Medication Chart for Type 2 Diabetes

<table>
<thead>
<tr>
<th>Med Group Descriptor, Drug Class, Drug Name</th>
<th>Action, Side Effects, Notes</th>
<th>Dosing</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biguanides</strong></td>
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</tr>
<tr>
<td><strong>Metformin (GLUCOPHAGE)</strong></td>
<td>Reduces the amount of glucose the liver releases between meals.</td>
<td>For metformin: 2–3 times/day. Take with meals to avoid stomach upset.</td>
<td>500-2,550 mg/day</td>
</tr>
<tr>
<td><strong>Also available in sustained release and oral solution:</strong> GLUCOPHAGE XR, FORTAMET, GLUMETZA, RIOMET</td>
<td>Side effects: Gas, diarrhea, upset stomach, nausea, abdominal pain. In rare cases, lactic acidosis may occur in people with abnormal liver or kidney function.</td>
<td>For sustained release: 1–2 times/day, with meals.</td>
<td>Maximum effective dose = 2,000 mg/day</td>
</tr>
<tr>
<td><strong>Notes:</strong> Take with food to decrease gas, diarrhea.</td>
<td>For oral solution: 2–3 times/day, with meals.</td>
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</tr>
<tr>
<td><strong>Sulfonylureas (SU)</strong></td>
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</tr>
<tr>
<td><strong>Glipizide (GLUCOTROL)</strong></td>
<td>Stimulates pancreas to release more insulin right after a meal and then over many hours.</td>
<td>1–2 times/day, 30 minutes pre-meal.</td>
<td>2.5-40 mg/day (IR product)</td>
</tr>
<tr>
<td><strong>Also available in extended release:</strong> GLUCOTROL XL</td>
<td>Side effects: Potential for hypoglycemia.</td>
<td>For extended release: 1–2 times/day, with meals.</td>
<td>5-20 mg/day (XL product)</td>
</tr>
<tr>
<td><strong>Glyburide (MICRONASE, MICRONASE DIABETA)</strong></td>
<td>1–2 times/day. Take with meals to avoid hypoglycemia.</td>
<td>1.25-20 mg/day</td>
<td>Near maximal effect is observed at 10 mg/day</td>
</tr>
<tr>
<td><strong>Also available in micronized:</strong> GLYNASE PRESTABS</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Glimepiride (AMARYL)</strong></td>
<td>1–2 times/day. 0–30 min pre meals. Skip meal, skip dose. Add meal, add dose to total of 4 doses/day.</td>
<td>2–4 times/day, unrelated to food.</td>
<td>0.5-16 mg/day</td>
</tr>
<tr>
<td><strong>Repaglinide (PRANDIN)</strong></td>
<td>Stimulates pancreas to release more insulin right after a meal.</td>
<td>2–4 times/day, 0–30 min pre meals.</td>
<td>0.5-16 mg/day</td>
</tr>
<tr>
<td><strong>Nateglinide (STARLIX)</strong></td>
<td>Potential for hypoglycemia.</td>
<td>1–3 times/day, 0–30 min pre meals.</td>
<td>180-360 mg/day</td>
</tr>
<tr>
<td><strong>Thiazolidinediones (TZD)</strong></td>
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<td></td>
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</tr>
<tr>
<td><strong>Pioglitazone (ACTOS)</strong></td>
<td>Improves insulin sensitivity.</td>
<td>1 time/day, same time daily.</td>
<td>15-45 mg/day</td>
</tr>
<tr>
<td><strong>Action (both):</strong></td>
<td>Side effects (both): Weight gain, fluid retention, osteopenia, increase in congestive heart failure in those at risk.</td>
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</tr>
<tr>
<td><strong>Notes:</strong> Don't prescribe with family or personal history of bladder cancer.</td>
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</tr>
<tr>
<td><strong>DPP-4 Inhibitors (Dipeptidyl peptidase-4)</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>Sitagliptin (JANUVIA)</strong></td>
<td>Increases insulin secretion following meal. Lowers hepatic glucose production.</td>
<td>1 time/day, unrelated to food.</td>
<td>25-100 mg/day</td>
</tr>
<tr>
<td><strong>Linagliptin (TRADJENTA)</strong></td>
<td>Side effects: Stuffy nose, sore throat, occasional diarrhea and stomach discomfort.</td>
<td>Same time daily.</td>
<td>5 mg/day</td>
</tr>
<tr>
<td><strong>Saxagliptin (ONGLYZA)</strong></td>
<td>1 time/day, unrelated to food.</td>
<td></td>
<td>2.5-5 mg/day</td>
</tr>
</tbody>
</table>

