# Ensuring Optimal Glycemic Control for Hospitalized Patients: *The Role of the Hospitalist*

**David Baldwin, Jr, MD**
**Professor of Medicine**
**Division of Endocrinology**
**Rush University Medical Center**
**Chicago, Illinois**

**CME Breakfast Symposium**

**Thursday, February 25, 2016**

# Disclosures

**UNAPPROVED USES OF DRUGS/DEVICES:** In accordance with requirements of the FDA, the audience is advised that information presented in this continuing medical education activity may contain references to unlabeled or unapproved uses of drugs or devices. Please refer to the FDA approved package insert for each drug/device for full prescribing/utilization information.

It is the policy of the Rush University Office of Interprofessional Continuing Education to ensure that its CE activities are independent, free of commercial bias and beyond the control of persons or organizations with an economic interest in influencing the content of CE. Everyone who is in a position to control the content of an educational activity must disclose all relevant financial relationships with any commercial interest (including but not limited to pharmaceutical companies, biomedical device manufacturers, or other corporations whose products or services are related to the subject matter of the presentation topic) within the preceding 12 months.

The course directors, planners and faculty of this activity have the following relevant financial relationships to disclose.

**Speaker:**
**David Baldwin, Jr, MD**        Dr Baldwin reports receiving research support from Boehringer Ingelheim and Novo Nordisk.

# Learning Objectives

After participating this activity, the participant will demonstrate the ability to:

- **DESCRIBE** the use of various insulins for glycemic control in hospitalized patients.

- **EVALUATE** strategies to safely maintain glycemic control during transitions of care in hospitalized patients.

- **DEVELOP** individualized glucose management plans for patients in the hospital setting.

# Accreditation & Credit Designation Statements

**ACCREDITATION STATEMENT –** Rush University Medical Center is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians. Rush University Medical Center designates this live activity for a maximum of one (1.0) *AMA PRA Category 1 Credit*™. Physicians should claim only credit commensurate with the extent of their participation in the activity.

This activity is being presented without bias and with commercial support.

To claim Continuing Education Credit, attendees must:
- Sign in at the registration desk;
- Provide a valid e-mail address at registration;
- Attend the entire session;
- Complete the evaluation and return to staff prior to leaving the Summit.

Certificates of participation will be sent by e-mail to each attendee 7 to 10 days after the Summit. Please be sure to provide a valid e-mail address.

# Overview

- **Preoperative planning for patients with diabetes**

- **Day-of-surgery management of diabetes**

- **Postoperative management of hyperglycemia: why bother?**

- **Post-op management of hyperglycemia**

  - **Using IV infusion in the ICU**

  - **Using SQ insulin on the general surgical unit**

- **What are risks for hypoglycemia and how do we mitigate them?**

- **Discharge planning: how to use the $HbA_{1c}$**

ICU = intensive care unit; $HbA_{1c}$ = hemoglobin $A_{1c}$; IV = intravenous; SQ = subcutaneous.

# Preoperative Planning for Patients with Diabetes Mellitus

- **Record an accurate description of antidiabetes medications, especially combination oral agents (eg, metformin and pioglitazone, sitagliptin/metformin, etc) and insulins. Remember Novolin or Humulin are not types of insulin; they are brand families of insulins.**

- **The best way to assess the presence of and the control of chronic hyperglycemia is $HbA_{1c}$ A value >6.5% is diagnostic of diabetes and well-controlled patients have an $HbA_{1c}$ of 6%–8%.**

# Preoperative Planning for Patients with Diabetes Mellitus

- **$HbA_{1c}$ is recommended to be done for all inpatients with diabetes or new hyperglycemia if not done within the past 2 months.* A current value should be a part of your pre-op evaluation for all patients with a history of diabetes or for patients with newly discovered hyperglycemia. If not checked pre-op, you are just going to have to do on POD-1; so you might as well do it pre-op where it will be valuable in pre-op planning.**

# Rush University Protocol for the Preoperative Management of Antidiabetic Therapies Other Than Insulin

- **Sulfonylureas**
    - **Glyburide, glipizide, glimepiride, repaglinide, nateglinide**
- **Metformin**
- **Pioglitazone**
- **Exenatide, liraglutide, dulaglutide**
- **Sitagliptin, linagliptin, saxagliptin, alogliptin**
- **Alpha-glucosidase inhibitors**
- **SGLT-2 inhibitors (eg, canaglifozin)**

**May take all with food the night prior to surgery;
Take none on the morning of surgery.**

SGLT-2 = sodium-glucose transporter-2.

# Rush University Protocol for the Preoperative Management of Insulin Therapy

| Medications at Home | Day Before and Morning of Surgery |
|---|---|
| **Long lasting insulin**<br>glargine (Lantus)<br>detemir (Levemir)<br>degludec (Tresiba) | • Take your full normal dose on the evening before; or<br>• the full dose on the morning of surgery if prescribed daily either AM or PM<br>• If prescribed twice a day, take the full dose during both the AM and PM |
| **Intermediate lasting insulin**<br>NPH (Novolin or Humulin) | Take the full dose the night before surgery and take 50% of the AM dose on the morning of surgery. |
| **Rapid-acting insulins:**<br>aspart (Novolog)<br>lispro (Humalog)<br>glulisine (Apidra)<br>regular (Novolin or Humulin) | Take the day before surgery if eating a normal diet. Do not take on the morning of surgery. |

# Rush University Protocol for the Preoperative Management of Insulin Therapy

- **What about premixed insulins?**
  - **Humulin or Novolin 70/30 (NPH/regular)**
  - **Humalog 75/25  (NPH/lispro)**
  - **Humalog 50/50  (NPH/lispro)**
  - **Novolog 70/30   (NPH/aspart)**
- **Take the full dose with dinner the night before surgery**
- **Take none on the morning of surgery**

# Rush University Protocol for the Preoperative Management of Insulin Therapy

## Insulin Pump Patients

- **Except for minor brief procedures, it is undesirable to have an SQ insulin infusion running during and after surgery**

- **OR staff and post-op recovery staff have no familiarity with insulin pumps**

- **These patients are obviously not in full command of their faculties**

- **There is no reason to take a high-risk drug and create an even higher-risk situation**

OR = operating room.

