A Novel Strategy for the Management Inpatient Hyperglycemia in Patients with Type 2 Diabetes

Guillermo E. Umpierrez, MD, FACP, FACE
Professor of Medicine
Director, Clinical Research Diabetes & Metabolism Center
Emory University School of Medicine
Director, Diabetes & Endocrinology Section
Grady Health System

Dr. Guillermo Umpierrez,
Personal/Professional Financial Relationships with Industry

<table>
<thead>
<tr>
<th>External Industry Relationships</th>
<th>Company Name(s)</th>
<th>Role</th>
</tr>
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<tr>
<td>Equity, stock, or options in biomedical industry companies or publishers</td>
<td>BMJ Open Diabetes Research &amp; Care Endocrine Society AACE</td>
<td>Editor-in-Chief Council At-Large Board of Directors</td>
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<tr>
<td>Industry funds to Emory University for my research</td>
<td>Merck, Sanofi, Novo Nordisk Boehringer Ingelheim Astra Zeneca</td>
<td>Investigator-initiated Research Projects</td>
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<td>Industry Advisory/Consultant activities</td>
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Objectives

- Outline current recommendations for the treatment of hyperglycemia in patients hospitalized with type 2 diabetes
- Discuss the appropriate times to stop and start diabetes meds for patients undergoing surgery
- Assess the effect of hypoglycemia on clinical outcomes and the importance of avoiding it in hospitalized patients with type 2 diabetes
- Review the rationale and current data for the use of with insulin and non-insulin agents in hospitalized patients with type 2 diabetes

Pre-Test Question 1

Which of the following statements regarding inpatient hypoglycemia in diabetes patients is correct?
1. Inpatient hypoglycemia is not currently listed by CMS as a “never event”
2. Associated with increased length-of-stay (LOS) but not increased mortality
3. Associated with increased LOS and increased mortality
4. Unsure

Pre-Test Question 2

Please rate your knowledge of the safety and efficacy of DPP-4 inhibitor regimens for hospitalized patients with T2DM?
1. Poor
2. Fair
3. Good
4. Excellent
Pre-Test Question 3

Which of the following is NOT a guideline recommendation for treatment of hospitalized T2DM patients in the non-ICU setting?

1. OADs are generally not recommended
2. Sliding scale insulin is not recommended
3. Glucose target of 140-180 mg/dL is recommended for most patients with T2DM
4. Therapy should be reassessed if BG<140 mg/dL to avoid hypoglycemia

Case Presentation:

TJ is a 68 y/o male with an 8 yr history of T2DM admitted with SOB and CHF on chest x-ray. Treated with metformin 1 gram b.i.d. and sitagliptin 100 mg/d.

Lab: BG 172 mg/dL, A1c: 8.0%; serum creatinine 1.3 mg/dL, eGFR: 45 ml/min

What is the best treatment option for glycemic control?

Should both patients be treated with insulin and to the same glucose target?

Case Presentation:

JP is a 42 y/o male with an 10 yr history of T2DM with diabetic foot infection and osteomyelitis left toe. Treated with metformin 1 g b.i.d. and glipizide 10 mg/d.

Lab: BG 294 mg/dL, A1c: 9.2%; serum creatinine 1.4 mg/dL, eGFR: 60 ml/min

What is the best treatment option for glycemic control?

Should both patients be treated with insulin and to the same glucose target?
Adverse Events Stratified by Perioperative Hyperglycemia

Diabetes
- Hospital/Death
- Pre-op
- Composite Infection
- BG >180 mg/dL
- BG >180 mg/dL

No Diabetes
- Hospital/Death
- Pre-op
- Composite Infection
- BG >180 mg/dL
- BG >180 mg/dL

Proportion of Patients (%)

BG at any point on the day of surgery, post-op day 1 and 2

N= 11,633, colorectal and bariatric surgery; 29.1% with hyperglycemia

* P <0.01; § p <0.05.

What Glucose Levels Predicts Hospital Complications?

Composite Complication Rate by Maximum BG Level

First 48 hours Maximum BG

What Glucose Levels Predicts Hospital Complications?

Composite of complications: pneumonia, acute renal or respiratory failure, acute MI, bacteremia, and death.


