Hospital Cases

Diabetes Care: From Hospital to Home
April 2, 2011
Moderator Barna Tugwell, MD, FRCP
Endocrinology and Metabolism
Disclosures

- Speaker honoraria from Sanofi Aventis, Novo Nordisk Canada, Bristol-Myers Squibb, AstraZeneca
- None relevant for this afternoon
Goals of the Session

- Participants should have familiarity with a general approach to a general ward inpatient who has
  - New diagnosis of diabetes
  - Hyperglycemia
  - Hypoglycemia
  - An operation while hospitalized
  - An insulin pump
  - Recovered but is waiting for discharge
- Raise awareness of available resources
- Will not focus on ICU management
Scope of the Problem

- Diabetes is the fourth most common comorbidity listed on hospital discharges
- Hyperglycemia has been associated with mortality in critically ill patients
- In a study of consecutive adult patients admitted to a community teaching hospital
  - 38% of patients had hyperglycemia
  - 26% had a known diagnosis of diabetes previously
  - 12% had newly diagnosed hyperglycemia

Vasa F. Am J Cardiol 2005;96:41E-46E.
Increased mortality among patients with new hyperglycemia
Newly diagnosed patients were frequently undertreated

- Only 13% were on a diabetic diet (vs. 53% for known DM patients)
- Only 6% received scheduled dose insulin (vs. 32%)
- Only 2% received oral agents (vs. 33%)
- They also had a longer length of stay compared to patients with known diabetes and normoglycemic patients
- They were more likely to be transferred to a transitional or extended care facility rather than be discharged home

Stress Hyperglycemia vs DM?

- The delay from development of type 2 diabetes to diagnosis is often very long (about 10 years)
- We will be diagnosing new type 2 diabetes frequently in the hospital
- Stress hyperglycemia is brought on in the setting of acute illness and the patient may not meet the diagnosis of diabetes once the illness is over
- How do you know the difference?
Meet Mr. Matthews

- Doug Matthews is a 52 year old man
- History of hypertension but otherwise no other past medical history
- Smokes 1 pack per day
- No recent visits with primary care provider
- Brought to emergency room after a motor vehicle accident
- Found to have a hip fracture and admitted to orthopedic surgery
On admission

- BP 154/94, weight 110 kg, BMI approximately 35 kg/m²
- Random serum blood glucose on admission 13 mmol/L
- Admits to low energy, increased thirst and urination over past few months
- A repeat serum glucose is 14.5 mmol/L
For the Patient with a New Diagnosis of DM: 3 Questions

- What are the diagnostic criteria for diabetes?
- What are the glycemic targets for outpatients and inpatients?
- How do we engage the patient in self-management?
New Diagnosis Diabetes during hospital admission

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What is Diabetes

- Diabetes mellitus is a metabolic disorder characterized by
  a) the presence of hyperglycemia due to defective insulin secretion,
  b) defective insulin action
  c) or a combination of both defects
Type 1 diabetes

- 10% of diabetics have type 1 diabetes
- Insulin deficiency – patient needs insulin to sustain life
- Usually diagnosed before age 30
- Patient who does not receive insulin will develop diabetic ketoacidosis – can be life threatening
At Risk for Type 2

- Age > 40
- First degree relative with type 2 diabetes
- High-risk population (Aboriginal, African / Asian descent)
- History of IGT or IFG
- Hypertension
- Dyslipidemia
- Abdominal Obesity
- Gestational Diabetes
- Other medical conditions
Type 2 diabetes

- 90% of patients who have diabetes are diagnosed as type 2
- Body still produces some insulin
  - Dual defect – insulin secretion
    - insulin action (resistance)
    - or both
BETA CELL FUNCTION DECLINES in the type 2 patient

Beta cell decline can start 10 years before diagnosis

How do we know it’s diabetes?
Diagnostic Criteria

- Casual blood glucose $> 11.1$ mmol/l plus symptoms

- Fasting plasma glucose $> 7.0$ mmol/L or random glucose $> 11.1$ mmol/L without symptoms should be confirmed by a second test.
## Recommended Glycemic Targets