# Rush University Protocol for the Preoperative Management of Insulin Therapy

## Insulin Pump Patients

- **Patients should get specific instructions from their endocrinologist. The ideal approach is to convert to insulin glargine the night before surgery. The glargine dose should equal the total 24-hour basal insulin dose delivered by the pump. After the glargine is given, disconnect the pump 2 hours later and leave it at home. Otherwise the patient will have to be converted in the pre-op holding area by the endocrine service.**

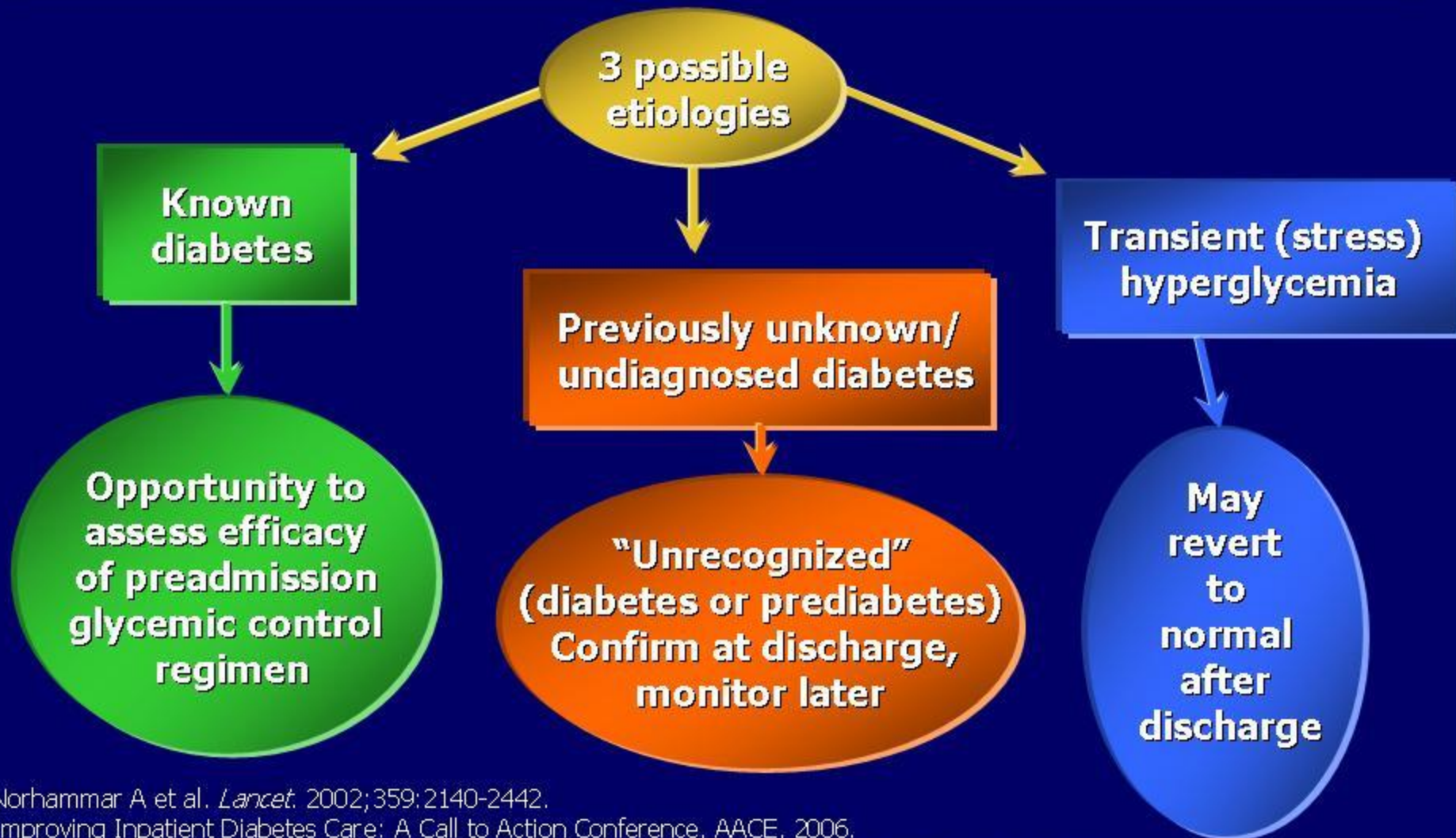# Conversion of Insulin Pump Basal Infusion to Once-Daily Insulin Glargine

# Potential Consequences of Hyperglycemia in the Hospital

- **Impaired leukocyte function**
  - **Chemotaxis**
  - **Phagocytosis**
  - **Bacteriocidal activity**
  - **Risk of bacteremia especially high in patients on TPN with poorly controlled glucose**
- **Poor wound healing and surgical site infection**
- **Volume depletion**
- **Signal to your patient that glucose control is unimportant**

TPN = total parenteral nutrition.

# Barriers to Glucose Control in the Hospital

- **Elevated levels of glucose counter-regulatory hormones**
- **Nausea, vomiting, anorexia, NPO status**
- **Erratic meal timing, tests, etc**
- **IV glucose**
- **Enteral high-calorie tube feeds**
- **Glucocorticoid therapy**
- **Reduced signs and symptoms of hypoglycemia**
- **Physician indifference and lack of attention to required adjustments in therapy**

NPO = nothing by mouth.

# Hyperglycemia in Hospitalized Patients



3 possible etiologies

Known diabetes

Previously unknown/ undiagnosed diabetes

Transient (stress) hyperglycemia

Opportunity to assess efficacy of preadmission glycemic control regimen

"Unrecognized" (diabetes or prediabetes) Confirm at discharge, monitor later

May revert to normal after discharge

Norhammar A et al. *Lancet.* 2002;359:2140-2442.
Improving Inpatient Diabetes Care: A Call to Action Conference, AACE, 2006.
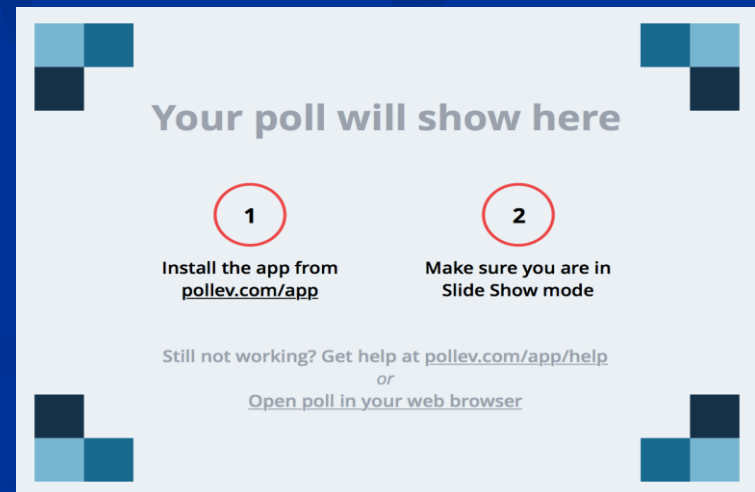Available at:http://www.aace.com/meetings/consensus/IIDC/IDGC0207.pdf. Accessed June 5, 2006.

# Significant Postoperative Infections After Elective Abdominal Surgery: Risks with Elevated Postoperative Blood Glucose

- **100 consecutive patients with diabetes**

- **Patients who had blood glucose (BG) >220 mg/dL on POD-1 had a risk of any infection that was 2.7x higher than patients with all BGs <220 mg/dL**

- **The risk of serious infections was 5.7x higher in patients with POD-1 BG >220 mg/dL**

- **Glucose control in the first 24- to 48-hour post-op window of time was pivotal to the risk of developing post-op infections**

Pomposelli et al. *J Paren Ent Nutr.* 1998;22:77.