Diagnosis & recognition of hyperglycemia and diabetes in the hospital setting

Admission
Assess all patients for a history of diabetes
- Obtain laboratory BG testing on admission

No history of diabetes
BG >140 mg/dL
Start POBC monitoring x 24-48h
Check A1C
BG monitoring
BG ≥ 6.5%

No history of diabetes
BG >140 mg/dL

History of diabetes

Insulin POBC monitoring according to clinical status

Guideline Recommendations for Glycemic Targets in Non-Critical Care Setting

1. Premeal BG target of <140 mg/dL and random BG <180 mg/dL for the majority of patients
2. 2016 American Diabetes Association – glucose target 140-180 mg/dL for most patients with T2DM
3. Glycemic targets be modified according to clinical status.
   - Patients with terminal illness <180-200 mg/dL
4. For avoidance of hypoglycemia, therapy should be reassessed when BG<100 mg/dL

Insulin Recommended  OADs Not Generally Recommended

Recommendations for Managing Patients With Diabetes in Non-ICU Setting

Antihyperglycemic Therapy

Management of Patients With Diabetes in Non-ICU Settings

- Discontinue oral antidiabetic agents
- Insulin naïve: starting total daily dose (TDD):
  - 0.3 U/kg to 0.5 U/kg
  - Lower doses in the elderly and renal insufficiency
- Previous insulin therapy: reduce outpatient insulin dose by 20-25%
- Basal bolus regimen: Half of TDD as basal and half as rapid-acting insulin before meals

Randomized Basal Bolus versus Sliding Scale Regular Insulin in Patients with T2DM (RABBIT-2 Trial)

- D/C oral antidiabetic drugs on admission
- Starting total daily dose (TDD):
  - 0.4 U/kg x BG between 140-200 mg/dL
  - 0.5 U/kg x BG between 201-400 mg/dL
- Half of TDD as basal insulin and half as rapid-acting insulin
  - Insulin glargine - once daily, at the same time/day.
  - Glulisine - three equally divided doses (AC)

Hypoglycemia rate:
- Basal Bolus Group:
  - BG < 60 mg/dL: 3%
  - BG < 40 mg/dL: none
- SSRI:
  - BG < 60 mg/dL: 3%
  - BG < 40 mg/dL: none

SC Insulin Administration

- Basal Bolus with Insulin Analogs vs. Sliding Scale Regular Insulin for the Management of Non-ICU Patients With Type 2 Diabetes

- Sliding Scale Insulin Regimen

- Rabbit 2 Trial: Changes in Glucose Levels With Basal-Bolus vs. Sliding Scale Insulin
T2DM on diet, oral agents or insulin treatment, does treatment with basal bolus regimen with glargine and glulisine is superior to SSRI?

**RABBIT-2 Surgery Trial:**

- **Research Question:**
  - Composite of hospital complications: wound infection, pneumonia, respiratory failure, acute kidney injury, and bacteremia

**Mean BG before meals and at bedtime during basal bolus and SSI therapy**

<table>
<thead>
<tr>
<th>Meal</th>
<th>Glargine+Glulisine</th>
<th>Sliding Scale Insulin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Lunch</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td>Dinner</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td>Bedtime</td>
<td>300</td>
<td>300</td>
</tr>
</tbody>
</table>

*p<0.001.

**Postoperative Complications**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>All (n=180)</th>
<th>Basal Bolus (n=88)</th>
<th>SSI (n=92)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with complications, n (%)</td>
<td>28 (16%)</td>
<td>6 (7%)</td>
<td>22 (24%)</td>
<td>0.002</td>
</tr>
<tr>
<td>Postsurgical ICU admission, n (%)</td>
<td>23 (13%)</td>
<td>10 (11%)</td>
<td>13 (14%)</td>
<td>0.66</td>
</tr>
<tr>
<td>Total hospitalization costs, USD</td>
<td>24457 ± 18359</td>
<td>23226 ± 18745</td>
<td>25641 ± 17991</td>
<td>0.09</td>
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</tbody>
</table>

**Hospitalization Outcomes and Costs**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>All (n=180)</th>
<th>Basal Bolus (n=88)</th>
<th>SSI (n=92)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of hospital stay, days</td>
<td>7.3 ± 5.6</td>
<td>7.3 ± 5.1</td>
<td>8.5 ± 5.9</td>
<td>0.15</td>
</tr>
<tr>
<td>Inpatient cost per day</td>
<td>4541 ± 18359</td>
<td>3907 ± 6606</td>
<td>3724 ± 4020</td>
<td>0.24</td>
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</tbody>
</table>

