Postoperative Glycemic Control in Adults with CHD

What the ICU Bedside Nurse Needs to Know

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Introduction

Adult patients with and without diabetes who have increased glucose levels both intra-operatively and in the immediate post operative period have a 10-fold increase in postoperative complications including death. Higher glucose levels have been identified as an independent predictor of morbidity. Lowering perioperative glucose levels with insulin therapy shows a decrease in both morbidity and mortality in cardiac surgery patients. Tight glycemic control lowers the incidence of wound infections, reduces hospital length of stay, and enhances long-term survival.

Class 1 recommendation for critically ill adult patients and those who require cardiac surgery repair. (Jacobi, 2012)

Tight glycemic control is not recommended for pediatric patients as there were no significant changes in infection rate, mortality, length of stay, or measures of organ failure compared with standard care. However, tight glucose control in pediatric patients increases the risk of hypoglycemia. (Agus, 2012)

Critical Thinking

Insulin reverses the harmful effects of hyperglycemia on the endothelium and myocardium.

Glycemic control is best achieved with continuous insulin infusions rather than intermittent SQ or IV doses. The goal for patients with and without diabetes is to maintain a serum glucose range of 100-150mg/dL with continuous insulin infusions in the perioperative period and for their ICU stay. (Class 1 evidence) Patients who require $\geq$ 3 days ICU stay should keep blood glucose <150 mg/dL (Class B) Patients should be transitioned to subcutaneous insulin before IV insulin infusions are discontinued. (Class B) Blood glucose levels below 70mg/dL are associated with increased mortality. [Lazarl,2009; Lazar, 2012; Jacobi, 2012]

Treatment

Order sets/specific protocols initiated in the perioperative period to direct insulin infusion by assessment of blood glucose levels are essential. (Examples of order sets from Oregon Health and Science University available upon request).

Order sets/protocols should include: (Jacobi, 2012; Lazar, 2012)

1. Insulin administration protocol
2. Appropriate staffing resources
3. Adequate glucose management with:

a. Continuous glucose intake
b. Standardized IV insulin preparation
c. Dosing format that requires minimal bedside decision-making
d. Frequency of blood glucose monitoring
e. Protocolized dextrose dosing for prompt treatment of hypoglycemia
f. Protocol to transition to SQ insulin prior to stopping of IV infusion

Special considerations

Evidence based nursing research comparing Point of Care (POC) glucose values with laboratory values supports several important considerations in the assessment of glucose values. (Cook, 2009; Denfeld, 2010; Shearer, 2009) These considerations include:

1. POC values are significantly different than laboratory glucose values by as much as 20mg/dL. *Individual institutions should compare the POC monitor that they use with their laboratory and adjust their glycemic control parameters to control the risk of inadvertent hypoglycemia.* (Note: OHSU goal for glycemic control recently changed from 80-109 mg/dL to 110-135 mg/dL based upon a nursing research study conducted in the OHSU Cardiac ICU comparing Point-of-Care and Laboratory Glucose.)

2. POC samples are less accurate with hypoglycemia.

3. POC values are affected by hematocrit --with decreased hematocrit glucose levels increase, with increased hematocrit glucose levels decrease. With hematocrits below 25 or greater than 60, glucose levels should be from laboratory analysis.

4. POC samples from central lines (either arterial or venous) have no significant difference from fingerstick samples. Fingerstick samples have a greater variation from laboratory samples.

5. Decreased mean arterial pressures, acidosis, finger edema do not affect glucose levels from fingerstick samples.

6. Consider pain from fingersticks and increased risk of infection from accessing central lines that do not have a closed system with reinfusion capability when deciding on POC sampling technique.

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Reviewed/revised
9/2015
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