Insulin protocols for hospital management of diabetes

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Most patients with diabetes admitted to community hospitals have their conditions managed by family physicians. Outpatient management of diabetes uses evidence-based guidelines for management and stresses tight glycemic control.[1-3] However, traditional hospital practice has been very ad hoc and there are currently no specific guidelines to help with inpatient management. The most frequently used treatment regimen has been the ubiquitous "sliding scale," with regular insulin given before meals.

Because of the unpredictable absorption kinetics of regular insulin and the reactive nature of the efforts at glucose control, the sliding scale is unphysiological and ineffective in controlling postprandial glucose and prone to inducing delayed hypoglycemia.[4] Not surprisingly diabetes "control" has been erratic and efforts at management are often a hit-or-miss exercise in frustration for physicians, nursing staff, and patients. A growing number of studies confirms that aggressive management of hyperglycemia in hospital reduces morbidity, mortality, infection rates, and length of stay.[5,6]

Historically, attempts to manage diabetes in hospital have met with variable success not only because of fear of hypoglycemia, but also because of the absence of several factors: consistency in the management approach, appreciation of the importance of better glucose control, and confidence in using the more physiological basal-bolus system of insulin replacement.[5]

Basal–bolus approach

Three years ago some colleagues encouraged me to introduce preprinted protocols at Kelowna General Hospital, a 350-bed tertiary care referral centre in Central Okanagan with a large complement of specialists and subspecialists but no endocrinologist. This centre has more than 100 primary care physicians involved with in-hospital care of patients.

Consultations with colleagues confirmed a powerful desire to improve in-hospital diabetes management. Our main goal in introducing these protocols was to get away from the near-universal use of sliding scale regular insulin and to introduce (and simplify) the basal-bolus approach to treatment.[5]

Basal insulin is required to prevent fasting and unchecked between-meals hyperglycemia. Usually about 50% of the total insulin requirement, basal insulin acts by suppressing hepatic glucose output (an often forgotten but critically important source of elevated blood glucose). Basal insulin is essential even when a patient has orders for nil by mouth. Ideally a basal insulin should be prolonged, peakless, and predictable; therefore, one of the new long-lasting analogues would be preferred. Insulin NPH, although not ideal, is currently the basal insulin available on our hospital formulary and is given in the morning and at bedtime.

Bolus (or prandial) insulin is necessary to prevent a glucose surge after intake of food, thus it should have a fast and predictable onset of action, peaking at a time that coincides with carbohydrate absorption. A rapid-acting analogue is preferred and is given immediately before mealtime. In addition, a correction dose of rapid-acting insulin can be given as needed (usually at bedtime) to reduce any unexpected elevation in blood glucose.

Various protocols

Priorities in drawing up these protocols were simplicity, safety, and effectiveness. The medical protocol is designed for a non-surgical patient who is able to eat and who requires insulin. The surgical and procedural protocols cover anyone who is receiving nil by mouth and might require insulin. Doses in the protocols were arrived at empirically and largely from my own clinical experience.

Before we launched the protocols, we made a presentation to the medical advisory committee and did teaching rounds and in-services for everyone affected, including our hospitalists and staff in nursing, pharmacy, medicine, surgery, emergency, and family practice. Some fine tuning was essential. On the advice of nursing staff, "tick boxes," which medical staff often didn't fill in, have been removed.

Starting dose of basal insulin is intentionally conservative and, in the interests of simplicity, we purposefully omitted insulin sensitivity factors and carbohydrate counting. Surprisingly, these omissions have not proven critical; this could be because frequent review is encouraged and changes can be made at the discretion of the treating physician. It is understood that many individuals

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are very insulin resistant and basal-insulin requirements in particular can be several times that suggested in the protocols. Glycemic goals are as follows: fasting blood sugar, <7 mmol; 2 hours after meals, <10 mmol; perioperative range, 5 to 10 mmol.

A hypoglycemia protocol, taken from the Canadian Diabetes Association guidelines,[3] is an integral part of our insulin protocols. Intravenous insulin infusion protocols are used in the intensive care unit, and occasionally on the labour floor and the renal unit.

Patient management

In-hospital patients who are competent, eating, and experienced in self-management are encouraged to continue self-managing their diabetes. Although this occasionally meets with some resistance from nursing (and medical) staff, individual expertise should be acknowledged and patients' self-management of their diabetes should be accommodated.

Patients previously unfamiliar with the basal-bolus approach to self-management are taught on the ward. Patients are encouraged to continue with this regimen on discharge and to follow up with an early appointment at our diabetes education centre to learn more about such things as carbohydrate counting and matching bolus insulin to carbohydrate intake.

Conclusion

The medical staff and nursing staff at Kelowna General Hospital have been using these inuslin protocols for several years. The unanimous opinion among the staff is that these protocols are a very effective and safe means of improving in-hospital management of diabetes and also reducing the likelihood of insulin errors. A more formal assessment of effectiveness, safety, and outcomes is being planned. In the meantime, we especially encourage family physicians working in community hospitals to consider their use.

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Competing interests

None declared

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