

GLYCEMIC CONTROL IN ELECTIVE SURGERY PATIENTS

Target Audience:

Physicians, Physician Assistants, Nurse Practitioners and Nurses at Good Samaritan Hospital impacted by the guideline.

Scope/Patient Population:

All patients undergoing elective surgical procedures at Good Samaritan Hospital.

Rationale:

In the United States, over 29.1 million (9.3% of the population) are living with diabetes; of those, an estimated 8 million are undiagnosed³. An additional 86 million Americans have pre-diabetes.

Multiple studies have shown that glycemic control during a hospital encounter is often inadequate; as many as 40% of a hospitalized patients have glucose levels outside of recommended ranges. While hyperglycemia (glucose > 140 mg/dL) is often a hallmark of diabetes, elevated glucose levels may be induced by stress and result in transient elevations of blood glucose levels¹.

Hyperglycemia is associated with increased mortality, hospital length of stay, and post-operative complications^{1,12,13,19}. For this reason, glucose levels should be monitored and treated across using a basal-bolus protocol, and in some instances an intravenous insulin infusion, across all operative time periods targeting a glucose range of 100-180 mg/dL (100-150 mg/dL for cardiac surgery patients)^{16,19,22,23}. Adherence to these glucose management standards has been shown to improve patient outcomes and diminish the risk of adverse events^{5,7,9,12,13,20,22,24}.

Objective

To improve the outcomes and reduce the cost of care for patients undergoing elective surgical procedures by:

- Identifying patients with uncontrolled and undiagnosed diabetes prior to undergoing elective surgery in order to reduce risk of surgical complications and prolonged hospitalization.
- Targeting a blood glucose goal of 100 to 180 mg/dL (100-150 mg/dL for

cardiac surgery patients) during the intra- and post-operative time periods.

- Engaging a Certified Diabetes Educator in the education and discharge planning process to promote a smoother transition to the outpatient setting.

Recommendations:

Preoperative Phase

Recommendation	Support
Obtain Hemoglobin A1c (HgbA1c) on all patients with diabetics within 90 days of elective surgery	Multiple guidelines recommend selective preoperative screening for surgical patients based upon risk factors associated with the development of diabetes (e.g. obesity) as it can guide preoperative instructions and decisions ^{7,15,19} . Early testing can help to identify some of the 25 to 30% of patients with previously undiagnosed diabetes and support prompt and appropriate treatment for these inpatients and as well as those with hyperglycemia caused by stress or medication ^{18,19,24} .
If the patient is coming in for other labs or an in-person pre-admit clinic visit, obtain glucose level on all patients with a BMI 30 or greater and/or over the age of 45 prior to the day of surgery.	
Obtain glucose level on all patients with known diabetes, BMI 30+ and age 45+ on the day of surgery	

Intraoperative Phase

Recommendation	Support
Initiate an IV insulin protocol if the patient's glucose is 180 mg/dL or greater.	Research indicates targeting a glucose range of 100-180 mg/dL can prevent a majority of complications without increasing the incidence of hypoglycemia ^{7,10,12,13,16,18,21,22} .
For patients with an initial day of surgery glucose over 120 and a surgery expected to last over 2 hours <ul style="list-style-type: none"> - Test glucose within 30-60 minutes of incision - If trend is increasing, continue testing periodically 	12% of non-diabetic patients will experience a hyperglycemia episode. 47% of all hyperglycemia episodes are in non-diabetics.

