



Inpatient Glucose Management Pocket Guide

Insulin Start Recommendations for Core Diabetes Application (CDA) SubQ Insulin

Determining Insulin Sensitivity Factor (ISF) and Insulin to Carbohydrate Ratio

- From CDA IV to SubQ Advance Decision Support Tool button located in the top right corner of the application: ISF and Carbohydrate Ratio recommendations based on history of IV insulin use.
- Patient already on insulin at home?
 - $ISF = 1800 / \text{Total Daily Dose (TDD)}$
 - $\text{Carbohydrate Ratio} = ISF / 3$
- Insulin naïve patients
 - Use weight-based default settings in the order selections:
($< 68 \text{ kg}$: ISF 60, Carb Ratio 15; $\geq 68 \text{ kg}$: ISF 30, Carb Ratio 10)

Determining Long-acting (Basal) Insulin Dose

- From CDA IV to SubQ Advanced Decision Support Tool button:
A 6-Hr summary of IV insulin administration will display and provide (TDD) equivalent. Basal insulin dosing recommendations based on history of IV insulin use.
 - Basal insulin dose
 - Eating patient: 40 % to 50 % of TDD
 - TPN or TF: 70 % to 80 % of TDD
 - * Stop IV Insulin Infusion 2 hours after subcutaneous basal insulin dose is given
 - Patient already on insulin
 - Use TDD from home for above calculation
 - Critically Ill
 - Consider NPH ordered every 6-8 hours until patient becomes more stable.
 - Insulin naïve patients
 - Use weight-based calculations: divide body weight in kilograms by 4.5

Consider for Special Populations:

The default weight-based settings for ISF and Carb Ratio are conservative but may still be too much for patients using very small doses of insulin and for populations such as:

1. **Type 1 Diabetes** — insulin sensitive but can NEVER go without insulin.
2. **Cystic Fibrosis** — similar to Type 1, high caloric needs necessitate accurate Carb Ratio.
3. **Renal Failure** — insulin keeps circulating and not cleared from system. Discontinue oral agents.
4. **Critically Ill** – cautiously evaluate for the insulin naïve patient.

Consider CDA IV Insulin Use for:

1. NPO/Surgery
2. Critically ill, dynamic patients with glucoses $>250 \text{ mg/dL}$
3. Glucose $>300 \text{ mg/dL}$

CDA SubQ is a calculator for Rapid Acting Insulin (RAI) dosing based on:

- * Current blood glucose level
- * Carbohydrate intake
- * Provider orders

Orders for ISF, Carb Ratio, and Target Settings determine RAI dose calculated. Adjust these components as needed to gain blood glucose control.

Insulin Adjustment Recommendations for the CDA SubQ Insulin

For patients who are eating:

Target the fasting glucose to adjust the basal insulin dose

Target the pre-meal (lunch and supper) and 3 hours after supper to adjust the carbohydrate ratio

For patients who are not eating:

Target all glucose levels to adjust the basal insulin dose

What is the Carbohydrate Ratio and how does it calculate the meal coverage?

Carb Ratio = How many grams of carbohydrate are covered by 1 unit of RAI

Total grams of carbohydrate eaten/Carb Ratio = RAI dose

Dose Example:

75 grams eaten, Carb Ratio of 15

$75 / 15 = 5$ units RAI carbohydrate coverage

Remember:

To give less insulin for food coverage, increase the Carb Ratio

To give more insulin for food coverage, decrease the Carb Ratio

Adjusting the Carbohydrate Ratio

Increase/decrease by 1 – 5 grams

- Carb Ratio 6 or less: adjust by 1 gram
- Carb Ratio 7 to 10: adjust by 2 – 3 grams
- Carb Ratio more than 10: adjust by 4 – 5 grams

Example:

Carb Ratio = 10

To give LESS insulin with meals, INCREASE Carb Ratio from 10 to 15

What is the Insulin Sensitivity Factor (ISF) and how does it calculate the correction coverage?

