Sweet Outcomes in Critical Care

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Insulin Treatments

- Conventional Therapy
  - Insulin infusion if BG >215 mg/dL
  - Goal range 180-200 mg/dL
- Intensive Therapy
  - Patients received insulin to maintain goal range 80-110 mg/dL

Results

- Reduced mortality during intensive care from 8% with conventional therapy to 4.6% mortality.
- Greatest reduction in mortality involved deaths due to multiple-organ failure with a proven septic focus

Van den Berghe Study 2001

- The New England Journal of Medicine
- Nov 2001, vol 345 Van den Berghe
- Prospective, randomized, controlled study
- Ventilated patients
  - Cardiac/Vascular surgery patients
  - Neuro disease, cerebral trauma, brain surgery
  - Abdominal surgery or peritonitis
  - Multiple trauma or severe burns
  - Transplantation and others

Results

- Patients receiving intensive therapy were less likely to require prolonged mechanical ventilation and intensive care
Conclusion

- Intensive Therapy reduces morbidity and mortality among critically ill patients in the surgical intensive care unit.

Research Review

Hyperglycemia in the Critical Care Setting

- Stress Response
- Insulin Resistance
- Increased susceptibility to infection
- Patients with and without diabetes

Hyperglycemia in the Critical Care Setting

- Increased plasma counter regulatory hormone levels have multiple effects on glucose homeostasis
- End result is hyperglycemia resistant to insulin

Hyperglycemia in the Critical Care Setting

- "Stress Diabetes"
  - Obesity
  - SIRS
  - Advanced Age
  - Exogenous Steroids or Catecholamines
  - Increased Fatty Acids
  - Nutrition Support

Adverse Effects

- Glycosuria and inappropriate diuresis
- Increased risk of infection
  - Impairing neutrophil and immunoglobulin function
- Exacerbation of cerebral edema
Critical Care Nutrition Goals

- Avoid Overfeeding
  - Metabolic Cart
  - Predictive Equations may over-estimate needs
  - Obesity
    - Adjusted Body Weight or Actual Body Weight
  - Fluid

Critical Care Nutrition Goals

- Initial
  - 100-200 grams of Glucose daily
  - 1.5-2.0 grams of Protein per IBW
- Overall
  - 20-35 Calories per Kilogram Usual Body Weight per Day

Critical Care Nutrition Goals

- Glucose
  - Minimum: 100 grams daily to maintain CNS function and drive the citric acid cycle
  - Maximum: 4-7 mg/kg per minute
    - > than this amount may result in lipogenesis and hyperglycemia
  - Up to 2 mg/kg per minute may be provided via gluconeogenesis

Glucose Control Goals

- In the past Hyperglycemia defined as blood glucose >200 mg/dL
- Now tighter control expected
- Need to be established for differing populations
- Critical Care Setting
- Acute Care setting

Protocols

- Sliding-Scale
- Insulin Drip

Total Parenteral Nutrition

Total Parenteral Nutrition

Day One:
- 150-200 grams of dextrose
- If patient previously treated with insulin, oral agents or fasting glucose 200 ml/dL: No more than 100 grams of dextrose/day
- Blood Glucose >300 mg/dL: Do not initiate until blood glucose <200 mg/dL

Addition of Basal Insulin
- In patients previously treated with insulin or oral agents
  - Initial Regimen: 0.1 units per gram of dextrose
  - Hyperglycemia >150 mg/dL: 0.15 units per gram of dextrose
  - Obese with Type II Diabetes may require 0.1 units for every 0.5 grams of dextrose
  - Thin Type I diabetic patient may require 0.1 units per 2 grams of dextrose

Monitor Capillary Glucose Levels
- Every 6 hours
- Until Stable
- Supplement with sliding-scale coverage

Modify Insulin Dosage Daily
- Based on needed sliding-scale coverage over previous 24 hour period

Separate Insulin Infusion
- If hyperglycemia persists when 0.3 units of insulin per gram of dextrose is exceeded
- If insulin needs are dynamic or difficult to predict
  - e.g. infection, inflammatory response

Basal Insulin
- Only Regular Human Insulin is Compatible
- Do not increase dextrose until blood glucose consistently <200 mg/dL in a 24 hour period
- Reassess insulin dose with dextrose modification

Diabetic Formula vs. Standard Formula
- Avoid Overfeeding

Enteral Nutrition
Challenges in Glucose Control

- Diabetic Patients
- Obesity
- Critical Care Setting
  - IV Infusions
  - Current Nursing Practice/Education