

**University of Maryland Medical Center**

**PROTOCOL NO: PHARMACY : 001**

**Adult ICU/ Intermediate Care Insulin Protocol**

**EFFECTIVE DATE: 03/15**

**LAST REVISION DATE: 07/16**

**Key Words:** Insulin protocol, blood glucose, titration

**I. ADULT ICU/ INTERMEDIATE CARE INSULIN PROTOCOL**

**A. OBJECTIVES**

To provide direction for patients who need continuous insulin infusions to maintain glycemic control within a blood sugar (BS) range of 100-180 mg/dL. This protocol is used in conjunction with existing hyperglycemia management order sets and with their associated continuous insulin infusion orders.

**B. INDICATION FOR USE**

1. This protocol is for use with any adult patient receiving insulin infusion in an Intensive Care or Intermediate Care Unit at UMMC.

**EXCEPTIONS:** patients with DKA, Hyperosmolar Hyperglycemic State, or patients with a pancreas transplant.

2. This protocol was created by the medical and nursing staff of the Critical Care Operations Committee, and has been reviewed and approved by the Pharmacy and Therapeutics Committee, Medical Executive Committee and the Chief Nursing Officer of the University of Maryland Medical Center.

**II. PATIENT CARE PROTOCOL**

**A. PATIENT CARE STANDARDS**

1. The standard concentration for regular insulin drip is 100 units/100 mL (1 unit/mL) as prepared by pharmacy.
2. A two nurse independent check is needed to verify the order, dose, and drug any time a new insulin bag is hung. (Bag to be checked every 24 hours)

**B. TITRATION:**

1. Initiate insulin infusion (concentration 100 units/100 mL NS) for three consecutive blood sugar readings which are **greater than 150 mg/dL or any blood glucose greater than 200 mg/dL**.  
**Exception: Cardiac Surgery – patients within the first 24 hours postoperative CABG and/or valve surgery initiate insulin infusion for one blood sugar reading greater than 150 mg/dL.**
2. Use the Titration Table to find starting rate based on blood sugar value and the scale A (0.06 scale).
3. Prime the tubing with at least 25 mL of insulin from the bag before initiating the drip.
4. Move between scale A, B, and C as below.

Two blood glucose readings >150	Increase to next scale (Scale A → Scale B → Scale C)
Blood glucose <120	Decrease to next scale (Scale C → Scale B → Scale A)

\* See F. Titration Table for infusion rate based on blood glucose and scale

**C. MONITORING:**

1. With any insulin infusion, blood sugars are to be checked every hour, and the dose is to be adjusted within ten minutes.
2. If blood glucose values are within desired range (100-180 mg/dL) for 2 consecutive hours, then blood sugars can be checked every 2 hours.
3. **Return to every 1 hour blood sugar checks if:**
  - a. Blood sugar out of goal range (less than 100 mg/dL or greater than 180 mg/dL)
  - b. Significant changes in clinical condition (e.g. sepsis, seizures, deterioration in neurologic status, arrest)
  - c. Initiation or discontinuation of steroid or vasopressor therapy
  - d. Initiation or discontinuation of hemodialysis, peritoneal dialysis or Continuous Renal Replacement Therapy
  - e. Initiation, discontinuation, or rate change of nutritional support (TPN, PPN, tube feeds)
4. Decrease insulin by 50% if nutrition held or patient made NPO.
5. If blood sugar decreases by more than 100mg/dL in one hour, decrease insulin infusion by 50% and notify provider.
6. Consider a glucose source, such as dextrose containing intravenous infusion, if NPO and glucose less than 200 mg/dL.



**D. CRITERIA FOR DISCONTINUATION:**

1. For any blood sugar less than **90 mg/dL**, hold infusion and recheck blood glucose in 30 minutes then every 1 hour for 4 hours. Restart the insulin drip on Scale A if the blood glucose is > 150 mg/dL during that time.
2. For any blood sugar 70 – 80 mg/dL, hold the insulin infusion, notify the provider and recheck blood glucose in 30 minutes then every 1 hour for 4 hours. Restart the insulin drip on Scale A if the blood glucose is > 150 mg/dL during that time.
3. For any blood sugar less than 70, immediately stop the insulin infusion, notify the provider and initiate hypoglycemia protocol.

