PERSPECTIVE

Diabetes Management

Insulin algorithm for achieving and maintaining glycemic objectives during hyperglycemic crisis therapy

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Description

Insulin therapy for hyperglycemic crises, diabetic ketoacidosis, and hyperglycemic hyperosmolar state may be ordered using a mix of weight-based and qualitative rules for the beginning and adjustment of the rate of intravenous insulin infusion, according to current standards of care. In the early hours of treatment, a fixed-dose insulin regimen, such as 0.1-0.14 units/kg/h of insulin, is frequently used. Higher-dose insulin protocols, which were once normal, were safely and efficiently replaced by low-dose regimens in the 1970s, possibly with a reduction in late hypoglycemia and hypokalemia.

Diabetic ketoacidosis or hyperglycemic hyperosmolar condition are two terms used to describe hyperglycemic crises. DKA was responsible for roughly 120,000 hospital discharges in the United States in 2005, amounting to 7.4 discharges per 1000 diabetes patient population, with diabetes patients under 45 years of age having the highest rate of discharges. Annual rates of DKA discharges per 1000 diabetic patient population under 45 years of age were 55.4 and 31.6 in 1987 and 2005, respectively. DKA has a higher incidence than HHS, however studies on the relative frequency of the two illnesses vary greatly, possibly because to variances in patient features and demographics.

In a big academic centre, hospital expenses, length of stay, and readmission rate were all lower when care was provided by an endocrinologist, yet DKA and HHS were frequently managed under the supervision of general practitioners. Treatment delays upon arrival and omissions of subcutaneous insulin prior to discontinuation of intravenous insulin infusion have highlighted the possibilities for improvement through more active nursing staff involvement.

The use of protocols and the development of standardized procedures for low-dose intravenous insulin infusion have lowered the rate of metabolic problems. Recent reviews have provided thorough advice on the general management of hyperglycemic crises in adults and children. After initial correction of admission hyperglycemia, the goal ranges for blood glucose during treatment are reported to be 150-199 mg/dl for DKA and 200-299 mg/dl for HHS.

Management of hyperglycemic crisis does not always result in the achievement or maintenance of glycemic objectives on time. Following achieving target range control, recovery may be hampered by BG levels falling below target, overt hypoglycemia, hypokalemia, recurrent hyperglycemia, or repeated ketoacidosis. Factors of deviation from target range control may include hydration status, intravenous dextrose use, patient comorbidities and concomitant medications, order timeliness, and other factors, as well as intravenous insulin infusion rate.

Among critically ill patients, algorithms expressing

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physiologic behavior or pharmacodynamic effects have achieved differences of glycemic control compared with algorithms that were not similarly engineered. These algorithms were not specifically designed for, or evaluated during, treatment of DKA or HHS. The use of low-dose insulin therapy for hyperglycemic crisis has been based on our understanding of the physiology of endogenous insulin action and the pharmacodynamics of insulin administration in normal physiology and in hyperglycemic crises.

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Algorithms representing physiologic behaviour or pharmacodynamic effects achieved better glucose control in critically ill patients than algorithms that were not similarly developed. These algorithms were not developed or tested especially for the treatment of DKA or HHS. Our understanding of the physiology of endogenous insulin activity and the pharmacodynamics of insulin delivery in normal physiology and in hyperglycemic crises has led to the use of low-dose insulin therapy for hyperglycemic crises.