

**Purpose:** To provide a safe and effective procedure for dosing, administering, and titrating of insulin infusions for uncontrolled hyperglycemia (except DKA/HHS patients)

**Policy Statement:**

**Indications for Use:**

Inclusions:  
-Uncontrolled hyperglycemia

Exclusions:  
-DKA/HHS

### **Insulin Infusion Guidelines**

**Goal Blood Glucose:** 140-180 mg/dL

#### **Recommendations to initiate infusion:**

Persistent blood glucose above goal. Encouraged for patients in the ICU.

#### **Optional Initial Bolus**

- Administer initial bolus equal to starting rate of infusion (e.g. starting rate 3 units per hour, bolus = 3 units) **REQUIRES PHYSICIAN ORDER**
- Do not administer an additional bolus if insulin infusion already started (e.g. insulin infusion started in the Emergency Department prior to admission)

#### **Calculation of Initial Infusion Rate**

- \*Starting rate maximum 0.1 units per kg per hour
- **If BG > 600 mg/dL – starting rate REQUIRES PHYSICIAN ORDER**
- If BG < 600 mg/dL – starting rate calculated as follows:

Starting rate calculated as follows:

Starting rate for units / hour = (Current BG – 60) x 0.02

Example: Current BG is 210 mg/dL => (210 – 60) x 0.02 = 3 units/hour (3 mL/hr)

\*Caution with elderly, CKD and low body weight individuals

\*Caution with **BG > 600 mg/dL** (starting dose may be too high)

\*Notify provider if insulin infusion rate calculation is ever > 20 units/hour (20 mL/hr)

#### **Nursing Communication**

- Insulin infusion titration requires hourly blood glucose checks
- Do not start insulin until potassium is > 3.3 mEq/L; insulin may lower potassium
- Check BMP prior to initiation of insulin infusion and q 4 hours while on insulin infusion
- If blood glucose levels are in target range (140-180 mg/dL) for 4 hours, decrease frequency of blood glucose checks to every 2 hours while in the target range

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- If there is unexplained hypo- or hyperglycemia, investigation of causative factors should be performed
- If there is a significant change in glycemic source (i.e. parenteral, enteral, or oral), expect to make insulin adjustments
- If the continuous source of glucose (IV Dextrose, TPN, or Enteral Feeds) is held or discontinued, reduce the insulin infusion by 50% and check blood glucose every 1 hour
- When patient leaves unit for procedures/transport, continue to check blood glucose every 1 hour and continue to titrate insulin infusion per protocol. If blood glucose cannot be checked every 1 hour, then turn insulin infusion OFF when patient leaves and resume when patient returns to unit
- If insulin infusion is discontinued, alternative glycemic management should be ordered