# Postoperative Management of Hyperglycemia

- **61-year-old man is admitted to the floor after undergoing elective hemicolectomy. BG was 224 mg/dL in pre-op holding. He was given intra-op dexamethasone and BG at 2:30 PM was 387 mg/dL. What to do?**

  - **Transfer emergently to the ICU for IV insulin infusion**
  - **Order 10 units of rapid-acting insulin and follow BG every 4 hours**
  - **Begin weight-based SQ insulin glargine or NPH (0.4 units/kg/day) as well as weight-based correction with rapid-acting insulin (0.2 units/kg) every 2–4 hours**



Your poll will show here

1 Install the app from pollev.com/app

2 Make sure you are in Slide Show mode

Still not working? Get help at pollev.com/app/help
or
Open poll in your web browser

# Postoperative Management of Hyperglycemia

- **Transferring emergently to the ICU for IV insulin infusion is a very impractical approach, will take a lot of time, will significantly raise costs, and is not necessary**

- **10 units of SQ rapid-acting insulin is unlikely to move the BG unless the patient weighs 50 kg given the dexamethasone. Giving rapid-acting insulin in the absence of adequate basal insulin will not control post-op hyperglycemia**

- **Begin weight-based SQ insulin glargine or NPH (0.4 units/kg/day) as well as weight-based correction with rapid-acting insulin (0.2 units/kg) every 2–4 hours**

# Randomized Study of Basal-Bolus Insulin Therapy in the Inpatient Management of Patients with Type 2 Diabetes Undergoing General Surgery (RABBIT 2 Surgery)

- **104 patients randomized to sliding-scale regular insulin every 6 hours**

- **107 patients randomized to glargine 0.25 units/kg plus glulisine 0.08 units/kg with meals when eating**

Umpierrez GE, et al. *Diabetes Care*. 2011;34:256–261.

# Randomized Study of Basal-Bolus Insulin Therapy in the Inpatient Managemet of Patients With Type 2 Diabetes Undergoing General Surgery
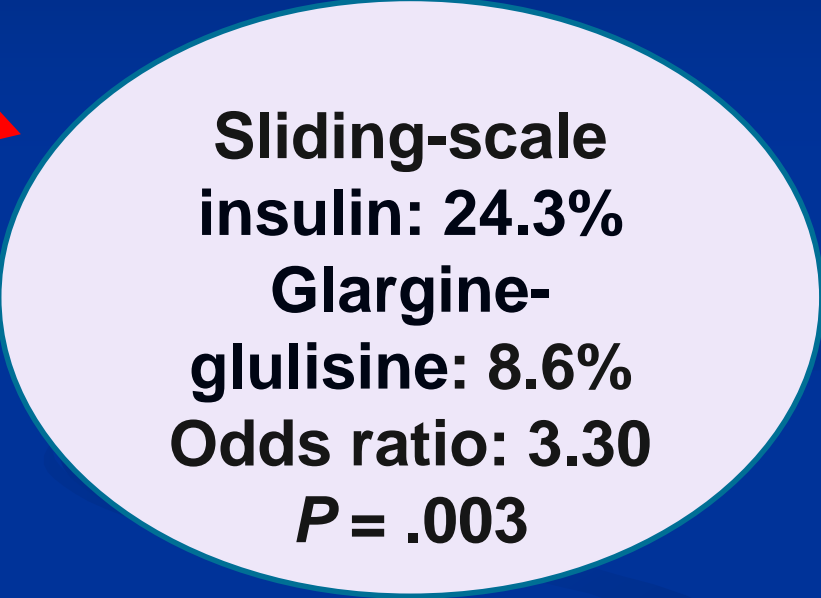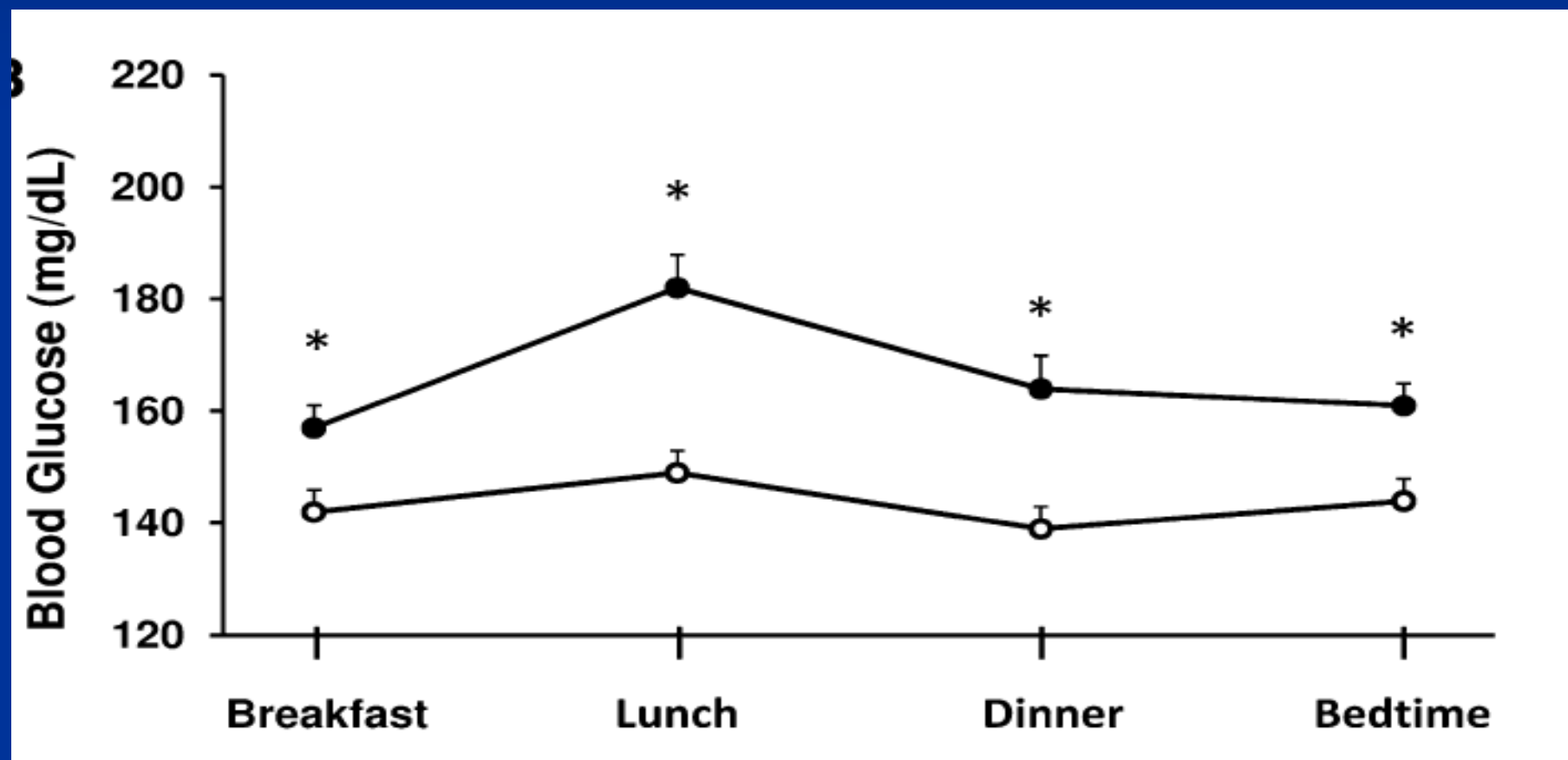
# RABBIT 2 Surgery—Outcomes