<table>
<thead>
<tr>
<th></th>
<th>A1C</th>
<th>FPG or Premeal glucose (mmol/L)</th>
<th>2 hour post meal glucose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1 and 2 diabetes</td>
<td>≤ 7</td>
<td>4.0 – 7.0</td>
<td>5.0 to 10.0*</td>
</tr>
</tbody>
</table>

* 5.0 – 8.0 mmol/L if A1C targets not being met

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**Goals of care during hospitalization**

- Avoiding hypoglycemia
- Avoiding symptomatic hyperglycemia
- Blood glucose reading less than 10 mmol/L
## A1C % Glycosylated Hemoglobin

<table>
<thead>
<tr>
<th>Average Blood sugar level (mmol/L)</th>
<th>Conversion Chart</th>
<th>A1C %</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.5</td>
<td></td>
<td>12%</td>
</tr>
<tr>
<td>17.5</td>
<td></td>
<td>11%</td>
</tr>
<tr>
<td>15.5</td>
<td></td>
<td>10%</td>
</tr>
<tr>
<td>13.5</td>
<td></td>
<td>9%</td>
</tr>
<tr>
<td>11.5</td>
<td></td>
<td>8%</td>
</tr>
<tr>
<td>9.5</td>
<td></td>
<td>7%</td>
</tr>
<tr>
<td>7.5</td>
<td></td>
<td>6%</td>
</tr>
</tbody>
</table>
Treatment Strategies

- Food
- Exercise
- SMBG
- Education
- ?Medication (Pills and or Insulin)
Managing Hyperglycemia

Clinical assessment

<table>
<thead>
<tr>
<th>Lifestyle intervention (initiation of nutrition therapy and physical activity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1C ≤ 9.0%</td>
</tr>
<tr>
<td>A1C ≥ 9.0%</td>
</tr>
<tr>
<td>Symptomatic hyperglycemia with metabolic decompensation</td>
</tr>
</tbody>
</table>

- Initiate metformin
- Initiate pharmacotherapy immediately without waiting for effect from lifestyle interventions:
  - Consider initiating metformin concurrently with another agent from a different class; or initiate insulin
- Initiate Insulin ± metformin
<table>
<thead>
<tr>
<th>Class</th>
<th>A1C</th>
<th>Hypoglycemia</th>
<th>Other advantages</th>
<th>Other disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha-glucosidase Inhibitor</td>
<td>↓</td>
<td>Rare</td>
<td>Improved postprandial control</td>
<td>GI side effects</td>
</tr>
<tr>
<td>Incretin agent: DPP-4 Inhibitor</td>
<td>↓ to ↓↓</td>
<td>Rare</td>
<td>Improved postprandial control</td>
<td>New agent (unknown long-term safety)</td>
</tr>
<tr>
<td>Insulin</td>
<td>↓↓↓</td>
<td>Yes</td>
<td>No dose ceiling</td>
<td>Weight gain</td>
</tr>
<tr>
<td>Insulin secretagogue:</td>
<td></td>
<td></td>
<td>Many types, flexible regimens</td>
<td></td>
</tr>
<tr>
<td>Meglitinide Sulfonylurea</td>
<td>↓ to ↓↓ , ↓↓</td>
<td>Yes*</td>
<td>Improved postprandial control Newer sulfonylureas (gliptazide, glimepiride) are associated with less hypoglycemia than glyburide</td>
<td>Requires TID to QID dosing Weight gain</td>
</tr>
<tr>
<td>TZD</td>
<td>↓↓</td>
<td>Rare</td>
<td>Durable monotherapy</td>
<td>Requires 12 weeks for maximal effect Weight gain Edema, rare CHF, rare fractures in females</td>
</tr>
<tr>
<td>Weight loss agent</td>
<td>↓</td>
<td>None</td>
<td>Weight loss</td>
<td>GI side effects (orlistat) Increased heart rate/BP (sibutramine)</td>
</tr>
</tbody>
</table>
If not at target

- Add another drug from a different class; or
- Add bedtime basal insulin to other agent(s); or
- Intensify insulin regimen