ISF = How much glucose is lowered by 1 unit of RAI

$(\text{Blood glucose} - \text{mid-point of target}) / \text{ISF} = \text{RAI correction dose}$

Example:

Target of 100 – 150 (Mid-point 125)

ISF of 30

Blood Glucose of 185

$(185 - 125) / 30 = 2$ units RAI correction

Remember:

To give LESS insulin for correction, INCREASE the ISF;

To give MORE insulin for correction, DECREASE the ISF

Adjusting the ISF

10 % to 50 % based on response to corrections

Example:

ISF = 30

To give MORE insulin in response to hyperglycemia, REDUCE ISF from 30 to 24

Remember: It is more important to adjust the basal and Carb Ratio insulin than to change the ISF for blood glucose control.

Tip: Keep the ISF 3 times the Carb Ratio.

Timing the Transition from CDA IV Insulin to CDA SubQ Insulin Dosing

1. Basal insulin should be given 2 hours prior to D/C of IV insulin infusion. Initiate this order from the CDA SubQ Insulin Power Plan: "Transition patient from IV insulin to SubQ insulin. Discontinue IV insulin 2 hours after the long-acting SubQ insulin has been given."
2. Timing of basal insulin dose for home—should be based on convenient time for patient and previous home regimen of Glargine, Detemir, Degludec, NPH or 70/30 BID.
Note: Cerner may automatically set the administration time. Pay special attention to the timing of the first dose.
3. If discontinuing the CDA IV Insulin Power Plan prior to the first dose of scheduled Glargine or Detemir, give dose/doses of NPH as a bridge to Glargine/Detemir to help maintain basal insulin coverage.

Examples:

- Order written to discontinue the CDA IV Insulin at 1300, but the first Glargine/Detemir dose with CDA SubQ Insulin is to start at 2100. There is an 8-hour time lapse to cover. Consider giving 1/3 of the Glargine/Detemir dose as a one-time order of "NPH now" to bridge until Glargine/Detemir given at 2100.
- To bridge 12 hours to first scheduled Glargine/Detemir dose, give 2 doses of NPH, each 25% of the Glargine/Detemir dose, as a "now dose" and again in 6 hours.

Additional Hospital Management Needs:

It is recommended to order a carbohydrate-modified diet for patients who are eating well to assist in determining appropriate meal coverage dose at discharge as well as providing reinforcement to the patient for diabetes dietary self-care guidelines.

In general, most women require 45-60 grams carbohydrate/meal, while most men require 60-75 grams carbohydrate/meal. There is a calorie range next to the Carbohydrate restricted diet order in Cerner. Total calories can vary depending on protein and fat intake at meals.

When deciding on which carb/meal diet to order, choose the higher calorie amount if your patient has increased metabolic stressors. For example: renal replacement therapy, infection, sepsis, trauma, postoperative, wounds, malnutrition, cancer, etc.

- 45 grams of carbohydrate/meal is approximately 1,000 – 1,200 calories/day.
- 60 grams of carbohydrate/meal is approximately 1,300 – 1,600 calories/day.
- 75 grams of carbohydrate/meal is approximately 1,700 – 2,200 calories/day.
- 90 grams of carbohydrate/meal is approximately 2,300 – 2,600 calories/day.

Carb Ratio insulin coverage is an advanced skill. It is **not** recommended to discharge patients on carbohydrate ratio insulin calculations for meal coverage unless this is already a known skill.

Education Needs:

Newly diagnosed diabetes, addition of insulin, or any deficit in diabetes self-management **should be determined as early in the admission as possible** and orders for diabetes education should be implemented.

Transitioning CDA Insulin orders to Home Regimen Insulin Orders:

Discharge Planning and Transition to Home

Here are some suggestions that can be used for guidelines. You will need to use your knowledge about the patient's home regimen, A1C level, and their insulin requirements during their hospital stay to order safe and adequate doses for home.