**Basal Bolus with Insulin Analogs vs. Sliding Scale Insulin Regimen in Non-ICU Patients With Type 2 Diabetes**

**Basal Bolus vs. Premixed Insulin for the Management of Non-ICU Patients With Type 2 Diabetes**

- Inpatient Management in non-ICU
- Basal Bolus Regimens
  - 50% Basal
  - 50% Prandial
- Premixed 70/30 Insulin

*Composite of hospital complications: wound infection, pneumonia, respiratory failure, acute renal failure, and bacteremia.*


Mean Daily Blood Glucose During Treatment with Basal Bolus and Premixed 30/70 Insulin

Impact of Inpatient Hypoglycemia

DEAN Trial: Changes in Mean Daily Blood Glucose Concentration

Basal Bolus with Insulin Analogs (glar+glu) vs. Human (NPH+reg) insulin
Prevalence of Hypoglycemia in Patients Treated with Human and Analogs

<table>
<thead>
<tr>
<th></th>
<th>ALL N=134</th>
<th>Analogs N=66</th>
<th>Human n=68</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild Hypoglycemia</td>
<td>37</td>
<td>35</td>
<td>38</td>
<td>0.68</td>
</tr>
<tr>
<td>Severe hypoglycemia</td>
<td>16</td>
<td>7.6</td>
<td>25</td>
<td>0.08</td>
</tr>
<tr>
<td>Patients with ≥2 episodes, n (%)</td>
<td>19</td>
<td>10</td>
<td>16</td>
<td>0.2</td>
</tr>
</tbody>
</table>


Alternatives to Basal Bolus Insulin Regimen in Non-ICU Settings

- Basal Plus (basal + correction)
- DPP4-inhibitors

Basal Plus Trial
Basal + Correction vs. Basal Bolus

<table>
<thead>
<tr>
<th>Basal plus Correction</th>
<th>Basal Bolus Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Start glargine: 0.25 U/kg once daily</td>
<td>- Start TDD: 0.5 U/kg</td>
</tr>
<tr>
<td>- Correction for BG &gt;140 mg/dL per sliding scale</td>
<td>- Glargine: 0.25 U/kg</td>
</tr>
<tr>
<td></td>
<td>- Glulisine: 0.25 U/kg (AC)</td>
</tr>
<tr>
<td></td>
<td>- Correction for BG &gt;140 mg/dL per sliding scale</td>
</tr>
</tbody>
</table>

* Reduce TDD to 0.15 U/kg in patients ≥70 yrs and/or serum creatinine ≥ 2.0 mg/dL.

Basal-PLUS vs Basal Bolus: Medicine and Surgery Patients

Basal Plus vs Basal Bolus

Basal PLUS: Medication and Surgery Patients


Management of Patients With Diabetes in the Non-ICU Setting

Insulin Recommended

1. Basal Bolus preferred over SSI
2. Basal Bolus is preferred over premixed insulin formulations

Limitations:
- Hypoglycemia Risk
- Regimen - Multiple injections
- Over-treatment in many patients

Insulin Treatment in in Non-ICU Setting

T2DM with BG > 140 mg/dL (7.7 mmol/L)

NPO
- Uncertain oral intake

Adhesive Oral intake

Basal insulin
- Start at 0.2-0.25 U/Kg/day
- Correction doses with rapid acting insulin AC
- Adjust basal as needed

Basal Bolus TDD: 0.4-0.5 U/Kg/day
-½ basal, ½ bolus
- Adjust as needed

* Reduce TDD to 0.15 U/kg in patients ≥70 yrs and/or serum creatinine ≥ 2.0 mg/dL.

Insulin Treatment in in Non-ICU Setting

**T2DM with BG > 140 mg/dL (7.7 mmol/L)**

- NPO
- Uncertain oral intake
- Basal insulin:
  - Start at 0.2-0.25 U/Kg/day*
  - Correction doses with rapid acting insulin AC
  - Adjust basal as needed
- Adequate Oral intake
- Basal Bolus
  - TDD: 0.4-0.5 U/Kg/day
  - ½ basal, ½ bolus
  - Adjust basal as needed


Management of Patients With Diabetes with Oral Agents in Non-ICU Settings

- **Inpatient Management in non-ICU**
  - Basal Bolus Regimens
    - 50% Basal
    - 50% Prandial
  - Oral Agents: DPP4-Inhibitors

DPP-4 Therapy in Hospitalized Patients

- **Study Type**: Multicenter, prospective, open-label randomized clinical trial
- **Patient Population**: Patients with T2DM admitted to general medicine and surgery services at 3 hospitals: Emory University, Grady, and University of Michigan
- **Treatment Groups**
  - Group 1. Sitagliptin once daily (n=30)
  - Group 2. Sitagliptin plus glargine insulin once daily (n=30)
  - Group 3. Basal bolus regimen with glargine once daily and lispro before meals (n=30)

