

# Evidence-Based Recommendations in Hyperglycemia and ACS

## The Portland Protocol

### *Disclaimer*

Please note that our only requirement, if you choose to use any one of these protocols or any part thereof, is that you refer to it as “The Portland Protocol” in any printed or electronic versions, including orders, in order to comply with its copyright.

It is highly recommended that you use the whole protocol rather than choosing parts, or modifying it in some way, as the protocol has been honed over 14 years to be highly safe and rapidly efficient. Altering or deleting parts of the Protocol will likely result in slower progress into the target range and potentially more hypoglycemia.

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**Portland Continuous Intravenous Insulin Protocol ICU TARGET BLOOD GLUCOSE 80 to 120mg/dl**  
**Version 2008.1: ICU PHASE 3**

- Start "Portland Protocol" on all ICU patients as indicated below (place these orders on all ICU admission and postoperative order sets):
  - Initial BG check on admission to ICU & q 2hours X 2
  - Send blood for Hgb A1c if not done on admission to hospital.
  - Start Portland Protocol for any BG >125 mg/dl, including "non-diabetic" patients

- Mix 1 unit Regular Human Insulin per 1 ml 0.9% Normal Saline, and start IV infusion via pump as follows:

Blood Glucose	IV Regular Insulin Syringe Bolus	Initial Regular Insulin Rate: Units/Hour	
		NIDDM or non-DM	IDDM
110 to 124 mg/dl	0	None	None
125 to 150 mg/dl	2 -- <b>For DM patients only *</b>	1 Unit / Hour	2 Units / Hour
151 to 180 mg/dl	4 Units	2 Units / Hour	3.5 Units / Hour
181 to 240 mg/dl	6 Units	3.5 Units / Hour	5 Units / Hour
241 to 300 mg/dl	8 Units	5 Units / Hour	6.5 Units / Hour
301 to 360 mg/dl	12 Units	6.5 Units / Hour	8 Units / Hour
Greater than 360 mg/dl	16 Units	8 Units / Hour	10 Units / Hour

- General Orders** for ALL patients on "Portland Protocol":
  - All intermittent (noncontinuous) IV medications** should be mixed in normal saline.
    - Do **NOT** administer intermittent (noncontinuous) IV medications mixed in dextrose-containing solutions
  - Do **NOT** use any dextrose-containing IV solutions for maintenance IV or daily IV fluids except when TPN is required.
  - If daily **steroids** are required: administer as a continuous infusion over a 24-hour period.
    - Do **NOT** administer Bolus IV steroids or oral steroids while on IV insulin protocol.
- Protocol **Duration**:
  - All Diabetic patients, and non-DM patients who remain hyperglycemic:** Continue Protocol throughout ICU stay
  - Non-DM, euglycemic patients** may stop protocol when target range maintained with <0.3 units / hour; then check BG every 2 hours X 6; then AC, 2 hours PC, and HS X 24 hours; if all BG < 125 mg/dl may cease monitoring; if any BG > 125 resume Protocol.
  - Non-Diabetic Patients** If continuing need for insulin exists on transfer after POD #3, and admission HgbA1c is greater than 6, ask physician to consult endocrinologist for DM workup and further follow-up orders.
- ICU Transfer:** Transition to Floor (ward) version of Portland Protocol on transfer out of ICU in:
  - All hyperglycemic patients:** within 3 days of operation or ICU admission, or those eating less than 50% of a regular diet.
  - Non-Diabetic Patients** If continuing need for insulin exists on transfer after POD #3, and admission HgbA1c is greater than 6, ask physician to consult endocrinologist for DM workup and further follow-up orders.
- Protocol **Cessation** permissible **ONLY on transfer in**:
  - Diabetic patients if more than 3 days since last operation or ICU admission and eating more than 50% of a regular diet then:**
    - If admission HgbA1c is LESS than 6.5:** Restart pre-admission glycemic control meds at 7AM on day of transfer and stop intravenous insulin infusion at 9AM prior to transfer  
(OR)
    - If admission HgbA1c is GREATER than 6.5:** Consider *additional* Basal-Pranial SQ insulin therapy – Initiate Portland Basal-Prandial SQ Insulin Transition Protocol
    - Continue to monitor BG – AC; 2 hours PC; and HS throughout rest of hospital stay
  - Non-Diabetic Euglycemic Patients may stop protocol** If meet criteria outlined in #4 "Duration"
  - Non-Diabetic Patients who remain hyperglycemic beyond the 3<sup>rd</sup> postoperative day** -- no need to continue Protocol on transfer. However Endocrinology consultation should be requested by physician (see #5 above)
- Test Blood Glucose (BG) by finger stick, arterial, or venous line drop samples. **Frequency of BG testing** is as follows:
  - Check BG every **30 minutes** when: BG greater than 150mg/dl; or  
BG less than 80 mg/dl; or  
after insulin drip is stopped; or  
after insulin drip is decreased more than 50%; or  
after Bolus IV Insulin dose is given; or  
when rapidly titrating Vasopressors (e.g. epinephrine, norepinephrine).
  - Check BG **every Hour** when BG is 80 – 150 mg/dl
  - Check BG **every 2 Hours** when BG is 80 - 120, **AND** there is less than 15mg/dl BG variation over 4 hours and Insulin Rate remains unchanged for 4 hours – "Stable Infusion Rate". Note – If any change in BG more than 15mg/dl, or any change in Insulin Rate more than 0.5 units: Return to checking BG every Hour.
  - During** initiation of, rate change of, or cessation of any nutritional support or renal correction therapy **Check BG every 30 minutes X**
    - Nutritional support (enteral or parenteral) includes Tube Feedings, TPN, PPN
    - Renal correction therapy = Renal Dialysis, CVVH, CVVHD, Peritoneal dialysis, etc.
- See Page 2 For Intravenous Insulin Titration Guidelines**
- See Page 3 For Meal Orders and adjunctive Periprandial SQ dosing schedules**

