CROSS OVER Healthcare Ministry
COMPASSIONATE HEALTHCARE FOR PEOPLE IN NEED

Type 2 Diabetes Diagnosis, Treatment, & Monitoring Best Practices

Source: American Diabetes Association *Diabetes Care* 2017 Standards of Medical Care in Diabetes

Diagnosis

	Hemoglobin A1c (1 reading)	Glucose
Prediabetes	5.7-6.4	Fasting 100-125
Diabetes	≥6.5	Fasting ≥126 on 2 occasions OR Classic Symptoms + Random >200

Treatment

Nutrition

No one-size-fits-all approach. Individualize based on baseline diet, socio-cultural-economic needs.
Reduce Portion Sizes
Minimize or eliminate soda or other sugar sweetened beverages
Limit Carbohydrates
- Educate on "surprise carbs" (i.e. white bread, corn/flour tortillas, pasta, white rice)
- Consume good carbs (veggies, fruit, whole grain, legumes, dairy) over bad carbs (containing fat, sugar, sodium)

Increase fruits and veggies (8-10 servings per day)
Low-fat dairy products (2-3 servings per day)
Increase Omega-3 Fatty Acids (i.e. salmon)
Substitute low glycemic load foods for high glycemic load foods
Fiber & whole grains
Limit Sodium to <2,300gm a day
Alcohol- Eliminate or limit (women ≤1 drink per day; men ≤ 2 drinks per day)

Physical Activity

Adults	Children
2 ½ hours moderate intensity aerobic activity per week spread over at 3 least days No more than 2 consecutive days without exercise. Avoid >**30** minutes sitting at a time	At least 60minutes aerobic activity a day Bone strengthening activities at least 3 days a week

Medications

[see appendices for algorithms]

Treatment Goals (variable dependent on patient characteristics)

Hemoglobin A1c	Patient Characteristics
≤ 6.5%	Possible goal for patient treated with metformin or lifestyle alone, long life expectancy, no cardiovascular disease, short duration of dm2
≤ 7.0 % **[FBG 80-130]** **[Random BG 80-180]**	**Most adult patients**
≤ 7.5 %	**All pediatric patients**
≤ 8.0 % [FBG 110-160] [Random BG 110-210]	Patients with any of the following- 1. Severe or recurrent hypoglycemia 2. Limited life expectancy 3. Advanced micro- or macro- vascular complications (i.e. CAD, nephropathy, retinopathy,etc) 4. Multiple comorbidities 5. Long-standing diabetics whom goal of <7% has been difficult to attain despite efforts

Monitoring

Labs	Hemoglobin A1c Comp Metabolic Profile Lipid Profile CBC with differential Urine microalbumin-creatinine ratio	Hemoglobin A1c- Every 3-6months (6months if at treatment goal) CMP- every 1-2yrs Lipid Profile- every 1-2yrs once at treatment goal CBC- at diagnosis Urine micro-cr- at diagnosis, then yearly if not already on and ACE or ARB
Eye exam		At diagnosis, then yearly (or more) if retinopathy present. Every 2 years without retinopathy. [pregnant women should be watched even closer]
Foot Exam	Monofilament test (neuropathy) Inspect for abnormalities Assess pulses	At diagnosis, then annually if normal exam. If exam abnormal, perform foot exam at every visit. Visual inspection of feet at every visit
Smoking	Ask about smoking status	Every visit

Vaccination

Vaccine	**Details**
Hepatitis B	-All diabetics aged 19-59yrs whom are unvaccinated *3-Dose Series*: 2nd dose at least 1 month after 1st dose 3rd dose @ least 2 months after 2nd dose & at least 4 months after 1st dose.
Influenza	Yearly during flu season
Pneumococcal (PPSV23, PCV13)	**PPSV23** -Once before age 65. Once at age ≥ 65 -The 2 PPSV23 shots must be separated by 5 years **PCV13** -For adults ≥ 65years old -If pneumococcal vaccine naïve, give PCV13 first, then PPSV23 6-12months later -If already vaccinated with PPSV23 before 65yr old, give PCV13 vaccination first, then give second PPSV23 6-12months later. -Make sure that PPSV23 shots are separated by 5 years, and that PPSV23 & PCV13 are separated by 6-12months.