Timely adjustments to and/or addition of antihyperglycemic agents should be made to attain target A1C within 6 to 12 months
Targets in Diabetes Care

- A1C $\leq 7.0\%$
- BP: $\leq 130/80$
- Chol: LDL $\leq 2.0$

CDA Clinical Practice Guidelines 2008
Isolated hyperglycemia does not = diabetes
Looking at Lab values is imperative
Random / Fasting glucose +/- A1c
Hyperglycemia in the presence of acute illness should be reassessed as an outpatient
Inpatient Care

- Nurse
- Dietician
- Physiotherapy
- Pharmaceutical
- Social Worker
- Allied Healthcare Provider
- PATIENT
- Medical Team
Assessment should include

- History & Physical
- Cognitive Status
- Social
- Financial
- Support system - Family
  - Community
  - Other
Patient Education
Survival Skills

- Type 2 diabetes: the basics
- Lows and highs: blood glucose levels
- Managing your blood glucose
- Physical activity and diabetes
- Just the Basics
- Injection Sites
- Insulin Pen Instructions
New Diagnosis
3 Messages

- Distinguishing preexisting type 2 diabetes from stress hyperglycemia can be challenging but an A1c on admission can help.
- Glycemic goals in the hospital are slightly higher than for outpatients (FPG 5 to 8 mmol/L, random 6-10 mmol/L)
  - Your patient may need more or less stringent targets.
- Involve the patient as the centre of the decision-making process.
After Mr. Matthews Gets Admitted

- The admitting team has put him on a sliding scale insulin regimen
- He has been in the hospital for 24 hours
- He is eating
- Chem strips on the floor are generally 10 to 17 mmol/L
- Hemoglobin A1c comes back at 13.5%
Treatment for Hyperglycemia

3 Questions

- For patients on the ward, what are the best insulin regimens? For type 1 patients?
- What are the critical treatment approaches for hyperglycemic emergencies?
- How do you transition from IV to subcutaneous insulin?
Schematic of the pathogenesis of diabetic ketoacidosis (DKA) and the hyperglycemic hyperosmolar state (HHS)

Hyperglycemia in the Hospital

Vanessa C. Donnelly BN RN MN(c)
Diabetes Case Management Coordinator
Hyperglycemia

• Hyperglycemia: “excess sugar” or glucose in the bloodstream above established targets
  “defective insulin secretion, defective insulin action, or both” (CDA, 2008, p. 10)

• Measured by a blood glucose monitor check or serum blood test

• Symptoms may or may not be present
Hyperglycemia in the hospital

• Very common!
  – Stress of illness
  – Medical procedures
  – Medications
  – Sedentary activity
  – Infections
  – Change in diet intake, timing and choice
Hyperglycemia in the hospital: Is it really a concern?

Short-term Complication:
• Increased risk of in-hospital morbidity & mortality for critically ill patients and a predictor of poor clinical outcomes in non-critically ill patients
  (Inzucchi, 2006)

Long-term Complication:
• “the chronic hyperglycemia of diabetes is associated with significant long-term sequelae, particularly damage, dysfunction and failure of various organs” (CDA, 2008, p. s10)
Symptoms of Hyperglycemia

- Fatigue
- Great thirst
- Excessive urination
- Weight loss
- Vision changes
- General malaise

Symptoms in and out of hospital can be vague and may not be noted until severe, at which point the patient has transitioned to a hyperglycemia emergency.
Hyperglycemia Emergencies:

DKA & HHS

“Diabetic Ketoacidosis (DKA) and Hyperosmolar Hyperglycemic State (HHS) are medical emergencies that require treatment and monitoring for multiple metabolic abnormalities and vigilance for complications. Precipitating factors must be sought and treated” (CDA, 2008, p. S65)
Diabetic Ketoacidosis

- T1DM: insulin deficiency
  - urinary loss of water, electrolytes & ECFV depletion
  - K+ shifted out of cells
  - acidosis (from elevated glucagon)
- Sudden onset
- Hyperglycemia not severe
- Ketones are present
- Electrolytes need to be replaced
- IV fluids and IV insulin
Hyperosmolar Hyperglycemic State