Physician Signature \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

**Portland Continuous Intravenous Insulin Protocol ICU TARGET BLOOD GLUCOSE 80 to 120mg/dl**  
**Version 2008.1: ICU PHASE 3**

**ICU:** May titrate Insulin Infusion between 0-30 units /hour using the following as GUIDELINES to rapidly (within 3 hrs) achieve and maintain BG in target range (80-120). Round insulin Infusion to the nearest tenth of a unit (0.1) when necessary.

<b>Blood Glucose (BG)</b>	<b>Note: If ANY BG is less than 40mg/dl or greater than 450mg/dl, obtain confirmatory laboratory BG</b> <b>Action:</b>
<b>Less Than 50</b>	<b>Stop Insulin:</b> <ul style="list-style-type: none"> <li>If not alert or if NPO: give 15 ml of D50W IV; If &lt; 40 give 25 ml of D50W IV</li> <li>If alert and taking PO give 8 ounces of juice PO <u>OR</u> 6 glucose tablets PO</li> <li>Recheck BG every 30 minutes until greater than 80mg/dl</li> <li>If next BG is &lt; 50mg/dl: Double amount of previous treatment; If next BG is 50 – 65 mg/dl repeat treatment</li> <li>When BG greater than 90mg/dl: Restart Insulin rate at 50% of previous rate &amp; recheck BG in 30 minutes</li> </ul>
<b>50 to 64</b>	<b>Stop Insulin:</b> <ul style="list-style-type: none"> <li>If Previous BG greater than 100 mg/dl <u>OR</u> if symptomatic from hypoglycemia: <ul style="list-style-type: none"> <li>° If <u>NPO</u>: give 15 ml of D50W IV; &lt;OR&gt; <b>IF taking PO</b>: give 4-6 ounces of juice <u>OR</u> 3 glucose tablets PO.</li> </ul> </li> <li>Recheck BG every 30 minutes until greater than 80mg/dl</li> <li>If next BG remains 50-64 mg/dl : Repeat previous treatment</li> <li>When BG greater than 90mg/dl: Restart Insulin rate at 50% of previous rate &amp; recheck BG in 30 minutes</li> </ul>
<b>65 to 79</b>	<ul style="list-style-type: none"> <li>If greater than last test: Decrease rate by 0.2 units / Hour</li> <li>If lower than last BG by more than 30 mg/dl: <b>Stop drip</b> &amp; recheck BG in 30 minutes (see bold * order)</li> <li>If lower than last BG by 15 – 30 mg/dl: Decrease rate by HALF (50%) &amp; recheck BG in 30 minutes</li> <li>If lower than last BG by 7 – 14 mg/dl: Decrease rate by 0.5 Units / Hour</li> <li>If equal to last BG or lower than last BG by less than 7 mg/dl: Decrease rate by 0.3 Units / Hour</li> </ul> <p><b>*If infusion turned off, recheck BG in 30 min, when BG greater than 90mg/dl restart at 50% of previous rate &amp; recheck BG in 30 minutes</b></p> <ul style="list-style-type: none"> <li>Recheck BG every 30 minutes until greater than 80mg/dl</li> </ul>
<b>80 to 120</b> Target Range <b>EXCELLENT!</b> May titrate drip in ICU to maintain this range. See Suggestions:	<ul style="list-style-type: none"> <li>If higher than last BG by more than 10mg/dl: Increase rate by 0.5 Units / Hour</li> <li>If lower than last BG by more than 40 mg/dl: <b>Stop drip</b> &amp; recheck BG in 30 minutes (see bold ** order)</li> <li>If lower than last BG by 21–40 mg/dl: Decrease rate by HALF (50%) &amp; recheck BG in 30 minutes</li> <li>If lower than last BG by 10-20mg/dl: Decrease rate by 0.5 Units / Hour</li> </ul> <p><b>** If infusion turned off, recheck BG 30 min, if /when BG greater than 120mg/dl restart at 50% of previous rate</b></p> <ul style="list-style-type: none"> <li>If within 10mg/dl of last BG <u>same rate</u>... unless the following applies:</li> <li><b>FOR ANY BG</b> in this range (even if within 10 mg/dl of last test) the following <b>ALWAYS</b> applies: <ul style="list-style-type: none"> <li>° BG has consistently decreased each of last 4 measurements: Decrease rate by an <b>additional</b> 0.3 Units / Hour</li> <li>° BG has consistently increased each of last 4 measurements: Increase rate by an <b>additional</b> 0.2 Units / Hour</li> </ul> </li> </ul>
