

Physician Drug Reference Chart for Diabetes

Antidiabetic Medications

Drug Class	Compound	Brand Name	Mechanism of Action	Advantages	Disadvantages
Alpha-glucosidase inhibitors (oral) <i>Medium Cost by Bayer Healthcare, Pfizer, Takeda Research</i>	Acarbose Miglitol Voglibose	Precose Glyset Voglib ⁴ Generic: Watson, Impax Roxane, Mylan	Slows intestinal carbohydrate digestion and absorption “starch blocker” Inhibits intestinal alpha-glucosidase	No Hypoglycemia ↓ Postprandial glucose excursions ↓ CVD Events (STOP-NIDDM) No weight gain	Modest lowering of A1c Requires frequent dosing (TID with each meal) Gastrointestinal side effects (flatulence, diarrhea, bloating)
Amylin analogs (SQ injection) <i>High Cost by Astra Zeneca</i>	Pramlintide ⁶	Symlin	↓ Glucagon secretion Slows gastric emptying ↑ Satiety	↓ Postprandial glucose excursions ↓ Weight Given at mealtime with short acting insulin to allow lowering of insulin dose	Modest lowering of A1c Gastrointestinal side effects (nausea, vomiting) Hypoglycemia unless frequent insulin dose is simultaneously reduced Training requirements with frequent glucose testing & physician follow-up
Biguanides (oral) <i>Low Cost by Merck KGaA/BMS, Shionogi, & multiple generics</i>	Metformin Metformin XR or ER	Glucophage Glumetza, Riomet Glucophage XR Fortamet (ER)	Activates AMP-kinase ↓ hepatic glucose production Extended release allows for 1x/day dosing	Extensive clinical experience Works with a number of other drugs No hypoglycemia ↓ CVD events (UKPDS) ↓ Weight Most common first line therapy	Gastrointestinal side effects (diarrhea, abdominal cramping); often transient Lactic acidosis risk (rare) Vitamin B12 deficiency Multiple contraindications: CKD, acidosis, hypoxia, dehydration
Bile acid sequestrants (oral) <i>High Cost by Daiichi-Sankyo</i>	Colesevelam	Welchol	↓ Hepatic glucose production ↑ Incretin levels	No hypoglycemia as monotherapy ↓ LDL-C Indicated as adjunctive therapy with diet & exercise for lowering LDL-C Additive with statins	Modest lowering of A1c Constipation ↑ Triglycerides May ↓ absorption of other drugs

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Dopamine receptor agonists (oral) <i>High Cost by VeroScience LLC</i>	Bromocriptine	Cycloset	Modulates hypothalamic regulation of metabolism Increases insulin sensitivity	No hypoglycemia May ↓ CVD events	Dizziness/syncope Nausea, fatigue Rhinitis
DPP-4 inhibitors (oral) <i>High Cost by Merck & Co., Novartis, BMS/Astra Zeneca, Boehringer/Eli Lilly, Takeda</i>	Sitagliptin Vildagliptin ¹ Saxagliptin Linagliptin Alogliptin	Januvia Galvus, Jalra, Zomelis Onglyza Tradjenta Nesina	Stimulates secretion of insulin (glucose-dependent) Inhibits glucagon secretion (glucose-dependent)	No hypoglycemia as monotherapy Well tolerated Not contraindicated in mild to severe renal impairment Some variability between brands in terms of CV risk	Angioedema/urticaria & other immune-mediated dermatological effects ↑ Acute pancreatitis ↑ Heart failure hospitalizations
GLP-1 receptor agonists (SQ injection) <i>High Cost by Astra Zeneca, Novo Nordisk, GlaxoSmithKline, Sanofi-Aventis, Boehringer/Eli Lilly</i>	Exenatide Exenatide ER Liraglutide(1.8mg, 3.0mg) Albiglutide Lixisenatide Dulaglutide Semiglutide ⁵	Byetta Bydureon Victoza Saxenda (obesity) Tanzeum Lyxumia Trulicity	Stimulates secretion of insulin (glucose-dependent) Inhibits glucagon secretion (glucose-dependent) Slows gastric emptying ↑ Satiety	No hypoglycemia ↓ Weight ↓ Postprandial glucose excursions ↓ Some cardiovascular risk factors Lowers insulin resistance & blood glucose levels	Gastrointestinal side effects (vomiting, nausea, diarrhea) ↑ Heart rate ↑ Acute pancreatitis C-cell hyperplasia/medullary thyroid tumors in animals Training requirements
Meglitinides (short-acting sulfonylurea) (Oral) <i>Medium Cost by Novo Nordisk, Novartis</i>	Repaglinide Nateglinide	Prandin Starlix	↑ Secretion of insulin	Lowers postprandial glucose excursions Dosing flexibility	Hypoglycemia w/wo other agents ↑ Weight Low durability Blunts myocardial ischemic preconditioning
SGLT-2 Inhibitors (Oral) <i>High Cost by Johnson & Johnson, Astra Zeneca, B. Ingelheim/Eli Lilly</i>	Canagliflozin Dapagliflozin Dapagliflozin Empagliflozin	Invokana Farxiga Forxiga ¹ Jardiance ⁴	Blocks glucose reabsorption by the kidney, increasing glycosuria	No hypoglycemia as monotherapy ↓ Weight Lowers blood pressure Use at all stages of T2DM ↓ CV events in patients with existing cardiovascular risks ⁴	Genitourinary infections Polyuria Volume depletion, hypotension, dizziness ↑ LDL-C ↑ Creatinine (transient)