FDA Indication is always the following except where noted differently:
Adult (≥ 18 yo): T2DM as monotherapy and combo therapy. Pediatrics (< 18 yo): Role has not been established in T2DM.
### Glucagon-Like Peptide-1 (GLP-1)

**Exenatide (BYETTA)**  
*Also available in extended release: Exenatide XR (BYDUREON)*  
**Action:** Enhances glucose-dependent insulin secretion.  
**Side effects:** Nausea, hypoglycemia, vomiting, diarrhea, feeling jittery, dizziness, headache, dyspepsia.  
**Dosing:**  
- 2 times/day.  
- For extended release:  
  - 1 time/week.  
  - For extended release:  
    - 2 mg/week.  
**Considerations:**  
- Average A1c decrease 0.5-1%.  
- Cautious use of metformin with renal impairment (Scr >1.5 mg/dL in men; Scr >1.4 mg/dL in women or GFR <60).

**Liraglutide (VICTOZA)**  
**Action:** 1 time/day.  
**Side effects:** Gas, diarrhea, stomach upset.  
**Dosing:**  
- 3 times/day, with first bite of meal.  
- 75-300 mg/day.  
**Considerations:**  
- Average A1c decrease 0.5-1%.  
- Cautious use of metformin with renal impairment (Scr >1.5 mg/dL in men; Scr >1.4 mg/dL in women or GFR <60).

### Alpha-Glucosidase Inhibitors (AGI)

**Acarbose (PRECOSE)**  
**Action:** Delays absorption and breakdown of carbohydrates from intestines  
**Side effects:** Gas, diarrhea, stomach upset.  
**Dosing:**  
- 3 times/day, with first bite of meal.  
- 75-300 mg/day.  
**Considerations:**  
- Average A1c decrease 0.5-1%.

**Miglitol (GLYSET)**  
**Action:** 1 time/day.  
**Side effects:** Gas, diarrhea, stomach upset.  
**Dosing:**  
- 1–2 times/day, with meals.  
- 75-300 mg/day.  
**Considerations:**  
- Cautious use of metformin with renal impairment (Scr >1.5 mg/dL in men; Scr >1.4 mg/dL in women or GFR <60).

### Fixed Combinations

**Glipizide and Metformin (METAGLIP)**  
**Dosing:** Available in 2.5mg/250mg, 2.5mg/500mg, and 5mg/500mg strengths.  
**Considerations:** See individual products above.

**Glyburide and Metformin (GLUCOVANCE)**  
**Dosing:** Available in 1.25mg/250mg, 2.5 mg/500mg, and 5mg/500mg strengths.  
**Considerations:** See black box warning for Actos above.  
- Cautious use of metformin with renal impairment (Scr >1.5 mg/dL in men; Scr >1.4 mg/dL in women or GFR <60).

**Pioglitazone and Metformin (ACTOPLUS MET)**  
**Dosing:** Available in 15mg/500mg and 15mg/850mg strengths.  
**Considerations:** See black box warning for Actos above.

**Pioglitazone and Metformin ER (ACTOPLUS MET XR)**  
**Dosing:** Available in 15mg/1000mg and 30mg/1000mg strengths.  
**Considerations:** Cautious use of metformin with renal impairment (Scr >1.5 mg/dL in men; Scr >1.4 mg/dL in women or GFR <60).

**Pioglitazone and Glimepride (DUETACT)**  
**Dosing:** Available in 30mg/2mg and 30mg/4mg strengths.  
**Considerations:** Cautious use of metformin with renal impairment (Scr >1.5 mg/dL in men; Scr >1.4 mg/dL in women or GFR <60).

**Sitagliptin and Metformin (JANUMET)**  
**Dosing:** Available in 50mg/500mg, 50mg/1000 mg strengths.  
**Considerations:** See individual products above.

**Saxagliptin and Metformin (KOMBIGLYZE XR)**  
**Dosing:** Available in 5mg/500mg, 5mg/1000 mg and 2.5mg/1000mg strengths.  
**Considerations:** See individual products above.