<b>121 to 135</b>	<ul style="list-style-type: none"> <li>If higher than last BG by more than 50mg/dl: Increase rate by 2 Units/Hour</li> <li>If higher than last BG by 20 - 50mg/dl: Increase rate by 1 Unit / Hour</li> <li>If higher than last BG by 0 - 20mg/dl: Increase rate by 0.5 Units / Hour</li> <li>If lower than last BG by 1 - 20 mg/dl: Same rate</li> <li>If lower than last BG by 21 - 40mg/dl: Decrease rate by 1 Unit / Hour</li> <li>If lower than last BG by 41 – 60 mg/dl: Decrease rate by HALF (50%) and recheck BG in 30 minutes</li> <li>If lower than last BG by more than 60 mg/dl: <b>Stop drip &amp; recheck BG in 30 minutes</b> (see bold ** order below)</li> </ul> <p><b>**If infusion turned off, recheck BG 30 min, if /when BG greater than 125mg/dl restart at 50% of previous rate</b></p>
<b>136 to 150</b>	<ul style="list-style-type: none"> <li>If higher than last BG by more than 30mg/dl: Increase rate by 2 Units/Hour &amp; bolus with 3 units IV</li> <li>If higher than last BG by 0 - 30mg/dl: Increase rate by 1 Unit / Hour &amp; bolus with 2 units IV</li> <li>If lower than last BG by 1 – 20: Increase rate by 1 Unit / Hour &amp; bolus with 2 units IV</li> <li>If lower than last BG by 21 to 50mg/dl: Same rate</li> <li>If lower than last BG by 51 – 80mg/dl: Decrease rate by HALF (50%) and recheck BG in 30 minutes</li> <li>If lower than last BG by more than 80mg/dl: <b>Stop drip &amp; recheck BG in 30 minutes</b> (see bold ** order below)</li> </ul> <p><b>**If infusion turned off, recheck BG 30 min, if /when BG greater than 125mg/dl restart at 50% of previous rate</b></p>
<b>151 to 180</b>	<ul style="list-style-type: none"> <li>If lower than last BG by more than 80mg/dl: Decrease rate by HALF (50%)</li> <li>If lower than last BG by 30 –80mg/dl: Continue same rate</li> <li>If lower than last BG by 0 – 30: Increase Insulin rate by 1 Unit / Hour &amp; bolus with 2 units IV</li> <li>If higher than last BG by 1- 20mg/dl: Increase Insulin rate by 2 Units / Hour &amp; bolus with 4 units IV</li> <li>If higher than last BG by more than 20mg/dl: Increase Insulin rate by 3 Units/Hour &amp; bolus 6 units IV</li> <li>Recheck BG in 30 minutes. Repeat BG every 30 minutes until less than 150mg/dl</li> </ul>
<b>181 to 240</b>	<ul style="list-style-type: none"> <li>If lower than last BG by more than 100 mg/dl: Decrease rate by HALF (50%)</li> <li>If lower than last BG by 50 – 100 mg/dl: Continue same rate</li> <li>If lower than last BG by less than 50mg/dl <u>OR</u> higher than last BG: <ul style="list-style-type: none"> <li>° BOLUS with 6 units Regular Insulin IV <u>AND</u> Increase Insulin rate by 2 Units / Hour</li> </ul> </li> <li>If BG remains 181 - 240 mg/dl and has not decreased after 3 consecutive increases in Insulin: <ol style="list-style-type: none"> <li>Give DOUBLE previous IV BOLUS dose up to a maximum of 24 units <u>AND</u></li> <li>DOUBLE Insulin drip rate -- up to a maximum of 20 units / hour</li> <li>If on 20 units/hour and no response <u>after 4 maximum boluses</u> – <u>CALL MD for further orders</u></li> </ol> </li> <li>Recheck BG in 30 minutes. Repeat BG every 30 minutes until less than 150mg/dl</li> </ul>
<b>Greater than 240</b>	<ul style="list-style-type: none"> <li>If lower than last BG by more than 150 mg/dl: Decrease rate by HALF (50%)</li> <li>If lower than last BG by 101-150mg/dl : Same rate</li> <li>If lower than last BG by 0- 100mg/dl <u>OR</u> if higher than last BG: <ul style="list-style-type: none"> <li>° BOLUS with 10 Units Regular Insulin IV <u>AND</u> DOUBLE Insulin rate up to a maximum of 30 units / hour</li> </ul> </li> <li>If BG remains greater than 240 mg/dl and has not decreased after 3 consecutive increases in Insulin: <ol style="list-style-type: none"> <li>Give DOUBLE previous IV BOLUS dose up to a maximum of 40 units <u>AND</u></li> <li>DOUBLE Insulin drip rate -- up to a maximum of 30 units / hour</li> <li>If on 30 units/hour and no response <u>after 4 maximum boluses</u> – <u>CALL MD for further orders</u></li> </ol> </li> <li>Recheck BG in 30 minutes. Repeat BG every 30 minutes until less than 150mg/dl</li> </ul>
<b>IF BG GREATER THAN 300 for 4 CONSECUTIVE READINGS: CALL MD FOR ADDITIONAL IV BOLUS ORDERS</b>	

