INSULIN PUMPS, CONTINUOUS GLUCOSE MONITORS & A DAY IN THE LIFE WITH DIABETES

Sharp Healthcare Diabetes Conference
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OBJECTIVES

• Possess the ability to recognize insulin pumps and continuous glucose monitors (CGM) and discuss their use in the acute care setting

• Explain the basic concepts of an insulin pump and cite the benefits and disadvantages of using one

• Understand CGM trend arrows as well as the emotional and physical effects of hypoglycemia and hyperglycemia

• Gain valuable insight about living with diabetes, including the diabetes diet, social stigmas and assumptions

• Recognize the impact that language used by clinicians have on persons living with diabetes
WHAT IS AN INSULIN PUMP?

• Subcutaneous, automated insulin delivery system
• Intended to mimic action of pancreas
  • **BASAL** delivery of insulin achieved by release of small amounts of rapid acting insulin to control blood glucose (BG) throughout day
  • **BASAL** delivery automatically set in pump - no user input needed
  • **BOLUS** delivery of insulin achieved by interaction from user
    • **BOLUS** insulin is extra dose to match ingested carbohydrates or to correct a BG above goal
• Not surgically implanted; changed by user q3 days
FIRST INSULIN PUMP

- 1960’s
- First developed by Arnold Kadish
- Fun fact → this “pump” actually worked as closed-loop device, which modified insulin dose based on glucose readings
PRESENT DAY DEVICE
WHERE ARE THESE DEVICES FOUND ON THE BODY?
- Abdomen
- Back
- Buttocks
- Arms
- Legs
BENEFITS OF PUMP THERAPY

- Reduction in number of injections
- Most users go from using two insulins to one
- Convenience
- Consistency of insulin doses
  - Long-acting insulin that lasts 18-24 hrs versus consistent hourly basal rate
- Precise calculations
- Extended boluses, temporary basal rates
With the Lantus it’s a one time shot that “lasts 24 hours”. Sometimes it didn’t for me. So I like knowing I’m getting my basal rate hourly.

I feel like I have no control on injections. I like being able to go back on the pump and see what I’ve bolused or what I have on board.

It calculates insulin for me… sometimes when I was on injections and correcting a high I would overcorrect going off of my sliding scale. And I think that’s because I didn’t know what I had on board.
MISCONCEPTIONS ABOUT INSULIN PUMP THERAPY

• Easier
  • Requires user input
  • Results equivalent to effort that is put in
  • Person w/ DM that is not well managed automatically a candidate for insulin pump therapy
• Everyone should be on an insulin pump
  • Age
  • Technology IQ
  • Finances, insurance
  • T1 versus T2 eligibility
• Surgically implanted
INSULIN PUMP THERAPY CONCEPTS

- Basal rates
  - *Amount of insulin being delivered hourly without any input from user*
  - Example
    - Basal rate = 1.15 units/hr = 1.15 units of rapid acting insulin being delivered on hourly basis to mimic action of long acting insulin
    - 1.15 units/hr x 24 hrs = 27.6 units total = basal TDD
    - Basal TDD roughly equivalent to long acting insulin dose
INSULIN PUMP THERAPY CONCEPTS

- IC Ratio - Insulin to Carbohydrate Ratio
  - Amount of carbohydrates one unit of insulin covers
  - Example
    - IC Ratio 1:10 = one unit covers 10 grams of carbohydrate
    - Meal with 47 carbs would suggest bolus of 4.7 units
INSULIN PUMP THERAPY CONCEPTS

• Correction Factor
  • Expected reduction in BG per one unit of insulin
  • Example
    • 1:50 = one unit of insulin lowers BG by 50 points
    • BG goal in pump set at 120 with current BG of 195 would suggest bolus of 1.5 units
INSULIN PUMPS - CLINICIAN CONSIDERATIONS
INSULIN PUMPS - CLINICIAN CONSIDERATIONS

• Individuals with *any* type of diabetes might be wearing a pump
• Some hospitals have policy for patient use
  • See hospital specific policy
  • Sharp policy
  • Pt characteristics
• Contraindicated during certain procedures
• Consider what insulin pump means to patient
• *Some* infusion sets have needle
CONTINUOUS GLUCOSE MONITORS
WHAT IS A CGM?