For ISF of 30 or greater:

Example:

ISF is 30

Carbohydrate Ratio is 10

Diet order of 4 carb choices (60 grams per meal)

Discharge Insulin Orders:

Consistent Base dose of insulin:

- Breakfast 6 units
- Lunch 6 units
- Dinner 6 units

Use for ISF 30 or greater:

Correction insulin for pre-meal glucoses (convert the ISF to a sliding scale):

For a Blood Sugar of:

- 70 or less, treat the hypoglycemia; subtract 2 units from the base meal dose (this may vary according to your patient)
- 71 – 99, subtract 1 unit from the base meal dose of insulin
- 100 – 150, take base dose of insulin
- 151 – 200, add 1 unit to base meal dose of insulin
- 201 – 250, add 2 units to base meal dose of insulin
- 251 – 300, add 3 units to base meal dose of insulin
- 301 – 350, add 4 units to base meal dose of insulin

If they eat all of their food, the insulin dose will be 6 units per meal. Assess the insulin recorded and see what the food coverage has been. This can be done by looking at the MAR, or Core Diabetes Application Flow sheet. You can give written suggestions to the patient such as:

If you eat all 4 carb choices, take all 6 units of your insulin.

If you only eat 2 carb choices (50 percent), take 3 units or half of the insulin.

Use for ISF of less than 30:

Correction insulin for pre-meal glucose (Convert the ISF to a sliding scale):

For a Blood Sugar of:

- 70 or less, treat the hypoglycemia, subtract 4 units from the base meal dose (this may vary according to your patient)
- 71 – 99, subtract 2 units from the base meal dose of insulin
- 100 – 150, take base dose of insulin
- 151 – 200, add 2 units to base meal dose of insulin
- 201 – 250, add 4 units to base meal dose of insulin
- 251 – 300, add 6 units to base meal dose of insulin
- 301 – 350, add 8 units to your base meal dose of insulin

A good rule of thumb is to divide the basal insulin by 3 and then use that number to order meal coverage insulin as the usual insulin requirements would be a 50/50 split between basal and bolus coverage needs. For example, if the basal need

of your patient is 30 units, send home on 30 units of basal insulin and 10 units for meal coverage.

Insulin Orders: Discharge Planning and Transition to Home

As the patient improves and the illness resolves, it may be perfectly reasonable to discharge the patient on their home regimen of oral agents or insulin if the A1C is < 8%.

If the patient wishes to go back to a previous pre-mixed insulin regimen (70/30) use the TDD of Glargine and Lispro in the hospital just as you used the home TDD to order Glargine, ISF, and Carb Ratio settings for the CDA SubQ Power Plan on admission. Divide the hospital TDD into a regimen of 2/3 before breakfast and 1/3 before supper.

Example:

30 Glargine and 10 Lispro at meals would equal TDD of 60 units

2/3 = 40 units 70/30 mix at breakfast

1/3 = 20 units 70/30 mix at supper

If the patient is to be discharged on twice daily Regular or RAI (aspart (NovoLOG)/Lispro (HumaLOG)/glulisine (Apidra) and NPH before breakfast and supper, divide each dose into 1/3 Regular or RAI, and 2/3 NPH.

Example:

2/3 TDD of 60 units = 13 RAI or Regular and 27 NPH before breakfast

1/3 TDD of 60 units = 7 RAI or Regular and 13 NPH before supper

Transition of Care Needs:

Inpatient A1C value will help to determine pre-hospital blood glucose control. Using the A1C and previous home regimen information along with insulin requirements while in the hospital will help determine appropriate discharge diabetes medication, education and follow-up needs.

Good Control is Important:

The higher the A1C is and the longer it stays high, the greater the risk for infection/complications.