Physician Signature \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

**Portland Continuous Intravenous Insulin Protocol ICU TARGET BLOOD GLUCOSE 80 to 120mg/dl  
Version 2008.1: ICU PHASE 3**

10. Diet: 1800 ADA Diabetic Diet starts with any PO intake. When need to advance diet exists, may begin with FULL liquids or SUGAR-FREE clear liquids and advance as tolerated. Patient may take oral or enteral nutrition at any time in conjunction with this protocol.

11. Prandial Subcutaneous Rapid-Acting Insulin Analogue (Humalog/Novolog/Apidra) Supplement in **ADDITION to** Insulin Infusion at **MEALTIMES:**

a. For the patient's **FIRST** meal give S.Q. Humalog/Novolog/Apidra **immediately** post-meal according to the following dosing schedule:

<b>Insulin Infusion Drip Rate at <u>First</u> Meal</b>	<b>Eats Greater Than 50% of Meal</b>	<b>Eats 25% to 50% of Meal</b>	<b>Snacks or less than 25% of meal</b>	<b>ROW #</b>
0 to 1.9 Units / Hour	4 Units	2 Units	1 Unit	1
2 to 3.9 Units / Hour	6 Units	3 Units	2 Units	2
4 to 5.9 Units / Hour	8 Units	4 Units	3 Units	3
6 to 7.9 Units / Hour	10 Units	5 Units	4 Units	4
8 to 10 Units / Hour	12 Units	6 Units	5 Units	5
Over 10 Units / Hour	14 Units	7 Units	6 Units	6

b. Chart the ROW # used from the above dosing schedule from the initial meal = "Initial Row #".

c. Continue Protocol BG frequency monitoring and treatment as noted in the IV portion of this protocol.

d. For all subsequent meals & periprandial S.Q. Insulin Analogue doses and titration use the table below.

- Note: Ignore the insulin IV insulin infusion rate after the first periprandial dose calculation and adjust all further doses using row # references.
- If consistently eating entire meal tray, give S.Q. Humalog/Novolog/Apidra when tray arrives at bedside.
- If uncertain of oral intake, then give S.Q. Humalog/Novolog/Apidra **immediately** post-meal

e. Based upon a postprandial BG reading obtained approximately 2 hours After Subcutaneous Analogue insulin was given, and using the "Initial Row #" as THE FIRST baseline row, titrate (adjust) the S.Q. dosing schedule Row # for the NEXT meal as follows:

- If the 2 hour postprandial BG is greater than 175mg/dl, increase insulin schedule for **next meal** by TWO ROWS
- If the 2 hour postprandial BG is 125 - 175mg/dl, increase insulin schedule for **next meal** by ONE ROW
- If the 2 hour postprandial BG is 81 – 124mg/dl, then repeat this dosing schedule with **next meal**
- If the 2 hour postprandial BG is 60 - 80mg/dl, then DECREASE insulin schedule for **next meal** by ONE ROW
- If the 2 hour postprandial BG is less than 60mg/dl, then DECREASE insulin schedule for **next meal** by TWO ROWS

<b>ROW #</b>	<b>Eats Greater Than 50% of Meal</b>	<b>Eats 25% to 50% of Meal</b>	<b>Snacks or less than 25% of meal</b>
1	4 Units	2 Units	1 Unit
2	6 Units	3 Units	2 Units
3	8 Units	4 Units	2 Units
4	10 Units	5 Units	3 Units
5	12 Units	6 Units	3 Units
6	14 Units	7 Units	4 Units
7	16 Units	8 Units	4 Units
8	18 Units	9 Units	5 Units
9	20 Units	10 Units	5 Units
10	22 Units	11 Units	6 Units
11	24 Units	12 Units	6 Units
12	26 Units	13 Units	7 Units

f. With each meal chart the ACTUAL ROW # used for S.Q. periprandial dosing.

g. This previous meal ROW# becomes the new Baseline row # from which the **NEXT** meal-related periprandial dose of S.Q Analogue will again be adjusted according to the titration schedule in 8.e as read from the table above.

h. Continue to titrate each subsequent meal-related S.Q. dose of Humalog/Novolog/Apidra according to the titration schedule in 8.e using the Row # actually used from the previous (Immediately preceding) meal as the baseline Row #.

