages 75 calories.</small>	<small>1 serving contains approximately C=11, P=3, F=1, and averages 45 calories.</small>	<small>Depending on food choice, there are or variable amounts of C, P & F in these food choices. Most contain negligible calories.</small>	
<small>Food lists with a significant amount of carbohydrate are shown in yellow. These food groups are called "Carbohydrate Choices". Each food group listed contains approximately 15 grams of carbohydrate. See above for approximate accounting of carbohydrate, protein, and fat per serving in each food group. KEY: C = carbohydrate grams, P = protein grams, and F = fat grams.</small>								
<small>Food lists with little to no carbohydrate are above. Each food group has a different amount of carbohydrate, protein & fat. KEY: C = carbohydrate grams, P = protein grams, and F = fat grams.</small>								

Dietary advice for Type II diabetes.

The basic technique for following low GI guidelines is simply a "this for that" approach – i.e.: replacing high GI foods with low GI foods. One need not count numbers or do any sort of mental arithmetic to make sure they are eating a healthy, low GI diet. Some tips include:

- Increasing the consumption of whole grains, nuts, legumes, fruit, and non-starchy vegetables
- Decreasing the consumption of starchy high-glycemic index foods like potatoes, white rice, and white bread
- Decreasing the consumption of sugary foods like cookies, cakes, candy, and soft-drinks

Choose My Plate

Choose My Plate replaces the retired USDA Food Pyramid and contains general, simple guidelines for healthy eating using a small plate to visually illustrate foods and portion control. An explanation and picture of the guide is listed earlier in this chapter.

Mediterranean-Style Eating

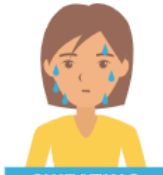
The Mediterranean-style eating pattern derived from the Mediterranean region of the world has been observed to improve glycemic control and cardiovascular disease risk factors. The Mediterranean eating pattern includes:

- Vegetables, fruits, nuts, seeds, legumes, potatoes, whole grains, breads, herbs, spices, fish, seafood and extra virgin olive oil. Emphasis is placed on use of minimally processed foods, seasonal fresh and locally grown foods
- Olive oil is the primary fat, replacing other fats and oils (including butter and margarine)
- Total fat ranging from 25% to 35% of total energy, with saturated fat no more than 7% of calories
- Low-to-moderate amounts of cheese and yogurt
- Twice-weekly consumption of fish and poultry; approximately seven eggs/week
- Fresh fruit as daily dessert; sweets only a few times/week
- Red meat a few times/month (limited to 12 oz to 16 oz per month)
- Regular physical activity to promote a healthy weight, fitness and well-being
- Moderate consumption of wine, normally with meals; approximately two glasses/day for men and one glass/day for women

Medications affecting someone's ability to recognize hypoglycemia

- Beta-blockers have the potential for masking symptoms of hypoglycemia. The catecholamine-mediated neurogenic hypoglycemic symptoms masked by this class of medications include tremor and palpitations.