* All groups received supplemental doses of lispro for BG > 140 mg/dL before meals


Randomization BG (<180 mg/dL and >180 mg/dL) and Mean Daily Glucose concentration

- Sitagliptin Hospital Trial
  - **Research Design and Methods**
    - **Study Type**: Multicenter, prospective, open-label randomized clinical trial
    - **Patient Population**: Patients with T2DM admitted with BG between 140-400 mg/dL, treated with diet, OADs and insulin at TDD < 0.6 Unit/kg
    - **Treatment Groups**
      - Group 1. Sitagliptin plus glargine once daily (n=140)
      - Group 2. Basal bolus regimen with glargine once daily and rapid-acting insulin before meals (n=140)

* Both groups received supplemental (correction) doses of rapid-acting insulin for BG > 140 mg/dL before meals

**Linagliptin Surgery Trial**

A Randomized Controlled Trial on the Safety and Efficacy of Linagliptin Therapy for the Inpatient Management of General Surgery Patients with Type 2 Diabetes

<table>
<thead>
<tr>
<th>Linagliptin Basal Bolus</th>
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</thead>
</table>

**General Surgery Patients**

Basal Bolus

Linagliptin

General surgery (non-cardiac) patients with T2DM admitted with BG between 140-400 mg/dL, treated with diet, OADs and insulin at TDD < 0.5 Unit/kg

**Linagliptin Basal Bolus**

63%

- Linagliptin:
  - Linagliptin: 5 mg/day

- Basal Bolus Regimen:
  - Total daily insulin dose: 0.4 unit/kg/day for BG between 140-200 mg/dL and 0.5 unit/kg/day for BG between 201-400 mg/dL.
  - Half of total daily dose (TDD) given as glargine once daily
  - Half of TDD given as lispro in three equal doses before meals

*Supplemental (correction) doses of rapid-acting insulin analog per sliding scale given as needed before meals for BG > 140 mg/dL or bedtime > 200 mg/dL.

**Linagliptin Surgery Trial**

A Randomized Controlled Trial on the Safety and Efficacy of Linagliptin Therapy for the Inpatient Management of General Surgery Patients with Type 2 Diabetes

- Linagliptin:
- Basal Bolus Regimen:
- Total daily insulin dose: 0.4 unit/kg/day for BG between 140-200 mg/dL and 0.5 unit/kg/day for BG between 201-400 mg/dL.
- Half of total daily dose (TDD) given as glargine once daily
- Half of TDD given as lispro in three equal doses before meals

*Supplemental (correction) doses of rapid-acting insulin analog per sliding scale given as needed before meals for BG > 140 mg/dL or bedtime > 200 mg/dL.

**Linagliptin Surgery Trial: Mean Daily BG During Treatment**


**Insulin Dose and # Injections/day**

<table>
<thead>
<tr>
<th>Slaglpiptin + Basal</th>
<th>Basal Bolus</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total daily dose, U/kg/day</td>
<td>0.2 ± 0.1</td>
<td>0.3 ± 0.2</td>
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<tr>
<td>Total daily dose, U/day</td>
<td>24.1 ± 18.2</td>
<td>34.3 ± 25.1</td>
</tr>
<tr>
<td>Basal-Glargine, U/day</td>
<td>17.8 ± 12.5</td>
<td>18.8 ± 10.4</td>
</tr>
<tr>
<td>Prandial-aspart/Lispro, U/day</td>
<td>12.7 ± 7.5</td>
<td>12.7 ± 7.5</td>
</tr>
<tr>
<td>Supplements-U/daily</td>
<td>5.8 ± 6.7</td>
<td>5.5 ± 4.7</td>
</tr>
</tbody>
</table>

**Number of Injections**

- # injections/day (Hospital stay): 2.2 ± 1.0 vs 2.9 ± 0.9 | < 0.001
- # injections/day (Day 2-10): 2.1 ± 1.4 vs 2.9 ± 1.1 | < 0.001

**Linagliptin Surgery Trial: Daily Glucose Levels**

Vellanki & Umpierrez et al. AHA 2017 Scientific Meeting.
Saxagliptin in Non-Critically Ill Hospitalized Patients with T2DM and Mild Hyperglycemia


DPP4-inhibitors for the Inpatient Management of General Medicine and Surgery Patients with T2DM

640 med-Surg patients, BG between 140 and 400 mg/dL treated with diet, OADs or total insulin dose ≤0.5 unit/kg/day, received DPP4-I alone (n=154), DPP4-I plus basal (n=167) or basal bolus (n=320). All groups received correction doses with rapid-acting insulin for BG>140 mg/dL.