		Adjustment of Existing Infusion Rate						
		INSULIN ADJUSTMENT TABLE – REQUIRES HOURLY BLOOD GLUCOSE CHECKS						
		Previous Blood Glucose Level (mg/dL)						
		<100	100-140	141-180	181-200	201-250	251-300	
Current Blood Glucose Level (mg/dL)	≤ 70	Hold insulin drip and initiate hypoglycemia SDO. If BG remains < 140 mg/dL after treatment, continue to hold insulin drip and check BG hourly until BG ≥ 140 mg/dL . Once BG ≥ 140 mg/dL call physician to resume insulin infusion at 50% previous rate and return to following insulin adjustment table.						
		-if <b>Type 1 DM</b> hold insulin drip and initiate hypoglycemia SDO. If and BG remains < 140 mg/dL after treatment, continue to hold insulin drip at 50 cc/hr and monitor BG hourly. Once BG ≥ 140 mg/dL call physician to resume insulin infusion at 50% previous rate. Stop D5W one hour after insulin drip is resumed if BG ≥ 140 mg/dL. Resume following insulin adjustment table.						
	71-100	Hold insulin drip and recheck BG at 15 minutes. If BG is 71-140 mg/dL continue to hold insulin drip at 50 cc/hr x 2 and then hourly. Once BG is ≥ 140 mg/dL call physician to resume insulin infusion at 50% previous rate. Stop D5W one hour after the insulin drip is resumed if BG ≥ 140 mg/dL. Resume following insulin adjustment table.						
		-if <b>Type 1 DM</b> – hold insulin drip and recheck BG at 15 minutes. If BG is 71-140 mg/dL continue to hold insulin drip at 50 cc/hr; check BG q 30 minutes x 2 and then hourly. Once BG is ≥ 140 mg/dL call physician to resume insulin infusion at 50% previous rate. Stop D5W one hour after the insulin drip is resumed if BG ≥ 140 mg/dL. Resume following insulin adjustment table.						
	101-140	↓ rate by 1 unit/hr  (check BG q 30 min until ≥ 140)	↓ rate by 25% or 0.5 units/hr*  (check BG q 30 min until ≥ 140)	↓ rate by 50% or 2 units/hr*  (check BG q 30 min until ≥ 140)			↓ rate by 50% or 2 units/hr*  (check BG q 30 min until ≥ 140)	
	141-180	No change				↓ rate by 50% or 2 units/hr*		
	181-200	↑ rate by 1 unit/hr	↑ rate by 0.5 unit/hr		↑ rate by 25% or 1 unit/hr*	No change	↓ rate by 50% or 2 units/hr*	
	201-250	↑ rate by 25% or 2 units/hr*			↑ rate by 25% or 1 unit/hr*			↑ rate by 25% or 1 unit/hr*
	251-300	↑ rate by 25% or 2.5 units/hr*		↑ rate by 25% or 1.5 unit/hr*	↑ rate by 25% or 1 unit/hr*	↑ rate by 25% or 1 unit/hr*	↑ rate by 25% or 1.5 unit/hr*	↑ rate by 25% or 1.5 unit/hr*
	301-400	↑ rate by 40% or 3 units/hr*						
>400		↑ rate by 50% or 4 units/hr*						
		* Whichever is greater						
		Round to the nearest tenth						

**DISCONTINUING INSULIN INFUSIONS:**

Consider change to subcutaneous insulin once BG is stable between 100-180 mg/dL for 6 hours.

Initiate alternative glycemic management 1 hour (rapid acting) to 2 hours (long acting) before discontinuing insulin infusion

For patients with type 1 diabetes or those with type 2 diabetes previously controlled on insulin:

- If NPO: Initiate basal subcutaneous insulin (glargine, detemir, or NPH) at 80% of

insulin administered over prior 24 hours by insulin infusion. Stop infusion 2 hours after administration of long-acting insulin

- If taking >50% of usual oral or enteral intake: Give 50% of insulin dose as basal insulin based on the previous 24 hours of insulin infused or 0.2 units/kg and initiate pre-meal bolus and correction dose to maintain BG in target range. If subcutaneous short acting insulin is given, stop the insulin infusion 1 hour after subcutaneous injection.

Another alternative is to resume the pre-hospital insulin regimen

## References

1. Joslin Diabetes Center and Beth Israel Deaconess Medical Center Guideline for Management of UNCONTROLLED GLUCOSE IN THE HOSPITALIZED ADULT (05/20/2013). Accessed 7/6/16. [http://www.joslin.org/docs/unc\\_gluc\\_in\\_hosp\\_guideline\\_final\\_5\\_13.pdf](http://www.joslin.org/docs/unc_gluc_in_hosp_guideline_final_5_13.pdf)
2. Joslin Diabetes Center and Joslin Clinic Guideline for Inpatient Management of Surgical and ICU Patients with Diabetes (Pre-, Per- and Postoperative Care) (12/30/2015). Accessed 7/6/16. <http://www.joslin.org/docs/Inpatient-management-of-surgical-patients-with-diabetes-12-30-2015.pdf>