- T2DM: prolonged insulin insufficiency
  - high catecholamine levels
  - inadequate fluid intake (high glucose intake)
  - greater ECFV depletion & hyperosmolality
- Minimal or no acidosis
- Ketones *not usually* present
- Prolonged onset
- Extreme hyperglycemia
- IV fluids (*slowly* to avoid cerebral edema) and IV insulin
Management of DKA/HHS

• Restoration of normal ECFV & tissue perfusion
• Resolution of ketoacidosis
• Correction of electrolyte imbalances and hyperglycemia
• Diagnosis and treatment of coexistent illness
• Assessment of precipitating causes
Transitioning patient from IV insulin to SC insulin

***Ensure patient is ready to transition (that is, DKA or HHS is resolved)

***Do not transition to SC insulin until DKA or HHS is resolved

***Do NOT transition to sliding scale insulin
Precipitating Causes of DKA/HHS

• New diagnosis of diabetes
• *Insulin omission***
• Infection
• Myocardial infarction
• Drugs

A possible precipitating cause of DKA/HHS in the hospital is *insulin omission*

***do not transition to sliding scale insulin***
Sliding Scale Insulin: It doesn’t work!

• Basal insulin not usually ordered
• Not standardized, not consistent
• Reacts to a single blood glucose rather than proactively managing glucose trends
• Encourages insulin stacking
• Promotes glucose variability and hypoglycemia
• Convenience over best practice

Why is sliding scale insulin still being used?
Sliding Scale Insulin: How it (doesn’t) work

<table>
<thead>
<tr>
<th></th>
<th>AM</th>
<th>Noon</th>
<th>Supper</th>
<th>HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 1</td>
<td>6.0</td>
<td>21.3</td>
<td>3.3</td>
<td>17.4</td>
</tr>
<tr>
<td></td>
<td>No insulin</td>
<td>12 units R</td>
<td>No insulin</td>
<td>10 units R</td>
</tr>
<tr>
<td>April 2</td>
<td>12.3</td>
<td>20.5</td>
<td>18.2</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>6 units R</td>
<td>12 units R</td>
<td>16 units R</td>
<td>No insulin</td>
</tr>
<tr>
<td>April 3</td>
<td>14.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Better Insulin Regimens

• OHAs with Basal Insulin at hs
• Mixed insulin (%basal + %regular) BID
• MDI (multiple daily injection) QID

Consider needs and goals of patient when helping them choose an insulin regimen for their diabetes management.
Considerations

• Does patient know how to monitor blood glucose and self-administer insulin?
• Does patient have a new insulin regimen or new insulin dosing and are they aware?
• Can patient afford testing strips, lancets and insulin?
• Does patient know how to recognize and treat hypoglycemia?
Treatment for Hyperglycemia

3 Messages

- Type 1 patients are insulin deficient and should never be without insulin, even when they are not eating.
- The major areas of treatment for hyperglycemic emergencies are:
  - Volume
  - Reversal of acidosis (in DKA)
  - Managing potassium and electrolyte disturbances
- Do not transition patients from IV insulin to sliding scale.
The call bell rings...

- The wife of Mr. Matthews starts frantically ringing the call bell
- He has become very confused, agitated, and sweaty
- Chemstrip is 2.5 mmol/L
Hypoglycemia

- Hypoglycemia is the biggest barrier to excellent glycemic control in outpatients
- In inpatients, hypoglycemia can be particularly dangerous
  - Altered mental status or medications can interfere with patient’s ability to detect or respond to hypoglycemia
  - Will predispose to falls and other complications
- There are many risk factors for hypoglycemia in the hospital including stopping and starting medications or feeds; interruption of meals; attempting tight glycemic control; errors in insulin
Hypoglycemia 3 Questions

- How should he be treated for this episode?
- Why might this have happened?
- What precautions should patients at risk for hypoglycemia take as inpatients or outpatients?
Hypoglycemia Management

Diabetes Care: From Hospital to Home
April 2nd 2011

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Objectives

- Define hypoglycemia
- Identify those at risk
- Review treatment and available resources
- Take home points
Hypoglycemia is defined as:

- The development of autonomic or neuroglycopenic symptoms
- A low plasma glucose level <4.0 mmol/L
- Symptoms responding to the administration of carbohydrate

The clinical manifestations or symptoms of Hypoglycemia further define it as mild, moderate and severe and will vary with each person.
Those at Risk

- Medication induced is most common
  - insulin or sulphonylureas, changes to diabetes medications or corticosteroids
- Sudden reduction in intake (oral, enteral or parenteral nutrition, NPO)
- Current low A1C (<6.0%)
- Previous hypoglycemic episodes and or lack of awareness
- ETOH consumption
- Adrenal insufficiency
- Impaired renal or hepatic function
Mild Hypoglycemia

- **Autonomic Signs and Symptoms**
  - Trembling
  - Palpitations
  - Sweating
  - Anxiety
  - Hunger
  - Nausea
  - Tingling

Patients usually conscious and able to treat themselves

- **Blood glucose typically less than 4mmol/L**
Moderate Hypoglycemia

- Develop autonomic and neuroglycopenic signs and symptoms
  - Autonomic
    - Trembling
    - Palpitations
    - Sweating
    - Anxiety
    - Hunger
    - Nausea
    - Tingling
  - Neuroglycopenic
    - Difficulty concentrating
    - Difficulty speaking
    - Drowsiness
    - Dizziness
    - Confusion
    - Weakness
    - Vision changes
    - Headache

- Blood glucose typically less than 4mmol/L

Patient is conscious but due to the presence of neuroglycopenic symptoms, **may require assistance to treat** the hypoglycemia.
Treatment-Mild or Moderate

- Oral ingestion of 15g of carbohydrate, preferably as glucose or sucrose tablets or solution
  - Glucose tabs
  - 15 mL sugar in H₂O
    - 175 mL juice or soft drink
  - 6 lifesaver candy
  - 15mL honey

- For pts with swallowing difficulties
  - 1½ tsp regular jam or ½ c. applesauce

- *For pts on acarbose use milk, honey or dextrose tablets as this medication delays the digestion of sucrose and starch
$\frac{3}{4}$ c. or 175 ml
Treatment - Mild or Moderate

- Wait 15 minutes,
- Retest blood glucose
- And retreat with another 15g of carbohydrate if the blood glucose remains <4mmol/L
Severe Hypoglycemia

- Autonomic and neuroglycopenic signs and symptoms
- May be conscious or unconscious
- May develop seizures

- Blood glucose is typically below 2.8 mmol/L

- If conscious, able to swallow and not experiencing a seizure, treat as moderate
Treatment-Severe

- **Conscious**
  - Oral ingestion of **20g** of carbohydrate, preferably as glucose or sucrose tablets or equivalent
    - Glucose tablets
    - 20 mL of sugar in H₂O
    - 200 mL of juice or soft drink
    - 8 lifesaver candy
    - 20 mL honey
  - Wait 15 minutes,
  - retest blood glucose
  - and retreat with another **15g** of carbohydrate if the blood glucose remains <4mmol/L
Treatment-Severe

- Unconscious
  - Position patient to minimize risk

- CALL PHYSICIAN: REFER TO HYPOGLYCEMIA PRE-PRINTED ORDERS
  PPO 0139MR Adult Severe Hypoglycemia.
    - Start IV with D5W and
      - PREPARE to give 50% Dextrose (20-50 mL over 1-3 minutes)
    - If IV access cannot be obtained
      - Glucagon 1mg IM (may repeat q15minutes X2)
Capital Health
PRE-PRINTED ORDER
Department of Medicine, Endocrinology, Diabetes Case Management

Adult Severe Hypoglycemia

Patient: ________________________ Allergies: ________________________

THE FOLLOWING ORDERS:
- May be used in any patient care area and will be carried out by a qualified health professional ONLY ON THE AUTHORITY OF AN AUTHORIZED PRESCRIBER
- All orders to be carried out must be checked/completed as appropriate
- All times must be written yyyy/mm/dd. All times must be on the 24-hour clock (hh:mm

