UCDMC Adult Continuous Intravenous Insulin Infusion Protocol

For blood glucose (BG) stabilization to achieve and maintain goal levels of 111-150 mg/dL

This protocol is NOT intended for Hyperosmolar Hyperglycemic State (HHS) or DKA

A physician order is required in EMR for this protocol. Implement as outlined below.

BLOOD GLUCOSE MONITORING BEFORE STARTING INSULIN INFUSION

- Check a BG (POC or STAT Glucose) **immediately** prior to beginning insulin infusion.
- If glucose measurement is 150 mg/dL or greater, then initiate the insulin protocol as ordered.

PRIOR TO INITIATION OF CONTINUOUS INFUSION INSULIN

- Discontinue all previous insulin and other diabetes medication orders.
- Optimal glucose control will be achieved in patients who are NPO and receiving a continuous glucose source (continuous tube feeding, parenteral nutrition, or dextrose containing IV Fluids).
- Use with caution in patients receiving oral feedings or bolus tube feedings.
- Do not use in patients who are pregnant. Refer to OB orderset and protocol.

NURSING DOUBLE CHECK

- Required at initiation of infusion, rate changes, change of shift and IV bag changes as per the PCS XIII-21 policy (Continuous Intravenous Insulin Therapy)

INITIATING THE INSULIN INFUSION

The insulin protocol allows the physician to choose whether or not an insulin bolus will be administered prior to initiating the infusion. The nurse must verify with the EMR order to determine this, then proceed as outlined below to either Table 1A or 1B.

TABLE 1A: INSULIN BOLUS ORDERED
At initiation of infusion

Blood Glucose (mg/dL)	Bolus Regular Insulin IV Push (units)	Insulin infusion rate (units/hr)
less than 150	0	0
150-179	2	1
180-240	4	2
241-300	6	3
301-360	8	4
Over 360	10	5

TABLE 1B: NO INSULIN BOLUS
At initiation of infusion

Blood Glucose (mg/dL)	Bolus Regular Insulin IV Push (units)	Insulin infusion rate (units/hr)
less than 150	0	0
150-179	0	1
180-240	0	2
241-300	0	3
301-360	0	4
Over 360	0	5

RESTARTING THE INSULIN INFUSION

If the insulin infusion is HELD per a separate physician order (e.g. for procedure), when RESTARTING the infusion, **USE TABLE 1B** to determine the rate of infusion to restart (as if a new start).

BLOOD GLUCOSE MONITORING FREQUENCY (while on insulin infusion)

The frequency of bedside (POC or STAT Glucose) blood glucose (BG) testing is as follows:

- STANDARD: BG every 60 minutes

1. If BG 70 mg/dL or greater

- STABLE: BG every 2 hours
    1. If BG values are 111-150 mg/dL **and** insulin infusion rate remains unchanged x 4 hours
- BG every 30 minutes is indicated under these situations
    1. BG less than 70 mg/dL
    2. If tube feeds or parenteral nutrition are stopped or decreased. (Resume monitoring every 60 minute testing if BG is 70 mg/dL or greater.)
    3. If insulin infusion rate is doubled and/or increased by 10 units/hr per protocol
- *Increase glucose monitoring as outlined above if BG values fall outside of the goal range, if insulin dose is changed, or if the patient's clinical condition significantly changes*
- If POC BG reads HIGH (BG > 600) and POC cannot be used for insulin infusion protocol; send STAT Glucose.
- Obtain a BG at same time of AM labs are drawn daily

OTHER MONITORING CONSIDERATIONS (while on insulin infusion)

Call the physician when:

- Other orders for insulin (SubQ, IV or in parenteral nutrition) are received without discontinuing this order set.
    - Exception: Initiation of long-acting or intermediate-acting insulin is permitted to provide coverage while insulin infusion is titrated off. This situation does NOT require a call to the prescriber prior to implementing the ordered insulin.
- Tube feedings, dextrose containing IV Fluids, or parenteral nutrition are started, stopped, interrupted or changed
- BG less than 40 mg/dL
- If BG values remain consistently low less than 70 mg/dL for 4 assessments
- BG greater than 200 mg/dL for 2 consecutive readings (after target achieved initially)
- If protocol calls for a rate above 20 units/hour, confirm with MD prior to rate change
- If protocol calls for a rate less than 0.5 units/hour

Documentation of MD notification required for any of the above

- Document in EMR with a MAR comment or Focus Note

HYPOGLYCEMIC INTERVENTION

- **If BG below 70mg/dL** :
    1. STOP insulin infusion
    2. Give DEXTROSE **SLOW IV PUSH** for hypoglycemia:

For BG 60-69mg/dL	STOP infusion for 30 minutes and recheck BG
For BG 50-59mg/dL	Administer 7.5 grams Dextrose Slow IV Push
For BG 30-49mg/dL	Administer 12.5 grams Dextrose Slow IV Push
For BG less than 30mg/dL	Administer 15 grams Dextrose Slow IV Push