i. May use PORTLAND PROTOCOL PRANDIAL TITRATION WORKSHEET, or chart in computer record

Physician Signature \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

**Portland Continuous Intravenous Insulin Protocol Floor TARGET BLOOD GLUCOSE 80 to 120mg/dl  
Version 2008.1: Floor PHASE 4**

- Start "Portland Protocol" on all Diabetic Floor patients if indicated as noted below:
  - Preoperative Patients -- Start Portland Protocol for any BG >180 mg/dl, including "non-diabetic" patients
  - Postoperative Patients -- Continue Portland Protocol upon transfer from ICU or restart if BG > 125 mg/dl
  - Medical Patients -- Start protocol if NPO or on clear liquids and BG > 150 mg/dl
  - Initial BG check on admission / transfer
  - Then recheck fingerstick BG AC, 2 hours PC & HS X 24 hours to determine if above inclusion criteria are met
  - Send blood for Hgb A1c if not already done on admission to hospital or in the ICU.

- Mix 1 unit Regular Human Insulin per 1 ml 0.9% Normal Saline, and start IV infusion via pump as follows:

Blood Glucose	IV Regular Insulin Syringe Bolus	Initial Regular Insulin Rate: Units/Hour	
		NIDDM <u>or</u> non-DM	IDDM
110 to 124 mg/dl	0	None	None
125 to 150 mg/dl	2 -- <b>For DM patients only *</b>	1 Unit / Hour	2 Units / Hour
151 to 180 mg/dl	4 Units	2 Units / Hour	3.5 Units / Hour
181 to 240 mg/dl	6 Units	3.5 Units / Hour	5 Units / Hour
241 to 300 mg/dl	8 Units	5 Units / Hour	6.5 Units / Hour
301 to 360 mg/dl	12 Units	6.5 Units / Hour	8 Units / Hour
Greater than 360 mg/dl	16 Units	8 Units / Hour	10 Units / Hour

- General Orders** for ALL patients on "Portland Protocol":
  - All **intermittent (noncontinuous) IV medications** should be mixed in normal saline.
    - Do **NOT** administer intermittent (noncontinuous) IV medications mixed in dextrose-containing solutions
  - Do **NOT** use any dextrose-containing IV solutions for maintenance IV or daily IV fluids except when TPN is required.
  - If daily **steroids** are required: administer as a continuous infusion over a 24-hour period.
    - Do **NOT** administer Bolus IV steroids or oral steroids while on IV insulin protocol.
- Protocol **Duration**:
  - Surgical Patients** -- Continue until 9 AM of 3<sup>rd</sup> Postoperative day. Then see transition to SQ insulin / oral agent orders.
  - Medical Patients** -- Continue Protocol until taking soft ADA diet or more. Then see transition to SQ insulin / oral agent orders.
  - Non-DM, euglycemic patients** may stop protocol when target range maintained with <0.3 units / hour; then check BG every 2 hours X 6; then AC, 2 hours PC, and HS X 24 hours; if all BG < 125 may cease monitoring; if any BG > 125 resume Protocol.
  - Non-Diabetic Surgical Patients** If continuing need for insulin exists after POD #3, and admission HgbA1c is greater than 6, ask physician to consult endocrinologist for DM workup and further follow-up orders.
- Transfer from ICU**: Transition to Floor (ward) version of Portland Protocol on transfer out of ICU in:
  - All **hyperglycemic patients**: within 3 days of operation or ICU admission, or those eating less than 50% of a regular diet.
  - Non-Diabetic Patients** If continuing need for insulin exists on transfer after POD #3, and admission HgbA1c is greater than 6, ask physician to consult endocrinologist for DM workup and further follow-up orders.
- Protocol **Cessation** permissible in:
  - Diabetic Surgical patients** if more than 3 days since last operation or ICU admission AND eating more than 50% of a regular diet -- Then see transition to SQ insulin / oral agent orders.
  - Non-Diabetic Surgical patients** if more than 3 days since last operation or ICU admission AND eating more than 50% of a regular diet -- May stop protocol without transition to SQ / Oral meds. Check BG AC 2 hours PC and HS X 48 hours
  - Diabetic Medical Patients** -- Transition Off Insulin Infusion when patient has been in target range for more than 4 hours, and is eating 50% or more of a soft or regular ADA meal. See transition to SQ insulin / oral agent orders
  - Non-Diabetic Euglycemic Patients** may stop protocol early If meet criteria outlined in #4 "Duration"
  - Non-Diabetic patients who remain hyperglycemic beyond the 3<sup>rd</sup> postoperative day** -- Endocrinology consultation should be requested by physician (see #5 above)
- Test Blood Glucose (BG) by finger stick, or venous line drop samples. **Frequency of BG testing** is as follows:
  - Check BG every **30 minutes** when:
    - BG greater than 150mg/dl
    - BG is less than 80mg/dl
    - after drip is stopped or decreased more than 50%
    - after Bolus IV Insulin dose is given.
  - Check BG **every Hour** when BG is 80 – 150 mg/dl
  - Check BG **every 2 Hours** when BG is 80 - 120, with less than 15mg/dl BG variation over 4 hours and Insulin Rate remains unchanged for 4 hours -- "Stable Infusion Rate". Note -- If any change in BG more than 15mg/dl, or any change in Insulin Rate more than 0.5 units: Return to checking BG every Hour.
  - During** initiation of, rate change of, or cessation of any nutritional support or renal correction therapy:
    - Check BG **every 30 minutes X 4**
      - Renal correction therapy = Renal Dialysis, CVVH, CVVHD, Peritoneal dialysis, etc.
      - Nutritional support (enteral or parenteral) includes Tube Feedings, TPN, PPN