ORAL TREATMENT
See Hypoglycemia Policy and Procedure GG15-025 Treatment for Reversal of Mild, Moderate and Severe Hypoglycemia. If following oral treatment, blood sugar is still below 4 mmol/L or if patient becomes unconscious at any time, initiate IV IV I M Treatment as follows:

IV IV M TREATMENT
- Start IV __________________ and give 0.5% 0.5% 20-50 mL IV push over 1-3 minutes. If no response, repeat and notify physician.
- Test blood glucose with a meter every 10 minutes until blood sugar is greater than 4 mmol/L for 3 consecutive readings.
- Once blood glucose is greater than 4 mmol/L, for 3 consecutive readings and patient is alert, test blood glucose q ______.
- Maintain IV __________________ at __________ mL/h until patient is eating well, then discontinue.
- For patients on sulfonylureas who experience severe hypoglycemia, start IV D____ W and run at __________ mL/h.
- Monitor blood glucose q ______.
- When IV access cannot be established, give Glucagon 1 mg IM (may repeat every 15 minutes x 2)
- When able to eat and if next meal is more than 1 hour away, give 15 g carbohydrate snack and a protein source (for example: 1/2 sandwich; 6 crackers; 1 slice bread with 1 package peanut butter or cheese)

MEDICATION OR INSULIN CONSIDERATIONS
- Sulfonylureas, in particular Glyburide, can cause severe prolonged hypoglycemia. In the elderly, gliclazide / Diamicron MR® may be preferred over Glyburide as it is associated with a reduced frequency of hypoglycemic events
- Non-sulfonylurea insulin secretagogues (GlucoNorm®) may be associated with a lower frequency of hypoglycemia. This would be the drug of choice for people with irregular eating habits.
- To avoid unnecessary hypoglycemia, metformin, alpha-glucosidase inhibitors, and/or thiazolidinediones (Avandia®/Actos®) should be considered before using insulin secretagogues (sulfonylureas and meglitinides) in patients at high risk for hypoglycemia
- Moving basal insulin from supper to bedtime may reduce the risk of nocturnal hypoglycemia

OTHER POSSIBLE PRECIPITATING FACTORS
- Impaired kidney or liver function
- Lack of education on hypoglycemia
- ETOH consumption
- Gastrointestinal disease
- Lifestyle/behavioral

IF ADMISSION REQUIRED, follow above orders and:
- Consult Endocrinology
- Activity as tolerated
- Diabetic Diet __________ kcal/day OR __________
- Consult Diabetes Case Management Coordinator (QEIH sites only) (473-2970/7905)

Prescriber's Signature ________________________ Date (yyyy/mm/dd) ________________________
Prescriber's Name ________________________ Reg. No. ________________________

FPO D139 MR March 20 2006 Copy 1 – chart Copy 2 – pharmacy Copy 3 – Diabetes Case Manager page 1 of 1
Follow-Up Management

- Once the hypoglycemia is reversed:
  - Provide usual meal or snack that is due at that time of day
  - If a meal is >1 hr away, have the patient consume a 15g carbohydrate and a protein snack
Take Home Points

- Treat promptly
  - use an intervention that provides the fastest rise in BG to a safe level
  - avoid overtreatment and rebound hyperglycemia

- Treat blood glucose less than 4mmol/L, even without symptoms

- Ready access to an appropriate form of glucose and supplements at all times

- Monitor trends in blood glucose levels daily with medication regimen and patient status

- Coordinate testing/procedures for pts receiving insulin

- PPO 0139MR “Adult Severe Hypoglycemia”.

- Education for patient and family

- **Goal** - Prevention rather than Reaction
References

- CDHA Interdisciplinary Clinical Policy and Procedure; Hypoglycemia, Treatment for the Reversal of Mild, Moderate and Severe CC 15-025.
- Lilly & Lifeshield
Hypoglycemia 3 Messages

- Treat but do not overtreat hypoglycemia (15 to 20 g carbohydrates)
- Most common reasons for hypoglycemia
  - Too much insulin (or use of sliding scale)
  - Not enough food
  - Increased activity
- Prevention at home: look at glucose targets and type of insulin required to get there, Medic Alert bracelets, glucagon emergency kits
Preparing for Surgery