Reyes-Umpierrez et al. ADA Scientific Meeting 2017.

Approach to the Glycaemic Management of General Medical and Surgical Patients in Hospital

No previous insulin therapy
Daily glucose <11 mmol/L
Total insulin dose ≤0.5 unit/kg/day
Basal or continue and increase basal insulin, add DPP4 inhibitor (start without rapid-acting insulin for the correction of hyperglycemia)
Individual glycemic target (eg, mean daily plasma glucose 7.8–10.0 mmol/L) not achieved
Continue and further increase basal insulin, add DPP4-I inhibitor, add rapid-acting insulin (for the correction of hyperglycemia)
Individual glycemic target (eg, mean daily plasma glucose 7.8–10.0 mmol/L) not achieved
Basal+bolus regimen, evening meal-related short-acting insulin injections, correctional insulin in case of excessive hyperglycemia


Management of General Medicine Patients With T2DM

Management of Patients With Diabetes After Hospital Discharge

Inpatient Management in non-ICU

Preoperative Management of Diabetes Patients

- No established consensus on preoperative management
- Goal is to minimize hypoglycemia risk and hyperglycemia exposure
- Evening before surgery
  - Continue usual meal plan, insulin, and OADs
  - If NPO after midnight, reduce bedtime basal insulin dose by 50% for NPH or 25% for glargine or detemir
- Day of surgery
  - Discontinue OADs, GLP-1 receptor agonists, and pramlintide
  - If moring BG >180 mg/dL, give correction doses of insulin
  - Check BGs every 2 hours

Preoperative Management of Diabetes Patients

- No established consensus on preoperative management
- Goal is to minimize hypoglycemia risk and hyperglycemia exposure
- Evening before surgery
  - Continue usual meal plan, insulin, and OADs
  - If NPO after midnight, reduce bedtime basal insulin dose by 50% for NPH or 25% for glargine or detemir
- Day of surgery
  - Discontinue OADs, GLP-1 receptor agonists, and pramlintide
  - If morning BG >180 mg/dL, give correction doses of insulin
  - Check BGs every 2 hours

Management of Patients With Diabetes After Hospital Discharge

Inpatient Management in non-ICU

Basal Bolus or
Basal Plus Regimens

What Regimen Should We Use at Hospital Discharge?
**Recommendations for Managing Patients With Diabetes After Hospital Discharge**

Use admission A1C to adjust therapy at discharge

- **ADD basal or REPLACE with basal/bolus**
  - 10%
- **ADD basal insulin therapy**
  - 9%
- **Adjust original therapy, ADD another agent or basal insulin**
  - 8%
- **Return to original therapy**
  - 7%

---

**Discharge Insulin Algorithm**

**Discharge Treatment**

- **A1C < 7%**
  - Re-start outpatient treatment regimen (OAD and/or insulin)
- **A1C 7%-9%**
  - Re-start outpatient oral agents and D/C on glargine once daily at 50% of hospital dose
- **A1C >9%**
  - D/C on basal bolus at same hospital dose.
  - Alternative: re-start oral agents and D/C on glargine once daily at 80% of hospital dose

---

**Hospital Discharge Algorithm Based on Admission HbA1C for the Management of Patients with T2DM**

<table>
<thead>
<tr>
<th>A1C Admission, %</th>
<th>A1C 4 Wks F/U, %</th>
<th>A1C 12 Wks F/U, %</th>
<th>Hypoglycemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.7±2.5</td>
<td>7.3±1.5</td>
<td>7.3±1.5</td>
<td>BG&lt;70 mg/dl</td>
</tr>
<tr>
<td>6.9±1.5</td>
<td>6.1±1.0</td>
<td>7.5±1.5</td>
<td>17 (3)</td>
</tr>
<tr>
<td>9.2±1.9</td>
<td>8.0±1.4</td>
<td>8.0±1.6</td>
<td>0 (0)</td>
</tr>
<tr>
<td>11.1±2.3</td>
<td>8.8±1.7</td>
<td>8.8±1.7</td>
<td>6.6±0.8</td>
</tr>
</tbody>
</table>

