

UNDERSTANDING THE DIFFERENT TYPES OF DIABETES MEDICATIONS CAN HELP IMPROVE YOUR HEALTH

PART 1 OF 2: BY MOUTH MEDICATIONS

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Currently there are over 60 different types of medications to help treat diabetes, with more being developed every day!

Understanding medications is a very important part of staying healthy because, how do you know it's working? Is what I am experiencing a side effect? Why am I on so many pills?

This webinar will help you gain an understanding of the different types and actions of non-injectable diabetes medications and how they help regulate blood sugar levels.

What is Diabetes?

A chronic disorder of carbohydrate metabolism resulting from inadequate production or utilization of insulin.

With diabetes, your pancreas either doesn't make enough insulin or your body can't use its own insulin effectively.

Why Diabetes Medications?

The cornerstone of diabetes management is keeping blood sugar levels under control (80 -130 mg/dcl and HgbA1c <7%) to help prevent complications of diabetes.

Taking diabetes medications is one way to help manage blood sugar levels, along with positive lifestyle changes (exercise, healthy eating, stress management).

Medications for Diabetes

generic vs Brand Name

Weigh the benefits vs the side effects, talk with doctor, do your own research on reputable websites and make an informed decision about the best medication for you and your particular situation.

Medications for Diabetes

Good websites for researching your medications:

- The medication's website
- Medline Plus
<https://medlineplus.gov/druginformation.html>
- The Mayo Clinic <https://www.mayoclinic.org/drugs-supplements/drug-list>

Oral Medications for Type 2 Diabetes

Classifications:

- 1) Biguanides
- 2) Sulfonylureas
- 3) SGLT 2 Inhibitors
- 4) DPP-4 Inhibitors
- 5) Thiazolidinediones “TZDs”
- 6) Glucosidase Inhibitors
- 7) Meglitinides
- 8) Dopamine Receptor Agonists
- 9) Bile Acid Sequestrants

BIGUANIDES

Metformin explained in 2 mins <https://youtu.be/NXD30fDSEo>

1950's France, 1994 USA, 2002 generic

Decrease hepatic glucose output; tells your liver to hang on to some of the glucose it makes

- metformin (Glucophage) 500 - 2500 mg (usually BID w/ meal)
- Riomet (liquid metformin) 500 - 2500mg (500mg/5mL)

Extended release

- Glucophage XR 500 – 2000 mg qd
- Glumetza 500 – 2000 mg qd
- Fortamet 500 – 2500 mg qd

First-line medication for the treatment of type 2 diabetes. More than 150 million people worldwide use metformin; it is the 4th most prescribed drug in the United States.

Side Effects: nausea, bloating, diarrhea, B12 deficiency. To minimize GI Side effects, use XR and take w/ meals. GFR <45 don't start.

If you experience any of the following symptoms, stop taking metformin and call your doctor immediately: extreme tiredness, weakness, or discomfort; stomach pain; decreased appetite; deep and rapid breathing or shortness of breath; dizziness; lightheadedness; fast or slow heartbeat; flushing of the skin; muscle pain; or feeling cold, especially in your hands or feet.

Benefits: lowers cholesterol, no hypoglycemia or weight gain, cheap. Approved for 10 yrs +

Lowers A1c 1.0%-2.0%.

SULFONYLUREAS

Increase the release of insulin from the pancreas; tell your pancreas to make more insulin. They are effective only when residual pancreatic β -cells are present.

- glyburide (Diabeta)
- glipizide (Glucotrol)
- glimepiride (Amaryl)

1st medication to treat diabetes- 1940s

Can take once or twice daily before meals. Low cost generic.

Caution: Glyburide most likely to cause hypoglycemia especially in alcohol abusers and if you are malnourished

Side Effects: hypoglycemia and weight gain. Avoid skipping meals because this medication causes your beta cells to produce insulin all day long. If you skip meals, your blood glucose level may go too low (hypoglycemia). You need to stick with a meal schedule—and eat even if you aren't hungry—to ensure that the insulin has enough glucose to process throughout the day.

Eliminated via kidney.

Lowers A1c 1.0% – 2.0%

SGLT2 INHIBITORS

Decreases glucose reabsorption in kidneys “glucoretic”; work by letting your kidneys pee out extra sugar

- canagliflozin (Invokana)
- dapagliflozin (Farxiga)
- empagliflozin (Jardiance)
- ertugliflozin (Steglatro)

Side effects: hypotension, UTIs, increased urination, genital infections, ketoacidosis. Canagliflozin increases risk of amputation.

Monitor GFR; GFR <45 -60, don't use

Benefits: Reduce risk of CV death, heart failure and preserve long-term kidney function, no hypoglycemia or weight gain. Lowers weight 1-3 lbs.

