A Simplified Approach to Initiating Insulin

When to Start Insulin:

1. Fasting plasma glucose (FPG) levels >250 mg/dL or
2. Glycated hemoglobin (A1C) >10% or
3. Random plasma glucose consistently >300 mg/dL
4. Not meeting glycemic goals with oral hypoglycemic agents or
5. Oral hypoglycemic agents are contraindicated or
6. Hyperglycemia and…
   a) Ketonuria / Metabolic acidosis
   b) Symptomatic diabetes with polyuria, polydipsia, and weight loss

- Regardless of the type or frequency of insulin use, the initiation of insulin should always be coupled with formal DM education.
- Insulin should not be used as a “last resort” therapy. Insulin is a viable option to achieve goal glucose levels in every patient with DM.
- Some providers may be comfortable with starting more complex, individualized insulin regimens while others may be more comfortable with starting standard low doses. For those providers who do not commonly initiate insulin, beginning with a fixed dose and titration scale may be appropriate. Weight based formulas and the use of multi-dose insulin regimens offer more individualized insulin regimens.
- Pre-mixed insulin (PreMix Regular 70/30 (Humulin, Novulin), PreMix Novolog 70/30, PreMix Humalog 75/25) offers simplistic, but inflexible insulin dosing. The fast acting insulin component of pre-mixed insulin requires that the patient eat a standard 3 meals a day to avoid hypoglycemia. Individuals who do not have regular access to food will be at a higher risk for significant hypoglycemia.
Starting Insulin – The Straightforward Algorithm

1. Patients not meeting their glycemic goals on orals agents can start with basal insulin alone if the HbA1c is less than 10% (Refer to attached insulin table.)

   1. A1c <10% or random glucose < 250mg/dl
      
      i. Start long-acting insulin glargine (Lantus) (preferred) or insulin detemir (levemir) (preferred) or NPH. (Administration time should be consistent.)
      
      ii. Set dose initiation of insulin
         
         A. Lantus or Levemir - Start 10 units at a consistent bed or morning time **OR**
         
         B. NPH – 5-10 units at bedtime
      
      iii. A weight based formula is more precise:
         
         0.2 units/kg (e.g. total weight in lbs/2.2 = kg X 0.2 units)
         
      iv. Titration: Increase the dose by 1 unit every day until the morning (fasting) glucose is less than 110 mg/dl
         
      v. Do not stop the oral hypoglycemic agents at this time. The sulfonylureas can be tapered once the patient’s glucose levels are better controlled.

   - A multi-dose insulin regimen does not need to be started at once. There are two methods for introducing a multi-dose insulin regimen.

     1. Prescribe evening basal insulin **and** the use of a premeal correction dose scale of rapid acting insulin (see insulin table) at meals (e.g. BS 151-200-2 units, 201-250 4 units, 251-300 6 units, 301-350 8 units, 351-400 10 units) **OR**

     2. Start evening insulin detemir (Levemir) or glargine (Lantus). Add a single dose of rapid acting insulin at the largest meal. Start at 5
units per meal or 1/3 of the basal insulin dose per meal
(whichever amount is less).

- Instruct patient to check SMBG 2 hours after meal(s) to assess peak affect of insulin on meal and blood glucose level
- Instruct the patient to check fasting SMBG to assess the effect of the basal insulin dose.

2. Patients with HbA1c >10% require basal and mealtime coverage
   1. A1c > 10% or random glucose >250 mg/dl
      i. Patient requires basal and mealtime insulin.
         A. Calculate the patient’s total daily insulin dose (TDD) using the formula: TDD = (Patient’s weight in kg x 0.4)
         B. One-half the TDD is initiated as the basal insulin
         C. One-half the TDD is divided into equal meal time doses
         D. Example: Patient weighs 120 kg.
            a. TDD = (120 kg x 0.4 units / kg)
            b. TDD = 48 units
            c. Initiate ½ the insulin as basal insulin (24 units) and the other half (24 units) divided as 8 units at each meal.  OR
      ii. Start pre-mixed insulin regimen before breakfast and before dinner
         A. Pre Mix Regular 70/30 (Humulin or Novolin)
            Instruct to administer 30 minutes before meal
         B. Pre Mix Novolog 70/30 or Humalog 75/25 (preferred)
            Instruct to administer just before breakfast and dinner meals
            a. Start Pre-mixed insulin 10 units before breakfast and before dinner
            b. If the patient weighs less than 130 lb or has end-stage
renal or hepatic disease, start 5 units pre-breakfast or pre-dinner

iii. Titration: Increase by 1 unit at breakfast and dinner each day until either fasting or pre-dinner glucose is less than 110 mg/dl.

- Discuss need to take Pre Mix insulin at consistent times of day and the need to eat food within ½ hour and 4 hours after taking Pre Mix insulin
- Instruct patient to check SMBG before breakfast and dinner and 2 hours after eating

**Patient Safety with Insulin Use**

1. Treatment of hypoglycemia (see patient handout on hypoglycemia)
2. Diabetes alert bracelet
3. Glucagon prescription
   i. Write: Glucagon Kit, use 1 IM for emergent hypoglycemia, #1 refill
   ii. Note expiration date replace every 6 months or as needed
   iii. Review the use with the patient and the person(s) who will be administering the glucagon
4. Test blood glucose prior to driving, exercising

**Please see attached insulin table and the patient information sheet on hypoglycemia.**

**Considering Pens versus Vials**

Insulin pens are preferred except in cases of cost or patient preference. Patient satisfaction is higher with insulin pens as the device: 1. improves the accuracy of dosing for visually impaired individuals; 2. are easier to carry and use outside the home; and 3. are simpler to use in patients with arthritic or muscular changes of their hands.
Care should be taken when using insulin pens from the same company. Because of the similar color and design a patient may occasionally confuse the pens. To avoid error, the provider can use pens from two different companies (ex: Lantus and Novolog instead of Levemir and Novolog). It may also help the patient to use nail polish or permanent marker to put a picture of a moon or sun on the basal insulin pen and a picture of a fork on their mealtime insulin.

