Glucose & Insulin Algorithms Rules for UWMC Rabbit 2 Protocols

Society of Hospital Medicine Glycemic Control Resources

American College of Endocrinology Consensus Development Conference on Inpatient Diabetes and Metabolic Control

The use of standardized protocols that are developed by multidisciplinary teams is associated with improved glycemic control and lower rates of hypoglycemia. In addition to specifying insulin dose, protocols should also include specific guidelines for identifying patients at risk for hypoglycemia and actions to be taken to prevent and treat hypoglycemia.

Amer Assoc Clinical Endocrinologists-Position Statement, 16 Dec 2003
http://www.aace.com/pub/ICC/inpatientStatement.php

GLUCOSE CONTROL ALGORITHMS

- The Rabbit 2 basal bolus protocol is online at http://care.diabetesjournals.org/lookup/suppl/doi:10.2337/dc10-1407/-/DC1
- The Society of Hospital Medicine Glycemic Control Resource room contains links to multiple insulin infusion protocols at http://www.hospitalmedicine.org/ResourceRoomRedesign/html/12Clinical_Tools/04_Insulin_OrdersIV.cfm

Rabbit 2 Protocols

1. Basal Bolus Regimen with Insulin Glargine and Glulisine
1.A. Insulin Orders
• Discontinue oral antidiabetic drugs (sulfonylureas, repaglinide, nateglinide, metformin, pioglitazone, rosiglitazone, sitagliptin) and non-insulin injected antidiabetic medication (pramlinitide, exenatide) on admission.
• Starting insulin total daily dose (TDD): 0.5 units per kg of body weight.
• Reduce insulin TDD to 0.3 units per kg of body weight in patients ≥ 70 years of age and/or with a serum creatinine ≥ 2.0 mg/dL.
• Give half of total daily dose as insulin glargine and half as insulin glulisine.
• Give insulin glargine once daily, at the same time of the day.
• Give insulin glulisine in three equally divided doses before each meal. Hold insulin glulisine if patient not able to eat.

Rabbit 2 Protocols

1.B. Supplemental insulin
• Give supplemental insulin glulisine following the "sliding scale" protocol (1E) for blood glucose > 140 mg/dl.
• If a patient is able and expected to eat all, give supplemental glulisine insulin before each meal and at bedtime following the "usual" column.
• If a patient is not able to eat, give supplemental glulisine insulin every 6 hours (6-12-6-12) following the "sensitive" column.

Rabbit 2 Protocols

1.C. Insulin adjustment
• If the fasting and predinner BG is between 100 - 140 mg/dl in the absence of hypoglycemia the previous day: no change
• If the fasting and predinner BG is between 140 - 180 mg/dl in the absence of hypoglycemia the previous day: increase insulin TDD by 10% every day
• If the fasting and predinner BG is >180 mg/dl in the absence of hypoglycemia the previous day: increase insulin TDD dose by 20% every day
• If the fasting and predinner BG is between 70 - 99 mg/dl in the absence of hypoglycemia: decrease insulin TDD dose by 10% every day
• If a patient develops hypoglycemia (BG <70 mg/dL), the insulin TDD should be decreased by 20%.
1.D. Blood glucose monitoring. Blood glucose will be measured before each meal and at bedtime (or every 6 hours if a patient is not eating) using a glucose meter

Rabbit 2 Protocols

1.E. Supplemental Insulin Scale

	☐	☐	☐
Blood Glucose (mg/dL)	Insulin Sensitive	Usual	Insulin Resistant
141-180	2	4	6
181-220	4	6	8
221-260	6	8	10
261-300	8	10	12
301-350	10	12	14
351-400	12	14	16
> 400	14	16	18

** Check appropriate column below and cross out other columns

The numbers in each column indicate the number of units of glulisine or regular insulin per dose. Supplemental" dose is to be added to the scheduled dose of glulisine or regular insulin.

UW I.V. Insulin Infusion Protocol

- ► **CONSULT ENDOCRINE SERVICE FOR:**
  - Acute Care patients on insulin infusion receiving oral nutrition or intermittent tube feeding

GOAL Blood Glucose (BG) RANGE :

ACUTE CARE OR ICU: 100-180 mg/dL initiate when ordered
ICU ONLY: ☐ 100-140 mg/dL initiate when BG>140 x 2

☒ **Discontinue all previous insulin orders.**

☒ **Insulin Infusion:** 100 units insulin/ 100 mL NS given IV infusion, at:

- ☐ **Algorithm 1**: Start here for most patients.
- ☐ **Algorithm 2**: Start here if S/P CABG surgery, solid organ transplant, receiving glucocorticoids, or patient receiving >80 units/day of insulin as an outpatient.
- **NO PATIENT STARTS AT ALGORITHM 3 OR 4.**

► See back of form for the Algorithms and decision tree

► When transitioning to SubQ: Use www.uwmedres.org/resources for dosing assistance: Give specified basal SubQ insulin dose, and then stop insulin infusion in 2 hours.