**8. See Page 2 For Intravenous Insulin Titration Guidelines**

**9. See Page 3 For Meal Orders and adjunctive Periprandial SQ dosing schedules**

Physician Signature \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

**Page 2 of 3**  
**Portland Continuous Intravenous Insulin Protocol Floor TARGET BLOOD GLUCOSE 80 to 120mg/dl**  
**Version 2008.1: Floor PHASE 4**

**ICU:** May titrate Insulin Infusion between 0-30 units /hour using the following as **GUIDELINES** to rapidly (within 3 hrs) achieve and maintain BG in target range (80-120). Round insulin Infusion to the nearest tenth of a unit (0.1) when necessary.

<b>Blood Glucose (BG)</b>	<b>Note: If ANY BG less than 40mg/dl or greater than 450mg/dl, obtain confirmatory laboratory BG</b>
<b>Less Than 50</b>	<b>Action:</b> <b>Stop Insulin:</b> <ul style="list-style-type: none"> <li>If not alert or if NPO: give 15 ml of D50W IV; If &lt; 40 give 25 ml of D50W IV</li> <li>If alert and taking PO give 8 ounces of juice PO <b>OR</b> 6 glucose tablets PO</li> <li>Recheck BG every 30 minutes until greater than 80mg/dl</li> <li>If next BG is &lt; 50mg/dl: Double amount of previous treatment; If next BG is 50 – 65 mg/dl repeat treatment</li> <li>When BG greater than 90mg/dl: Restart Insulin rate at 50% of previous rate &amp; recheck BG in 30 minutes</li> </ul>
<b>50 to 64</b>	<b>Stop Insulin:</b> <ul style="list-style-type: none"> <li>If Previous BG greater than 100mg/dl <b>OR</b> if symptomatic from hypoglycemia:                      ° If <b>NPO</b>: give 15 ml of D50W IV; &lt;OR&gt; <b>IF taking PO</b>: give 4-6 ounces of juice <b>OR</b> 3 glucose tablets PO.</li> <li>Recheck BG every 30 minutes until greater than 80mg/dl</li> <li>If BG remains 50- 64 mg/dl : Repeat previous treatment</li> <li>When BG greater than 90mg/dl: Restart Insulin rate at 50% of previous rate &amp; recheck BG in 30 minutes</li> </ul>
<b>65 to 79</b>	<ul style="list-style-type: none"> <li>If greater than last test: Decrease rate by 0.2 units / Hour</li> <li>If lower than last BG by more than 30 mg/dl: <b>Stop drip</b> &amp; recheck BG in 30 minutes (see bold * order)</li> <li>If lower than last BG by 15 – 30 mg/dl: Decrease rate by HALF (50%) &amp; recheck BG in 30 minutes</li> <li>If lower than last BG by 7 – 14 mg/dl: Decrease rate by 0.5 Units / Hour</li> <li>If equal to last BG or lower than last BG by less than 7 mg/dl: Decrease rate by 0.3 Units / Hour</li> </ul> <p><b>*If infusion turned off, recheck BG in 30 min, when BG greater than 90mg/dl restart at 50% of previous rate &amp; recheck BG in 30 minutes</b></p> <ul style="list-style-type: none"> <li>Recheck BG every 30 minutes until greater than 80mg/dl</li> </ul>
<b>80 to 120</b> Target Range <b>EXCELLENT!</b> May titrate drip in ICU to maintain this range. See Suggestions:	<ul style="list-style-type: none"> <li>If higher than last BG by more than 10mg/dl: Increase rate by 0.5 Units / Hour</li> <li>If lower than last BG by more than 40 mg/dl: <b>Stop drip</b> &amp; recheck BG in 30 minutes (see bold ** order)</li> <li>If lower than last BG by 21–40 mg/dl: Decrease rate by HALF (50%) &amp; recheck BG in 30 minutes</li> <li>If lower than last BG by 10-20mg/dl: Decrease rate by 0.5 Units / Hour</li> </ul> <p><b>** If infusion turned off, recheck BG 30 min, if /when BG greater than 120mg/dl restart at 50% of previous rate</b></p> <ul style="list-style-type: none"> <li>If within 10mg/dl of last BG <u>same rate</u> unless the following applies:</li> <li><b>FOR ANY BG</b> in this range (even if within 10 mg/dl of last test) the following <b>ALWAYS</b> applies:                     <ul style="list-style-type: none"> <li>° BG has consistently decreased each of last 4 measurements: Decrease rate by an <b>additional</b> 0.3 Units / Hour</li> <li>° BG has consistently increased each of last 4 measurements: Increase rate by an <b>additional</b> 0.2 Units / Hour</li> </ul> </li> </ul>