- Method of tracking BG 24/7
- Small cannula and metal filament inserted into interstitial fluid (not blood)
  - Information from interstitial fluid sent wirelessly to receiving device
    - Phone (most popular)
    - Receiver from manufacturer
- Not surgically implanted
  - Inserted by user q 10-14 days
- Glucose level from interstitial fluid read approximately q 5 minutes
- Provides information on rate of change
BENEFITS OF CGM

• Ongoing ("continuous") reading of BG
• Convenience
  • Eliminates process of finger sticks
    • Some day… no finger sticks?
  • Directional arrows provide information on rate of change
    • Increases predictability of how high/low BG will go
    • Influences dosing for meal times, corrections
• In most cases, calibration not required
**DIRECTIONAL ARROWS**

- Double arrows straight up or down = may increase/decrease > 90 points in 30 minutes
DIRECTIONAL ARROWS

- One arrow straight up or down = may increase/decrease 60-90 points in 30 minutes
DIRECTIONAL ARROWS

• Straight horizontal arrow = increasing/decreasing less than 1 point each minute
• Does not indicate “no change” in BG
DIRECTIONAL ARROWS

- One arrow diagonal up or down = may increase/decrease 30-60 points in 30 minutes
DIRECTIONAL ARROWS

- No arrow = do not use reading to make treatment decisions
  - Perform fingerstick instead
  - Wait for directional arrow
HOW ARE THESE THINGS INSERTED?

- CGM Insertion
- CGM Insertion 2
- CGM Insertion 3
CGM - CLINICIAN CONSIDERATIONS
CGM - CLINICIAN CONSIDERATIONS

- Personal CGM devices not approved to make treatment decisions in acute care setting
- Some hospitals have policy for patient use
  - See hospital specific policy
  - Sharp policy
- Contraindicated during certain procedures
- Check BG if symptoms do not match CGM reading
A DAY IN THE LIFE - LIVING WITH DIABETES
It isn’t just an insulin pump...
What does your insulin pump or CGM mean to you?

I am beyond grateful for my pump. I haven’t been diagnosed with diabetes for long, but since I made the change to the pump, being able to take care of myself and my sugars has become a lot easier…

It’s my lifeline. I mean, it’s what keeps me sane. If my CGM stops, I feel lost.

Whether it’s my insulin pump, my CGM, my syringes, my vial of insulin - it all is so personal. It is my lifeline. I know where each of these items are at 24/7, and leaving home without them is the equivalent feeling of leaving home without shoes on - you know something is wrong!
FOOD
• Persons with diabetes have a unique relationship with food…
Let’s talk about how blood sugars make us “feel”
A GOOD DAY

- A diabetes homerun
- Mental benefits
- Physical benefits
HYPOGLYCEMIA

- Different for everyone
- Physical
- Mental
- Symptomatic versus non-symptomatic
HYPERGLYCEMIA

- Different for everyone
- Physical
- Mental
- Symptomatic versus non-symptomatic
  - Living at high average for extended periods of time
Approximately 1.5 hours
250+ point shift
It's Friday! Time to disconnect from it all...except for my insulin pump, my CGM, my backup glucose monitor, my carb counting app... #TID is 24/7.
CLINICIAN CONSIDERATIONS
REMEMBER THAT SLIDE ABOUT THE INSULIN PUMP AND PANCREAS…

- Be mindful of your hands
- Do not pick up a patients’ device without first asking for permission
### THE “DIABETES DIET”

- It’s carbs, not sugar
- Total carbohydrates
- Fiber
- Sugar
- Sugar alcohols

<table>
<thead>
<tr>
<th>Nutritional Facts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serving Size: 6.7 ounces (190 g)</td>
</tr>
<tr>
<td>Servings Per Container: 1</td>
</tr>
<tr>
<td><strong>Amount Per Serving</strong></td>
</tr>
<tr>
<td>Calories: 100</td>
</tr>
<tr>
<td>% Daily Value*</td>
</tr>
<tr>
<td>Total Fat: 0.5g</td>
</tr>
<tr>
<td>Saturated Fat: 0g</td>
</tr>
<tr>
<td>Cholesterol: 0mg</td>
</tr>
<tr>
<td>Sodium: 11mg</td>
</tr>
<tr>
<td><strong>Total Carbohydrate:</strong> 23g</td>
</tr>
<tr>
<td>Dietary Fiber: 5g</td>
</tr>
<tr>
<td>Sugars: 18g</td>
</tr>
<tr>
<td>Protein: 0.5g</td>
</tr>
<tr>
<td>Vitamin A: 2%</td>
</tr>
<tr>
<td>Calcium: 1%</td>
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</tbody>
</table>