Fluid/Nutrition Orders:

Recommendations for patients that are not eating:

DM Type 1 (10 grams glucose/hour) **DM Type 2** (5 grams glucose/hr)

- ☐ D51/2 normal saline with_____ mEq/L Potassium chloride IV at _____mL/hr
- ☐ D5LR with_____ mEq/L Potassium chloride IV at _____mL/hr
- ☐ TPN or Enteral Feeds (see separate orders)
- ☐ Other _____at _____mL/hr

UW I.V. Insulin Infusion Protocol

Patient Monitoring:

- ☒ Check BG every 1 hour until it is within **goal** range for 4 hours. Then decrease BG checks to every 2 hours. ALWAYS resume hourly checks if BG exits goal range.
- ► Hourly monitoring may be indicated for critically ill patients or patients having medical or surgical procedures even if they have stable BG.

Notify the Provider:

- ☒ For any BG increase >100 mg/dL from a stable baseline
- ☒ For 2 consecutive BG decreases of >100 mg/dL
- ☒ For any hypoglycemia which results in loss of consciousness **OR** does not resolve within 20 min of implementing the hypoglycemia protocol below

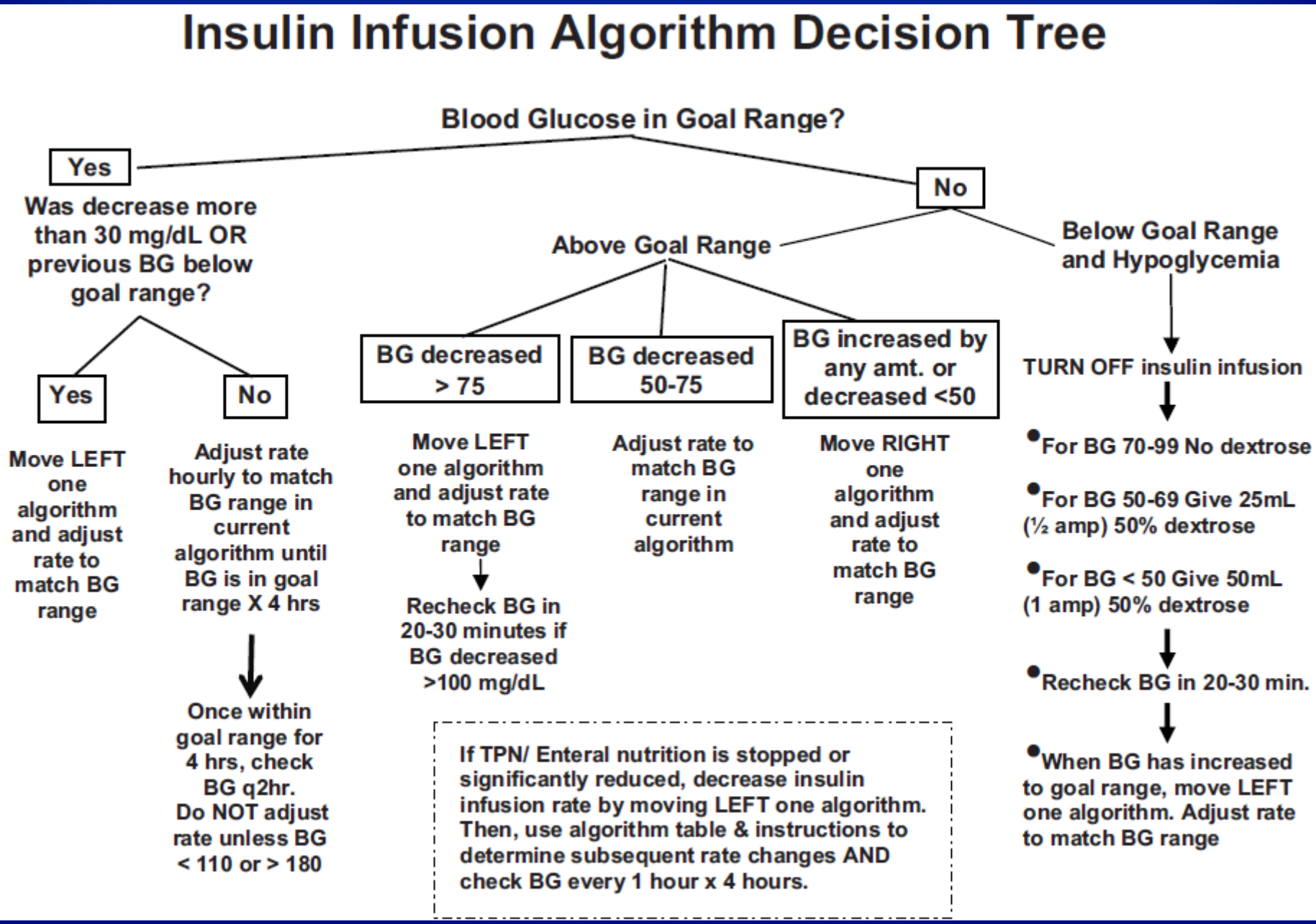
Treatment of Hypoglycemia (BG <70 mg/dL) or symptoms of hypoglycemia

