Preoperative Diabetes Screening

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Agenda

Surgical Home
Preoperative optimization
Impact of hyperglycemia on surgical outcome
Diabetes screening and optimization
Preoperative instructions
Financial Disclosures

None
Perioperative Surgical Home

A patient-centered and physician-led multidisciplinary and team-based system of coordinated care that guides the patient throughout the entire surgical experience.
Perioperative Surgical Home

- Increase quality
- Reduce complications
- Increase the efficiency and cost-effectiveness of perioperative care
- Improve the patient’s surgical experience
Perioperative Surgical Home

Five major goals

1. Provide a portal of entry to perioperative care and ensure continuity.
2. Identify and manage patients according to acuity, comorbidities and risk factors.
3. Deliver evidence-based clinical care before, during and after the procedure.
4. Manage, coordinate and follow up on perioperative care across specialty lines.
Prehabilitation

Interventions to optimize preoperative condition

Opportunities for Optimization

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<th>Cardiovascular</th>
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Opportunities for Optimization

Cardiovascular  Electrolyte Abnormalities
Pulmonary  Diabetes Mellitus
Anemia  Bleeding disorders
Malnutrition  Obesity
Smoking  Substance abuse
Functional status
8% of the US population have diabetes mellitus

At least 1/3 are unaware of their disease.

7 Million

In 2007 diabetes was a contributing factor in over 231,000 deaths.
Estimated percentage of people aged 20 years or older with diagnosed and undiagnosed diabetes, by age group, United States, 2005–2008

- 20–44: 3.7%
- 45–64: 13.7%
- ≥65: 26.9%

Criteria for Diagnosis

HbA1C ≥ 6.5%

Fasting Plasma Glucose ≥ 126 mg/dl (7.0 mmol/l)*

2-h plasma glucose ≥ 200 mg/dl (11.1 mmol/l) during OGTT*

Classic symptoms of hyperglycemia or hyperglycemic crisis, with a random plasma glucose ≥ 200 mg/dl (11.1 mmol/l)

*In the absence of unequivocal hyperglycemia, confirm by repeat testing.
Perioperative effects of Hyperglycemia

Increased risk of perioperative infections
- Pneumonia
- Urinary tract infection
- Wound infection
- Sepsis

Impaired wound healing

Vascular endothelium injury and organ dysfunction

Positioning injuries

VTE

Increased hospital length of stay

Increased mortality
Perioperative Glycemic Goals

Avoidance of significant hyper- or hypo-glycemia
- Critically ill patients: 140-180 mg/dL
- Non-critically ill:
  - Pre-meal < 140 mg/dL
  - Random < 180 mg/dL

Maintenance of electrolyte and fluid balance

Prevention of Ketoacidosis in patients with type 1 DM

Decrease risk of diabetes related complications
- Postoperative wound infections
Hyperglycemia and Cardiac Surgery

J Thorac Cardiovasc Surg 2005;130:1144
High peak serum glucose during CPB
risk factor for mortality/morbidity
in diabetics and nondiabetics

Increased post CABG mortality, renal failure,
  infection, Afib, LOS with elevated HbA1c

  8.6% -- 4 fold increase mortality
  7.8% -- 5 fold increase deep sternal wound infection
Hyperglycemia and General Surgery

Eur J Vasc Endovasc Surg 2006;32:188
Increased post vascular surgery wound infection and composite 30 day morbidity with elevated HbA1c

Ann Surg 2006;141:375 (NSQIP)
“Good” preop glycemic control HbA1c < 7% -- Decreased infectious complications

J Gastrointest Surg 2009;13:508
Mean 48 h postop glucose > 200 mg/dL -- 3 fold increased SSI

Arch Surg. 2010;145:858 (NSQIP)
Increased SSI with opreop glucose > 180 ml/dL or postop glucose > 140 ml/dL

Cardiovascular Diabetology 2011;10:63
10 mg/dl increase in preop glucose – 11% increase in perioperative cardiovascular events

Ann Surg 2011;253:158 (NSQIP)
Mean serum glucose > 150 mg/dL – increased postop infections after non-cardiac surgery

Hyperglycemia – 2 fold increased risk of infection, re-operation, anastomotic failures, mortality

Diabetes Care 2014;37:611 (NSQIP)
A1c > 8% associated with longer LOS after major non-cardiac surgery
Hyperglycemia and General Surgery


- 40 mg/dl increase serum glucose
  - 30% increased risk of postop infection after general and vascular surgery

Postop hyperglycemia also increased LOS
Hyperglycemia and General Surgery

Diabetes Care 2010; 33:1783
General, neuro, ortho, vascular, uro, GYN, ENT

Periop hyperglycemia
Increased 30 day mortality in non-diabetics
Hyperglycemia and General Surgery