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					Contraindicated in severe renal disease
<p>Sulfonylureas (Oral)</p> <p><i>Low Cost by Pfizer, Servier, Sanofi, Ranbaxy & others</i></p>	<p>Glyburide/Glibenclamide Glipizide Gliclazide² Glimepiride</p>	<p>Glynase Glucotrol/Glucotrol XR Diamicon Amaryl Generic: Glimpid</p>	<p>Stimulate beta-cells to secrete insulin Each drug class differs in duration, binding site on beta-cell receptor & route of elimination</p>	<p>Extensive clinical experience ↓ Microvascular risk (UKPDS) Appears to work well as first line therapy in a small group of patients</p>	<p>↑ Risk of hypoglycemia w/wo other drugs ↑ Weight Does not address insulin resistance or cardiovascular Caution for use in the elderly Low durability Use declining due to side effects & limited effectiveness</p>
<p>Thiazolidinediones (TZD's) (Oral)</p> <p><i>Low Cost by Eli Lilly, Takeda, GlaxoSmithKline, Mylan & others</i></p>	<p>Pioglitazone Rosiglitazone Pioglitazone generic</p>	<p>Actos Avandia Various brand names</p>	<p>Peroxisome proliferator Activated receptors (PPARs) Increases insulin sensitivity through PPAR gamma 1 & gamma 2, and lipid metabolism at PPAR alpha</p>	<p>No hypoglycemia as monotherapy ↓ HDL-C/Dcr Triglycerides (pioglitazone) ↑ CVD event in heart failure patients (rosiglitazone & pioglitazone) ↓ Insulin resistance Reduces NAFLD (PIO) Reduces strokes and atherogenic risk Improves cardiovascular risk markers</p>	<p>↑ Weight Edema, more pronounced in renal impaired Contraindicated in NYHA III or IV heart failure ↑ Bone fracture observed ↑ LDL-C (Rosiglitazone) CV concerns overturned by FDA with new data with Rosiglitazone, but use is now limited</p>
SELECTED INSULINS					
<p>Rapid-acting insulin analogs (SQ injection)</p> <p><i>Varied Cost by Eli Lilly, Novo Nordisk, Sanofi-Aventis</i></p>	<p>Lispro Aspart Glulisine</p>	<p>Humalog Novolog Aphidra</p>	<p>↑ Glucose disposal Inhibits glucose production in liver</p>	<p>Nearly universal response Theoretically unlimited efficacy ↓ Microvascular risk (UKPDS) Rapid onset allows insulin to control both blood sugars during and after meals</p>	<p>Hypoglycemia Weight gain Possible mitogenic effects Frequent SQ injections</p>
<p>Short-acting insulins & Intermediate-acting insulins (SQ injection)</p>	<p>Human regular Human regular Insulin aspart 70/30 Human NPH</p>	<p>Humulin Novolin R Novolog Mix 70/30 Humulin N</p>		<p>Designed to optimize control of postprandial blood sugars</p>	<p>Frequent injections (up to 3-4 x/day) Patient reluctance & compliance Training requirements</p>

