YALE INSULIN INFUSION PROTOCOL

The following insulin infusion protocol is intended for use in hyperglycemic adult patients in an ICU setting, but is not specifically tailored for those individuals with diabetic emergencies, such as diabetic ketoacidosis (DKA) or hyperglycemic hyperosmolar states (HHS). When these diagnoses are being considered, or if BG≥ 500 mg/dL, an MD should be consulted for specific orders. Also, please notify an MD if the response to the insulin infusion is unusual or unexpected, or if any situation arises that is not adequately addressed by these guidelines.

Initiating an Insulin Infusion

1.) INSULIN INFUSION: Mix 1 U Regular Human Insulin per 1 cc 0.9 % NaCl. Administer via infusion pump (in increments of 0.5 U/hr).
2.) PRIMING: Flush 50 cc of infusion through all IV tubing before infusion begins (to saturate the insulin binding sites in the tubing).
3.) TARGET BLOOD GLUCOSE (BG) LEVELS: **100-139 mg/dL**
4.) BOLUS & INITIAL INSULIN INFUSION RATE: Divide initial BG level by 100, then round to nearest 0.5 U for bolus AND initial infusion rate.
Examples: 1.) Initial BG = 325 mg/dL: 325 ÷ 100 = 3.25, round ↑ to 3.5: IV bolus 3.5 U + start infusion @ 3.5 U/hr.
2.) Initial BG = 174 mg/dL: 174 ÷ 100 = 1.74, round ↓ to 1.5: IV bolus 1.5 U + start infusion @ 1.5 U/hr.

Blood Glucose (BG) Monitoring

1.) Check BG hourly until stable (3 consecutive values within target range). In hypotensive patients, capillary blood glucose (i.e., fingersticks) may be inaccurate and obtaining the blood sample from an indwelling vascular catheter is acceptable.
2.) Then check BG q 2 hours; once stable x 12-24 hours. BG checks can then be spaced to q 4 hours IF:
a.) no significant change in clinical condition AND b.) no significant change in nutritional intake.
3.) If any of the following occur, consider the temporary resumption of hourly BG monitoring, until BG is again stable (2-3 consecutive BG values within target range):
a.) any change in insulin infusion rate (i.e., BG out of target range)
b.) significant changes in clinical condition
c.) initiation or cessation of pressor or steroid therapy
d.) initiation or cessation of renal replacement therapy (hemodialysis, CVVH, etc.)
e.) initiation, cessation, or rate change of nutritional support (TPN, PPN, tube feedings, etc.)

Changing the Insulin Infusion Rate

If BG < 50 mg/dL:
D/C INSULIN INFUSION Give 1 amp (25 g) D50 IV; recheck BG q 15 minutes.
⇒ When BG ≥ 100 mg/dL, wait 1 hour, then restart insulin infusion at 50% of original rate.

If BG 50-74 mg/dL:
D/C INSULIN INFUSION If symptomatic (or unable to assess), give 1 amp (25 g) D50 IV; recheck BG q 15 minutes.
If asymptomatic, give 1/2 Amp (12.5 g) D50 IV or 8 ounces juice; recheck BG q 15-30 minutes.
⇒ When BG ≥ 100 mg/dL, wait 1 hour, then restart infusion at 75% of original rate.

If BG ≥ 75 mg/dL:
STEP 1: Determine the CURRENT BG LEVEL - identifies a COLUMN in the table:

BG 75-99 mg/dL	BG 100-139 mg/dL	BG 140-199 mg/dL	BG ≥ 200 mg/dL

STEP 2: Determine the RATE OF CHANGE from the prior BG level - identifies a CELL in the table - Then move right for **INSTRUCTIONS:**
[Note: If the last BG was measured 2-4 hrs before the current BG, calculate the hourly rate of change. Example: If the BG at 2PM was 150 mg/dL and the BG at 4PM is now 120 mg/dL, the total change over 2 hours is -30 mg/dL; however, the hourly change is –30 mg/dL ÷ 2 hours = -15 mg/dL/hr.]

BG 75-99 mg/dL	BG 100-139 mg/dL	BG 140-199 mg/dL	BG ≥ 200 mg/dL	INSTRUCTIONS*
		BG ↑ by > 50 mg/dL/hr	BG ↑	↑ INFUSION by "2Δ"
	BG ↑ by > 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, BG UNCHANGED, *OR* BG ↓ by 1-25 mg/dL/hr	BG ↓ by 1-50 mg/dL/hr	BG ↓ by 26-75 mg/dL/hr	NO INFUSION CHANGE
BG UNCHANGED *OR* BG ↓ by 1-25 mg/dL/hr	BG ↓ by 26-50 mg/dL/hr	BG ↓ by 51-75 mg/dL/hr	BG ↓ by 76-100 mg/dL/hr	↓ INFUSION by "Δ"
BG ↓ by > 25 mg/dL/hr *see below*†	BG ↓ by > 50 mg/dL/hr	BG ↓ by > 75 mg/dL/hr	BG ↓ by > 100 mg/dL/hr	HOLD x 30 min, then ↓ INFUSION by "2Δ"

†D/C INSULIN INFUSION; √BG q 30 min; when BG ≥ 100 mg/dL, restart infusion @75% of most recent rate.

***CHANGES IN INFUSION RATE** ("Δ") are determined by the current rate:

Current Rate (U/hr)	Δ = Rate Change (U/hr)	2Δ = 2X Rate Change (U/hr)
< 3.0	0.5	1
3.0 - 6.0	1	2
6.5 - 9.5	1.5	3
10 - 14.5	2	4
15 - 19.5	3	6
20 - 24.5	4	8
≥ 25	≥ 5	10 *(consult MD)*

Figure 1—*Yale Insulin Infusion Protocol.*