- **Composite outcome incidence of:**
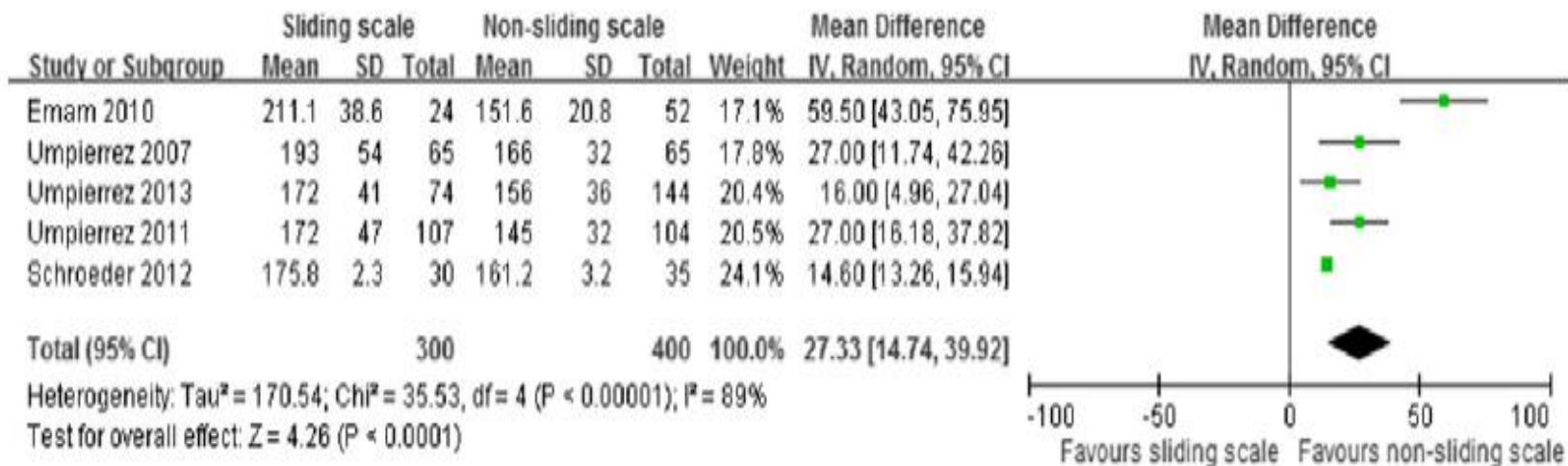    - **Wound infection**
    - **Pneumonia**
    - **Acute renal failure**
    - **Bacteremia**

**Sliding-scale insulin: 24.3%**
**Glargine-glulisine: 8.6%**
**Odds ratio: 3.30**
$P = .003$

Umpierrez U, et al. *Diabetes Care*. 2011;34:256-261.

# The Inferiority of Sliding-Scale Insulin: Where's the Basal?

| Study or Subgroup | Sliding scale Mean | SD | Total | Non-sliding scale Mean | SD | Total | Weight | Mean Difference IV, Random, 95% CI |
|---|---|---|---|---|---|---|---|---|
| Emam 2010 | 211.1 | 38.6 | 24 | 151.6 | 20.8 | 52 | 17.1% | 59.50 [43.05, 75.95] |
| Umpierrez 2007 | 193 | 54 | 65 | 166 | 32 | 65 | 17.8% | 27.00 [11.74, 42.26] |
| Umpierrez 2013 | 172 | 41 | 74 | 156 | 36 | 144 | 20.4% | 16.00 [4.96, 27.04] |
| Umpierrez 2011 | 172 | 47 | 107 | 145 | 32 | 104 | 20.5% | 27.00 [16.18, 37.82] |
| Schroeder 2012 | 175.8 | 2.3 | 30 | 161.2 | 3.2 | 35 | 24.1% | 14.60 [13.26, 15.94] |
| | | | | | | | | |
| Total (95% CI) | | | 300 | | | 400 | 100.0% | 27.33 [14.74, 39.92] |

Heterogeneity: Tau² = 170.54; Chi² = 35.53, df = 4 (P < 0.00001); I² = 89%
Test for overall effect: Z = 4.26 (P < 0.0001)

Mean Difference IV, Random, 95% CI
-100  -50  0  50  100
Favours sliding scale    Favours non-sliding scale

– Forest plot of comparison: the RISS versus non insulin sliding-scale. Outcome: the mean blood glucose level, mg/dL.

# The Inferiority of Sliding-Scale Insulin: Where's the Basal?



– Forest plot of comparison: the RISS versus other regimens. Outcome: the incidence of wound infection.
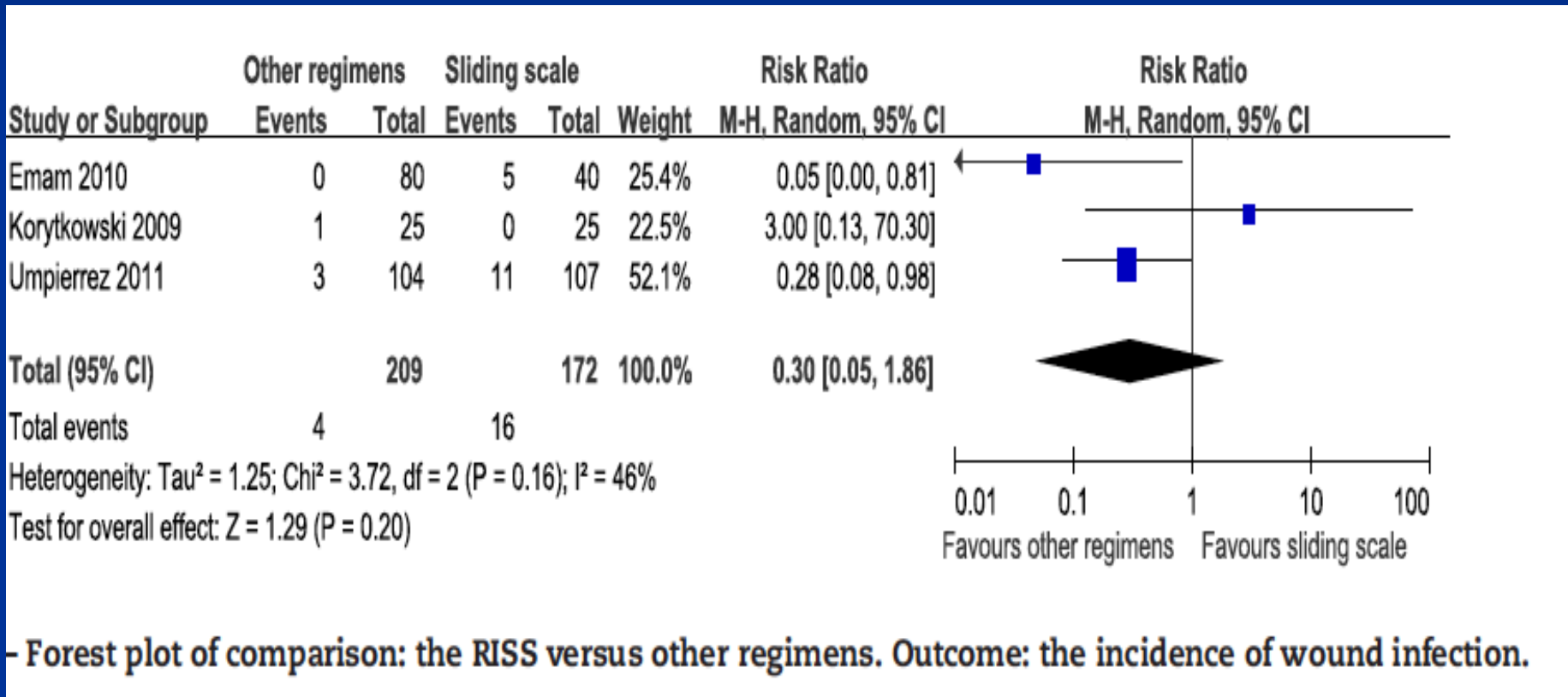
# Postoperative Blood Glucose Management