**Primary outcome:**
- change in A1C at 4 wks and 12 wks after discharge

---

**Revised Discharge Insulin Algorithm**

**Discharge Treatment**

- **A1C < 7%**
  - Sitagliptin ± metformin and/or previous antidiabetic regimen (OAD or insulin)
- **A1C 7%-9%**
  - Sitagliptin ± metformin plus glargine once daily at 50% of hospital dose
- **A1C >9%**
  - Sitagliptin ± metformin plus glargine once daily at 80% of hospital dose

---

**Sitagliptin-Discharge Trial**

**Discharge Treatment**

- **A1C < 7%**
  - Sitagliptin ± metformin and/or previous antidiabetic regimen (OAD or insulin)
- **A1C 7%-9%**
  - Sitagliptin ± metformin plus glargine once daily at 50% of hospital dose
- **A1C >9%**
  - Sitagliptin ± metformin plus glargine once daily at 80% of hospital dose
Changes in HbA1c at 3, 6 Months of Therapy

Transition of Diabetes Care in Surgery Patients with T2DM using Linagliptin in an HbA1c-based Algorithm

A1C < 7%
- Linagliptin ± metformin

A1C 7%-9%
- Linagliptin ± metformin plus glargine at 50% of hospital dose

A1C >9%
- Linagliptin ± metformin plus glargine at 80% of hospital dose

Case Presentation: Antihyperglycemic Therapy

- TJ is a 68 y/o male with an 8 yr history of DM admitted with SOB and CHF on chest x-ray. Previously treated with metformin 1 gram b.i.d. and sitagliptin 100 mg/day.
- JP is a 42 y/o male with an 10 yr history of DM with diabetic foot infection and osteomyelitis left toe. Treated with metformin 1 g b.i.d. and glipizide XL 10 mg/day.

Management of diabetes in non-critical care setting

So... What really have we learned?

Case Presentation:

- TJ is a 68 y/o male with an 8 yr history of DM admitted with SOB and CHF on chest x-ray.
- JP is a 42 y/o male with an 10 yr history of DM with diabetic foot infection and osteomyelitis left toe.

Individualization of care is needed for the management of hyperglycemia and diabetes in the hospital
What Glucose Levels Predict Hospital Complications?

Composite Complication Rate (%)

First 48 hours Maximum BG

RABBIT 2 Trial: Changes in Glucose Levels with Basal-Bolus vs Sliding Scale Insulin

Postoperative Complications

Composite of hospital complications: wound infection, pneumonia, respiratory failure, acute renal failure, and bacteremia.

Insulin Treatment in Non-ICU Setting

Basal-PLUS vs Basal Bolus:
300 Medical & Surgical Non-ICU Patients

Baseline Plus:
- Glargine once daily
- 0.25 U/kg plus glulisine supplements

Baseline Bolus:
- TTD: 0.5 U/kg/d
- Glargine 50%
- Glulisine 50%

Revised Discharge Insulin Algorithm

Preliminary results: Basal-Bolus 71 patients, basal-plus 49 patients.

**DPP4-Inhibitors for the Inpatient Management of General Medicine and Surgery Patients with T2DM**

- 640 med-surg patients, BG140-400 mg/dL treated with diet, OADs or total insulin dose ≤0.5 U/kg/day received DPP4-I alone (n=164), DPP4-I plus basal (n=167) or basal bolus (n=309). All groups received correction doses with rapid-acting insulin for BG>140 mg/dL.

---

**Post-Test Question 1**

- Which of the following statements regarding inpatient hypoglycemia in diabetes patients is correct?
  1. Inpatient hypoglycemia is not currently listed by CMS as a "never event"
  2. Associated with increased length-of-stay (LOS) but not increased mortality
  3. Associated with increased LOS and increased mortality
  4. Unsure

---

**Post-Test Question 2**

- Please rate your knowledge of the safety and efficacy of DPP-4 inhibitor regimens for hospitalized patients with T2DM?
  1. Poor
  2. Fair
  3. Good
  4. Excellent

---

**Post-Test Question 3**

- Which of the following is NOT a guideline recommendation for treatment of hospitalized T2DM patients in the non-ICU setting?
  1. OADs are generally not recommended
  2. Sliding scale insulin is not recommended
  3. Glucose target of 140-180 mg/dL is recommended for most patients with T2DM
  4. Therapy should be reassessed if BG<140 mg/dL to avoid hypoglycemia

---

**Thank you!**

guempie@emory.edu