Lowers A1c 0.6%-1.5%.

DPP-4 INHIBITORS

“Incretin Enhancers”; prolongs action of gut hormones; increases insulin secretion; delays gastric emptying. They work by blocking the action of DPP-4, an enzyme which destroys a group of gastrointestinal hormones called incretins. Incretins help stimulate the production of insulin when it is needed (e.g. after eating) and reduce the production of glucagon by the liver when it is not needed (e.g. during digestion).

- sitagliptin (Januvia)
- saxagliptin (Onglyza)
- linagliptin (Tradjenta)
- alogliptin (Nesina)

S/E: headache and flu-like symptoms. Can cause severe, disabling joint pain. Contact MD, stop med. Report signs of pancreatitis. Saxagliptin and alogliptin can increase risk of heart failure. Notify MD for shortness of breath, edema, weakness, etc.

Benefits: No weight gain or hypoglycemia.

Lowers A1c 0.6%-0.8%.

THIAZOLIDINEDIONES “TZDs” (glitazones)

Increase insulin sensitivity; reduce circulating fatty acid concentrations and lipid availability in liver and muscle, which improves sensitivity to insulin. They help insulin work better and help lower insulin resistance from your cells so your pancreas doesn't have to work as hard.

- pioglitazone (Actos)
- rosiglitazone (Avandia)

Side effects: edema, weight gain, macular edema and heart failure

Black Box Warning: TZDs may cause or worsen CHF. Monitor for edema and weight gain.

Increased peripheral fracture risk. Actos may increase risk of bladder cancer.

Lowers A1c 0.5% – 1.0%

GLUCOSIDASE INHIBITORS

Delay the absorption of carbohydrates from the small intestine and thus have a lowering effect on postprandial blood glucose and insulin levels; slow the digestion of food with complex carbohydrates like bread, pasta, rice, potatoes, and corn which keeps your blood sugar from shooting up after you eat.

- acarbose (Precose)
- miglitol (Glyset)

Side effects: GI (gas, diarrhea, bloating, and abdominal cramps)

Start low dose, increase at 4-8 wk intervals to decrease GI effects. Caution with liver or kidney problems.

In case of hypoglycemia, treat w/ glucose tabs.

Lowers A1c 0.5– 1.0%.

MEGLITINIDES

Directly stimulate the release of insulin from pancreatic beta cells and thereby lower blood glucose concentrations. Because they work by stimulating insulin secretion, they are useful only in patients with some beta cell function. These medications tell your pancreas to make more insulin.

- repaglinide (Prandin)
- nateglinide (Starlix)

Side effects: hypoglycemia and weight gain

Take before meals. Do not take pill then skip a meal.

Lowers A1c 1.0% – 2.0%.

DOPAMINE RECEPTOR AGONISTS

Resets circadian rhythm (thought to act on the circadian neuronal activities in the hypothalamus, to reset an abnormally elevated hypothalamic drive for increased plasma glucose, free fatty acids, and triglycerides in insulin-resistant patients).

Within 2 h of awakening it augments low hypothalamic dopamine levels and inhibits excessive sympathetic tone within the central nervous system, resulting in a reduction in postmeal plasma glucose levels due to enhanced suppression of hepatic glucose production.

This medication works directly on the brain to help it process dopamine. This, in turn, can increase your sensitivity to insulin so your body doesn't need as much of it. You also need to implement some lifestyle changes such as a healthy diet and exercise for the medication to be more effective.

- bromocriptine mesylate (Cycloset)

Side effects: Nausea, vomiting, dizziness, drowsiness, lightheadedness, tiredness, constipation, or headache

Take within 2 hrs of waking.

Lowers A1c 0.6% – 0.9%.

BILE ACID SEQUESTRANTS

Decreases cholesterol / BG levels; belongs to a class of drugs called bile acid-binding resins. Bile acid is a natural substance the liver makes by using cholesterol. This medication works by removing bile acid from the body. This causes the liver to make more bile acid by using cholesterol, which reduces cholesterol levels in the blood. It is not known how colesevelam works in lowering blood sugar.

- colesevelam HCL (Welchol)

Side effects GI in nature.

Do not use if history of bowel obstruction, triglycerides >500, or pancreatitis. Can decrease absorption of certain meds (glipizide), soluble vitamins.