<ul style="list-style-type: none"> - If glucose exceeds 180, consider administering IV insulin 	
<p>Deliver insulin intravenously. Do not administer insulin subcutaneously.</p>	<p>IV insulin should be administered during the intraoperative time period as subcutaneous insulin has an unpredictable absorption in normal circumstances and may be worse when changes in tissue perfusion occur ^{2,25}.</p>
<p>Postoperative Phase</p>	
<p>Recommendation</p>	<p>Support</p>
<p>Monitor glucose level before meals and at bedtime or every 6 hours (for patients that are NPO, receiving enteral tube feedings or TPN) in all patients with a history of diabetes or who had a day of surgery glucose greater than 140 mg/dL.</p>	<p>Multiple studies have shown that glycemic control during a hospital encounter is often inadequate; specifically as many as 40% of a hospitalized patients have glucose levels outside of recommended ranges. Monitoring glucose levels frequently and timely treatment with insulin will offer an opportunity to improve glucose values during a patient's hospital stay ^{13,16,19,22}.</p>
<p>Treat hyperglycemia using a basal/bolus protocol. Do not use sliding scale insulin for glucose control.</p>	<p>The RABBIT2 trial demonstrated superiority in using a basal/bolus protocols when compared to using a sliding scale for glucose control ²³.</p>
<p>Discharge</p>	
<p>Recommendation</p>	<p>Evidence</p>
<p>Engage a Certified Diabetes Educator (CDE) in the education and discharge planning process to promote a smoother transition to the outpatient setting especially when patients are newly diagnosed or have uncontrolled diabetes (i.e. HgbA1c > 7%, glucose level > 200 mg/dL on 2 different days).</p>	<p>The American Diabetes Association and Washington State Health Association recommend that a CDE be involved in a patient's plan of care when education is required^{14,20} Involving a CDE improves the transition care-coordination process so that patient-specific information can be relayed effectively to the patient's PCP ^{6,8}.</p>

Algorithm:

See Appendix A

Evidence:

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2. Bantle JP, Laine DC. **Day-to-day variation in glycemic control in type I and type II diabetes mellitus.** Diabetes Res. 1988 Jul;8(3):147-9.
3. Centers for Disease Control and Prevention. **2014 National diabetes fact sheet: national estimates and general information on diabetes and prediabetes in the United States.** Atlanta: U.S. Department of Health and Human Services. Available at <http://www.cdc.gov/diabetes/pubs/statsreport14/national-diabetes-report-web.pdf> Accessed on August 10, 2015.
4. Dellinger EP. **Preventing Surgical-Site Infections: The Importance of Tiing and Glucose Control.** Infection Control and Hospital Epidemiology. 2001 Oct; 22(10): 604-606.
5. Duncan AE, Abd-Elsayed A, Maheshwari A, Xu M, Soltesz E, Koch CG. **Role of Intraoperative and Postoperative Blood Glucose Concentrations in Predicting Outcomes after Cardiac Surgery.** Anesthesiology. 2010 Apr; 112: 860-871.
6. Feddersen E, Lockwood DH. **An inpatient diabetes educator's impact on length of hospital stay.** Diabetes Educ. 1994 Mar-Apr;20(2):125-8.
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10. Ku SY, Sayre CA, Hirsch IB, Kelly JL. **New insulin infusion protocol improves blood glucose control in hospitalized patients without increasing hypoglycemia.** Jt Comm J Qual Patient Saf. 2005; 31:141–147.
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Association of Diabetes and Glucose Control with Surgical Site Infections Among Cardiothoracic Surgery Patients. Infection Control and Epidemiology. 2001 Oct;22(10):607-612.

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13. Moghissi ES, Korytkowski MT, DiNardo M, Einhorn D, Hellman R, Hirsch IB, Inzucchi SE, Ismail-Beigi F, Kirkman MS, Umpierrez GE; American Association of Clinical Endocrinologists; American Diabetes Association. **American Association of Clinical Endocrinologists and American Diabetes Association consensus statement on inpatient glycemic control.** Diabetes Care. 2009 Jun;32(6):1119-31.

14. Noordzij PG, Boersma E, Schreiner F, et al. **Increased preoperative glucose levels are associated with perioperative mortality in patients undergoing noncardiac, nonvascular surgery.** Eur J Endocrinol 2007;156:137-142.

15. Pomposelli JJ, Baxter JK 3rd, Babineau TJ, et al. **Early postoperative glucose control predicts nosocomial infection rate in diabetic patients.** JPEN J Parenter Enteral Nutr 1998;22:77-81.

16. Qaseem A, Humphrey LL, Chou R, Snow V, Shekelle P; **Clinical Guidelines Committee of the American College of Physicians. Use of intensive insulin therapy for the management of glycemic control in hospitalized patients: a clinical practice guideline from the American College of Physicians.** Ann Intern Med. 2011 Feb 15;154(4):260-7.

