

Intensive Insulin Therapy in Critically Ill Hospitalized Patients: Making It Safe and Effective

David C. Klonoff, M.D., FACP

Abstract

Intensive insulin therapy (IIT) for hyperglycemia in critically ill patients has become a standard practice. Target levels for glycemia have fluctuated since 2000, as evidence initially indicated that tight glycemic control to so-called normoglycemia (80–110 mg/dl) leads to the lowest morbidity and mortality without hypoglycemic complications. Subsequent studies have demonstrated minimal clinical benefit combined with greater hypoglycemic morbidity and mortality with tight glycemic control in this population. The consensus glycemic targets were then liberalized to the mid 100s (mg/dl).

Handheld POC blood glucose (BG) monitors have migrated from the outpatient setting to the hospital environment because they save time and money for managing critically ill patients who require IIT. These devices are less accurate than hospital-grade POC blood analyzers or central laboratory analyzers.

Three questions must be answered to understand the role of IIT for defined populations of critically ill patients: (1) How safe is IIT, with various glycemic targets, from the risk of hypoglycemia? (2) How tightly must BG be controlled for this approach to be effective? (3) What role does the accuracy of BG measurements play in affecting the safety of this method? For each state of impaired glucose regulation seen in the hospital, such as hyperglycemia, hypoglycemia, or glucose variability, the benefits, risks, and goals of treatment, including IIT, might differ.

With improved accuracy of BG monitors, IIT might be rendered even more intensive than at present, because patients will be less likely to receive inadvertent overdoses of insulin. Greater doses of insulin, but with dosing based on more accurate glucose levels, might result in less hypoglycemia, less hyperglycemia, and less glycemic variability.

J Diabetes Sci Technol 2011;5(3):755–767

Author Affiliation: Diabetes Research Institute, Mills-Peninsula Health Services, San Mateo, California

Abbreviations: (A1C) hemoglobin A1c, (AACE) American Association of Clinical Endocrinologists, (ACP) American College of Physicians, (ADA) American Diabetes Association, (BG) blood glucose, (CID) critical-illness-induced dysglycemia, (FDA) Food and Drug Administration, (ICU) intensive care unit, (IIT) intensive insulin therapy, (NICE-SUGAR) Normoglycemia in Intensive Care Evaluation—Survival Using Glucose Algorithm Regulation, (POC) point-of-care, (TGC) tight glycemic control

Keywords: critical care, glucose, glucose monitoring, glucose variability, hyperglycemia, hypoglycemia, insulin, intensive, intensive care unit, point of care

Corresponding Author: David C. Klonoff, M.D., FACP, Diabetes Research Institute, Mills-Peninsula Health Services, 100 S. San Mateo Dr., Room 5147, San Mateo, CA; email address dklonoff@yahoo.com