

## Association of Hyperglycemia, Glucocorticoids, and Insulin Use with Morbidity and Mortality in the Pediatric Intensive Care Unit

Kupper A. Wintergerst, M.D.,<sup>1</sup> Michael B. Foster, M.D.,<sup>1</sup> Janice E. Sullivan, M.D.,<sup>2</sup> and Charles R. Woods, M.D., M.S.<sup>3</sup>

### Abstract

#### Background:

Studies of pediatric intensive care unit (PICU) patients have shown a significant association of morbidity and mortality with hyperglycemia. We retrospectively evaluated the degree of hyperglycemia as well as its correlation with glucocorticoid and insulin use and assessed its association with hospital length of stay (LOS) and mortality. This study preceded the initiation of a standard glycemetic control protocol.

#### Methods:

We examined medical records at Kosair Children's Hospital for all PICU admissions from 2008 of patients without diabetes mellitus. Critical illness hyperglycemia (CIH) was defined by having three or more peak glucose values greater than thresholds of 110, 140, 180, and 200 mg/dl. These patients were evaluated for glucocorticoid, insulin use, and outcome measures.

#### Results:

We evaluated the eligible 1173 admissions, where 10.5% of these patients reached the highest threshold (200 mg/dl) of CIH. Glucocorticoids were used in 43% of these patients, with dexamethasone being the most common (58%). There was a significant correlation between glucocorticoids and higher peak glucose values, where 81% of the patients who were above the 200 mg/dl cutoff level were treated with glucocorticoids. Only 36.8% in that group were also treated with insulin. Patients at the 200 mg/dl cutoff had the highest median PICU and total hospital length of stays (4 and 10 days, respectfully). Mortality was associated with increasing glucose levels, reaching 18.7% among patients above the 200 mg/dl cutoff.

#### Conclusion:

Hyperglycemia was prevalent in the PICU and was associated with increased morbidity, as characterized by increased LOS and increased mortality. Glucocorticoid use was prevalent among patients exhibiting hyperglycemia. Insulin use was uncommon.

*J Diabetes Sci Technol 2012;6(1):5-14*

**Author Affiliations:** <sup>1</sup>Department of Pediatrics, Division of Endocrinology, University of Louisville School of Medicine, Louisville, Kentucky; <sup>2</sup>Department of Pediatrics, Division of Critical Care, University of Louisville School of Medicine, Louisville, Kentucky; and <sup>3</sup>Department of Pediatrics, Division of Infectious Disease; University of Louisville School of Medicine, Louisville, Kentucky

**Abbreviations:** (CI) confidence interval, (CIH) critical illness hyperglycemia, (ICD) International Statistical Classification of Diseases and Related Health Problems, (ICU) intensive care unit, (LOS) length of stay, (NICE-SUGAR) Normoglycemia in Intensive Care Evaluation-Survival Using Glucose Algorithm Regulation study, (NOS) not otherwise specified, (PICU) pediatric intensive care unit

**Keywords:** critical illness, glucocorticoids, glucose, hyperglycemia, hypoglycemia, insulin, intensive care, morbidity, mortality, pediatric

**Corresponding Author:** Kupper A. Wintergerst, M.D., Department of Pediatrics, Division of Endocrinology, University of Louisville, School of Medicine, 571 South Floyd St., Suite 423, Louisville, KY 40202; email address [kawint01@louisville.edu](mailto:kawint01@louisville.edu)