Br J Anaesthesia 2014;112:79

75,600 elective non-cardiac surgery cases
Diabetic patients had higher mortality risk at low-normal blood glucose levels
Non-diabetics had higher mortality risk at increased blood glucose levels
Hyperglycemia and Orthopedic Surgery

Orthopedic trauma, non-diabetic patients
Hyperglycemia risk factor for 30 day SSI

J Arthroplasty 2010; 25:64
Preop blood glucose > 200 mg/dL –
3 fold increased risk of PE after total joint arthroplasty
Hyperglycemia and Neurosurgery

Surg Neurol Int. 2012; 3: 49

- 900 craniotomy or spine surgery
- Blood glucose > 120 mg/dL -- increased risk of postop complications
- Preop glucose > 120 mg/dL -- increased ICU and hospital LOS
Does treatment of hyperglycemia improve perioperative outcome?

“Delaying elective major surgery while glycemic control is improved is predicted to decrease mortality and serious morbidity”

Does treatment of hyperglycemia improve perioperative outcome?

Diabetes Care 34:256–261, 2011
RABBIT 2 General Surgery Study
Basal-Bolus Insulin
Improved glycemic management
Decrease complications, wound infections, ICU length of stay
Increased hypoglycemia

![Graph showing blood glucose levels at different times of the day](image)
Does treatment of hyperglycemia improve perioperative outcome?

Endocr Pract. 2006; 12[Suppl 3]:22 (Portland Diabetes Project)

Perioperative hyperglycemia during cardiac surgery increases risk of mortality, deep sternal wound infection, LOS

3 days of IV insulin decreases risk
ADA Screening Recommendations

All adults with BMI ≥ 25 and have the following:
- Physical inactivity
- First-degree relative with diabetes
- Member of high-risk ethnic group
  - African-American, Native American, Pacific Islander, Latino
- Women with history of gestational DM or a baby >4.1 kg (9 lbs)
- Hypertension
  - > 135/80 mm Hg (US preventative Services Task Force)
- HDL cholesterol level <35 mg/dL or triglyceride level >250 mg/dL
- History of cardiovascular disease
- Women with polycystic ovarian syndrome
- History of impaired glucose tolerance or impaired fasting glucose
- Other clinical conditions associated with insulin resistance

In the absence of the above criteria, ≥ age 45
- If normal, repeat at least at 3-year intervals

Patients with prior diagnosis of DM
  - Measure non fasting (random) or fasting blood glucose
  - Measure HbA1c if not done within past 90 days

Patients with no prior diagnosis of DM
  - Measure non fasting (random) or fasting blood glucose if BMI > 30 or age > 45
    - Measure HbA1c if non fasting blood glucose greater than 180 mg/dL or fasting blood glucose greater than 126 mg/dL
  - Notify patient, PCP, and surgeon if newly diagnosed hyperglycemia/DM
Day of Procedure
Glycemic Screening

Measure fasting blood glucose

Measure HbA1c if not performed within 90 days
  Diabetic patients
  Non-diabetics with fasting blood glucose > 126 mg/dL
Criteria for postponing Elective surgery

Relative

Poorly controlled diabetes when postoperative infection or impaired wound healing would cause significant morbidity

Fasting blood glucose > 200 mg/dL
Consider delay of non-emergent surgery for treatment until blood glucose is less than 200 mg/dL and any hydration and electrolyte abnormalities are normalized

Hgb A1C > 7.5 %
Criteria for postponing Elective surgery

Absolute

- Severe Dehydration
- Ketoacidosis
- Hyperosmolar nonketotic state

HbgA1C ≥ 9%

Delay elective surgery until glycemic management is optimized as determined by PCP or specialist
Diabetic Medication Instructions

Metformin, Oral Hypoglycemic agents and non-insulin injectable agents

Hold PM prior to, and AM of surgery

Long Acting Insulin

glargine (Lantis), detimer (levemir)
80% of usual evening dose the day before surgery
80% of usual morning dose the day of surgery

Intermediate Acting Insulin

NPH, Novalin-N, Humulin-N, 70/30, U500
80% of usual evening dose prior to surgery
50% of usual morning dose day of surgery

Insulin Pump

0600 DOS, set to “sleep” basal rate for 12 hours.
Summary

The surgical home model of perioperative care strives to improve both surgical outcome and longitudinal care.

An important component is preoperative assessment and optimization of co-morbidities.

Perioperative hyperglycemia can increase morbidity, mortality, LOS, and cost of care.

Undiagnosed diabetic patients may have higher risk of hyperglycemia related complications than known diabetics.

Preoperative and perioperative optimization of serum glucose may decrease the risk of hyperglycemia related complications.