

Evidence-Based Tight Glycemic Control for Post Surgical Patients

Heather L. Bowen, BSN, MHA, MBA

Michael E. DeBakey VA Medical Center

Hamam Alrabaa (Presenter)

Problem

Approximately 50% of postsurgical patients have hyperglycemia. Tighter glycemic control is essential to promote healing and prevent complications for these patients.

Evidence

A systematic literature review was performed to collect current evidence published within the last 5 years on the best practice of glycemic control for postsurgical patients. The randomized controlled trials (RCT) were used as part of the key words in the PubMed search. A total of 16 papers were located.

Strategy

The best outcomes based on the time to the targeted blood glucose (80-110 mg/dl) was achieved by using the computerized algorithms, 7 RCTs published in last 2 years; as compared to the nurse-driven protocols.

Practice Change

The computerized system utilizes an algorithm that gradually lowers blood sugar maintaining the metabolic homeostasis for insulin infusion.

Evaluation

A computer program that regulates the insulin drip based on blood sugar level is superior to other methods of glycemic control.

Results

Time to achieve targeted glucose ranges are 13.6-14.1 hours for physician-driven and 7.4 hours for nurse-driven insulin infusion protocols; and 6.9 hours for the computerized system. The hypoglycemia rate is 0.4% to 0.6% for the computerized system, vs. 1.1%-3.4% for the other protocols. If hypoglycemia occurs, the computer instantly stops administering insulin; with the average time to recover from hypoglycemia was 26 minutes with an alarm to alert the nurse requiring a blood test. The majority of hypoglycemic cases in the nurse-driven protocols were due to nursing errors such as forgetting to decrease the units per hour, the complexity of the protocol, and quick response in rechecking blood sugar levels. Carbohydrate intake commonly offset the glycemic balance for all methods.

Recommendation

The findings reveal that the computerized insulin infusion is safe and efficient with less adverse effects.

Bibliography

- Barcellos, C. S., Wender, O., Azambuja, P. (2007). Clinical and hemodynamic outcome following coronary artery bypass surgery in diabetic patients using glucose-insulin-potassium (GIK) solution: a randomized clinical trial. *Rev Bras Cir Cardiovascular*, 22(3), 275-284.
- Button, E., Keaton, P. (2006). Glycemic control after coronary bypass graft: using intravenous insulin regulated by a computerized system. *Critical Care Nursing Clinics of North America*, 18, 257-265.
- Chant, C., Wilson, G., Friedrich, J. O. (2005). Validation of an insulin infusion nomogram for intensive glucose control in critically ill patients. *Pharmacotherapy*, 25(3), 352-359.
- Dortch, M. J., Mowery, N.T., Ozdas, A., Dossett, L., Cao, H., Collier, B., et al. (2008). A computerized insulin infusion titration protocol improves glucose control with less hypoglycemia compared to a manual titration protocol in a trauma intensive care unit. *Journal of Parenteral Enteral Nutrition*, 32(1), 18-27.
- Furnary, A. P., Wu, Y., Bookin, S. O. (2004). Effect of hyperglycemia and continuous intravenous insulin infusions on outcome of cardiac surgical procedures: the Portland diabetic project. *Endocrine Practice*, 10(2), 21-33.
- Hoedemaekers, C.W., Pickkers, P., Netea, M.G., Deuren, M., Van Der Hoeven, J. G. (2005). Intensive insulin therapy does not alter the inflammatory response in patients undergoing coronary artery bypass grafting: a randomized controlled trial. *Critical Care*, 9(6), R790-R797.
- Junega, R., Roudebush, C., Kumar, N., Macy, A., Golas, A., Wall, D., et al. (2007). Utilization of a computerized intravenous insulin infusion program to control blood glucose in the intensive care unit. *Diabetes Technology and Therapeutics*, 9(3), 232-240.
- Li, J., Sun, S., Wu, S. (2006). Continuous insulin infusion improves postoperative glucose control in patients with diabetes mellitus. *Texas Heart Institute Journal*, 33, 445-451.
- Okabayashi, T., Hnazaki, K., Nishimori, I., Sugimoto, T., Maeda, H., Yatabe, T. et al. (2007). Continuous post-operative blood glucose monitoring and control using a closed-loop system in patients undergoing hepatic resection. *Digestive Disease Science*, [Online]. Available: Springer Science + Business Media, LLC 2007.
- Plank, J., Blaha, J., Cordingley, J., Wilinska, M. E., Chassin L. J., Morgan, C., et al. (2006). Multicentric, randomized, controlled trial to evaluate blood glucose control by the model predictive control algorithm versus routine glucose management protocols in intensive care unit patients. *Diabetes Care*, 29, 271-276.
- Shulman, R., Finney, S. J., O'Sullivan, C., Glynne, P. A., Greene, R. (2007). Tight glycemic control: a prospective observational study of a computerized decision-supported, intensive insulin therapy protocol. *Critical Care*, 11(4), R75. [Online]. Available: <http://ccforum.com/content/11/4/R75>.
- Taylor, B. E., Schallom, M. E., Sona, C. S., Buchman, T. G., Boyle, W. A., Mazuki, J. E., et al. (2006). Efficacy and safety of an insulin infusion protocol in a surgical ICU. *Journal of the American College of Surgeons*, 202(1), [Online]. Available: <http://www.mdconsult.com/das/article/body/86702489-2/>.
- Toschlog, E. A., Newton, C., Allen, N., Newell, M. A., Goettler, C. E., Schenaris, P. et al. (2007). Morbidity reduction in critically ill trauma patients through use of a computerized insulin infusion protocol: a preliminary study. *The Journal of Trauma Injury, Infection, and Critical Care*, 62, 1370-1376.

- Van den Berghe, G. (2007). Does tight blood glucose control during cardiac surgery improve patient outcome? *Annals of Internal Medicine*, 146(4), [Online]. Available: www.annals.org
- Van den Berghe, G., Wouters, P. J., Bouillon, R., Weekers, F., Verwaest, C., Scheta, M. et al. (2003). Outcome benefit of intensive insulin therapy in the critically ill: insulin dose versus glycemic control. *Critical Care Medicine*, 31(2), [Online]. Available: <http://www.mdconsult.com/das/article/body/86392857-2/>.
- Zimmerman, C. R., Mlynarek, M. E., Jordan, J. A., Rajda, C. A., Horst, H. M. (2004). An insulin infusion protocol in critically ill cardiothoracic surgery patients. *The Annals of Pharmacotherapy*, 38, 1123-1129. [Online]. Available: www.theannals.com