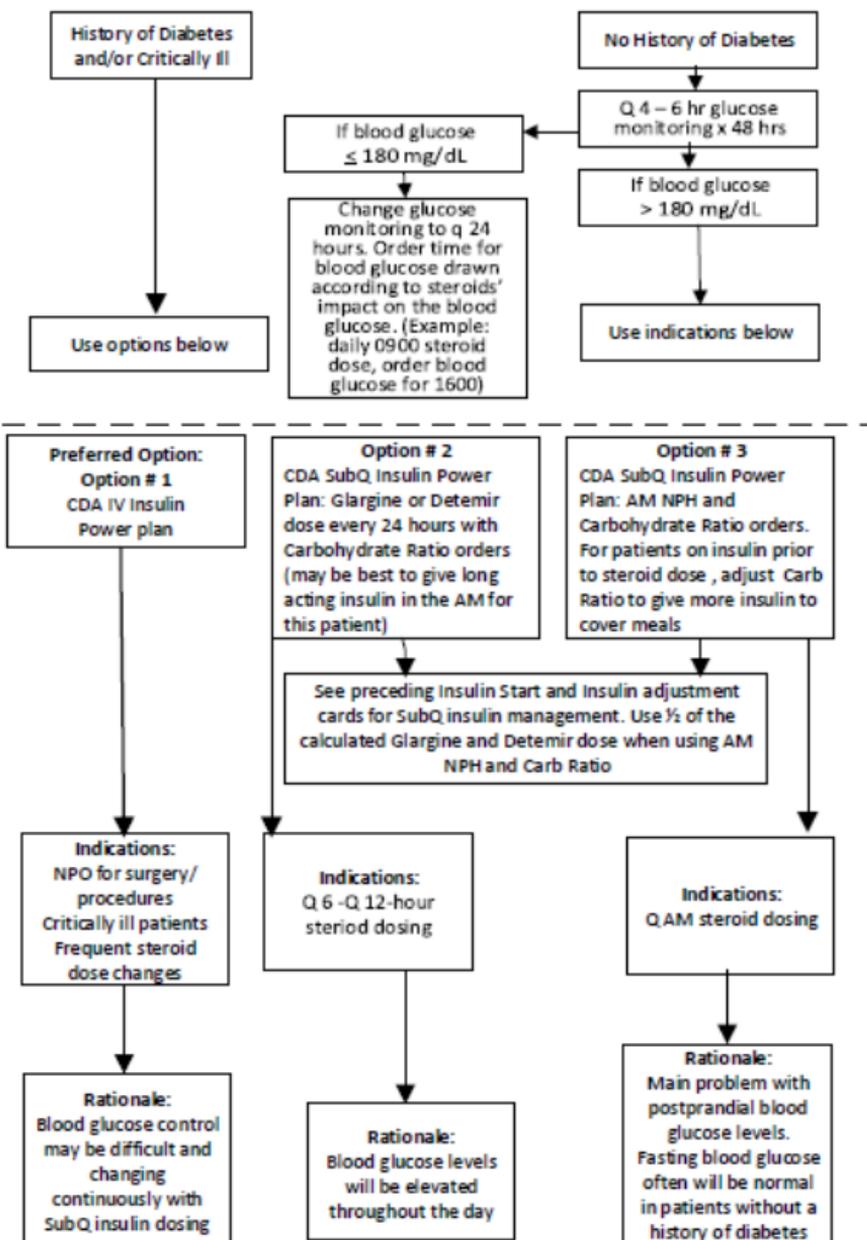
A1C of 5.7% to 6.4% diagnoses Pre-diabetes and identifies those at increased risk to develop diabetes.

A1C of 6.5% or greater indicates the presence of diabetes.