17. Sheehy AM, Gabbay RA. **An overview of preoperative glucose evaluation, management, and perioperative impact.** J Diabetes Sci Technol. 2009 Nov 1;3(6):1261-9.

18. Society of Hospital Medicine. **Improving Glycemic Control, Preventing Hypoglycemia and Optimizing Care of the Inpatient with Hyperglycemia and Diabetes.** 2nd Edition. 2015. Society of Hospital Medicine.

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	<p>Hospital Society.</p> <p>20. Reduction of Surgical Site Infections: Glucose Control Tool Kit. Washington State Hospital Association. January 18, 2013.</p> <p>21. NICE-SUGAR Study Investigators. Intensive versus Conventional Glucose Control in Critically Ill Patients. N Engl J Med. 2009; 360:1283–1297.</p> <p>22. Umpierrez GE, Hellman R, Korytkowski MT, Kosiborod M, Maynard GA, Montori VM, Seley JJ, Van den Berghe G; Endocrine Society. Management of hyperglycemia in hospitalized patients in non-critical care setting: an endocrine society clinical practice guideline. J Clin Endocrinol Metab. 2012 Jan;97(1):16-38.</p> <p>23. Umpierrez GE, et al. Randomized Study of Basal-Bolus Insulin Therapy in the Inpatient Management of Patients With Type 2 Diabetes Undergoing General Surgery (RABBIT 2 Surgery). Diabetes Care. 34:256–261, 2011.</p> <p>24. Umpierrez GE, Isaacs SD, Bazargan N, You X, Thaler LM, Kitabchi AE. Hyperglycemia: an independent marker of in-hospital mortality in patients with undiagnosed diabetes. J Clin Endocrinol Metab. 2002 Mar; 87:978–982.</p> <p>25. Vora JP, Burch A, Peters JR, Owens DR. Relationship between absorption of radiolabeled soluble insulin, subcutaneous blood flow, and anthropometry. Diabetes Care. 1992 Nov;15(11):1484-93.</p>
	<p>List of Implementation Items and Patient Education:</p> <ul style="list-style-type: none"> • <i>Care Pathway (Algorithm)</i> • <i>Glycemic Control QlikView Application</i>
	<p>Metrics Plan:</p> <p>Goals</p> <ul style="list-style-type: none"> • Reduce length of stay in diabetic elective surgery patients by X days • Reduce 30 day readmissions in diabetic elective surgery patients to X% • Reduce day of surgery cancellations for elective surgery due to high glucose to X%

Aims

Before Surgery

Pre-Admit

- Increase percentage of known diabetics with an A1c tested within 15-90 days of surgery to X%
- Increase percentage of patients of patients with BMI 30+ tested with a blood glucose tested 15-30 days prior to surgery to X%.

Pre-Op

- Increase percentage of all surgery who are known diabetics, BMI 30+ and age 45+ tested with a point-of care glucose on the day of surgery prior to surgery to X%.

Intra-Op and Post-op

- Improvement in patient glucose control intra- and post-operatively. Four ways we will measure for elective surgery patients only:
 - Reduce percent of glucose tests results over 180 mg/dL during intra- and post- operative period to X%
 - Reduce the percentage of patients with X consecutive glucose measurements of 180+ during the intra-op or post-op period to X%
 - Reduce the percentage of patient-days where a patient has a glucose measure over 180 to X% (post-op only)
 - Decrease the mean glucose in elective surgery patients to X

Discharge

Increase the percentage of known diabetics who received a consultation with the CDE prior to discharge to X%.

PDCA Plan:

Review bi-annually by the Surgery Collaborative.

Point of Contact:

Surgery Collaborative Ops Lead

Approval By: MHS/Other Committee: SWAC Collaborative (Surgery) MCC/Collaborative Leadership	Date of Approval: <i>03/2016</i> <i>03/2016</i> <i>04/2016</i>
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Distribution: MultiCare Connected Care + MultiCare Health System

