Intravenous Insulin Management: ICU
(Not for DKA Management)

**Goal:** Maintain blood glucose level between 140-180 mg/dL. This protocol is NOT to be used for patients in Diabetic Ketoacidosis (DKA).

**Monitoring:**
1. Glucose levels will be evaluated by finger stick testing or blood testing
2. Check hourly blood glucose (BG) levels upon initiation
3. With three consecutive BG values within desired range, BG testing may be spaced to every 2 hours.
4. Resume hourly glucose monitoring with any of the following: change in insulin infusion rate, significant change in clinical status, initiation or cessation of pressor therapy, initiation or cessation of renal therapy (i.e., hemodialysis, CVVH), change in nutritional support, or glucocorticoid supplementation.

The different algorithms represent different levels of insulin resistance.

**Algorithm 1:** Start here for most general floor patients OR if the patient is judged to be very insulin sensitive.

**Algorithm 2:** Start here for patients at risk for insulin resistance (i.e. critical care, solid organ or islet cell transplant, s/p CABG, receiving glucocorticoids, or diabetes patients who receive >80 units/day insulin as outpatients)

**Algorithm 3-6:** Not appropriate to start patients here without fellow or faculty physician approval

**Helpful Hints**
- Pts with high acuity, sepsis, receiving steroids and multiple antibiotics will be hard to control.
- Antibiotics and other medications are frequently given in D5, which will temporarily elevate the blood sugar. The scheduling of the hourly checks may need to be modified to occur before these medications and then again at their completion.
- Hourly BG is needed until 3 stable checks in goal range (140-180), then may space at every 2-hour intervals.
- Contact physician for orders if nursing judgment indicates a change not covered by the algorithm.
- The different algorithms represent different levels of insulin resistance. Titration by algorithm utilizes a dual criteria for titration. Both CURRENT BG value and CHANGE from previous value are used to make clinical decisions.
- Discontinue all currently active insulin orders
- If not on CVN or enteral feeding, initiate feeding or consider some form of dextrose infusion.
- If patient is on CVN or enteral feeding and they are held or cycled, contact MD for specific instructions regarding the insulin infusion.
- Insulin infusions will be provided as 100 units of regular insulin/100 ml in 0.9% Sodium Chloride (1 unit insulin/1 ml NS).
- If subcutaneous insulin (correction scale or scheduled) is ordered, discontinue the insulin infusion 2 hr after the 1st dose of subcutaneous insulin
- Discontinue this protocol when the patient is able to tolerate PO carbohydrate intake and is being transitioned to subcutaneous insulin or no longer requires insulin therapy. See Guidelines for Initial Dosing of Subcutaneous Insulin.

**Hypoglycemic Management:**
1. **If BG Decreases by >100mg/dl in ANY hour:** Decrease ONE Algorithm and Adjust Rate within Algorithm for current BG.
2. **If BG <70mg/dl:** STOP the infusion - Check q 15 minute BG until 2 BG > 100mg/dL. Restart insulin by Decreasing ONE Algorithm and Adjust Rate to current BG. If already using Algorithm 1, decrease the infusion by half.
3. **If BG 40-60 mg/dl:** STOP the infusion, and give ½ amp D50. This may be repeated once in 15 minutes if the blood glucose remains 40-60 mg/dl. Recheck blood glucose every 15 minutes until two blood sugars are greater than 100 mg/dL. Notify MD if hypoglycemia unresolved after 30 minutes. Restart insulin infusion when BG > 100 mg/dl. Resume by Decreasing ONE Algorithm and Adjust Rate for current BG. If already using Algorithm 1, decrease the infusion by half.
4. **If BG<40 mg/dl:** STOP the infusion, and give 1 amp D50. Recheck BG q 15 minutes until BG > 100 mg/dL. Notify MD if hypoglycemia is unresolved. Restart the insulin infusion after BG >100 mg/dl. Restart by Decreasing ONE Algorithm and Adjust Rate for current BG. If already using Algorithm 1, decrease the infusion by half.
**Maintenance of the continuous infusion protocol:** The titration guidelines take into consideration BOTH the BG’s CURRENT value and the CHANGE from the previous value. Follow Hypoglycemia Prevention and Treatment Orders as NEEDED

**BG < 70 mg/dl:** turn off the drip and follow hypoglycemia management orders (see reverse side)

**BG is 70-89 mg/dl:** turn off drip and check BG levels every 15 minutes. If BG is 70-89 mg/dl for 3 consecutive measurements, call HO. When the BG is > 90 mg/dl, resume insulin at the next lower Algorithm. If already in Algorithm 1 (p.2), decrease the insulin infusion by half.

**BG is 90-109 mg/dl:** decrease one Algorithm. If already in Algorithm 1, decrease the insulin infusion by half. Recheck BG in 30 minutes

**BG is 110-139 mg/dl:** decrease one Algorithm. If already in Algorithm 1, decrease the insulin infusion by half.

**BG is 140-180 mg/dl:** stay in the same Algorithm

**BG is >180** and the BG has decreased by at least 50 mg/dl in one hour, stay in the same Algorithm and adjust the rate for the current BG.

**BG is >180** and the BG does NOT decrease by at least 50 mg/dl in one hour, move up to the next Algorithm.

If the BG decreases by more than 100 mg/dl in one hour, move down to the next lesser Algorithm. If already in Algorithm 1 (pg. 2), decrease the insulin infusion by half.

**Algorithms for insulin infusion rate adjustments.**

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<thead>
<tr>
<th>Algorithm 1</th>
<th>Algorithm 2</th>
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**Notify Physician:**
- Any blood glucose change of > 100 mg/dl in 1 hour
- If blood glucose is < 40 mg/dl,
- If blood glucose is > 360 mg/dl in Algorithm 5 & 6
- If blood glucose is not controlled on Algorithm 6
- Any hypoglycemia unresolved within 30 minutes of discontinuation of insulin drip and administration of D50W
- When advance in algorithms do not result in targeted blood glucose levels
- Any other questions or concerns