**E. CLINICAL NOTES:**

1. Dispose of any unused insulin infusion in the black box. An empty insulin drip bag may go in clear waste bags.
2. Unused insulin infusions are to be stored in the refrigerator.
3. For sliding scale insulin use and treatment of hypoglycemia, refer to individual unit order sets.  
**NOTE:** Blood glucose < 70 mg/dL trigger the same hypoglycemia interventions prescribed for glucose < 60mg/dL in current unit based order sets.
4. Once insulin infusion is between 1-2 units per hour without active titration, consider sliding scale insulin.

**F. UMMC Insulin Titration Scales**

1. If two blood sugar readings >150, increase to next scale (Scale A → Scale B → Scale C)
2. If any blood sugar <120, decrease to next scale (Scale C → Scale B → Scale A)

Scale A		Scale B		Scale C	
Blood Sugar gms/dL	Insulin Infusion Rate units/hr (mL/hr)	Blood Sugar gms/dL	Insulin Infusion Rate units/hr (mL/hr)	Blood Sugar gms/dL	Insulin Infusion Rate units/hr (mL/hr)
80 – 99	0	80 – 99	0	80 – 99	0
100 – 104	1	100 – 112	2	100 – 104	2
105 – 121	2	112 – 123	3	105 – 114	3
122 – 138	3	124 – 136	4	115 – 124	4
139 – 154	4	137 – 148	5	125 – 134	5
155 – 171	5	149 – 161	6	135 – 144	6
172 – 188	6	162 – 173	7	145 – 154	7
189 – 204	7	174 – 186	8	155 – 164	8
205 – 221	8	187 – 198	9	165 – 174	9
222 – 238	9	199 – 211	10	175 – 184	10
239 – 254	10	212 – 223	11	185 – 194	11
255 – 271	11	224 – 236	12	195 – 204	12
272 – 288	12	237 – 248	13	205 – 214	13
289 – 304	13	249 – 261	14	215 – 224	14
305 – 321	14	262 – 273	15	225 – 234	15
322 – 338	15	274 – 286	16	235 – 244	16
339 – 354	16	287 – 298	17	245 – 254	17
355 – 371	17	299 – 311	18	255 – 264	18
372 – 388	18	312 – 323	19	265 – 274	19
389 – 390	19	324 – 336	20	275 – 284	20
<b>Important Points:</b> <ul style="list-style-type: none"> <li>• If two blood sugar readings &gt;150, increase to next scale (Scale A → Scale B → Scale C)</li> <li>• If any blood sugar &lt;120, decrease to next scale (Scale C → Scale B → Scale A)</li> <li>• If blood glucose values are within <u>desired</u> range (100-180 mg/dL) for <u>2 hours</u>, then blood sugars can be checked every 2 hours.</li> <li>• <b>Return to every 1 hour blood sugar checks if:</b> Blood sugar out of goal range (less than 100 mg/dL or greater than 180 mg/dL).</li> </ul>	337 – 348	21	285 – 294	21	
	349 – 361	22	295 – 304	22	
	362 – 373	23	305 – 314	23	
	374 – 386	24	315 – 324	24	
	387 – 390	25	325 – 334	25	
	<b>Evidence Based Formula:</b> <i>Formula for insulin rate:</i> <i>(BS = Blood Sugar)</i> <i>Scale A: (BS-80) X 0.06 = Units/hour</i> <i>Scale B: (BS-80) X 0.08 = Units/hour</i> <i>Scale C: (BS-80) X 0.1 = Units/hour</i>	335 – 344	26	335 – 344	26
		345 – 354	27	345 – 354	27
		355 – 364	28	355 – 364	28
		365 – 374	29	365 – 374	29
		375 – 384	30	375 – 384	30
385 – 390	31	385 – 390	31		