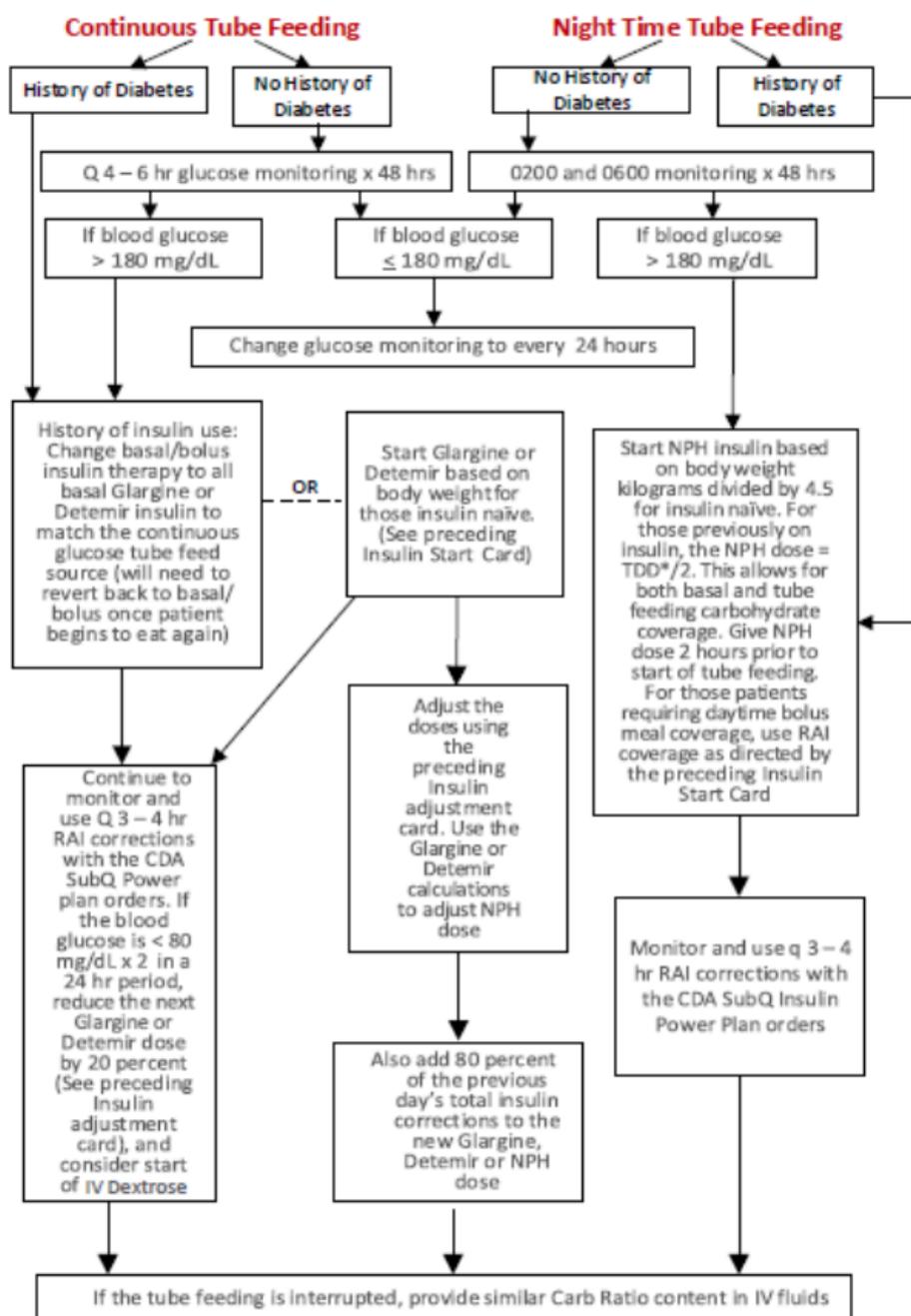
How estimated blood glucose levels relate to A1C:

6% – 126	9% – 212	12% – 298
7% – 154	10% – 240	13% – 326
8% – 183	11% – 269	14% – 355