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<i>Varied Cost by Eli Lilly, Novo Nordisk</i>					May need to augment responses with other drugs including long-acting insulin
Long-acting basal insulin (SQ injection) <i>High Cost by Sanofi, Aventis, Sanofi, Novo Nordisk, Ingelheim./Eli Lilly</i>	Glargine – U100 Glargine – U300 Detemir Degludec Glargine biosimilar ³	Lantus Toujeo Levemir Tresiba Basaglar		Offers convenient once a day dosing Can be stand-alone treatment in selected patients or in combination with oral medications	Many patients need augmentation with meal-time insulins or other anti-diabetic medications, oral or injectable
Inhaled insulins <i>High Cost by Mannkind</i>		Afrezza	Short acting inhaled insulin	No injections Potentially improved compliance	Contraindicated in COPD and other lung conditions Very weak adoption to date
SELECTED COMBINATION DRUGS					
Thiazolidinediones (TZD's) – Combinations:					
Metformin + Pioglitazone (oral) <i>Low Cost by Merck KGaA/BMS, Generics</i>		Actosplus Met	See individual drugs above	See individual drugs above Frequently used in dual or triple therapy	Lactic acidosis – metformin rare Edema and weight gain – PIO Reduce dose of PIO in NYHA I/II heart failure Metformin contraindicated in renal impairment
Alogliptin + Pioglitazone (oral) <i>High Cost by Takeda</i>		Oseni	See individual drugs above	See individual drugs above	Edema & weight gain – PIO Pancreatitis & medullary thyroid cancer in incretins Reduce dose of PIO in NYHA I/II heart failure PIO contraindicated in NYHA III/IV patients

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SGLT-2 Inhibitors – Combinations:					
Metformin + Canagliflozin (oral) <i>High Cost by Janssen</i>		Invokamet	See individual drugs above	See individual drugs above	Lactic acidosis rare with metformin Genitourinary infections w/canagliflozin
Metformin + Dapagliflozin (oral) <i>High Cost by Astra Zeneca</i>		Xigduo	See individual drugs above	See individual drugs above Single tablet dosing	See individual drugs above Lactic acidosis rare with metformin Genitourinary infections
DPP-4 – Combinations:					
Metformin + Sitagliptin (oral) <i>High Cost by Merck & Co.</i>		Janumet	See individual drugs above	Often used in combination therapy Single tablet dosing	Lactic acidosis rare with metformin ⬆️ Acute pancreatitis
Metformin + Linagliptin (oral) <i>High Cost by Boehringer I//Eli Lilly</i>		Jentadueto	See individual drugs above	See individual drugs above Single tablet dosing	See individual drugs above Lactic acidosis rare with metformin ⬆️ Acute pancreatitis - Linagliptin
Metformin + Saxagliptin (oral) <i>High Cost by Astra Zeneca</i>		Kombiglyze XR	See individual drugs above	See individual drugs above Single tablet dosing	Lactic acidosis rare with metformin ⬆️ Acute pancreatitis – Saxagliptin
Metformin + Alogliptin (oral) <i>High Cost by Takeda</i>		Kazano	See individual drugs above	See individual drugs above Single tablet dosing	Lactic acidosis rare with metformin Acute pancreatitis – Alogliptin
Dapagliflozin + saxagliptin (oral)		QTERN		See individual drugs above Single tablet dosing	Genitourinary infections with dapagliflozin Contraindicated in moderate to

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<i>High Cost by Takeda</i>					severe renal impairment
Meglitinides (short-acting sulfonylurea) – Combinations:					
Metformin + Repaglinide (oral)		Prandimet	See individual drugs above	See individual drugs above Single tablet dosing	Lactic acidosis rare with metformin Hypoglycemia and headache – Repaglinide GI side effects – metformin Do not use in hepatic/renal impairment
<i>High Cost by Novo Nordisk</i>					
Insulin (long –acting) – Combinations:					
Long-acting insulin glargine & lixisenatide (injection)		Soliqua 100/33	See individual drugs above	See individual drugs above One daily simultaneous SQ injection	See individual drugs above
<i>High Cost by Sanofi</i>					
Long-acting insulin degludec & liraglutide (injection)		Xultophy 100/3.6	See individual drugs above	See individual drugs above One daily simultaneous SQ injection	See individual drugs above
<i>High Cost by Novo Nordisk</i>					

¹ Brand name outside US

ER – Extended Release

² Not licensed in US

XR – Extended Release

³ B. Ingelheim/Eli Lilly insulin glargine is first FDA approved biosimilar, more to follow including a biosimilar from Merck and Co.

⁴ November 2016 Jardiance received first FDA labeling claims for reducing risk of non-fatal myocardial infarct or non-fatal stroke in patients or cardiovascular death in patients with pre-existing cardiovascular disease

⁵ FDA submissions made in November 2016 in US with likely approval in 2nd half of 2017

⁶ Not licensed for Europe for Type 2 diabetes

The information in this chart is solely for use by an appropriately qualified health care professional, and meant to be used solely as a supplementary aid for a clinician. The chart may contain errors and should not be solely relied upon. Please refer to Physician's Desk Reference (PDR) or package insert available from the drug manufacturer for details on drug contraindications, side effect profile, black box warnings, if any, and potential drug combination incompatibilities based on all medications taken by your patients.