**Target populations**
- **Preexisting diabetes**
- **Major surgery (eg, cardiothoracic, transplantation)**
- **Enteral tube feeding**
- **TPN**
- **Glucocorticoid therapy**
- **New hyperglycemia—BG >160 mg/dL**

**Initial approach**
- **Begin point-of-care BG testing every 6 hours**
- **Discontinue oral antidiabetic medications**
- **Initiate SQ basal-bolus insulin regimen**
                    **OR**
- **Begin an IV insulin infusion**

# Guidelines for the Use of IV Insulin – Society of Critical Care Medicine 2012

- **Initiate IV insulin infusion when BG >150 mg/dL and absolutely before >180 mg/dL**

- **Utilize a protocol that maintains glucose level ~150 mg/dL while avoiding any readings <70 mg/dL**

- **Adequate training of RN users is mandatory.**

- **Test BG hourly, preferably utilizing arterial or central venous blood**

- **Utilize a specific protocol to transition patients from IV insulin to an SQ insulin regimen consisting of both basal insulin and mealtime insulin**

# Summary: IV Insulin

- **Begin IV insulin in the ICU when BG is >150–180 mg/dL**

- **Use a specific single protocol and a well-trained nursing team**

- **Use a computer-controlled protocol if possible**

- **Use a glucose target of ~130–170 mg/dL**

- **Pick your glucose target based on the success of your unit/protocol to keep:**
    - **BG <70 mg/dL at no more than 1:100–200 readings**
    - **BG <40 mg/dL at no more than 1:3000 readings**

# Glucose Control After IV Insulin Infusion

**When ready to transition to SQ insulin, assess current rate of IV insulin infusion:**

- **Give glargine insulin SQ at dose of 20x the current stable IV insulin rate, and stop IV insulin infusion 2–3 hours later**
- **Adjust glargine insulin daily to maintain fasting morning glucose 100–130 mg/dL**
- **When eating, add rapid-acting insulin analog with each meal beginning with 1/6th of the dose of glargine**
- **Adjust rapid-acting insulin to maintain preprandial glucoses 130–160 mg/dL**

# Action Profiles (SQ) of Insulin Analogues
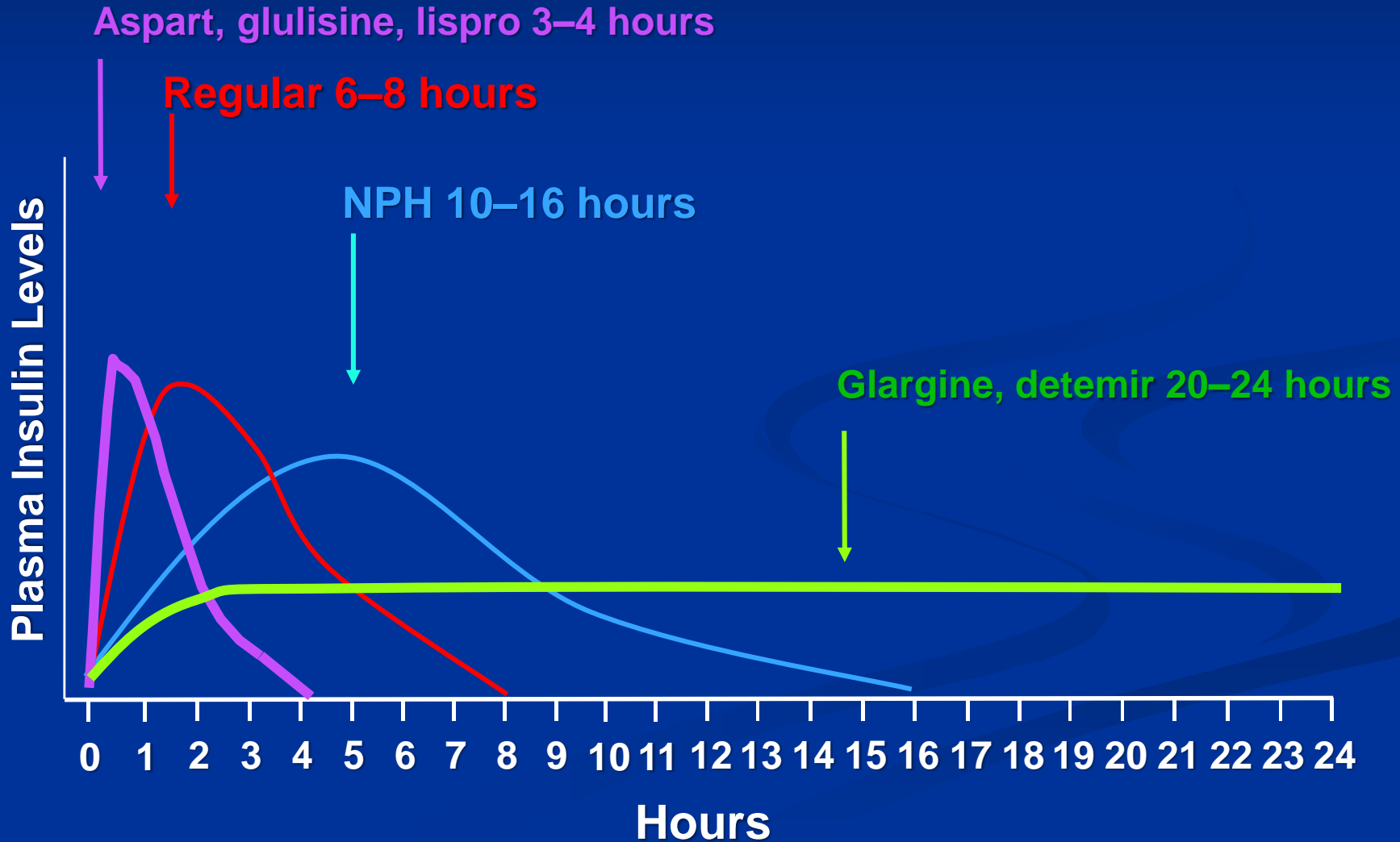
# Glucose Control in Non-ICU Postoperative Patients

- **On the PM POD-0 if glucose >160 mg/dL begin SQ daily glargine insulin at 0.2–0.4 units/kg**
- **Adjust glargine insulin every day to maintain a fasting morning glucose 100–130 mg/dL**
- **When beginning to eat, add rapid-acting insulin analog with meals beginning with 1/6th of the dose of glargine**
- **Increase rapid-acting insulin analog as needed usually to 1/3rd of the daily dose of glargine**
- **Remember the golden rule of insulin dosing: all 3 mealtime insulin doses should add up to the daily basal insulin dose in patients consuming 100% of a PO diet**
- **Adjust rapid-acting insulin doses every day to maintain preprandial glucose 130–160 mg/dL**

PO = by mouth; POD-0 = postoperative day 0.

