Hyperglycemia in the Clinic

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VAMHCS
Conflicts of Interest

None
Objectives

- Identify methods of simplifying diabetes regimens in cases of non-adherence
- Name at least 5 reasons for unexpected hyperglycemia
- Describe weight based method of insulin initiation
- Identify means of incorporating technology into the management of type 2 diabetes
- Identify and recognize features of secondary diabetes
46 yr old male

OJ is a 46 yr old man

- **PMH**
  - T2D (x 10 years) and schizophrenia

- **HbA1c 9.2%**

- **DM Meds**
  - Metformin
  - Saxagliptin
  - Insulin glargine, 50 units daily
  - Insulin Aspart, 15 units with meals
  - Pt reports routinely missing doses of insulin

- **SH** Intermittently homeless
Exam

Glucose 219
Obese
BP 130/77; HR 66
Heart, lungs normal
Abd WC 45 inches
No skin lesions
AAO x 3; cognition intact
What should we do?

Check insulin injection technique

Simplify regimen
  ◦ Aspart 70/30
    ◦ 63 units before breakfast
    ◦ 32 units before dinner

Follow up
  ◦ HbA1c 7.8%
  ◦ No hypoglycemia detected
35 yr old male

SC is 35 yr old male PMH

- T1DM – well controlled
- Mental handicap

- Meds
  - Detimir 9 units BID
  - Aspart 1-8 units with meals
  - Correction aspart PRN

- Hb A1c 6.8%
Reasons for unexplained hyperglycemia

- Infection
- Pain
- Stress
- Acute MI
- Change in physical activity
Further history
What questions shall we ask?

Is there a pattern to the hyperglycemia?
  ◦ Primarily elevated in morning?
    ◦ Rule out nocturnal hypoglycemia
    ◦ Elevated primarily after meals?

Any signs of infection?

Change in mood, affect?

Insulin date?
60 yr old male

PMH CAD, Depression, Hyperlipidemia, T2DM, obesity

T2D >10 years
- Glucose well controlled on 4 oral meds
- Today reports glucose has been consistently >200
- HbA1c 8.7% today
Figure 1.
Stages of Type 2 Diabetes

Beta Cell Preservation

Beta Cell Recovery

Type 2 Diabetes Phase III

Years From Diagnosis

Insulin initiation

Weight based dose
- BW in Kg x 0.2
  - $112 \text{ kg} \times 0.2 = 22 \text{ units of basal insulin}$

Consider c peptide with glucose prior to insulin initiation
mHealth

- Low cost
- Improves communication with care team
- Personalized ‘coaching’
- Improves glycemic control\(^1\)
  - Effect size 0.5-1% reduction in HbA1c
  - Younger patients benefit more
    - 14 studies, ~1600 patients
- But still some inconsistency in findings\(^2\)
  - Might work better for some than others

\(^1\) Hou et al 2016 *Diabetes Care*; \(^2\) Hamine et al 2015 *JMIR*
DiaSocial App

![DiaSocial App Interface]

<table>
<thead>
<tr>
<th>Name</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
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<tbody>
<tr>
<td>Glucose</td>
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<td>25</td>
<td>27</td>
<td>27</td>
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<td>45</td>
<td>34</td>
<td>34</td>
<td>35</td>
<td>0</td>
</tr>
</tbody>
</table>

Legend:
- Exceeded Goal
- Met Goal
- Goal not met
Regulatory Mode

- Two distinct motivational orientations
  - Locomotion
    - “Just do it”
  - Assessment
    - “Do it right”
- Measured with modified 6-item scales

3Kruglanski et al 2000 JPSP
### Regulatory Mode Scale Items

<table>
<thead>
<tr>
<th>Locomotion Items</th>
<th>Assessment Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I feel excited just before I am about to reach a goal.</td>
<td>1. I never evaluate my social interactions with others after they occur. (R)</td>
</tr>
<tr>
<td>2. I enjoy actively doing things, more than just watching and observing.</td>
<td>2. I spend a great deal of time taking inventory of my positive and negative characteristics.</td>
</tr>
<tr>
<td>3. I am a “doer”.</td>
<td>3. I like evaluating other people’s plans.</td>
</tr>
<tr>
<td>4. When I decide to do something, I can’t wait to get started.</td>
<td>4. I often compare myself with other people.</td>
</tr>
<tr>
<td>5. I am a “low energy” person. (R)</td>
<td>5. I often critique work done by myself or others.</td>
</tr>
<tr>
<td>6. Most of the time my thoughts are occupied with the task I wish to accomplish.</td>
<td>6. I am a critical person.</td>
</tr>
</tbody>
</table>
Change in HbA1c

- Better outcomes for people who used the app more

Remote monitoring

CPT Codes
- 99091

- American Diabetes Association (endorsed)
  - GlucoseZone

- FDA approved
  - BlueStar
CM

CM is a 42 yr old female

- PMH T2D (x 10 years), HTN, PCOS
- Meds
  - Basal/bolus insulin
  - Weekly GLP-1 agonist
  - Metformin
  - Spironolactone
- HbA1c 8.2%
- Physical Exam
  - Thin arms/legs
  - Round belly, no stretch marks
  - No bruising, skin tear
Secondary Diabetes

- Hemochromatosis
- Endocrinopathies
  - Acromegaly
  - Cushing Disease
  - Pheochromocytoma
  - Glucagonoma
  - Others
- Medications
  - Tacrolimus
  - mTOR inhibitors
  - Atypical antipsychotics
    - Clozapine, olanzapine
    - Others
- Infection/inflammation
Secondary Diabetes

Hemochromatosis
- transferrin saturation
  - >60% men
  - >50% women

- Autosomal recessive
  - Most common \textit{HFE} gene
    - 10% Caucasians heterozygotes
    - 1/200 homozygous

- Typical signs
  - Abnormal LFT
  - Weak lethargic
  - Skin hyperpigmentation
  - Arthralgia
  - Diabetes mellitus
  - ECG abnormal
  - Male impotence
SCREENING FOR CUSHINGS

Midnight salivary cortisol x 2
Overnight 1mg dexamethasone suppression test
24 hour urine cortisol
Conclusions

Simplify diabetes regimens when possible
Rule out unexpected causes of hyperglycemia
Check insulin dates/quality
Utilize weight based dosing when initiating insulin
Utilize technology to improve diabetes outcomes
Rule out secondary causes of diabetes