- He recovers from the hypoglycemic event
- He will need to go to the OR tomorrow
- At this point he is receiving NPH 10 units in the morning and at bedtime, and Novorapid 5 units with each meal with good glycemic control
Care of the Perioperative Patient

- How do we prepare hospitalized patients with diabetes for surgery the night before?
- How do we prepare them the morning of surgery?
- What do you do with their therapy after surgery?
Perioperative management of the Diabetic Patient

Jackie Frew BN
Clinical Nurse Educator
Perioperative goal
Maintain targeted glycemic control

- Reduce risk of infection
- Improve mortality and morbidity
- Improve healthcare economic outcomes
Operations/Anesthesia

↑ stress hormones & inflammatory stressors

Insulin resistance

Impaired insulin secretion
Preoperative Care

- Hemoglobin A1C
- Time of surgery
- Anesthesia
- Medications to start, stop or continue
Type 1 Diabetes

- Continue basal insulin
- Supplemental scale for coverage
- Rapid acting vs regular
- Regular (short acting) - Novolin Toronto, Humulin R

- Rapid acting Analogues - Humalog, Novorapid

- NPH (Intermediate) - Novolin NPH Humulin N

- Basal analogues - Glargine, Detemir

Starts to work in 30-45 minutes peaks in 2-3 hours duration of action 6-8 hours

Starts to work in 5-10 minutes peaks in 1-2 hours duration of action 4-5 hours

Starts to work in 2-4 hours peaks in 6-8 hrs duration of action 12-16 hours

Onset of action about 90 minutes, This insulin has no pronounced peak Duration of action up to 24 hours
Type 2 Diabetes

- Discontinue insulin secretagogues
- Metformin renal considerations
Intraoperative/Critical care
Insulin considerations

- Insulin infusion
- NPO patients with out enteral/parenteral nutrition require IV dextrose
- Transition from IV to subcut
- Rapid/short 30mins – 2 hrs
- Basal 12-24 hrs
Summary

- Sliding scale is no longer sufficient
- Access must be available to the appropriate form of glucose
- Advocate for optimal care of our diabetic patients
Where to Get More Information

- Canadian Diabetes Association
- American Diabetes Association
- Cleveland Clinic Journal of Medicine, November 2009
- Joslin Diabetes Center
- Pre printed order by the Department of Medicine “Subcutaneous Insulin Orders”
Perioperative Patients
3 Main Messages

- Night prior to OR, practice varies but can consider reducing basal insulin dose if patient tends toward low morning blood sugars
- Morning of OR, give a portion (50-70%) of their basal insulin (NPH or basal analogue) and hold mealtime insulin, hold oral agents
  - Prolonged or CABG surgeries may require IV insulin
- After OR, resume insulin and oral agents when eating and no contraindications
Meet Miss Diane Mills

- Diane is a 27 year old woman who presents to the emergency room with acute abdominal pain
- She has had type 1 diabetes for 15 years
- She is on an insulin pump
Insulin Pumps in the Hospital

- Pumps are becoming more common and more sophisticated
- Their users are often very sophisticated and will typically have expertise regarding their pump
- CDHA currently has no pump policy in place but we must have an approach when we encounter pumps
ADA 2011 Standards of Care

- Patients who use CSII pump therapy in the outpatient setting can be candidates for diabetes self-management in the hospital, provided that they have the mental and physical capacity to do so. A hospital policy and procedures delineating inpatient guidelines for CSII pump therapy are advisable. The availability of hospital personnel with expertise in CSII therapy is essential. It is important that nursing personnel document basal rates and boluses taken on a regular basis (at least daily).

Insulin Pumps in the Hospital
3 Questions

- Which insulin pump patients are candidates to manage their own pumps while hospitalized?
- What consultation(s) should be considered for a pump patient who is hospitalized?
- What is the obligation of nursing personnel?
Insulin Pumps
Insulin Pumps

- Contain rapid acting insulin
- Deliver basal insulin continuously
- The patient delivers bolus doses of insulin for meals and for correction of high sugars
- Insertion site and all tubing should be changed every 3 days.
- Insertion sites are the same as for subcutaneous insulin injection.
Insulin Pumps

- Patient should be testing a minimum of 4 times per day.
- Site should be checked regularly.
- Supplies should be brought in to hospital by the patient or their family.
- Patients should be able to manage their pump independently while in hospital.
Pumps may need to be removed during some tests or procedures.

