Banner Good Samaritan
Medical Center

PHYSICIANS DOSING GUIDELINES FOR SUBCUTANEOUS INSULIN:

Note-Use "Subcutaneous Insulin Order Set: Basic" OR "Subcutaneous Insulin Order Set: Tube Feeds"
(Find Intranet Dosing Tool and on-line copies of order sets at Home page→"Departments"→"Pharmacy")

1. **TARGET:** Hyperglycemia increases risk for mortality, infection, overall morbidity and length of stay.
   - For most patients on the medical/surgical floors, fasting blood sugars of **90-130 mg/dL** and less than **180 mg/dl** at all times are the goal.
   - If a patient has hypoglycemic risk factors (renal failure, end stage liver disease, hyperbaric therapy, recent hypoglycemia, tapering steroid doses, etc), then goal fasting glucose values should be **90-150 mg/dl**.
   - Post op cardio-thoracic surgery goals are **80-110 mg/dL** fasting and less than 180 at all times.

2. **Estimating Insulin Doses:** Calculate the estimated total daily dose (TDD) of insulin based on ONE of the following methods **(in order of preference).**
   1. Transferring from insulin gtt. Use average hourly rate over the last 6 hours (assuming that the dose has not been adjusted in the last 3 hours), multiply by 20 to get the TDD→ some newly hyperglycemic patients on very low dose gtts (< 1 unit per hour) may not require scheduled subcutaneous insulin.
   2. Use total insulin required at home (all types added together): For example, a patient on 70/30 40 units in the morning and 20 units at dinner would have a TDD of 60 units
   3. Calculate/ estimate insulin requirement as follows based on body size:
      - Dialysis (regardless of BMI) use 0.3 units/kg/day,
      - Lean (BMI < 25), new steroid induced hyperglycemia or new diagnosis of DM: use 0.4 units/kg/day
      - Overweight (BMI 25-30) use 0.5 units/kg/day,
      - Obese (BMI > 30) or high dose steroids use 0.6 units/kg/day
   - In known type 2 diabetics whose outpatient blood sugars were controlled with diet alone, or stress/steroid induced hyperglycemia supplemental scale may be sufficient to control blood sugars in the hospital.

3. **For the first day**,
   - If it is prior to noon, consider giving ½ of the usual HS dose of glargine X 1 then usual hs dose OR give a dose of NPH X 1 and then the usual HS dose of long acting insulin.
   - If it is after noon, consider giving the hs dose of glargine early.
   - If you are stopping an insulin gtt, give glargine (lantus) or NPH 2-4 h prior to turning gtt off.

4. **Special Situations**
   1. **ICU patients:**
      - An iv insulin drip is preferred and should be used for almost all ICU patients this provides the safest and most effective control
      - Subcutaneous basal/bolus per protocol may be appropriate as extubated patients, off pressors, transition out of the ICU.
      - Some patients on very low doses of insulin infusions (less than 1 unit per hour), will not need basal insulin after they leave the ICU. Also, if they are on very high requirements (5-8 units/hour) then there may be infusion delivery failure.
      - Be sure to give basal insulin at least 2 hours before the insulin drip is turned off
      - See the dosing algorithm for transition doses
   2. **CV Surgery:**
      - Almost all patients will be on IV insulin in the ICU. Use the guides in "Transitioning to home" and "ICU patients" to help determine how to adjust insulin as they transition out of the ICU and to home.
      - IV insulin is preferred so as long as they are in the SICU, they generally should not be transitioned to subcutaneous insulin until their transfer to tele is ready.
      - Pressors should be off and blood glucose values should be stable in the preceding 3 hours before IV insulin is transitioned to subcutaneous.
   3. **Type 1 diabetics**
      - Require at least some scheduled insulin at **all times** to prevent ketosis, even when NPO—They will need dextrose containing IVF to prevent hypoglycemia.
      - Many times, you can use the regimen the patient has at home including basal and meal insulin, often with carbohydrate counting to account for the variable oral intake in the hospital.
      - Sliding scale insulin as the only coverage should not be used.
      - If they are on an insulin pump, keep the pump, call the diabetic educator and complete the insulin pump protocol on the intranet under "Policies and Procedures".