Lowers LDL cholesterol by 15-30%. Lowers A1c ~ 0.5%

Combo Oral Medications

Trijardy XR = empagliflozin, linagliptin, metformin XR

ACTOplus Met = pioglitazone, metformin; also in XR form

Duetact = pioglitazone, glimepiride

Glucovance = glyburide, metformin

Glyxambi = empagliflozin, linagliptin

Invokamet = canagliflozin, metformin

Janumet = sitagliptin, metformin; also in XR form

Jentadueto = linagliptin, metformin

Kazano = alogliptin, metformin

Combo Oral Medications

Kombliglize XR = Onglyza, metformin XR

Metaglip = glipizide, metformin

Oseni = alogliptin, pioglitazone

Prandimet = repaglinide, metformin

Qtern = saxagliptin, dapagliflozin

Segluromet = ertugliflozin, metformin

Steglujan = ertugliflozin, sitagliptin

Synjardy = empagliflozin, metformin; also in XR form

Xigduo XR = dapagliflozin, metformin

New Oral Medication for Type 2 Diabetes

GLP-1 Receptor Agonist (GLP-1 RA)

“Incretin Mimetic”: Increases insulin release with food, slows gastric emptying, promotes satiety, suppresses glucagon

- semaglutide (Rybelsus)

Take pill on an empty stomach when you first wake up with a sip of plain water; after 30 minutes, you can eat, drink, or take other oral medicines

Side effects: nausea, stomach abdominal pain, diarrhea, decreased appetite, vomiting, and constipation. Severe s/e: hypoglycemia, pancreatitis, vision changes, kidney problems

Lowers A1c 0.5 – 1.6%

Weight loss of 1.6 to 6.0kg (3.5 to 13 pounds)

Anti-Hyperglycemic Therapy in T2DM

Therapeutic options: Oral Agents & Non-Insulin Injectables

Most Popular in U.S. and Europe

Metformin
SGLT-2 Inhibitors
GLP-1 Receptor Agonists
DPP-4 Inhibitors
Thiazolidinediones
Sulfonylureas

Less Commonly Used

Meglitinides
A-Glucosidase Inhibitors
Colesevelam
Dopamine-2 Agonists
Amylin Mimetics

American Diabetes Association. 8. Pharmacologic approaches to glycemic treatment: Standards of Medical Care in Diabetes. *Diabetes Care* 2018; 41 (Suppl. 1): S73-S85

 American Diabetes Association.

Glucose Management in Type 2 Diabetes

Glucose Management in Type 2 Diabetes

Please Note: This algorithm is **not** intended for treatment and target selection in children or in women who are or could become pregnant.

Step 1: Determine Individualized A1C Target Range

Select based on age, duration of diabetes, patient preference, comorbidities, hypoglycemia risk, and other factors.

Major Comorbidity	Microvascular Complications		
	Absent or Mild	Moderate	Advanced
Absent (and/or >10-15 years of life expectancy)	6.0-7.0%	7.0-8.0%	7.5-8.5%
Present (and/or 5-10 years of life expectancy)	7.0-8.0%	7.5-8.5%	7.5-8.5%
Marked (and/or <5 years of life expectancy)	8.0-9.0%	8.0-9.0%	8.0-9.0%

Major comorbidity includes but is not limited to significant CVD; recent stroke; life-threatening malignancy; or severe CKD, COPD, or chronic liver disease.

Microvascular disease: retinopathy, neuropathy, or CKD.

Adapted from the [VA/DoD Management of Diabetes Mellitus Guideline](#)

↓ If A1C not within individualized target range

Step 2: Initiate Medication Therapy

If significant weight loss or ketonuria, use insulin (hospitalize if acidotic).

Otherwise:

Start metformin if A1C above patient's target but <9%.

Start metformin and a second medication if A1C ≥9% (see Step 3).

↓ If A1C not within individualized target range

Step 3: Increase Dosage(s) and/or Add Another Medication

Select additional medication(s) based on formulary options, side effects, cost, comorbidities (e.g., CVD), medication regimen complexity, and patient preference.

Medication	Weight	A1C	Risk of Hypoglycemia	Cost
Metformin	- to ↓	↓↓	-	\$
DPP-4 Inhibitor	-	↓	-	\$\$
GLP-1 Receptor Agonist	↓↓	↓↓	-	\$\$\$
Insulin	↑↑ to ↑↑↑	↓↓↓	↑↑↑	\$\$ to \$\$\$
SGLT2 Inhibitor	↓	↓	-	\$\$\$
Sulfonylurea	↑↑	↓↓	↑↑	\$
Thiazolidinedione	↑	↓↓	-	\$

Do not use GLP-1 Receptor Agonists and DPP-4 inhibitors together as no A1C benefit

Metformin

Monitor and supplement vitamin B12 as needed with long term use.

Discontinue if eGFR <30mL/min/1.73m².

Warning: May cause lactic acidosis (rare).

Start 500mg daily with meals and increase no faster than 500mg/day each week.