Clinical Examples
Several steps are important for the safe initiation of insulin. The following are a list of steps for the patient, healthcare provider and staff to ensure a smooth insulin start. The forms and worksheets included in the insulin protocol packet will aid in this process.

Instructions, Prescription and Education for Every Patient Starting Insulin

The patient will:
- perform agreed upon glucose monitoring. (Refer to the Self Monitoring of Blood Glucose Levels protocol).
- continue lifestyle changes.

You or your staff:
- review and demonstrate glucometer use and insulin administration.
- observe the patient re-demonstrate glucometer use and insulin administration adequately.
- ask the patient to state their insulin dosages and schedule.
- ask the patient to state how to identify and treat hypoglycemia.
- schedule a follow up appointment in 2 to 4 weeks and ask them to call with any questions or consistently low or high blood sugars.
- refer to a DM education program to reinforce appropriate insulin use.
- instruct how to record on glucose log.
The patient is given information on insulin use and safety:

- a low blood sugar reaction patient instruction sheet.
- a blood sugar recording log.
- an insulin injection site sheet.
- verbal and written instructions in insulin use.
- Collaborative’s videos on insulin use, safety and storage.

A. A 57 year old woman comes for her routine follow-up visit for her diabetes. She attempts to adjust her lifestyle. On maximal doses of metformin and glipizide her HbA1c is 9.2%. Her fasting glucose levels are approximately 200mg/dl. Previously she did not tolerate exanatide. After reviewing the treatment options your patient and you decide to begin a bedtime dose of detemir (Levemir) insulin. Her weight is 260 lb: (260 lb/2.2 = 118kg).

\[
\text{Weight based formula for initiating basal insulin} \\
(\text{wt in kg} \times 0.2 \text{ units}) = \text{initial dose of basal insulin} \\
(118 \text{ kg} \times 0.2 \text{ units}) = 23 \text{ units of basal insulin}
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You prescribe:

- Levemir Flexpen, 23 units at 10 pm each night.
- 31 gauge, 5/16” pen needles (UF[ultra-fine], short). For patients with a normal BMI prescribe 31 gauge, 3/16” pen needles (UF, mini).

The patient can state:

- take the 23 units of Levemir insulin each evening at 10pm, even if BG is in range at bedtime or not eating.
- to titrate her Levemir by 1 unit every night until her fasting glucose levels are below 110mg/dl.
Follow the Instructions, “Prescription and Education for Every Patient Starting Insulin”

B. A 62 year old man with a 4 year history of DM has a random glucose in the office of 480 mg/dl. You last saw the patient 2 years ago. He now presents after a hospitalization for a diabetic foot ulcer. He was discharged on metformin and glipizide and PreMix Fast acting Novolog 70/30 15 units twice a day that he takes sporadically. His intermittent access to food puts him at risk for hypoglycemia when he does take the prescribed medication. For ease and safety you and the patient decide he should receive a single dose of long acting insulin. The glargine (Lantus) or detemir Levemir) dose should be 80% of the patient’s NPH dose. (70% x 30 units per day of 70/30 insulin) x 80% = 17 units. You start the patient on an AM dose of 17 units of glargine (Lantus).

Concerned that the patient may have barriers to adhering with glucose checks, while reviewing optimal SMBG, you ask him to attempt to check his glucose two times per day alternating between pre-breakfast and pre-dinner one day, with SMBG checks pre-lunch and pre-bedtime on alternate days. The same concept of monitoring at different times of the day can be used to evaluate post meal glucose levels or if the patient is checking the BG only once per day. He is given an insulin pen which will last one month without refrigeration. The patient is scheduled for a follow up appointment in two weeks due to his barriers and complicated DM and asked to call with any questions or consistently low or high blood sugars. You plan to check a random glucose check at these visits and if needed provide his sample of insulin.

You prescribe:

- Lantus Solostar insulin pen
- 31 gauge, 5/16” pen needles (UF [ultra-fine], short). For patients with a normal BMI prescribe 31 gauge, 3/16” pen needles (UF, mini).
The patient can state:
- take 17 units of Lantus (glargine) insulin at the same time each morning
- to titrate his Lantus by 1 unit every morning until his dinner or evening glucose levels are below 110mg/dl.

Follow the “Instructions, Prescription and Education for Every Patient Starting Insulin”.

3. A 48 y/o woman has a history of increasing glucose levels over the past eight months. Her A1c is 11.2% on a combination of glyburide, metformin and pioglitazone. She attempts to follow a meal plan with her three meals each day. Because her A1c is greater than 10% you recognize the need for both basal and mealtime insulin.

You prescribe:
- PreMix Novolog 70/30 insulin vials 10 units before breakfast and dinner
- ½ cc, 31 gauge 5/16” (1/2cc, UF, short) insulin syringes.

She can state:
- to increase her PreMix Novolog 70/30 insulin by 1 unit at breakfast and dinner each day until either fasting or pre-dinner glucose is less than 110 mg/dl.
- SMBG before breakfast and dinner and 2 hours after eating (to assess affect on meal/blood glucose) while titrating insulin

Follow the “Instructions, Prescription and Education for Every Patient Starting Insulin”.