*Percent Daily Value based on a 2000 calorie diet.*
THE “DIABETES DIET”

• Balance
• Portion control
• Nothing is off limits
  • More person preference than anything
    • Choosing to avoid certain foods because of known BG affect versus indulging in them anyway
LANGUAGE

- Why Language Matters
LANGUAGE

• AADE & ADA
  • Recommendations for language
    • 1) neutral; nonjudgemental; based on facts, actions or physiology/biology
    • 2) stigma-free
    • 3) strength based, respectful, inclusive, imparts hopes
    • 4) encourages collaboration between patients and providers
    • 5) person-centered
<table>
<thead>
<tr>
<th>Compliant, noncompliant</th>
<th>That patient is non-compliant…</th>
<th>engagement, participation. This patient takes her insulin about 50% of the time.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diabetic (noun &amp; adjective)</strong></td>
<td>Are you a diabetic? That patient has a diabetic foot.</td>
<td><strong>Person with diabetes</strong> Do you have diabetes? The foot appears to have an infection caused by chronically high blood sugars.</td>
</tr>
<tr>
<td><strong>Refused</strong></td>
<td>She refuses to listen to me about how much insulin to take before her meal.</td>
<td><strong>Declined, decided not to</strong> She decided not to take my recommendation about how much insulin to take before her meal.</td>
</tr>
<tr>
<td><strong>Good control, bad control, uncontrolled, poorly controlled</strong></td>
<td>This patient has terrible control over their sugars!</td>
<td><strong>Manage</strong> He’s having a difficult time managing his blood sugar.</td>
</tr>
<tr>
<td><strong>Can’t</strong></td>
<td>You can’t eat that.</td>
<td>There is no good substitute. Don’t tell patients what they can or cannot do :)</td>
</tr>
</tbody>
</table>
How does it feel to have someone make a comment about your blood sugar?

I feel like I am constantly educating others about blood sugar and how it is not a reflection of the individual.

I don’t like when people ask what my A1c is, because it’s something I’ve struggled with and have been embarrassed about my whole life.

Some days I can be really sensitive about it and embarrassed.

I really just wanna punch them in the face.

After 26 years it doesn’t bother me. People simply don’t understand how truly difficult and sensitive managing your blood sugar is; how having a test, an anxious day or getting the flu can cause a fluctuation in your sugars.
Your words have power. Use them wisely.

- Unknown
What do you think this person’s A1c is?
• A. 13.5%
• B. 6.4%
• C. 9.6%
• D. 6.9%
Which person is appropriate for insulin pump use in the hospital?

A. Patient with hx of T1DM, on legal psychiatric hold that came to the ER after attempted overdose of Humalog.

B. 79-year old female with a history of T2DM, admitted for observation after a trip and fall at home without LOC

C. 21-year old female admitted to MICU with DKA precipitated by failure to realize that insulin pump was not charged and had not been infusing for > 12 hours

D. A 33-year old non-verbal male that uses an insulin pump at home, which is managed by his parents and/or his caregivers; parents and caregivers are not currently present.
Person with diabetes is eating 30 carbs; BG before meal is 240.

Settings in pump as follows:
IC ratio: 1:15
Correction factor: 1:70
BG goal: 100

Calculate the dose.
- A. 5 units
- B. 3.5 units
- C. 7.25 units
- D. 4 units
Having diabetes is like getting a masters degree in the *Art of Diabetes*, even when it wasn’t your program of study.

Pretend you were forced to major in music, but it wasn’t your calling. It’s trying to make peace with an art-form to learn it’s ebbs and flows when it wasn’t what you were meant to be expert in.

I can appreciate music, but some might say I’m tone deaf. Diabetes is like that. Some days you are better at it, but other days you are tone deaf and ignore the signals and the blood sugars have you dancing all over the place out of rhythm.
REFERENCES