*all vaccines above are available at both Crossover clinics

ADA risk test (from ADA *Diab Care* 2017 StandardsMedicalCare)

ARE YOU AT RISK FOR

TYPE 2 DIABETES?

American Diabetes Association.

Diabetes Risk Test

1. **How old are you?**
   Less than 40 years (0 points)
   40—49 years (1 point)
   50—59 years (2 points)
   60 years or older (3 points)

2. **Are you a man or a woman?**
   Man (1 point) Woman (0 points)

3. **If you are a woman, have you ever been diagnosed with gestational diabetes?**
   Yes (1 point) No (0 points)

4. **Do you have a mother, father, sister, or brother with diabetes?**
   Yes (1 point) No (0 points)

5. **Have you ever been diagnosed with high blood pressure?**
   Yes (1 point) No (0 points)

6. **Are you physically active?**
   Yes (0 points) No (1 point)

7. **What is your weight status?** *(see chart at right)*

Write your score in the box.

Height	Weight (lbs.)		
4' 10"	119-142	143-190	191+
4' 11"	124-147	148-197	198+
5' 0"	128-152	153-203	204+
5' 1"	132-157	158-210	211+
5' 2"	136-163	164-217	218+
5' 3"	141-168	169-224	225+
5' 4"	145-173	174-231	232+
5' 5"	150-179	180-239	240+
5' 6"	155-185	186-246	247+
5' 7"	159-190	191-254	255+
5' 8"	164-196	197-261	262+
5' 9"	169-202	203-269	270+
5' 10"	174-208	209-277	278+
5' 11"	179-214	215-285	286+
6' 0"	184-220	221-293	294+
6' 1"	189-226	227-301	302+
6' 2"	194-232	233-310	311+
6' 3"	200-239	240-318	319+
6' 4"	205-245	246-327	328+
	(1 Point)	(2 Points)	(3 Points)
	You weigh less than the amount in the left column (0 points)		

Adapted from Bang et al., Ann Intern Med 151:775-783, 2009.
Original algorithm was validated without gestational diabetes as part of the model.

Add up your score.

If you scored 5 or higher:
You are at increased risk for having type 2 diabetes. However, only your doctor can tell for sure if you do have type 2 diabetes or prediabetes (a condition that precedes type 2 diabetes in which blood glucose levels are higher than normal). Talk to your doctor to see if additional testing is needed.

Type 2 diabetes is more common in African Americans, Hispanics/Latinos, American Indians, and Asian Americans and Pacific Islanders.

For more information, visit us at www.diabetes.org or call 1-800-DIABETES

Visit us on Facebook
Facebook.com/AmericanDiabetesAssociation

Lower Your Risk

The good news is that you can manage your risk for type 2 diabetes. Small steps make a big difference and can help you live a longer, healthier life.

If you are at high risk, your first step is to see your doctor to see if additional testing is needed.

Visit diabetes.org or call 1-800-DIABETES for information, tips on getting started, and ideas for simple, small steps you can take to help lower your risk.

STOP DIABETES.

Medication Therapy for Diabetes (table from ADA *Diab Care* 2017 StandardsMedicalCare)

Start with Monotherapy unless:

A1C is greater than or equal to 9%, **consider Dual Therapy.**

A1C is greater than or equal to 10%, blood glucose is greater than or equal to 300 mg/dL, or patient is markedly symptomatic, **consider Combination Injectable Therapy** (See Figure 8.2).

Monotherapy Metformin Lifestyle Management

EFFICACY*	high
HYPO RISK	low risk
WEIGHT	neutral/loss
SIDE EFFECTS	GI/lactic acidosis
COSTS*	low

If A1C target not achieved after approximately 3 months of monotherapy, proceed to 2-drug combination (order not meant to denote any specific preference – choice dependent on a variety of patient- & disease-specific factors):

Dual Therapy Metformin + Lifestyle Management

	Sulfonylurea	Thiazolidinedione	DPP-4 inhibitor	SGLT2 inhibitor	GLP-1 receptor agonist	Insulin (basal)
EFFICACY*	high	high	intermediate	intermediate	high	highest
HYPO RISK	moderate risk	low risk	low risk	low risk	low risk	high risk
WEIGHT	gain	gain	neutral	loss	loss	gain
SIDE EFFECTS	hypoglycemia	edema, HF, fxs	rare	GU, dehydration, fxs	GI	hypoglycemia
COSTS*	low	low	high	high	high	high

