

Technical Challenges and Clinical Outcomes of Using a Closed-Loop Glycemic Control System in the Hospital

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Abstract

According to large randomized trials, results suggest that maintaining normoglycemia postoperatively through tight glycemic control (TGC) and intensive insulin therapy (IIT) can improve surgical outcomes as well as reduce mortality and morbidity in critically ill patients. However, trials examining the effects of TGC have had conflicting results. Systematic reviews and meta-analyses have also led to differing conclusions. The main reason these clinical trials and meta-analyses show negative results for TGC is the high incidence of hypoglycemia induced by IIT. This could not be prevented because there is no reliable technique that can avoid this condition during IIT. The development of accurate, continuous blood glucose monitoring devices and closed-loop systems for computer-assisted blood glucose control in the intensive care unit (ICU) will probably help avoid hypoglycemia in these situations.

The STG closed-loop glycemic control system was introduced to our department to be used and evaluated for strict serum glucose control with no hypoglycemic episodes during IIT in the surgical ICU, to reduce the workload of ICU nurses, and to decrease incidents related to the management of blood glucose levels according to manual conventional venous infusion insulin therapy. The goal of our team was to use the STG closed-loop glycemic control system for perioperative TGC in surgical patients to solve the complications of IIT and reduce risk of hypoglycemia. The challenge at our hospital demonstrated that the STG closed-loop glycemic control system can be expected to achieve TGC with no occurrence of hypoglycemia induced by IIT after surgery.

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Abbreviations: (BG) blood glucose, (ICU) intensive care unit, (IIT) intensive insulin therapy, (SSI) surgical site infection, (TGC) tight glycemic control

Keywords: closed-loop glycemic control system, hypoglycemia, intensive care unit, intensive insulin therapy, liver, pancreas, STG, surgery, tight glycemic control

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