HYPOGLYCEMIA SYMPTOMS



SWEATING



PALLOR



IRRITABILITY



HUNGER



LACK OF
COORDINATION



SLEEPINESS

HYPERGLYCEMIA SYMPTOMS



DRY MOUTH



INCREASED
THIRST



WEAKNESS



HEADACHE

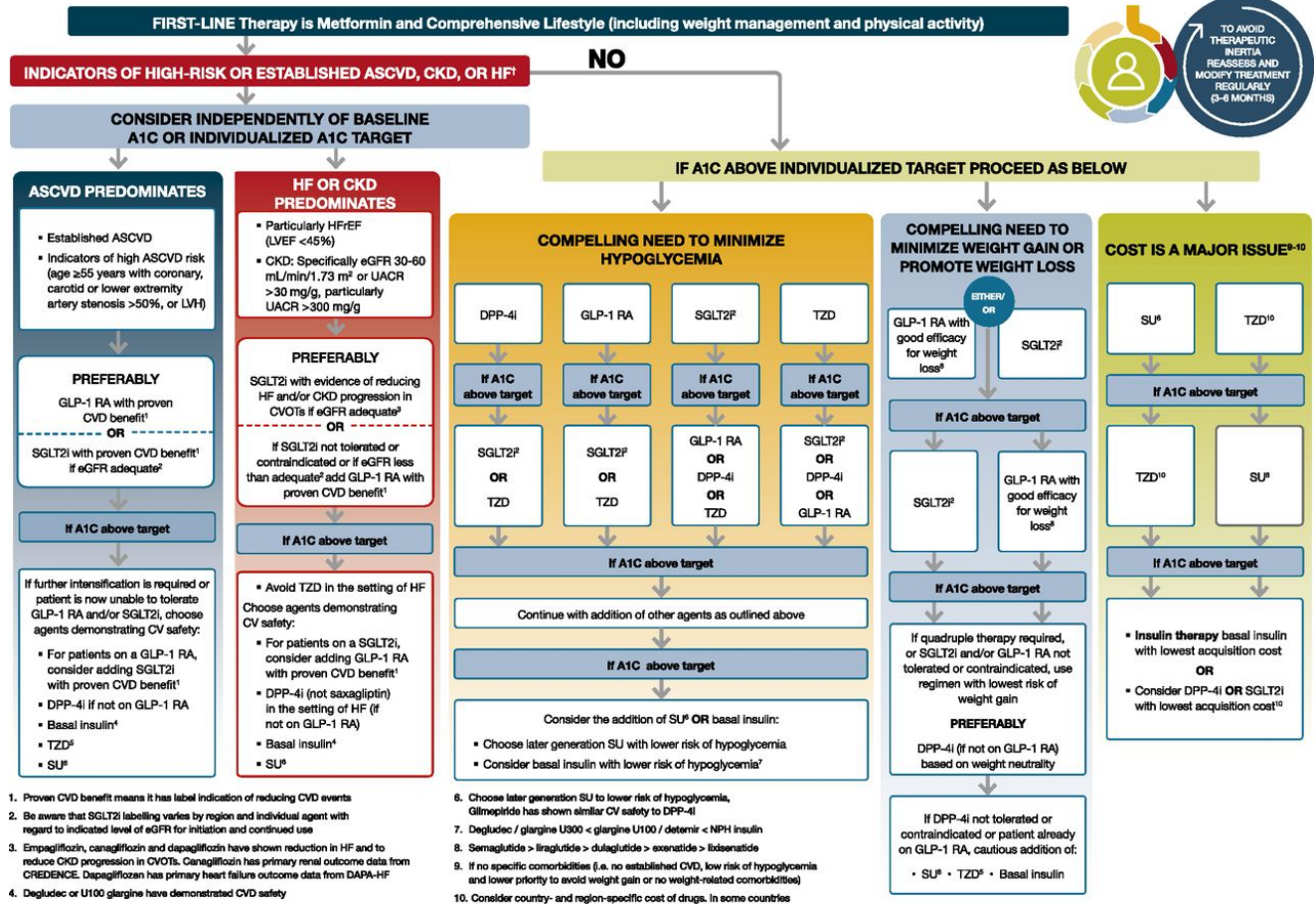


BLURRED
VISION



FREQUENT
URINATION

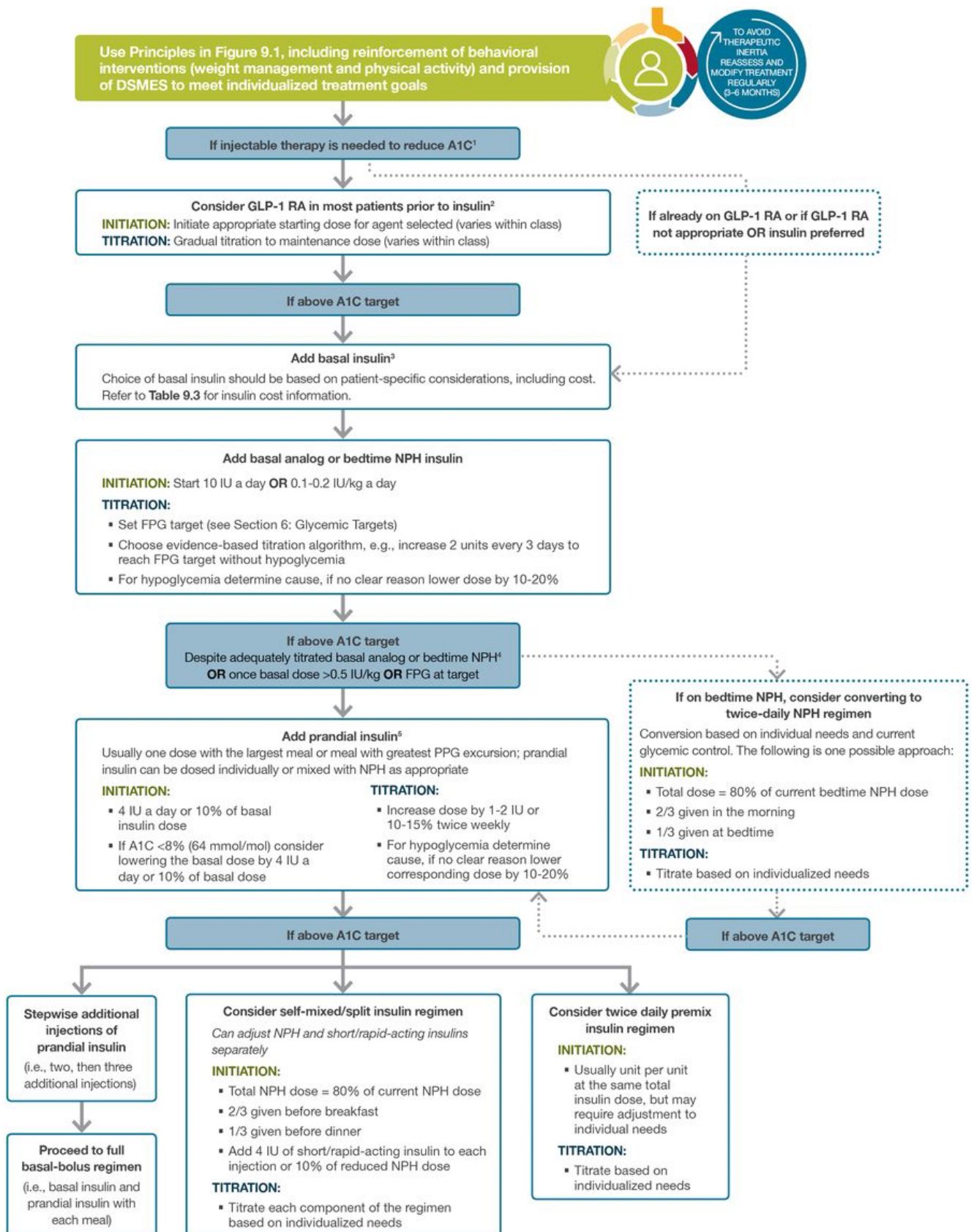
American Diabetic Association (2020) Pharmacologic approaches to Glycemic Treatment



1. Proven CVD benefit means it has label indication of reducing CVD events
 2. Be aware that SGLT2i labelling varies by region and individual agent with regard to indicated level of eGFR for initiation and continued use
 3. Empagliflozin, canagliflozin and dapagliflozin have shown reduction in HF and to reduce CKD progression in CVDts. Canagliflozin has primary renal outcome data from CREDENCE. Dapagliflozin has primary heart failure outcome data from DAPA-HF
 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 to lower risk of hypoglycemia, Glimperide has shown similar CV safety to DPP-4i
 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

† Actioned whenever these become new clinical considerations regardless of background glucose-lowering medications.

LVI = Left Ventricular Hypertrophy; HF/EF = Heart Failure reduced Ejection Fraction
 UACR = Urine Albumin-to-Creatinine Ratio; LVEF = Left Ventricular Ejection Fraction



1. Consider insulin as the first injectable if evidence of ongoing catabolism, symptoms of hyperglycemia are present, when A1C levels (>10% [86 mmol/mol]) or blood glucose levels (≥ 300 mg/dL [16.7 mmol/L]) are very high, or a diagnosis of type 1 diabetes is a possibility.
2. When selecting GLP-1 RA, consider: patient preference, A1C lowering, weight-lowering effect, or frequency of injection. If CVD, consider GLP-1 RA with proven CVD benefit.
3. For patients on GLP-1 RA and basal insulin combination, consider use of a fixed-ratio combination product (iDegLira or iGlarLixi).
4. Consider switching from evening NPH to a basal analog if the patient develops hypoglycemia and/or frequently forgets to administer NPH in the evening and would be better managed with an AM dose of a long-acting basal insulin.
5. If adding prandial insulin to NPH, consider initiation of a self-mixed or premixed insulin regimen to decrease the number of injections required.