# Comparison of Basal-Bolus and Premixed Insulin Regimens in Hospitalized Patients with Type 2 Diabetes
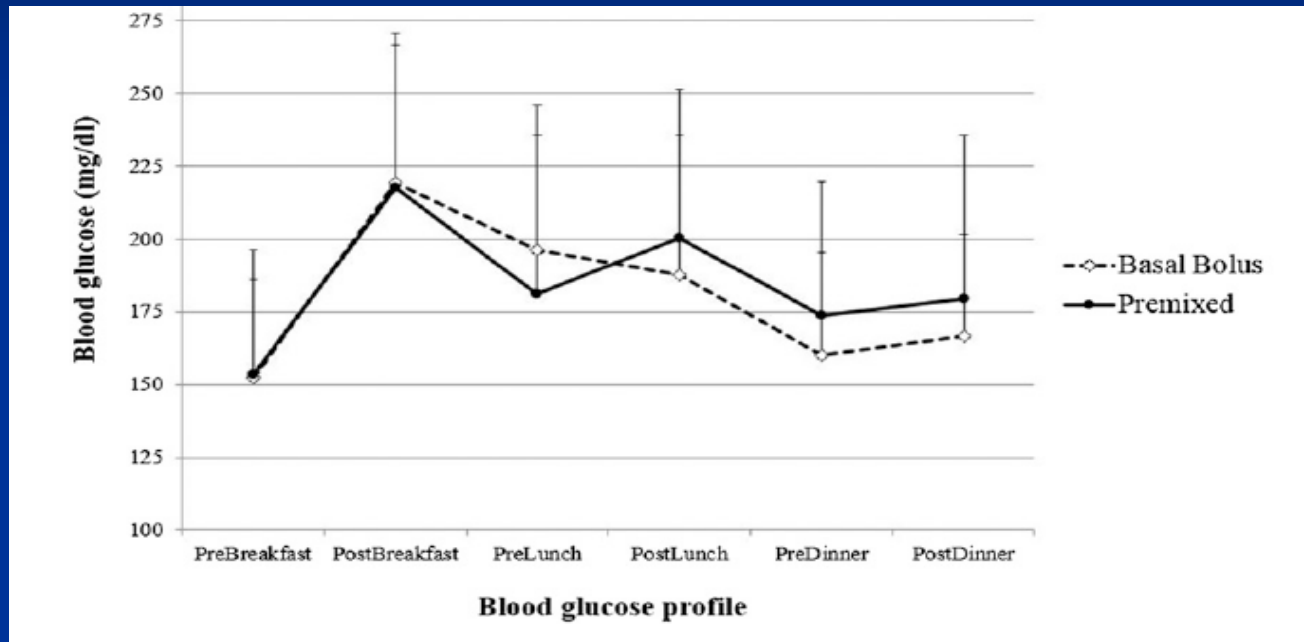


| | Glargine and Glulisine | 70/30 Premixed Insulin |
|---|---|---|
| **Mean blood glucose** | 175 ± 32 mg/dL | 179 ± 43 mg/dL |
| **Percent of patients with blood glucose <70 mg/dL** | 24.2% | 64.1% |

Bellido V, et al. *Diabetes Care.* 2015;38:2211-2216. For educational purposes only.

# Poor Glucose Control and Treatment Intensification in Hospitalized Patients with Diabetes

- **Hyperglycemia (>180 mg/dL) was documented at least once for 82.5% of patient admissions**

- **Antihyperglycemic treatment was intensified for 22.0% of inpatient days with hyperglycemia**

- **Low frequency of treatment intensification (scheduled or sliding-scale insulin) was associated with poor reduction in BG**

- **Hypoglycemia (<50 mg/dL) was documented in only 2.2% of inpatient days after antihyperglycemic treatment intensification**

Matheny ME, et al. *J Gen Intern Med.* 2008;23:184-189.

# Inpatient Postoperative Glucose Control Special Situations

- **Enteral tube feeding**
  - **Begin NPH insulin at 0.1 units/kg every 12 hours if glucose >160–180 mg/dL**

    **Or**

  - **Begin insulin glargine at 0.2–0.3 units/kg every 24 hours**
  - **Adjust SQ insulin daily to maintain glucose 140–160 mg/mL**
  - **Remember to order dextrose 10% IV at the same rate as the tube feeding to be started immediately if the tube feeding ever stops to prevent hypoglycemia**

# Inpatient Postoperative Glucose Control Special Situations

- **TPN**
  - Begin by adding regular insulin to the TPN bag at 0.1 units per gram of dextrose if BG is >140–160 mg/dL
  - Adjust insulin in TPN bag daily to maintain BG 120–150 mg/dL
  - Can cover with a dose of NPH in the AM if BG >160 mg/dL (10% of current TPN insulin dose)

# Inpatient Postoperative Glucose Control Special Situations

- **Glucocorticoid therapy**
  - **All patients with steroid-caused or steroid-worsened hyperglycemia will need insulin.**
  - **Daily glargine or BID NPH coupled with rapid-acting insulin is appropriate for patients receiving dexamethasone or twice-daily methylprednisolone/prednisone.**
  - **NPH and rapid-acting insulin QAM is appropriate for patients receiving prednisone QAM.**
  - **Significant up-titrations are usually needed twice daily to bring BG levels back under 180–200 mg/dL.**

BID = twice a day; QAM = every morning.

# Inpatient Postoperative Glucose Control Special Situations

- **Glucocorticoid therapy**
  - Since glucocorticoid dosing in hospitalized patients frequently changes from day to day, pay close attention to daily insulin dose titration and to enteral or parenteral carbohydrate intake.
  - Premixed insulins such as 70/30 or 75/25 are not useful because of their inherent inflexibility for dosing.
  - The sole use of rapid-acting insulin without concomitant basal insulin is doomed to failure.

# Factors Increasing Risk of Hypoglycemia in Hospitalized Patients

- **Factors related to carbohydrate intake**
  - **Mistiming of insulin dosage with respect to food**
  - **Transportation off ward causing meal delay**
  - **New NPO status**
- **Interruption of any of the following:**
  - **IV dextrose, TPN, enteral feedings**
- **Inadequate glucose monitoring**
- **Medication and medication changes**
- **Liver or renal dysfunction, advanced age**

ACE/ADA Task Force on Inpatient Diabetes. *Endocr Pract*. 2006;12:458-468.