If A1C target not achieved after approximately 3 months of dual therapy, proceed to 3-drug combination (order not meant to denote any specific preference – choice dependent on a variety of patient- & disease-specific factors):

Triple Therapy Metformin + Lifestyle Management

Sulfonylurea +	Thiazolidinedione +	DPP-4 inhibitor +	SGLT2 inhibitor +	GLP-1 receptor agonist +	Insulin (basal) +
TZD	SU	SU	SU	SU	TZD
or DPP-4-i	or DPP-4-i	or TZD	or TZD	or TZD	or DPP-4-i
or SGLT2-i	or SGLT2-i	or SGLT2-i	or DPP-4-i	or SGLT2-i	or SGLT2-i
or GLP-1-RA	or GLP-1-RA	or Insulin[¶]	or GLP-1-RA	or Insulin[¶]	or GLP-1-RA
or Insulin[¶]	or Insulin[¶]		or Insulin[¶]		

If A1C target not achieved after approximately 3 months of triple therapy and patient (1) on oral combination, move to basal insulin or GLP-1 RA, (2) on GLP-1 RA, add basal insulin, or (3) on optimally titrated basal insulin, add GLP-1 RA or mealtime insulin. Metformin therapy should be maintained, while other oral agents may be discontinued on an individual basis to avoid unnecessarily complex or costly regimens (i.e., adding a fourth antihyperglycemic agent).

Combination Injectable Therapy (See Figure 8.2)

Oral Agents available for each class to CrossOver patients

	Biguanide	DPP-4 Inhibitors	SGLT-2 Inhibitors	GLP-1 agonist	SU	Combinations
Retail $4 list	Metformin Metformin ER				Glipizide Glimiperide Glyburide	
Crossover Pharmacy		Januvia (sitagliptin)		Bydureon + (exenatide) Tanzeum + (albiglutide)		Janumet (metformin/ sitagliptin) Janumet XR
TPC (mail order)		Tradjenta (linagliptin)* Onglyza (saxagliptin)	Farxiga (dapaglflozin) Invokana (canagliflozin) Jardiance (empagiflozin)	Trulicity + (dulaglutide) Victoza (liraglutide)		

*safe in patients with renal impairment
+Weekly injections

Medication Properties for Diabetes(table from ADA *Diab Care* 2017 StandardsMedicalCare)