Controlling Glucose During Steroid Therapy

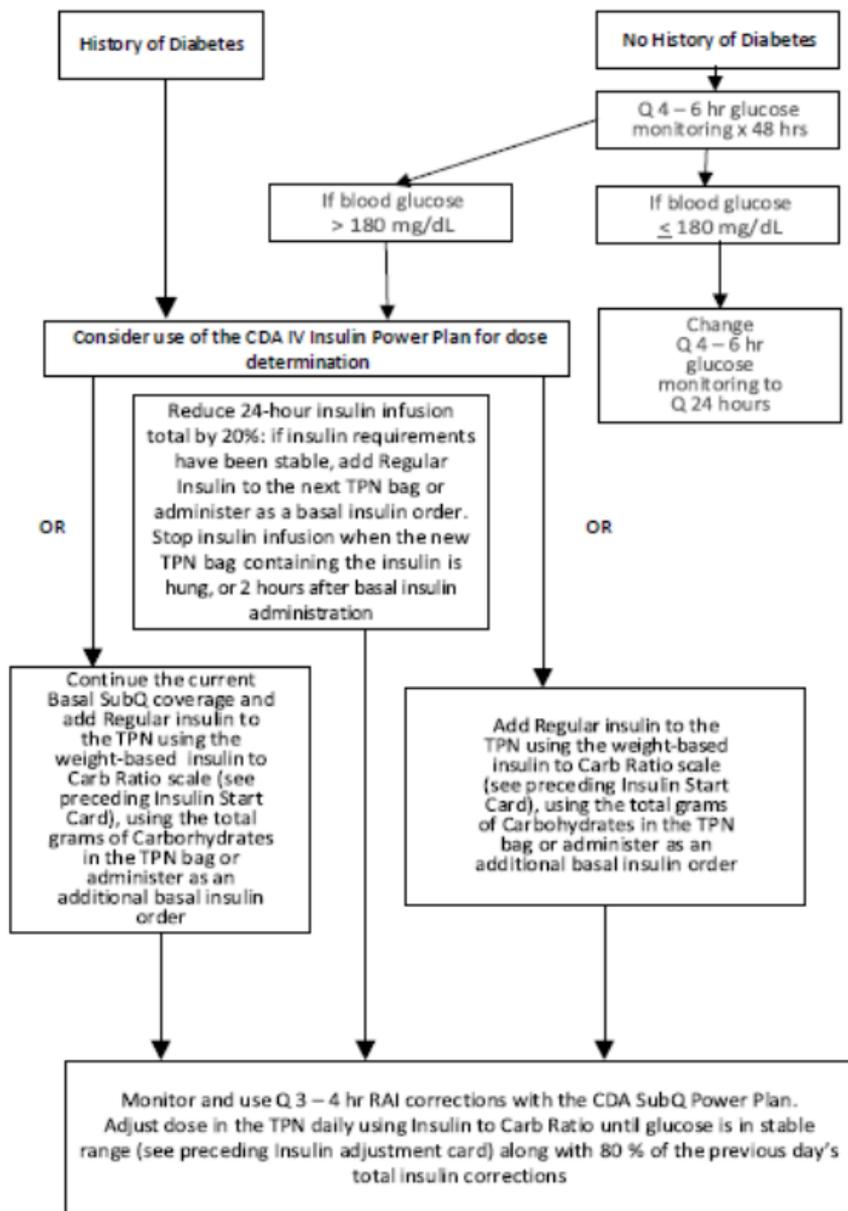


RAI = rapid acting insulin: lispro (HumaLOG)
 Glargine = Lantus
 Detemir = Levemir



TDD = Total Daily Dose
 RAI = Rapid Acting Insulin: lispro (HumaLOG)
 Glargine = Lantus
 Detemir = Levemir

Total Parental Nutrition (TPN)



1 Gram Dextrose in TPN = 1 Gram carbohydrate
RAI = Rapid Acting Insulin: Ispiro (Humalog)



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