# Inpatient Glargine-Glulisine Dosing in Chronic Renal Failure

- **Multicenter trial**
- **107 patients randomized from general hospital units—70% medical, 30% surgical**
- **Type 2 diabetes duration >1 year**
- **eGFR <45 mL/min, but no patients on dialysis**
- **Initial BG >180 mg/dL**
- **Duration of study >48 hours**
- **No use of any non-insulin diabetic therapies**

# Inpatient Glargine-Glulisine Dosing in Chronic Renal Failure

| 50 subjects | 57 subjects |
|:---:|:---:|

**Glargine 0.25 units/kg daily**
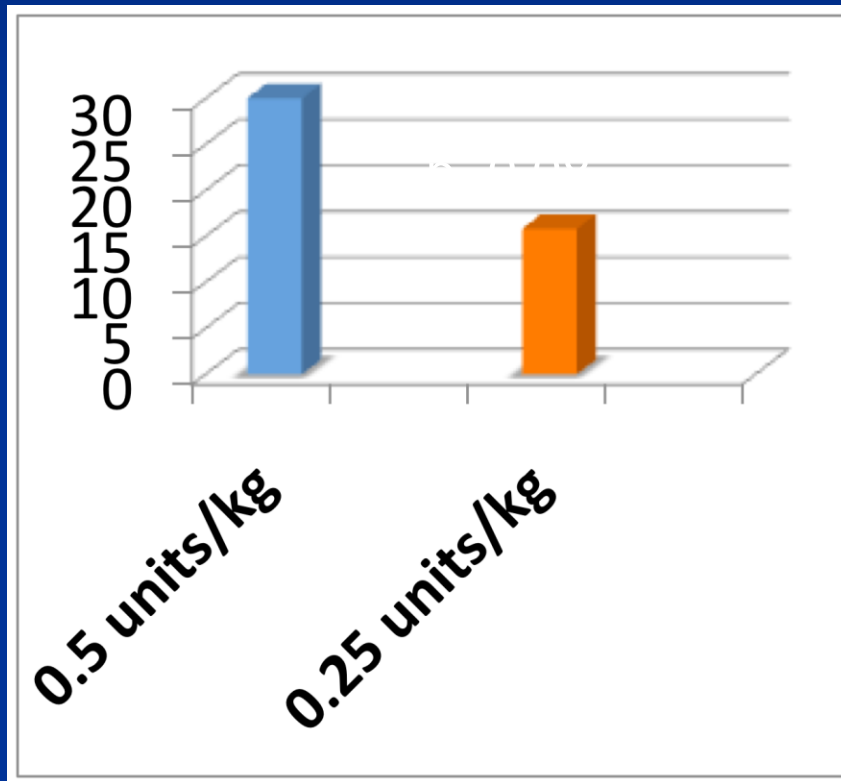
**Glulisine 0.08 units/kg/meal**

**Glargine 0.125 units/kg daily**
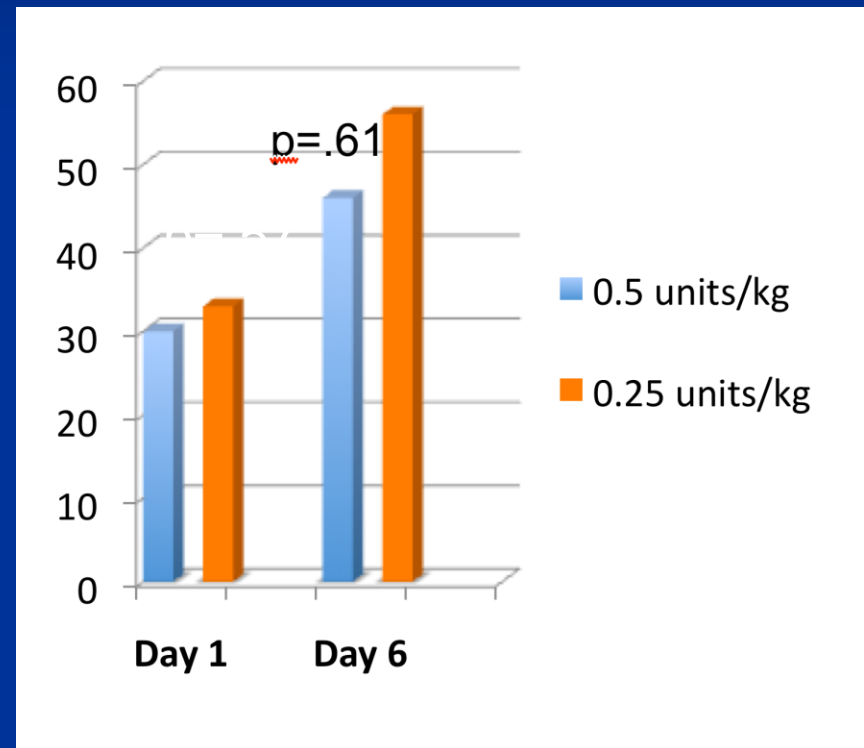
**Glulisine 0.04 units/kg/meal**

- **BG checked pre-meals and at bedtime.**
- **Insulin doses were adjusted daily aiming to keep all BG readings in the 100–180 mg/dL target range.**

Baldwin et al. *Diabetes Care*. 2012;35:1970–1974.

# Incidence of Hypoglycemia

**Percent of subjects with BG <70 mg/dL**

**Percent of BGs 100–180 mg/dL**



**BG <50 mg/dL 0.5 U/kg: 6% of subjects**
**BG <50 mg/dL 0.25 U/kg: 1.8% of subjects**

# Inpatient Postoperative Glucose Control Special Situations

- **Insulin therapy in renal failure**

  - **Elderly patients may have a substantial decrease in eGFR despite having a mild elevation in serum creatinine. Incorporate eGFR into weight-based initiation of insulin dosing.**

  - **For patients with eGFR <45 mL/min, reduce the total daily insulin dose by 50% to 0.25 units/kg/day, half basal insulin and half rapid-acting, in order to reduce the frequency of hypoglycemia.**

  - **This dosing modification of insulin dosing has been shown to reduce the frequency of hypoglycemia in renal failure patients receiving insulin.**

Baldwin D, et al. *Diabetes Care*. 2012;35:1970-1974.