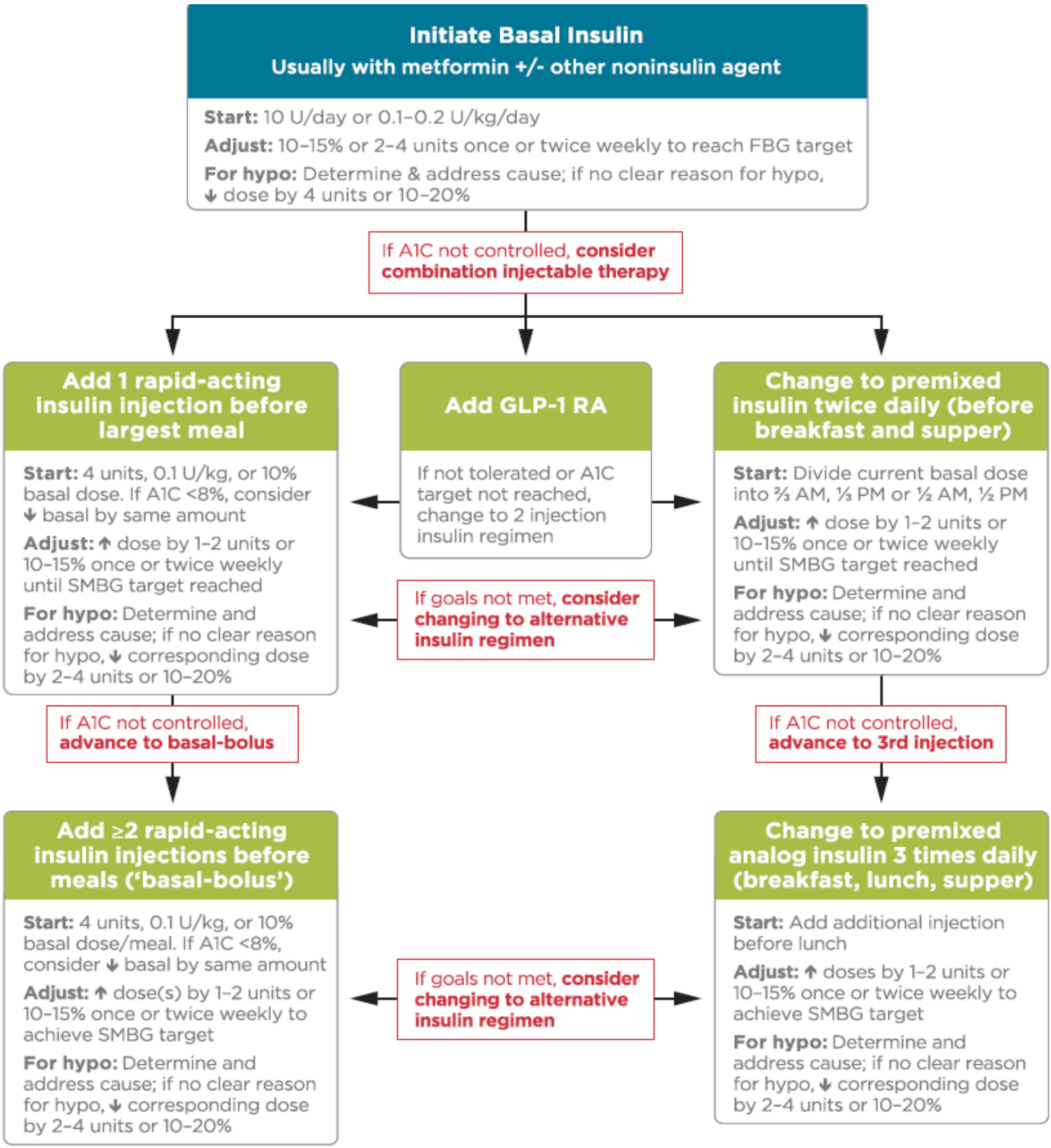
Class	Compounds	Cellular mechanism	Primary physiological actions	Advantages	Disadvantages	Cost
Biguanides	Metformin	Activates AMP-kinase	↓ Hepatic glucose production	Extensive experience Rare hypoglycemia ↓CVD events (UKPDS) Relatively higher A1C efficacy	Gastrointestinal side effects (diarrhea, abdominal cramping, nausea) Vitamin B12 deficiency Contraindications: eGFR< 30, acidosis, hypoxia, dehydration, etc. Lactic acidosis risk (rare)	Low
Sulfonylureas	2nd generation Glyburide Glipizide Glimepiride	Closes KATP channels on b-cell plasma membranes	↑ Insulin secretion	Extensive experience ↓ Microvascular risk (UKPDS) Relatively higher A1C efficacy	Hypoglycemia ↑Weight	Low
DPP-4 inhibitors	Sitagliptin Saxagliptin Linagliptin Alogliptin	Inhibits DPP-4 activity, increasing postprandial incretin (GLP-1, GIP) concentrations	↑Insulin secretion (glucose dependent) ↓Glucagon secretion (glucose dependent)	Rare hypoglycemia Well tolerated	Angioedema/urticaria and other immune-mediated dermatological effects ? Acute pancreatitis ↑Heart failure hospitalizations (saxagliptin; ? alogliptin)	High
GLP-1 receptor agonists	Exenatide Exenatide extended release Liraglutide Albiglutide Lixisenatide Dulaglutide	Activates GLP-1 receptors	↑ Insulin secretion (glucose dependent) ↓ Glucagon secretion (glucose dependent) Slows gastric emptying ↑Satiety	Rare hypoglycemia ↓ Weight ↓ Postprandial glucose excursions ↓ Some cardiovascular risk factors Associated with lower CVD event rate and mortality in patients with CVD (liraglutide LEADER) (30)	Gastrointestinal side effects (nausea/vomiting/diarrhea) ↑Heart rate ? Acute pancreatitis C-cell hyperplasia/medullary thyroid tumors in animals Injectable Training requirements	High