4. **Corticosteroids** affect carbohydrate metabolism and characteristically leads to more exaggerated postprandial hyperglycemia. These are often challenging patients, if you are not gaining control in 2-3 days, consider an endocrinology consult.
    - Consider changing the ratio from 50% of TDD Basal/50% TDD bolus (meal) to 30% basal and 70% with meals OR keep the same basal insulin dose and increase the meal insulin.
    - If on once daily oral steroids then consider using NPH as the basal insulin and dosing it around the steroid dose. The dose of NPH given around the oral steroid dose will be larger.
5. **TPN:** Regular insulin added to the TPN bag, with a correction dose scale for glucose values out of the target range is the preferred method of control.
    - Once the total daily dose of insulin required is known (by use of the supplemental scale on the initial days, or prior requirements) 70-80% of the insulin used in the previous 24 hours can be added to the TPN (as regular insulin), with additional regular insulin given to correct for any values out of range.
    - In the event of interrupted TPN, adjustment is easy when the regular insulin is in the TPN bag, whereas it could be problematic if a subcutaneous regimen is used.
    - These orders should be written directly on the TPN orders and can be discussed with the nutritionist.
6. **Cystic Fibrosis and DM from chronic pancreatitis:** Due to nutritional needs, they should be on a REGULAR diet with supplementation. Because of the higher caloric intake, carbohydrate counting and correction factor calculation are the most physiologic, many patients will not need basal insulin.
7. **Continuous or bolus Tube Feeds: Use the "Subcutaneous insulin order set**: **tube feeds"** to assure standing orders for interruptions in feeding that predispose patients to hypoglycemia..
8. **Exclusive Nocturnal Tube Feeds**: This is a rare situation that is not built into our order set. It is best to keep the current daytime regimen and add a written order for the additional dose of NPH at the start of tube feeds, blood sugars q 4 hours during tube feeds and an order to notify MD if tube feeds are interrupted. The dose of NPH can be determined by monitoring blood sugars every 4 hours for the first few nights with supplemental scale coverage.

5. **Daily Dose Adjustments: The TDD is the total amount of insulin they received in the preceding 24 hours (scheduled PLUS correction).**
    - If some glucoses were < 80 mg/dl use 80% of yesterday's total insulin given as new total
    - If some glucoses were > 180 mg/dl and none < 80 mg/dl use 110 % of yesterday's total as new total and then re-divide as 50% basal and 50% bolus.
    - Other considerations: You may only adjust specific parts of your dosing based on highs or lows.
        1. Review the supplemental scale, patients may need to have this adjusted if they overcorrected following a supplemental dose
        2. Review the blood sugars that were high. If dinner blood sugar is high, increase meal insulin given at lunch. If bedtime is high, increase meal insulin given at dinner, etc.

6. **Transitioning to home:** There are currently no ADA diagnostic thresholds using HbA1C. The diagnosis of diabetes will have to be established (in general, each oral agent can decrease the A1C by 1-2%).
    - HbA1C<5.2 Not diabetic, taper insulin by about 20% per day to off as condition improves
    - HbA1C 5.2-6: May ultimately be diagnosed with diabetes, should have an outpatient OGTT
    - HbA1C 6-7: Continue home regimen if no significant hypoglycemia or new contraindications.
    - HbA1C 7-8: Increase dose of home oral agents, add a third agent, or add basal insulin at bedtime. If they were not previously diagnosed with DM, they need close follow up.
    - HbA1C >8: If already on 2 oral agents at home then add once a day basal insulin at bedtime (see instructions below for starting doses). If adding insulin to TZDs, only pioglitazone is FDA approved and so they will need to be switched to this particular agent.
    - If patients are going to be discharged on insulin alone, there are multiple acceptable regimens. The specific one depends on their resources, knowledge and frequency of injections.
    - If patients are going to be discharged on basal insulin in addition to oral agents,
        - Discontinue mealtime bolus insulin but continue the same dose of basal insulin and correction factor.
        - Once discharged, the long acting insulin dose can be safely increased in patients with creatinine < 2 mg/dl every 3 days by 2 units if the fasting blood sugar is still >100 mg/dL.
    - If patients will be discharged on oral agents only, discontinue the basal insulin 12-24 hours prior to restarting the oral diabetic medications and discontinue the scheduled nutritional insulin at the same time pills are started.

References:

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ADA Technical Review: Clement S, Braithwaite SS, Magee MF et al; American Diabetes Association Diabetes in Hospitals Writing Committee. Management of diabetes and hyperglycemia in hospitals. Diabetes Care. 2004;27:553-91.
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