

Yale New Haven Health  
Department of Pharmacy

Insulin Infusion Protocol for Adult COVID-19 Patients (Nurse-Driven; Every 2hr BG checks)

YNHHS

Original Date Approved / Date Effective: 04/2020

Date Reviewed / Revised:

Approved by: FIC Endocrine Subcommittee, Formulary Integration Committee (FIC)

**Purpose:**

Management of adult patients with or suspected to have COVID-19 infection and significant hyperglycemia that is not responding to appropriate subcutaneous (SC) insulin dosing. Patients with a blood glucose (BG) >500 mg/dL should be reviewed with the provider since a higher initial insulin dose and additional monitoring / therapy may be required.

**Exclusion Criteria:**

Patients with diabetic ketoacidosis (DKA) [refer to the [Adult Patient DKA Guidelines](#)] or hyperosmolar hyperglycemic state (HHS).

**Patient Selection:**

1. **Critical Care Units:** While this protocol may be considered whenever two BG values are  $\geq 200$  mg/dL, it should be specifically used when the BG is persistently >250-300 mg/dL and not decreasing adequately despite attempts at aggressive titration of SC insulin, non-dextrose-containing IV fluids and temporary calorie restriction over 6-12 h.
2. **Non-Critical Care Units:** Consider in hospitalized patients outside of a critical care unit with severe hyperglycemia (>300 to 350 mg/dL) not decreasing adequately despite attempts at SC insulin with aggressive titrations over at least 24-48 hrs. **Should be used ONLY if proper nursing supervision is available.** (Use in these units not applicable to BH, GH, LMH and WH.)

**Procedure:**

1. This nurse-driven protocol is initiated with a provider order and insulin infusion supplied from pharmacy (1 unit Regular Human Insulin / 1 mL 0.9% NaCl)
2. Priming: Before connecting, flush the insulin infusion solution through the primary IV tubing (approximately 20 mL) and administer via infusion pump.
3. Confirm additional intravenous access for other IV fluid and/or medication administration.
4. **Target BG range: 150 – 199 mg/dL**
5. If enteral / parenteral nutrition is stopped abruptly, REDUCE the insulin infusion rate by 50%. Be mindful of significant changes in dextrose containing fluid infusion rates.
6. Patients on insulin infusion are typically kept NPO. If eating, SC insulin lispro with or immediately after meals to “cover” the meal (1 unit insulin lispro/15 grams of carbohydrates consumed with usual dose of 3 to 6 units) should be considered with order obtained from provider. If meal consumption is uncertain, dose may be given after the meal and adjusted proportionate to the percentage of the carbohydrate portion of the tray consumed (i.e.  $\frac{1}{2}$  insulin dose if  $\frac{1}{2}$  of tray eaten).
7. Notify provider if infusion is discontinued without appropriate scheduled SC insulin ordered for patients with Type 1 diabetes mellitus, insulin requiring patients with type 2 diabetes, and those requiring greater than 1 unit per hour. These patients should be transitioned to scheduled (Basal-Bolus-Correction or Basal-Correction) SC insulin. Refer to the [ADULT Transition from Intravenous Insulin Infusion to Subcutaneous Insulin Guidelines](#).
8. Recommend checking serum potassium every 8 hours (critical care) or 12 hours (non-critical care) while on insulin infusion, especially during first 24 to 48 hours. Check more frequently if serum K+ less than 3.5 mmol/L.

**Bolus and Initial Infusion Rate:** Divide current BG by 100 then round to the nearest 0.5 units for **the bolus dose and the initial infusion rate**. Max initial bolus dose 10 units.

Example: Pre-protocol BG is 425 mg/dL  $\rightarrow 425/100 = 4.25$ , round to nearest 0.5 = 4.5 units for bolus and 4.5 units/hr for initial infusion rate

Example: Pre-protocol BG is 374 mg/dL  $\rightarrow 374/100 = 3.74$ , round to nearest 0.5 = 3.5 units for bolus and 3.5 units/hr for initial infusion rate

**Blood Glucose (BG) Monitoring:**

1. **Check BG every 2 hours while on infusion / protocol**
2. Once BG is stable (defined as 3 consecutive values in target range), may reduce checks to every 3 hours
3. If BG is stable for 12 to 24 hours, may reduce checks to every 4 hours
4. Resume BG checks every 2 hours again if any of following occurs:
  - a. BG out of target range
  - b. Any change in insulin infusion rate
  - c. Any significant change in clinical condition
  - d. Initiation / Discontinuation of steroids, vasopressors, parenteral nutrition, tube feeds, dialysis, CVVH or CAVH
5. In patients who are vasoconstricted/hypotensive, capillary BG (i.e. fingerstick) may be inaccurate and venous or arterial blood sampling for blood glucose checks are required in this setting. Refer to policy [Glucose Point of Care Testing for Patients in Critical Care Areas with Compromised Capillary Circulation](#).