	Efficacy	Hypoglycemia	Weight change	CV effects		Cost	Oral/SQ	Renal effects		Additional considerations
				ASCVD	HF			Progression of DKD	Dosing/use considerations*	
Metformin	High	No	Neutral (potential for modest loss)	Potential benefit	Neutral	Low	Oral	Neutral	<ul style="list-style-type: none"> Contraindicated with eGFR <30 mL/min/1.73 m² 	<ul style="list-style-type: none"> Gastrointestinal side effects common (diarrhea, nausea) Potential for B12 deficiency
SGLT-2 Inhibitors	Intermediate	No	Loss	Benefit: empagliflozin [†] , canagliflozin	Benefit: empagliflozin [†] , canagliflozin, dapagliflozin [‡]	High	Oral	Benefit: canagliflozin, empagliflozin, dapagliflozin	<ul style="list-style-type: none"> Renal dose adjustment required (canagliflozin, dapagliflozin, empagliflozin, ertugliflozin) 	<ul style="list-style-type: none"> FDA Black Box: Risk of amputation (canagliflozin) Risk of bone fractures (canagliflozin) DKA risk (all agents, rare in T2DM) Genitourinary infections Risk of volume depletion, hypotension ↑LDL cholesterol Risk of Fournier's gangrene
GLP-1 RAs	High	No	Loss	Neutral: lixisenatide Benefit: See label indication of reducing CVD events	Neutral	High	SQ; oral (semaglutide)	Benefit: liraglutide	<ul style="list-style-type: none"> Renal dose adjustment required (exenatide, lixisenatide) Caution when initiating or increasing dose due to potential risk of acute kidney injury 	<ul style="list-style-type: none"> FDA Black Box: Risk of thyroid C-cell tumors (liraglutide, albiglutide, dulaglutide, exenatide extended release) Gastrointestinal side effects common (nausea, vomiting, diarrhea) Injection site reactions ↑Acute pancreatitis risk
DPP-4 Inhibitors	Intermediate	No	Neutral	Neutral	Potential risk: saxagliptin	High	Oral	Neutral	<ul style="list-style-type: none"> Renal dose adjustment required (sitagliptin, saxagliptin, alogliptin); can be used in renal impairment No dose adjustment required for linagliptin 	<ul style="list-style-type: none"> Potential risk of acute pancreatitis Joint pain
Thiazolidinediones	High	No	Gain	Potential benefit: pioglitazone	Increased risk	Low	Oral	Neutral	<ul style="list-style-type: none"> No dose adjustment required Generally not recommended in renal impairment due to potential for fluid retention 	<ul style="list-style-type: none"> FDA Black Box: Congestive heart failure (pioglitazone, rosiglitazone) Fluid retention (edema; heart failure) Benefit in NASH Risk of bone fractures Bladder cancer (pioglitazone) ↑LDL cholesterol (rosiglitazone)
Sulfonylureas (2nd generation)	High	Yes	Gain	Neutral	Neutral	Low	Oral	Neutral	<ul style="list-style-type: none"> Glyburide: not recommended Glipizide and glimepiride: initiate conservatively to avoid hypoglycemia 	<ul style="list-style-type: none"> FDA Special Warning on increased risk of cardiovascular mortality based on studies of an older sulfonylurea (tolbutamide)
Insulin	Human Insulin	Yes	Gain	Neutral	Neutral	Low	SQ; inhaled	Neutral	<ul style="list-style-type: none"> Lower insulin doses required with a decrease in eGFR; titrate per clinical response 	<ul style="list-style-type: none"> Injection site reactions Higher risk of hypoglycemia with human insulin (NPH or premixed formulations) vs. analogs
	Analog					High	SQ			