<b>121 to 135</b>	<ul style="list-style-type: none"> <li>If higher than last BG by more than 50mg/dl: Increase rate by 2 Units/Hour</li> <li>If higher than last BG by 20 - 50mg/dl: Increase rate by 1 Unit / Hour</li> <li>If higher than last BG by 0 - 20mg/dl: Increase rate by 0.5 Units / Hour</li> <li>If lower than last BG by 1 - 20 mg/dl: Same rate</li> <li>If lower than last BG by 21 - 40mg/dl: Decrease rate by 1 Unit / Hour</li> <li>If lower than last BG by 41 – 60 mg/dl: Decrease rate by HALF (50%) and recheck BG in 30 minutes</li> <li>If lower than last BG by more than 60 mg/dl: <b>Stop drip &amp; recheck BG in 30 minutes</b> (see bold ** order below)</li> </ul> <p><b>**If infusion turned off, recheck BG 30 min, if /when BG greater than 125mg/dl restart at 50% of previous rate</b></p>
<b>136 to 150</b>	<ul style="list-style-type: none"> <li>If higher than last BG by more than 30mg/dl: Increase rate by 2 Units/Hour &amp; bolus with 3 units IV</li> <li>If higher than last BG by 0 - 30mg/dl: Increase rate by 1 Unit / Hour &amp; bolus with 2 units IV</li> <li>If lower than last BG by 1 – 20: Increase rate by 1 Unit / Hour &amp; bolus with 2 units IV</li> <li>If lower than last BG by 21 to 50mg/dl: Same rate</li> <li>If lower than last BG by 51 – 80mg/dl: Decrease rate by HALF (50%) and recheck BG in 30 minutes</li> <li>If lower than last BG by more than 80mg/dl: <b>Stop drip &amp; recheck BG in 30 minutes</b> (see bold ** order below)</li> </ul> <p><b>**If infusion turned off, recheck BG 30 min, if /when BG greater than 125mg/dl restart at 50% of previous rate</b></p>
<b>151 to 180</b>	<ul style="list-style-type: none"> <li>If lower than last BG by more than 80mg/dl: Decrease rate by HALF (50%)</li> <li>If lower than last BG by 30 –80mg/dl: Continue same rate</li> <li>If lower than last BG by 0 – 30: Increase Insulin rate by 1 Unit / Hour &amp; bolus with 2 units IV</li> <li>If higher than last BG by 1- 20mg/dl: Increase Insulin rate by 2 Units / Hour &amp; bolus with 4 units IV</li> <li>If higher than last BG by more than 20mg/dl: Increase Insulin rate by 3 Units/Hour &amp; bolus 6 units IV</li> <li>Recheck BG in 30 minutes. Repeat BG every 30 minutes until less than 150mg/dl</li> </ul>
<b>181 to 240</b>	<ul style="list-style-type: none"> <li>If lower than last BG by more than 100 mg/dl: Decrease rate by HALF (50%)</li> <li>If lower than last BG by 50 – 100 mg/dl: Continue same rate</li> <li>If lower than last BG by less than 50mg/dl <b>OR</b> higher than last BG:                     <ul style="list-style-type: none"> <li>° BOLUS with 6 units Regular Insulin IV <b>AND</b> Increase Insulin rate by 2 Units / Hour</li> </ul> </li> <li>If BG remains greater than 180-240 mg/dl and has not decreased after 3 consecutive increases in Insulin:                     <ol style="list-style-type: none"> <li>Give DOUBLE previous IV BOLUS dose up to a maximum of 24 units <b>AND</b></li> <li>DOUBLE Insulin drip rate -- up to a maximum of 20 units / hour</li> <li>If on 20 units/hour and no response <b>after 4 maximum boluses – CALL MD for further orders</b></li> </ol> </li> <li>Recheck BG in 30 minutes. Repeat BG every 30 minutes until less than 150mg/dl</li> </ul>
<b>Greater than 240</b>	<ul style="list-style-type: none"> <li>If lower than last BG by more than 150 mg/dl: Decrease rate by HALF (50%)</li> <li>If lower than last BG by 101-150mg/dl : Same rate</li> <li>If lower than last BG by 0- 100mg/dl <b>OR</b> if higher than last BG:                     <ul style="list-style-type: none"> <li>° BOLUS with 10 Units Regular Insulin IV <b>AND</b> DOUBLE Insulin rate up to a maximum of 30 units / hour</li> </ul> </li> <li>If BG remains greater than 240 mg/dl and has not decreased after 3 consecutive increases in Insulin:                     <ol style="list-style-type: none"> <li>Give DOUBLE previous IV BOLUS dose up to a maximum of 40 units <b>AND</b></li> <li>DOUBLE Insulin drip rate -- up to a maximum of 30 units / hour</li> <li>If on 30 units/hour and no response <b>after 4 maximum boluses – CALL MD for further orders</b></li> </ol> </li> <li>Recheck BG in 30 minutes. Repeat BG every 30 minutes until less than 150mg/dl</li> </ul>
<b>IF BG GREATER THAN 300 for 4 CONSECUTIVE READINGS: CALL MD FOR ADDITIONAL IV BOLUS ORDERS</b>	