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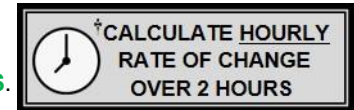
### Adjusting Infusion Rate (for the YNHHS COVID-19 Nurse-Driven Insulin Infusion Protocol):

- If BG less than 50 mg/dL: HOLD INSULIN INFUSION** and administer 25 g D50 IV Push; recheck BG every 15 minutes until BG greater than or equal to 100 mg/dL.  
 ↑ Then, recheck BG in 1 hour and then every 2 hours; when greater than or equal to 175 mg/dL, restart infusion at **30%** of most recent rate (rounded **down** to nearest 0.5 unit/hr)
- If BG 50 – 74 mg/dL: HOLD INSULIN INFUSION** and administer 12.5 g D50 IV Push; recheck BG every 15 minutes until greater than or equal to 100 mg/dL.  
 ↑ Then, recheck BG in 1 hour and then every 2 hours; when greater than or equal to 175 mg/dL, restart infusion at **40%** of most recent rate (rounded **down** to nearest 0.5 unit/hr)
- If BG 75 – 99 mg/dL: HOLD INSULIN INFUSION** and recheck BG every 15 minutes until BG reaches or remains greater than or equal to 100 mg/dL.  
 ↑ Then, recheck BG in 1 hour and then every 2 hours; when greater than or equal to 175 mg/dL, restart infusion at **50%** of most recent rate (rounded **down** to nearest 0.5 unit/hr)

**If BG greater than or equal to 100 mg/dL:**

**Step 1:** Determine the **CURRENT BG** level – Identify a COLUMN in the table below

**Step 2:** Determine the **HOURLY RATE OF CHANGE**† from the prior BG level – Identify a **CELL** in the table. Then move right for **INSTRUCTIONS**.



**NOTE:** If the last BG was measured 2 or more hours before the current BG, calculate the **hourly** rate of change.

Example: BG at 2pm was 150 mg/dL and next BG at 4pm is 120 mg/dL. The total BG change over 2 hours is ↓ 30 mg/dL, however, the hourly change is ↓ 15 mg/dL/hour

BG 100-149mg/dL	BG 150-199 mg/dL	BG 200-249 mg/dL	BG ≥ 250 mg/dL	INSTRUCTIONS*
		BG ↑ by greater than 50 mg/dL/hr	BG ↑	↑ Infusion by “2Δ”
	BG ↑ by greater than 25 mg/dL/hr	BG ↑ by 1 – 50 mg/dL/hr OR BG Unchanged	BG unchanged OR BG ↓ by 1 – 25 mg/dL/hr	↑ Infusion by “Δ”
BG ↑	BG ↑ by 1 – 25 mg/dL/hr OR BG unchanged	BG ↓ by 1 – 25 mg/dL/hr	BG ↓ by 26-50 mg/dL/hr	<b>NO Infusion Change</b>
BG unchanged OR BG ↓ by 1 – 25 mg/dL/hr	BG ↓ by 1 - 25 mg/dL/hr	BG ↓ by 26-50 mg/dL/hr	BG ↓ by 51-75 mg/dL/hr	↓ Infusion by “Δ”
BG ↓ by greater than 25 mg/dL/hr See Instructions Below††	BG ↓ by greater than 25 mg/dL/hr	BG ↓ by greater than 50 mg/dL/hr	BG ↓ by greater than 75 mg/dL/hr	<b>HOLD infusion x 30 min and then ↓ Infusion by “2Δ”</b>

††**HOLD INSULIN INFUSION.**  
 Check BG in 15 min to be sure BG remains above 100 mg/dL. Then, recheck BG every 2 hours; when ≥ 175 mg/dL, restart infusion at 50% of most recent rate, rounded down to the nearest 0.5 unit/hr.

**Step 3:** Changes in Infusion Rate\* (“Δ”) are determined by the current infusion rate:

Current Rate (Units/Hr)	Δ = Rate Change (Units/Hr)	2 Δ = 2x Rate Change (Units/Hr)
< 3	0.5	1
3 – 6	1	2
6.5 – 9.5	1.5	3
10 – 14.5	2	4
15 – 19.5	3	6
≥ 20	4	8

**Non-Critical Care Units:** Infusion rates typically range between 2 – 8 units/hour. Doses greater than 10 units/hour are unusual and if required, the covering provider must be notified to explore other potential contributing factors (i.e. technical problems with the IV infusion or dilution errors). Transfer to a higher level of care should also be considered.

**Critical Care Units:** Infusion rates typically range between 2 – 12 units/hour. Doses greater than 20 units/hour are unusual and if required, the responsible provider should be notified to explore other potential contributing factors (including technical problems with the IV infusion or dilution errors).