

Supplementary Table 1. The Portland Protocol Original Manual. Portland Protocol During the Re-perfusion Phase in Liver Transplantation (Version 2008.2; ICU Phase 3; Target Blood Glucose 80–120 mg/dl). ICU: Intensive Care Unit.

■ PREPARATION OF AN INSULIN INFUSION ■

- 1) Mix 1-unit regular insulin per 1 ml 0.9% normal saline. Administer via infusion pump.
- 2) Target blood glucose concentrations: 80–120 mg/dl.

■ BLOOD GLUCOSE CONCENTRATION (BGC) MONITORING ■

- 1) Check BGC predetermined time points.
- 2) Start “the Portland protocol” for 5 min after re-perfusion BGC > 125 mg/dl, including “non-diabetic” patients.
- 3) If any of the following occur, notify the attending staff, consider the target BGC change:
 - a) BGC < 70 mg/dl
 - b) K⁺ concentration < 3.0 mEq/L

■ INSULIN INITIATION DOSE ■

Blood glucose	IV regular insulin syringe bolus	Initial regular insulin rate: units/hour	
		NIDDM or non-DM	IDDM
110 to 124 mg/dl	0 units	None	None
125 to 150 mg/dl	2 → For DM patients only*	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

■ CHANGING THE INSULIN INFUSION RATE ■

Blood glucose (BG)	Note: If any BG is less than 40 mg/dl or greater than 450 mg/dl, obtain confirmatory laboratory BG. Action:
< 50 mg/dl	Stop insulin Give 15 ml of D50W IV; if < 40 give 25 ml of D50W IV. Re-check BG every 30 min until greater than 80 mg/dl. If next BG is < 50 mg/dl: double amount of previous treatment; if next BG is 50–65 mg/dl repeat treatment. When BG greater than 90 mg/dl: restart insulin rate at 50% of previous rate & re-check BG in 30 min.
50–64 mg/dl	Stop insulin If previous BG greater than 100 mg/dl OR if symptomatic from hypoglycemia: give 15 ml of D50W IV. Re-check BG every 30 min until greater than 80 mg/dl. If next BG remains 50–64 mg/dl: repeat previous treatment. When BG greater than 90 mg/dl: restart insulin rate at 50% of previous rate & re-check BG in 30 min.
65–79 mg/dl	If greater than last test: decrease rate by 0.2 units/hour. If lower than last BG by more than 30 mg/dl: stop drip & re-check BG in 30 min (see bold * order). If lower than last BG by 15–30 mg/dl: decrease rate by HALF (50%) & re-check BG in 30 min. If lower than last BG by 7–14 mg/dl: decrease rate by 0.5 units/hour. If equal to last BG or lower than last BG by less than 7 mg/dl: decrease rate by 0.3 units/hour. *If infusion turned off, re-check BG in 30 min, when BG greater than 90 mg/dl restart at 50% of previous rate & re-check BG in 30 min. Re-check BG every 30 min until greater than 80 mg/dl.

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<p>80–120 mg/dl (target range)</p>	<p>If higher than last BG by more than 10 mg/dl: increase rate by 0.5 units/hour. If lower than last BG by more than 40 mg/dl: stop drip & re-check BG in 30 min (see bold ** order). If lower than last BG by 21–40 mg/dl: decrease rate by HALF (50%) & re-check BG in 30 min. If lower than last BG by 10–20 mg/dl: decrease rate by 0.5 units/hour. **If infusion turned off, re-check BG 30 min, if /when BG greater than 120 mg/dl restart at 50% of previous rate. If within 10 mg/dl of last BG: same rate unless the following applies: FOR ANY BG in this range (even if within 10 mg/dl of last test) the following ALWAYS applies: ° BG has consistently decreased each of the last 4 measurements: decrease rate by an additional 0.3 units/hour. ° BG has consistently increased each of the last 4 measurements: increase rate by an additional 0.2 units/hour.</p>
<p>121–135 mg/dl</p>	<p>If higher than last BG by more than 50 mg/dl: increase rate by 2 units/hour. If higher than last BG by 20–50 mg/dl: increase rate by 1 unit/hour. If higher than last BG by 0–20 mg/dl: increase rate by 0.5 units/hour. If lower than last BG by 1–20 mg/dl: same rate. If lower than last BG by 21–40 mg/dl: decrease rate by 1 unit/hour. If lower than last BG by 41–60 mg/dl: decrease rate by HALF (50%) and re-check BG in 30 min. If lower than last BG by more than 60 mg/dl: stop drip & re-check BG in 30 min (see bold ** order below). **If infusion turned off, re-check BG 30 min, if /when BG greater than 125 mg/dl restart at 50% of previous rate.</p>
<p>136–150 mg/dl</p>	<p>If higher than last BG by more than 30 mg/dl: increase rate by 2 units/hour & bolus with 3 units IV. If higher than last BG by 0–30 mg/dl: increase rate by 1 unit/hour & bolus with 2 units IV. If lower than last BG by 1–20 mg/dl: increase rate by 1 unit/hour & bolus with 2 units IV. If lower than last BG by 21–50 mg/dl: same rate. If lower than last BG by 51–80 mg/dl: decrease rate by HALF (50%) and re-check BG in 30 min. If lower than last BG by more than 80 mg/dl: stop drip & re-check BG in 30 min (see bold ** order below). **If infusion turned off, re-check BG 30 min, if /when BG greater than 125 mg/dl restart at 50% of previous rate.</p>
<p>181–240 mg/dl</p>	<p>If lower than last BG by more than 100 mg/dl: decrease rate by HALF (50%). If lower than last BG by 50–100 mg/dl: continue same rate. If lower than last BG by less than 50 mg/dl OR higher than last BG: °BOLUS with 6 units regular insulin IV AND increase insulin rate by 2 units/hour. If BG remains 181–240 mg/dl and has not decreased after 3 consecutive increases in insulin: a. Give DOUBLE previous IV BOLUS dose up to a maximum of 24 units, AND b. DOUBLE insulin drip rate up to a maximum of 20 units/hour. c. If on 20 units/hour and no response after 4 maximum boluses: CALL MD for further orders. Re-check BG in 30 minutes. Repeat BG every 30 min until less than 150 mg/dl.</p>
<p>> 240 mg/dl</p>	<p>If lower than last BG by more than 150 mg/dl: decrease rate by HALF (50%). If lower than last BG by 101–150 mg/dl: same rate. If lower than last BG by 0–100 mg/dl OR if higher than last BG: ° BOLUS with 10 units regular insulin IV AND DOUBLE insulin rate up to a maximum of 30 units/hour. If BG remains greater than 240 mg/dl and has not decreased after 3 consecutive increases in insulin: d. Give DOUBLE previous IV BOLUS dose up to a maximum of 40 units, AND e. DOUBLE insulin drip rate up to a maximum of 30 units/hour. f. If on 30 units/hour and no response after 4 maximum boluses: CALL MD for further orders. Re-check BG in 30 min. Repeat BG every 30 min until less than 150 mg/dl.</p>

■ FLOW SHEET ■

Time points	Glucose (mg/dl)	Potassium (mEq/L)	RI bolus (IU)	RI continuous (IU/h)
10 min before re-perfusion			X	X
5 min after re-perfusion				
30 min after re-perfusion				
1 hour after re-perfusion				
2 hours after re-perfusion				
3 hours after re-perfusion				
4 hours after re-perfusion				
ICU arrival			X	X