# Emergent Perioperative Management of Uncontrolled Hyperglycemia

- **51-year-old man presents to the ED with a history of polyuria, abdominal pain, and nausea/vomiting. BP 154/88, HR 112; Temperature = 100.5°; Weight = 102 kg**

- **BG is 539 mg/dL. DKA is ruled out.**

- **He is dehydrated with BUN 64, creatinine 2.5.**

- **He has no PMH but + FH of type 2 diabetes.**

- **Ultrasound reveals acute cholecystitis.**

- **He is given 10 units regular insulin SQ in the ED and admitted to the general surgical floor.**
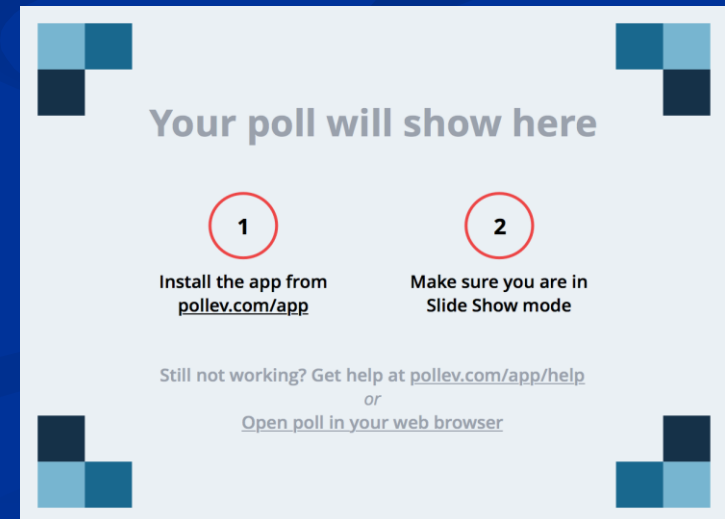
- **Repeat BG 2 hours later is 398 mg/dL.**

BP = blood pressure; BUN = blood urea nitrogen; DKA = diabetic ketoacidosis; ED = emergency department; FH = family history; HR = heart rate; PMH = past medical history.

# Emergent Perioperative Management of Uncontrolled Hyperglycemia

- **Newly diagnosed type 2 diabetes**
  - $HbA_{1c}$ is pending.
- **Acute cholecystitis, being prepared for surgery**
  - IV antibiotics are started.
- **Dehydration with acute kidney injury**
  - Aggressive volume replacement with IV fluids begun.
- **How should you manage this patient's diabetes?**

# Emergent Perioperative Management of Diabetes What's the Best Practice?

- **Give 0.4 units/kg insulin glargine SQ and 0.2 units/kg rapid-acting insulin SQ**

- **Give 0.2 units/kg rapid-acting insulin SQ and repeat the BG in 2 hours**

- **Give 0.2 units/kg insulin glargine SQ and 0.1 units/kg rapid-acting insulin SQ**

- **Clear the patient for immediate surgery; will implement diabetes management  post-op**

- **Transfer the patient to the ICU for IV insulin**



Your poll will show here

1 Install the app from pollev.com/app

2 Make sure you are in Slide Show mode

Still not working? Get help at pollev.com/app/help
or
Open poll in your web browser

# Emergent Perioperative Management of Diabetes: Best Practice

- 0.4 units/kg insulin glargine SQ and 0.2 units/kg rapid-acting insulin SQ is too much insulin to give since eGFR <45 mL/min.
- Give 0.2 units/kg rapid-acting insulin SQ and repeat the BG in 2 hours is only using the sliding-scale approach. This will not be effective!
- Give 0.2 units/kg insulin glargine SQ and 0.1 units/kg rapid-acting insulin SQ. YES!
- Clear the patient for immediate surgery; will implement diabetes management post-op. NO; why deny and delay appropriate management?
- Transfer the patient to the ICU for IV insulin. Not needed if vital signs are stable.

# Emergent Perioperative Management of Uncontrolled Hyperglycemia

- **Phase 1 (preoperative)**
- **IV hydration**
- **Initiation of insulin**
- IV insulin infusion—probably not necessary
- Begin basal insulin 0.3 units/kg daily
- Add 0.1 units/kg SQ rapid-acting insulin. Can repeat dose every 2 hours until BG <200
- Check BG every 2 hours until better then every 4–5 hours

# Emergent Perioperative Management of Uncontrolled Hyperglycemia

- Phase 2 (immediately postoperative)
- Because of beta-cell glucotoxicity, SQ insulin is the best option for the next 4–8 weeks.
- Adjust the dose of insulin glargine every 24 hours
- Continue correction dosing of rapid-acting insulin every 4–5 hours for glucose >160 mg/dL
- Complete IV hydration
- Add scheduled rapid-acting insulin SQ with meals

# Emergent Perioperative Management of Uncontrolled Hyperglycemia

- **Phase 3 (preparing for discharge)**
- **Teach survival skills: diet, insulin, glucose monitoring, hypoglycemia, and provide meter**
- **Can discharge home in 48 hours if you have the necessary resources**
- **Provide rapid access to comprehensive outpatient diabetic education**
- **Provide telephone access for daily or every-other-day insulin dose adjustment**

# The Discharge Handoff: Inpatient HbA$_{1c}$—Avoidance of Clinical Inertia

- **Clinical inertia is defined as the failure to make appropriate intensification in chronic disease management during a patient encounter**

- **HbA$_{1c}$ is ideally suited to universal pre-op/inpatient measurement and therapeutic intensification as needed at the time of hospital discharge**

# The Discharge Handoff: Inpatient HbA$_{1c}$—Avoidance of Clinical Inertia

- **59-year-old man with an 8-year history of type 2 diabetes**

- **Admitted for peripheral arterial bypass**

- **For the past year he has been treated with metformin 500 mg BID and glipizide 10 mg BID.**

- **Initial BG is 249 mg/dL.**

# The Discharge Handoff: Inpatient HbA$_{1c}$—Avoidance of Clinical Inertia

- He is taken to the OR and admitted post-op.
- Oral agents are stopped.
- NPH and rapid-acting insulin are begun BID with BG levels stabilizing in the 100–140 mg/dL range.
- After 4 days he is ready for discharge home.

**What do you send the patient home on?**

# The Discharge Handoff: Inpatient HbA$_{1c}$—Avoidance of Clinical Inertia

**What do you send the patient home on?**

**It all depends on the HbA$_{1c}$!**

# The Discharge Handoff: Inpatient HbA$_{1c}$—Avoidance of Clinical Inertia

**Scenario 1**
**HbA$_{1c}$ = 6.6%**

**Do nothing**
**Home on metformin**
**500 mg BID**
**and glipizide 10 mg BID**

**Not Ideal**

**Increase metformin**
**to 1000 mg BID**
**Continue glipizide 10 mg BID**

**Ideal**

# The Discharge Handoff: Inpatient HbA$_{1c}$—Avoidance of Clinical Inertia

**Scenario 2**
**HbA$_{1c}$ = 7.8%**

**Increase metformin to 1000 mg BID**
**Continue glipizide 10 mg BID**

**Increase metformin to 1000 mg BID**
**Continue glipizide 10 mg BID**
**and add a third agent**

**Not Ideal**

**Better**

# The Discharge Handoff: Inpatient HbA$_{1c}$—Avoidance of Clinical Inertia

**Scenario 3 HbA$_{1c}$ = 9.8%**

**Increase metformin to 1000 mg BID Continue glipizide 10 mg BID and add a third agent**

**Continue insulin!** **(and metformin)**

**Not Ideal**

**Ideal**

# Use Your HbA$_{1c}$ to Break the Cycle of Clinical Inertia for Blood Glucose Control in Diabetes

## Use This Golden Opportunity

Baldwin D, et al. *Diabetes Care*. 2005;28:1008-1011.