- ☒ **Turn off** insulin infusion for any BG below goal **AND**
- ☒ Give 25 mL (1/2 amp) of 50% dextrose IV if BG 50-69 mg/dL **OR**
- ☒ Give 50 mL (1 amp) of 50% dextrose IV if BG < 50 mg/dL.
- ☒ Recheck BG every 20 minutes until BG ≥100 mg/dL
  - → IF BG is <70 mg/dL repeat 25 mL (1/2 amp) 50% dextrose
  - → WHEN BG is ≥100 mg/dL, restart the insulin infusion at a lower dose by using one algorithm **LEFT** from previous algorithm (see "Evaluating Trends & Using Algorithms" section).

UW I.V. Insulin Infusion Protocol

BG monitoring: Check BG every 1 hour until it is within **goal** range for 4 hours. Then decrease BG checks to every 2 hours. ALWAYS resume hourly checks if BG exits goal range and when there is a change in algorithm. Check BG in 20-30 minutes as noted below. Hourly monitoring may be indicated for critically ill patients or patients having medical or surgical procedures even if they have stable BG.

UW I.V. Insulin Infusion Protocol



UW I.V. Insulin Infusion Protocol

Algorithm 1		Algorithm 2		Algorithm 3		Algorithm 4		If NOT achieving glycemic control with Algo 4 X ≥3 consecutive hours Consider High Dose Infusion Protocol
BG	Unit/hr	BG	Units/hr	BG	Units/hr	BG	Units/hr	
<70 = Hypoglycemia See front of form for treatment								
70-99: Off x 20-30 minutes & recheck BG								
100-120	0.5	100-120	1	100-120	1.5	100-120	2	
121-140	0.8	121-140	1.5	121-140	2.5	121-140	3.5	
141-160	1.2	141-160	2	141-160	3	141-160	4.5	
161-180	1.5	161-180	2.5	161-180	4	161-180	6	
181-210	2	181-210	3	181-210	5	181-210	7.5	
211-240	2.5	211-240	4	211-240	6.5	211-240	9.5	
241-270	3	241-270	5	241-270	8	241-270	11	
271-300	3.5	271-300	6	271-300	9	271-300	13	
301-330	4	301-330	6.5	301-330	10.5	301-330	15	
331-360	4.5	331-360	7.5	331-360	12	331-360	17	
>360	5	>360	8.5	>360	14	>360	19	

UW I.V. Insulin Infusion Protocol

UWMC **HIGH DOSE** Insulin Infusion Protocol

Initiate HIGH DOSE Insulin Infusion Orders **only after documented failure to achieve glycemic control with Algorithm 4 Standard Insulin Infusion Orders X ≥3 consecutive hrs**

GOAL Blood Glucose (BG) RANGE – check one box:

ACUTE CARE OR ICU: ☐ 100-180 mg/dL

ICU ONLY: ☐ 100-140 mg/dL

UW I.V. Insulin Infusion Protocol

Algorithm 5		Algorithm 6		Algorithm 7		Algorithm 8	
BG	Unit/hr	BG	Units/hr	BG	Units/hr	BG	Units/hr
<70 = Hypoglycemia See front of form for treatment							
70-99: Off x 20-30 minutes & recheck BG							
100-110: Recheck BG in 20-30 min, consider moving left one Algorithm							
100-120	3	100-120	4	100-120	5	100-120	6
121-140	5	121-140	6.5	121-140	8.5	121-140	10
141-160	7	141-160	9	141-160	12	141-160	14
161-180	9	161-180	12	161-180	15	161-180	18
181-210	11	181-210	15	181-210	19	181-210	23
211-240	14	211-240	19	211-240	23	211-240	28
241-270	17	241-270	23	241-270	28	241-270	34
271-300	20	271-300	26	271-300	33	271-300	40
301-330	23	301-330	30	301-330	38	301-330	46
331-360	26	331-360	34	331-360	42	331-360	52
>360	29	>360	38	>360	47	>360	57