Patient can call the 24 hotline for the pump company to find out if they should remove their pump during a test or procedure.

Keep in mind patients should take corrective action if they are to be disconnected from their pump for more than 1 hour.
Highs and Lows

On insulin pump:

- patients can have very high sugars and/or develop DKA within a few hours of being disconnected from the pump

- If a patient has a low sugar they can suspend insulin delivery to recover from a low more quickly.
High Blood Sugars

If sugar > 15 with no logical cause:

- Check pump site, tubing.
- If patient has Type 1 Diabetes check for ketones
- Take correction dose using pump to bolus insulin. (If ketones present immediately take correction dose by syringe)
- Retest in 1 hour
- If sugar is not decreasing, take a correction dose via syringe and change tubing, reservoir and insulin.
- Continue testing and correcting.
Don’t forget

- Patients know about their diabetes and how to manage it.

- Take the opportunity to offer a referral to the Diabetes Management Center for support and further education once the patient is discharged from hospital.
3 Messages about Insulin Pumps in Hospital

- Patients who have a pump as an outpatient can use them in the hospital, provided that they have the mental and physical capacity to do so.
- May consider consulting the endocrine service or the specialist responsible for the pump upon admission for decisions about infusion adjustment.
- Patient or nurse should document basal rates, boluses and blood glucoses, and discuss any pump problems.
Back to Mr. Matthews

- He has recovered well and is ready to go home
- He is on metformin and insulin
Questions for Discharge

- What skills should he be taught and what barriers might exist?
- What major aspects of his health besides blood sugars should be communicated with him and his family doctor?
- What kind of outpatient resources are available to him?
Discharge Planning should start on admission!
During hospitalization….

- During hospitalization providing patient with survival skills to deal with diabetes management until s/he is connected to resources in the community
- Connection to Unit Dietician
- Connection to Social Worker
- Connection to the healthcare discipline identified
So at discharge we …..

- Have financial/social challenges been addressed
- Need for application for NS Family Pharmacare; Metro Dispensary (referral by Social Worker)
- Exception Status form faxed to MSI
- Does the patient have prescription for medications and supplies.
- Does patient need referral to Continuing Care in the Community to support diabetes activities that were started in hospital? i.e. VON visits for support bridging until patient connected to Diabetes Center team.
Follow up is important!

- Plan for follow-up care is discussed with patient
  - visit to GP within reasonable time
  - referral to Diabetes Center for education and follow-up.

Other resources in the Community:
Supermarket Programs
Smoking Cessation Program
Hearts in Motion Community Program
Meals on Wheels
VON Frozen Favorites
CDA Guidelines re Care by Interdisciplinary team
Daily Commitment Of The Person With Diabetes To Self-Management

- Approach should include problem solving, goal setting and active participation in decision-making.
- People with diabetes should be supported in interpreting and acting on self-monitoring of blood glucose results, making informed management decisions about insulin, medication, nutrition, physical activity and other lifestyle issues, including daily preventive practices such as good foot care.

............... let’s get our patients off to a good start!
Where to find Diabetes Information

- [www.diabetes.ca](http://www.diabetes.ca)
- CDHA Intranet - Diabetes Resource
- Diabetes Care Program Nova Scotia
- Diabetes Education Centers (throughout the Province)
- Primary Care Provider – [http://www.gov.ns.ca/health](http://www.gov.ns.ca/health) or toll free at 1-877-731-1931
- Community Pharmacists
- Diabetes Support Groups
Discharge Planning
Main Messages

- Discharge planning starts on admission
- Good health is not centred on blood sugars alone
- Many community resources are available, from the VON, Diabetes Education Centres, the local supermarket, and the internet
- For more information
  - Diabetes Care Program of Nova Scotia, www.diabetescareprogram.ns.ca
  - CDHA intranet diabetes resources
Thank you! Questions?