



IV INSULIN INFUSION PROTOCOL FOR CRITICALLY-ILL ADULT PATIENTS IN THE ICU SETTING

Intended for use in hyperglycemic critically-ill adult patients: Sepsis, pre- and post-surgery, high-dose steroid therapy, TPN, those requiring ventilator support, etc. **This algorithm is not intended to be used for those individuals with diabetic emergencies such as diabetic ketoacidosis or hyperglycemic hyperosmolar states.**

Goal BG = 80–140 mg/dL (Generally ~110 mg/dL)

GENERAL GUIDELINES:

1. **Standard drip:** 100 units/100 mL 0.9% NaCl via an infusion device.
2. IV insulin therapy should be started when BG > established goal; insulin infusions should be discontinued when a patient is eating AND has received 1st dose of SC basal/bolus insulin (see 10. below).
3. **BOLUS & INITIAL INSULIN INFUSION RATE:** Divide initial BG level by 100, then round to nearest 0.5 units for bolus AND initial infusion rate.
 Examples: 1) Initial BG=326 mg/dL: $326 \div 100 = 3.26$, round ~ to 3.5: IV bolus 3.5 units + start infusion @ 3.5 units/h
 2) Initial BG=174 mg/dL: $174 \div 100 = 1.74$, round ~ to 1.5: IV bolus 1.5 units + start infusion @ 1.5 units/h
4. Intravenous Fluids:
 - Most patients will need 5–10 g glucose per hour
 ~ D₅W or D₅W1/2NS at 100–200 mL/h or equivalent (TPN, enteral feeds, etc.).
5. Adjusting the Infusion:
 - **Algorithm 1:** Start here for most patients.
 - **Algorithm 2:** For patients not controlled with Algorithm 1, or start here if s/p CABG, s/p solid organ transplant or islet cell transplant, receiving glucocorticoids, or patient with diabetes receiving >80 units/day of insulin as an outpatient.
 - **Algorithm 3:** For patients not controlled on Algorithm 2. **NO PATIENTS START HERE** without authorization from the endocrine service.
 - **Algorithm 4:** For patients not controlled on Algorithm 3. **NO PATIENTS START HERE** without authorization from the endocrine service.

Algorithm 1		Algorithm 2		Algorithm 3		Algorithm 4	
BG	units/h	BG	units/h	BG	units/h	BG	units/h
<60 = Hypoglycemia (See below for treatment)							
<70	Off	<70	Off	<70	Off	<70	Off
70–109	0.2	70–109	0.5	70–109	1	70–109	1.5
110–119	0.5	110–119	1	110–119	2	110–119	3
120–149	1	120–149	1.5	120–149	3	120–149	5
150–179	1.5	150–179	2	150–179	4	150–179	7
180–209	2	180–209	3	180–209	5	180–209	9
210–239	2	210–239	4	210–239	6	210–239	12
240–269	3	240–269	5	240–269	8	240–269	16
270–299	3	270–299	6	270–299	10	270–299	20
300–329	4	300–329	7	300–329	12	300–329	24
330–359	4	330–359	8	330–359	14	330–359	28
>360	6	>360	12	>360	16	>360	32



6. Moving from Algorithm to Algorithm:
- Moving Up: An algorithm failure is defined as BG outside the goal range (see above target), and the BG does not change by at least 60 mg/dL within 1 hr.
 - Moving Down: When BG is <70 mg/dL X 2.
7. Patient Monitoring:
- Once hourly venous BG <500 mg/dL, check capillary BG (i.e., fingersticks) every hr until it is within goal range for 4 hrs, then decrease to every 2 hrs for 4 hrs, and if remains stable may decrease to every 4 hrs.
 - Hourly monitoring may be indicated for critically ill patients even if they have stable BG.
 - In hypotensive patients, capillary BG may be inaccurate and obtaining the blood sample from an indwelling vascular catheter is advisable
 - 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 (dialysis).
 - e). Initiation, cessation, or rate change of nutritional support (TPN, PPN, tube feedings, etc.)
8. Treatment of Hypoglycemia (BG <60 mg/dL)
- Discontinue insulin drip AND
 - Give D₅₀W IV
 - ~ BG 40–60 mg/dL: 12.5 g (1/2 amp)
 - ~ BG <40 mg/dL 25 g (1 amp)
 - Recheck BG every 15–30 minutes and repeat D₅₀W IV as above. Restart drip once BG >80 mg/dL X 2. Restart drip with lower algorithm (see Moving Down).
9. Notify the physician:
- For patients not responding to Algorithm 1 or 2.
 - For hypoglycemia which has not resolved after administration of D₅₀W IV and discontinuing the insulin drip.
10. Transition from IV insulin to SC insulin [Wait 4 hours to DC IV after 1st long-acting insulin (basal) dose is given SC]

Calculate TDI (80% total daily infusion dose)

Begin glargine = 50% TDI
 analog/Reg = 50% TDI ÷ 3 (TID AC)

OR

Begin NPH AM = 4/9 TDI
 Reg AM = 2/9 TDI
 Reg PM = 1/9 TDI
 NPH HS = 2/9 TDI

***If NPH/Reg regimen used, overlap drip 1 hr with 1st SC Reg insulin dose; with analog therapy, drip can be discontinued < 15 minutes after SC Rapid-acting analog dose is given.**



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ABBREVIATIONS:

AC: Before meals

BG: Blood glucose

CABG: Coronary artery bypass surgery

HS: Bedtime

ICU: Intensive care unit

IV: Intravenous

PPN: Peripheral parenteral nutrition

SC: Subcutaneous

TDI: Total daily insulin in units

TID: Three times daily

TPN: Total parenteral nutrition

U: Units