SGLT2 inhibitors	Canagliflozin Dapagliflozin‡ Empagliflozin	Inhibits SGLT2 in the proximal nephron	Blocks glucose reabsorption by the kidney, increasing glucosuria	Rare hypoglycemia ↓ Weight ↓ Blood pressure c Associated with lower CVD event rate and mortality in patients with CVD (empagliflozin EMPA-REG OUTCOME)	Genitourinary infections Polyuria Volume depletion/hypotension/dizziness ↑ LDL-C ↑ Creatinine (transient) DKA, urinary tract infections leading to urosepsis, pyelonephritis	High
TZDs	Pioglitazone‡ Rosiglitazone§	Activates the nuclear transcription factor PPAR-g	↑ Insulin sensitivity	Rare hypoglycemia Relatively higher A1C efficacy Durability ↓ Triglycerides (pioglitazone) ? ↓ CVD events (PROactive, pioglitazone) ↓Risk of stroke and MI in patients without diabetes and with insulin resistance and history of recent stroke or TIA (IRIS study [42], pioglitazone)	↑ Weight Edema/heart failure Bone fractures ↑LDL-C (rosiglitazone)	Low
Meglitinides (glinides)	Repaglinide Nateglinide	Closes KATP channels on b-cell plasma membranes	↑ Insulin secretion	↓ Postprandial glucose excursions Dosing flexibility	Hypoglycemia ↑ Weight Frequent dosing schedule	Mod
a-Glucosidase inhibitors	Acarbose Miglitol	Inhibits intestinal a-glucosidase	Slows intestinal carbohydrate digestion/absorption	Rare hypoglycemia ↓ Postprandial glucose excursions ? ↓ CVD events in prediabetes (STOP-NIDDM) Nonsystemic	Generally modest A1C efficacy Gastrointestinal side effects (flatulence, diarrhea) Frequent dosing schedule	Low to mod
Bile acid sequestrants	Colesevelam	Binds bile acids in intestinal tract, increasing hepatic bile acid production	? ↓ Hepatic glucose production ? ↑ Incretin levels	Rare hypoglycemia ↓ LDL-C	Modest A1C efficacy Constipation ↑ Triglycerides May ↓ absorption of other medications	High
Dopamine-2 agonists	Bromocriptine (quick release)§	Activates dopaminergic receptors	Modulates hypothalamic regulation of metabolism ↑ Insulin sensitivity	Rare hypoglycemia ? ↓ CVD events (Cycloset Safety Trial)	Modest A1C efficacy Dizziness/syncope Nausea Fatigue Rhinitis	High
Amylin mimetics	Pramlintide§	Activates amylin receptors	↓ Glucagon secretion Slows gastric emptying ↑ Satiety	↓ Postprandial glucose excursions ↓ Weight	Modest A1C efficacy Gastrointestinal side effects (nausea/vomiting) Hypoglycemia unless insulin dose is simultaneously reduced Injectable Frequent dosing schedule Training requirements	High

Insulins	Rapid-acting analogs - Lispro - Aspart - Glulisine - Inhaled insulin Short-acting - Human Regular Intermediate-acting - Human NPH Basal insulin analogs - Glargine - Detemir - Degludec Premixed insulin products - NPH/Regular 70/30 270/30 aspart mix 275/25 lispro mix 250/50 lispro mix	Activates insulin receptors	↑ Glucose disposal ↓ Hepatic glucose production Suppresses ketogenesis	Nearly universal response Theoretically unlimited efficacy ↓ Microvascular risk (UKPDS)	Hypoglycemia Weight gain Training requirements Patient and provider reluctance Injectable (except inhaled insulin) Pulmonary toxicity (inhaled insulin)	High