    3. Continue to check BG every 30 minutes until above 70 mg/dL x 2 consecutive readings, then resume testing every 60 minutes
    4. **Refer to Table 1B for restart insulin infusion when BG greater than 150 mg/dL**
- If BG values remain consistently low (less than 70 mg/dL for 4 assessments), then call HO and consider discontinuation of insulin infusion order

UCDMC Continuous Intravenous Insulin Infusion Protocol

ADJUSTING THE INSULIN INFUSION RATE

Blood Glucose Above 70mg/dL

- Step 1: Determine the CURRENT BLOOD GLUCOSE level AND identify the corresponding row in the table below
- Step 2: Determine the CHANGE IN BLOOD GLUCOSE since the prior reading AND identify the corresponding column in the table below
- Step 3: Determine the CELL that corresponds to the CURRENT BLOOD GLUCOSE and CHANGE IN BLOOD GLUCOSE. The cell contains an ADJUSTMENT FACTOR that will be used to calculate the new insulin infusion rate.
- Step 4: **Multiply** the adjustment factor by the current rate. This will be the new rate:

CURRENT INSULIN RATE X ADJUSTMENT FACTOR = NEW RATE

Example: Current rate is 2 units/hour. Current Blood Glucose is 165 mg/dL. Prior Blood Glucose was 140 mg/dL. Adjustment factor is 1.5
Therefore, new rate should be **2 units/hr X 1.5 = 3 units/hr**

- ROUND ALL INSULIN INFUSION RATES TO THE NEAREST **0.1** unit/hr
- *NOTE: pump will not allow for a rate less than 0.5 units/hr, if the new rate is less than 0.5 units/hr, contact the physician*

	ADJUSTMENT FACTOR: Current Rate x factor below = NEW RATE					
CURRENT Blood Glucose (mg/dL)	**CHANGE in blood glucose (BG) from previous reading**					
	BG Decreased more than 50	**BG Decreased 31-50**	**BG Decreased 11-30**	**No change (± 10)**	**BG Increased 11-30**	**BG Increased more than 30**
70-110	**Stop for 30 min Refer to Table 1B for restart when BG greater than 150 mg/dL**	current rate X 0.25 ↓	current rate X 0.5 ↓	current rate X 0.75 ↓	Continue current rate	↑ current rate X 1.5 *Max increase NOT to exceed 10 units
111-150	current rate X 0.25 ↓	current rate X 0.5 ↓	current rate X 0.75 ↓	Continue current rate	↑ current rate X 1.25 *Max increase NOT to exceed 10 units	↑ current rate X 1.5 *Max increase NOT to exceed 10 units
151-180	current rate X 0.5 ↓	current rate X 0.75 ↓	Continue current rate	↑ current rate X 1.25 *Max increase NOT to exceed 10 units	↑ current rate X 1.5 *Max increase NOT to exceed 10 units	↑ current rate X 2 *Max increase NOT to exceed 10 units
181-210	current rate X 0.75 ↓	Continue current rate	Continue current rate	↑ current rate X 1.5 *Max increase NOT to exceed 10 units		↑ current rate X 2 *Max increase NOT to exceed 10 units
Over 210	Continue current rate	Continue current rate	↑ current rate X 1.5 *Max increase NOT to exceed 10 units		↑ current rate X 2 *Max increase NOT to exceed 10 units	

- Do not increase rate by more than 10 units/hour (see example below)
- Monitor BG 30 minutes after rate change if insulin infusion rate is doubled and/or increased by 10 units/hr per protocol

- If adjusting rate outside of protocol for patient specific clinical reasons (e.g. held continuous feeds), documentation of reason required on MAR infusion rate or as a Focus Note in the note activity section of the EMR

High rate infusion example	• Step 1: Determine the CURRENT BLOOD GLUCOSE level AND identify the corresponding row in the table above • Step 2: Determine the CHANGE IN BLOOD GLUCOSE since the prior reading AND identify the corresponding column in the table below • Step 3: Determine the CELL that corresponds to the CURRENT BLOOD GLUCOSE and CHANGE IN BLOOD GLUCOSE. The cell contains an ADJUSTMENT FACTOR that will be used to calculate the new insulin infusion rate. • Step 4: **Multiply** the adjustment factor by the current rate. This will be the new rate: **CURRENT INSULIN RATE X ADJUSTMENT FACTOR = NEW RATE** Example: Current rate is 16 units/hour. Current Blood Glucose is **195** mg/dL. Prior Blood Glucose was 140 mg/dL. BG **increased by 55 mg/dL** = Adjustment factor 2 (see chart above) The new rate calculation 16 **units/hr X 2 = 32; however, the maximum rate increase is 10 units. Therefore the new rate is 26 units hr = 16 units/hr + 10 units/hr.** ** **MAXIMUM INCREASE NOT TO EXCEED 10 units**. **NEW RATE = 26** units/hr **

TRANSITIONING FROM INTRAVENOUS TO SUBCUTANEOUS INSULIN

- A physician MAY initiate long- or intermediate- acting subcutaneous insulin while patient is simultaneously on intravenous insulin infusion in an effort to titrate the patient OFF of intravenous insulin infusion.
- For guidelines on transitioning from IV to subcutaneous insulin, please refer to section 8 of the Adult Complete SQ Insulin Guideline.