### Insulins

#### Bolus Insulin: Rapid- or Short-Acting

<table>
<thead>
<tr>
<th>Insulin</th>
<th>Onset of Action</th>
<th>Peak Effect</th>
<th>Duration of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lispro (Humalog), aspart (Novolog), glulisine (Apidra)</td>
<td>15 - 30 minutes</td>
<td>30 - 150 minutes</td>
<td>≤ 5 hours</td>
</tr>
<tr>
<td>Regular (Humulin R, Novolin R)</td>
<td>30 minutes</td>
<td>2.5 - 5 hours</td>
<td>4 - 12 hours</td>
</tr>
</tbody>
</table>

#### Basal Insulin: Intermediate- or Long-Acting

<table>
<thead>
<tr>
<th>Insulin</th>
<th>Onset of Action</th>
<th>Peak Effect</th>
<th>Duration of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPH (Humulin N, Novolin N)</td>
<td>About 2 hours</td>
<td>4 - 12 hours</td>
<td>12 - 20 hours</td>
</tr>
<tr>
<td>Detemir (Levemir)</td>
<td>3 - 4 hours</td>
<td>3 - 9 hours</td>
<td>16 - 23 hours</td>
</tr>
<tr>
<td>Glargine (Lantus)</td>
<td>3 - 4 hours</td>
<td>No peak</td>
<td>≥ 24 hours</td>
</tr>
</tbody>
</table>

#### Insulin Mixes

<table>
<thead>
<tr>
<th>Insulin Mixes</th>
<th>Onset of Action</th>
<th>Peak Effect</th>
<th>Duration of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPH/regular (Humulin 70/30, Novolin 70/30)</td>
<td>See individual products above.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lispro protamine/lispro (Humalog Mix 50/50, Humalog Mix 75/25)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspart protamine/aspart (Novolog Mix 70/30)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

See pages 3-4 for insulin titration algorithms >>
Insulin Titration Algorithm for NPH

**Start with PM or bedtime NPH 10 units or 0.2 units per kg**

Increase dose by 2 units q 3 days until fasting levels are 70-130 mg/dl; can increase dose by 4 units q 3 days if fasting glucose >180 mg/dl

If hypoglycemia occurs, or fasting glucose level <70 mg/dl, reduce bedtime dose by ≥4 units, or 10% if dose >60 units

**A1c <7% after 3 months?**

- **Yes**
  - **Check BG pre-dinner. Is pre-dinner BG >150 mg/dl?**
    - **Yes** Add AM NPH 10 units. Can increase dose by 4 units q 3 days if pre-dinner BG >180mg/dl
    - **No** Continue regimen; check A1c q 6 months
  - **No**
    - **Yes** Check BG pre-lunch and at bedtime. Is pre-lunch or bedtime BG >150? 
      - **Yes** Add 4 units Regular or short acting analog insulin at breakfast for high pre-lunch BG, or at dinner for high bedtime BG; can increase meal-specific dose by 2 units every 7 days if BG >180
      - **No** A1c <7% after 3 months?
        - **Yes** Check 2 hour postprandial levels and adjust pre-prandial Regular or short acting analog insulin
        - **No**

**NOTE:**

1. Sulfonylurea should be discontinued when Regular or short acting analog insulin is started.
2. For ease of dosing, Regular or short acting analog insulin can be combined with NPH at breakfast and/or dinner (use of 70/30 insulin should be avoided unless patient is unable to comply with mixed regimen). If frequent hypoglycemia occurs >4 hours after dinner, fast-acting insulin could be given alone at dinner and NPH moved to bedtime.

**NOTE:** Consider Glargine (Lantus) instead of NPH if: 1) hypoglycemia occurs due to NPH/fast-acting insulin overlap despite dosage-time adjustments, OR 2) patient unable to comply with multiple injections per day. Refer to basal/bolus insulin algorithm on page 4.
Insulin Titration Algorithm for Basal/Bolus Insulin

Start with PM or bedtime basal (long acting) insulin 10 units or 0.2 units per kg

Increase dose by 2 units q 3 days until fasting levels are 70-130 mg/dl; can increase dose by 4 units q 3 days if fasting glucose >180 mg/dl

If hypoglycemia occurs, or fasting glucose level <70 mg/dl, reduce bedtime dose by ≥4 units, or 10% if dose >60 units

A1c <7% after 3 months?

Yes

Check BG 2 hours after meals (start with largest meal). Is post-prandial BG >150 mg/dl?

Yes

Add 4 units short-acting insulin prior to meal. Can increase meal-specific dose by 2 units q 7 days if BG >180 mg/dl

A1c <7% after 3 months?

No

Check BG 2 hours after remaining meals. Is post-prandial BG >150 mg/dl?

Yes

Add 4 units Regular or short acting analog insulin at breakfast for high pre-lunch BG, or at dinner for high bedtime BG \(^1,2\); can increase meal-specific dose by 2 units every 7 days if BG >180

A1c <7% after 3 months?

No

Yes

A1c <7% after 3 months?

Yes

No

Continue adjusting basal insulin to control fasting BG and short-acting (bolus) insulin to control post-prandial glucose.

1. Sulfonylurea should be discontinued when Regular or short acting analog insulin is started.
2. Long acting analog insulin (Glargine) should NOT be mixed with other insulins.