- CVD, cardiovascular disease; EMPA-REG OUTCOME, BI 10773 (Empagliflozin) Cardiovascular Outcome Event Trial in Type 2 Diabetes Mellitus Patients (29); GIP, glucose-dependent insulinotropic peptide;
- HDL-C, HDL cholesterol; IRIS, Insulin Resistance Intervention After Stroke Trial; LDL-C, LDL cholesterol; PPAR-g, peroxisome proliferator–activated receptor g; PROactive, Prospective Pioglitazone Clinical Trial in
- Macrovascular Events (43); STOP-NIDDM, Study to Prevent Non-Insulin-Dependent Diabetes Mellitus (44); TIA, transient ischemic attack; TZD, thiazolidinedione; UKPDS, UK Prospective Diabetes Study (45,46).
- Cycloset trial of quick-release bromocriptine (47). *Cost is based on lowest-priced member of the class (21). ‡Initial concerns regarding bladder cancer risk are decreasing after subsequent study. §Not licensed in
- Europe for type 2 diabetes. #Cost is highly dependent on type/brand (analogs . human insulins) and dosage. Adapted with permission from Inzucchi et al. (21).

Approach to starting & adjusting insulin in DM2 (table from ADA *Diab Care* 2017 StandardsMedicalCare)



Insulin available for CrossOver Patients (initiate w/samples, mail order takes 4weeks)

Long acting	**Intermediate acting**	**Rapid acting**	**Premixed**	**Comments**
Lantus (glargine U-100)	Novolin N	Apidra		**Social security number (SSN) required**
Levemir (detemir)		Novolog	Novolog Mix 70/30	
Toujeo (glargine U-300)		Novolin R	Novolin 70/30	**No age requirement**
	Relion N	Relion R	Relion 70/30	At walmart ~$25/vial
Basaglar (glargine)	Humulin N	Humalog	Humalog Mix 75/25 or 50/50	**No SSN requirements**
		Humulin R	Humulin 70/30	**Age <65 years old**

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Recommendations for statin and combination treatment in people with diabetes

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Age	Risk factors	Recommended statin therapy
< 40 years	None	None
	ASCVD risk factor(s) **	Moderate to high
	ASCVD	High
40-75 years	None	Moderate
	ASCVD risk factors	High
	ASCVD	High
	ACS and LDL cholesterol ≥50mg/dL (1.3mmol/L) or in patients with a history of ASCVD who cannot tolerate high dose statin	Moderate plus Ezetimibe (Zetia)
>75 years	None	Moderate
	ASCVD risk factors	Moderate or high
	ASCVD	High
	ACS and LDL cholesterol ≥50mg/dL (1.3mmol/L) or in patients with a history of ASCVD who cannot tolerate high dose statin	Moderate plus Ezetimibe (Zetia)

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*In addition to lifestyle therapy. **ASCVD risk factors include LDL cholesterol ≥100 mg/dL (2.6 mmol/L), high blood pressure, smoking, chronic kidney disease, albuminuria, and family history of premature ASCVD.

Table 9.2—High-intensity and moderate-intensity statin therapy*

High-intensity statin therapy (lowers LDL cholesterol by $50%)	Moderate-intensity statin therapy (lowers LDL cholesterol by 30% to ,50%)
Atorvastatin 40–80 mg	Atorvastatin 10–20 mg
Rosuvastatin 20–40 mg	Rosuvastatin 5–10 mg
	Simvastatin 20–40 mg
	Pravastatin 40–80 mg
	Lovastatin 40 mg
	Fluvastatin XL 80 mg
	Pitavastatin 2–4 mg

*Once-daily dosing. XL, extended release.

Mean Glucose Levels for specified A1c levels

A1C (%)	Mean plasma glucose*		Mean fasting glucose	Mean premeal glucose	Mean postmeal glucose	Mean bedtime glucose
	mg/dL	mmol/L	mg/dL	mg/dL	mg/dL	mg/dL
6	126	7.0				
<6.5			122	118	144	136
6.5–6.99			142	139	164	153
7	154	8.6				
7.0–7.49			152	152	176	177
7.5–7.99			167	155	189	175
8	183	10.2				
8–8.5			178	179	206	222
9	212	11.8				
10	240	13.4				
11	269	14.9				
12	298	16.5				

- A calculator for converting A1C results into eAG, in either mg/dL or mmol/L, is available at http://professional.diabetes.org/eAG.
- * These estimates are based on ADAG data of ~2,700 glucose measurements over 3 months per A1C measurement in 507 adults with type 1, type 2, and no diabetes. The correlation between A1C and average glucose was 0.92 (25).