If GI symptoms occur, may increase more slowly.

Max dose: Regular release tablets: 2,550mg divided BID or TID.

XR tablets: 2,000mg daily or divided BID.

Dipeptidyl Peptidase-4 (DPP-4) Inhibitors*

Alogliptin (Nesina®) Start 25mg daily. May increase risk of heart failure.

Sitagliptin (Januvia®) Start 100mg daily.

Linagliptin (Tradjenta®) Start 5mg daily.

Saxagliptin (Onglyza®) Start 2.5-5mg daily. May increase risk of heart failure.

Glucagon-Like Peptide-1 (GLP-1) Receptor Agonists

GI side effects common.

Warning: May increase risk of thyroid tumor.

Dulaglutide (Trulicity®) Start 0.75mg SC weekly. May increase to 1.5mg/week.

Exenatide ER (Bydureon®) Start 2mg SC weekly.*

Liraglutide (Victoza®) Start 0.6mg SC daily.

Increase to 1.2mg daily in 1 week. May increase to 1.8mg daily.

Indicated to reduce the risk of CV events in patients with established CVD.

Semaglutide (Ozempic®) Start 0.25mg SC weekly for 4 weeks, then increase to 0.5mg weekly for 4 weeks. May increase to 1mg weekly.

Insulin - [See Insulin Therapy Algorithm.](#)

Sodium-Glucose Co-Transporter 2 (SGLT2) Inhibitors*

May cause volume depletion, orthostatic hypotension, genital fungal infections, DKA, acute kidney injury, and UTI.

Canagliflozin (Invokana®) Start 100mg daily before first meal. May increase to 300mg daily.

Warning: May increase risk of lower limb amputations.

Indicated to reduce the risk of CV events in patients with established CVD.

Empagliflozin (Jardiance®) Start 10mg daily. May increase to 25mg daily.

Indicated to reduce the risk of CV death in patients with established CVD.

Sulfonylureas

May cause hypoglycemia, weight gain.

Glipizide Start 2.5-5mg daily - max 20mg BID. ER formulation dosed 5-20mg daily.

Glimepiride Start 1-2mg daily - max 8mg daily.

Thiazolidinedione (TZD)

May increase risk of bone fracture. Do not use in patients with bladder cancer.

Check LFTs before starting. May cause weight gain.

Warning: Increased risk of heart failure.

Pioglitazone (Actos®) Start 15mg daily; may increase to 30-45mg daily.

Max A1C changes may take up to 12 weeks to occur.

* See prescribing reference when eGFR <60ml/min/1.73m².

Medications on the IHS National Core Formulary are in **BOLD** above.

Please consult a complete prescribing reference for more detailed information. This is a summary of the most commonly ordered non-insulin diabetes medications and drug classes from the IHS National Supply Service Center. No endorsement of specific products is implied.

Last updated: April 2021

Diabetes Medication Manufacturer Cost Saving Resources

<https://www.diabeteseducator.org/practice/practice-tools/app-resources/affordability-resources>

Medication Discount Programs

GoodRX (Rated #1)

The GoodRx website and mobile app allow you to search by drug name for the lowest prices in your local area.

Optum Perks

More than 64,000 pharmacies in the U.S. accept Optum Perks (not just pharmacy chains, local pharmacies, too).

SingleCare

When you register for their Bonus Savings program, you earn money towards future prescriptions.

ScriptSave WellRx

Discounts on prescriptions, including some pet medications, may be as high as 80%, but on average are in the 60% range.

Blink Health

Allows you to pick up your medication from one of the 35,000+ pharmacies in their network, but also offers free home delivery.

RX Saver

RxSaver offers the Rx Advocacy Program for a monthly fee of \$60 per month for people who have chronic medical conditions. <https://rxsaver.retailmenot.com/rxadvocacy/>

AARP Prescription Discount Card

Pharmacy Discount Programs

Require enrollment and usually charge a nominal annual fee
Many medications/ diabetes supplies are free in the program

- Kroger pharmacy
- Walgreens pharmacy
- Publix pharmacy
- Sam's Club pharmacy
- CVS pharmacy

Diabetes Medications & Low/ No Vision

Empower yourself to be responsible for your medications (do not let blindness be an excuse):

- Research your medications (online, apps, Alexa, doctor, nurse, diabetes educator, pharmacist)
- Have a safe way to identify your medications (ScripTalk, Spoken RX, braille, large print, etc.)
- Develop a medication management regimen that works for you
- Educate, Advocate, Activate!

STAY TUNED LATER FOR PART 2: INSULINS AND INJECTABLE MEDICATIONS FOR DIABETES

Thank you!



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