Physician Signature \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

**Portland Continuous Intravenous Insulin Protocol Floor TARGET BLOOD GLUCOSE 80 to 120mg/dl  
Version 2008.1: Floor PHASE 4**

10. Diet: 1800 ADA Diabetic Diet starts with any PO intake. When need to advance diet exists, may begin with FULL liquids or SUGAR-FREE clear liquids and advance as tolerated. Patient may take oral or enteral nutrition at any time in conjunction with this protocol.
11. Prandial Subcutaneous Rapid-Acting Insulin Analogue (Humalog/Novolog/Apidra) Supplement in **ADDITION to** Insulin Infusion at **MEALTIMES:**
- a. For the patient's **FIRST** meal give S.Q. Humalog/Novolog/Apidra **immediately** post-meal according to the following dosing schedule:

<b>Insulin Infusion Drip Rate at <u>First</u> Meal</b>	<b>Eats Greater Than 50% of Meal</b>	<b>Eats 25% to 50% of Meal</b>	<b>Snacks or less than 25% of meal</b>	<b>ROW #</b>
0 to 1.9 Units / Hour	4 Units	2 Units	1 Unit	1
2 to 3.9 Units / Hour	6 Units	3 Units	2 Units	2
4 to 5.9 Units / Hour	8 Units	4 Units	3 Units	3
6 to 7.9 Units / Hour	10 Units	5 Units	4 Units	4
8 to 10 Units / Hour	12 Units	6 Units	5 Units	5
Over 10 Units / Hour	14 Units	7 Units	6 Units	6

- b. Chart the ROW # used from the above dosing schedule from the initial meal = "Initial Row #".
- c. Continue Protocol BG frequency monitoring and treatment as noted in the IV portion of this protocol.
- d. For all subsequent meals & periprandial S.Q. Insulin Analogue doses and titration use the table below.
- Note: Ignore the insulin IV insulin infusion rate after the first periprandial dose calculation and adjust all further doses using row # references.
  - If consistently eating entire meal tray, give S.Q. Humalog/Novolog/Apidra when tray arrives at bedside.
  - If uncertain of oral intake, then give S.Q. Humalog/Novolog/Apidra **immediately** post-meal
- e. Based upon a postprandial BG reading obtained approximately 2 hours After Subcutaneous Analogue insulin was given, and using the "Initial Row #" as THE FIRST baseline row, titrate (adjust) the S.Q. dosing schedule Row # for the NEXT meal as follows:
- If the 2 hour postprandial BG is greater than 175mg/dl, increase insulin schedule for **next meal** by TWO ROWS
  - If the 2 hour postprandial BG is 125 - 175mg/dl, increase insulin schedule for **next meal** by ONE ROW
  - If the 2 hour postprandial BG is 81 – 124mg/dl, then repeat this dosing schedule with **next meal**
  - If the 2 hour postprandial BG is 60 - 80mg/dl, then DECREASE insulin schedule for **next meal** by ONE ROW
  - If the 2 hour postprandial BG is less than 60mg/dl, then DECREASE insulin schedule for **next meal** by TWO ROWS

<b>ROW #</b>	<b>Eats Greater Than 50% of Meal</b>	<b>Eats 25% to 50% of Meal</b>	<b>Snacks or less than 25% of meal</b>
1	4 Units	2 Units	1 Unit
2	6 Units	3 Units	2 Units
3	8 Units	4 Units	2 Units
4	10 Units	5 Units	3 Units
5	12 Units	6 Units	3 Units
6	14 Units	7 Units	4 Units
7	16 Units	8 Units	4 Units
8	18 Units	9 Units	5 Units
9	20 Units	10 Units	5 Units
10	22 Units	11 Units	6 Units
11	24 Units	12 Units	6 Units
12	26 Units	13 Units	7 Units

- f. With each meal chart the ACTUAL ROW # used for S.Q. periprandial dosing.
- g. This previous meal ROW# becomes the new Baseline row # from which the **NEXT** meal-related periprandial dose of S.Q Analogue will again be adjusted according to the titration schedule in 8.e as read from the table above.
- h. Continue to titrate each subsequent meal-related S.Q. dose of Humalog/Novolog/Apidra according to the titration schedule in 8.e using the Row # actually used from the previous (Immediately preceding) meal as the baseline Row #.
- i. May use PORTLAND PROTOCOL PRANDIAL TITRATION WORKSHEET, or chart in computer record.