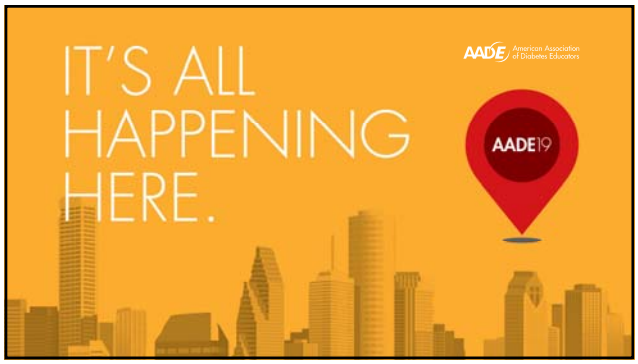

Interpreting pump and CGM Data: Navigating the Maze

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- Notice of Requirements For Successful Completion
  - Please refer to learning goals and objectives
  - Learners must attend the full activity and complete the evaluation in order to claim continuing education credit/hours
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  - Presenter: Eileen Egan- nothing to disclose
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Learning Objectives

- List at least 3 advantages of utilizing insulin pump and continuous glucose monitoring (CGM) to mitigate glycemic variability
- Identify how to evaluate reports for dangerous glycemic excursions
- Through use of case study, identify impact of hemodialysis, peritoneal dialysis and gastroparesis on glycemic variability

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Diabetes Management

- Technology has changed the way we administer medication, evaluate glycemic patterns and guide our patients towards being self-directed
  - Pumps: traditional, tubeless, automated
  - CGMs: real time, continuous, implantable

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Data Overload

- Abundance of data; real-time and continuous
- Multitude of software systems and cloud based systems collecting and evaluating data
  - Allows for more informed decisions
    - Able to make more targeted adjustments
    - Strategize, problem solving
    - Patient empowerment
  - Increased touch points with patients
    - Remote monitoring

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Advantages of Current Technology

- Minimize hypoglycemia
  - Alerts, alarms, trending arrows
- Minimize post-prandial hyperglycemia
  - Ease of evaluating post meal excursions
- Minimize prolonged hyperglycemia
  - Alerts, alarms, trending arrows
- Maximize time in range
  - Looking beyond the A1C

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Minimize Hypoglycemia

- Identify hypoglycemia, start with nocturnal
- Evaluate what precipitated/preceded the hypoglycemia
  - Adjust carb ratio and correction
  - Adjust basal rate
- Review appropriate treatment

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Minimize Post-prandial excursions

- Review carb counting
- Review nutrient components of the meal
- Review timing of meal bolus
- Review timing of correction bolus
- Adjust carb ratio and correction

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Minimize Prolonged Hyperglycemia

- Identify causality
  - Missed bolus
  - Inaccurate carb counting
  - Bolusing after eating
  - Medications
  - Complication, coexisting conditions
  - Nutrient complexity of meal
    - Extending bolus/micro bolus

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Maximize Time in Range

- Set personal glycemic targets
  - Pre and post meal
  - A1C
- Minimize glycemic variability
  - Reducing hypoglycemia and hyperglycemia
- Reduce risk for complications
  - Endothelial dysfunction
  - Inflammatory markers

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The case of Mrs. K

- A1C >8%
- Extremely frustrated, doing everything right
  - Carb counting
  - Bolusing
  - exercising
- Type 1 diabetes for 20 years
- On a pump

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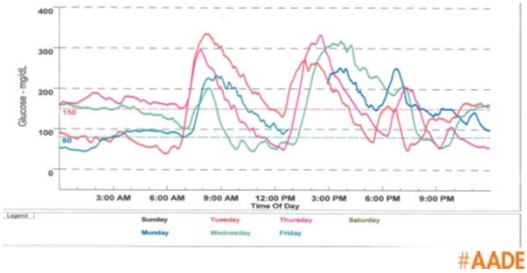
CGM



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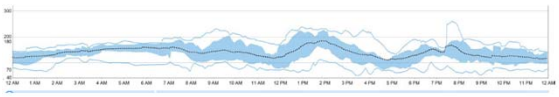
CGM……..after



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The case or Mr. D

- Hemodialysis 3 x week: Tuesday, Thursday, Saturday from 7p-10p
  - His A1C is 6.2% but his glucose is frequently > 200 mg/dl in your office
  - He takes Toujeo 10 units before bed and Humalog 6 units before meals
  - He eats dinner before going to dialysis
  - The dialysis nurse call reporting hypoglycemia during dialysis
  - He checks once or twice a day and isn't interested in doing more because the numbers are always the same

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Hemodialysis

- Hyperglycemia
  - May be related to secondary hyperparathyroidism and Vitamin D deficiency may impair insulin sensitivity
- Hypoglycemia
  - "Burn out diabetes"
  - Malnutrition, protein wasting, gastroparesis
  - Clearance of endogenous insulin is prolonged
  - Decrease nephron mass and kidney function lead to decreased renal gluconeogenesis
  - Accumulation of uremic toxins leading to insulin sensitivity

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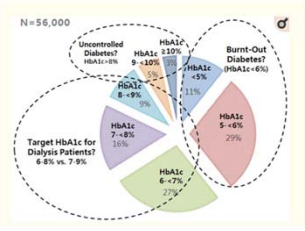
Average A1C of Dialysis Patients



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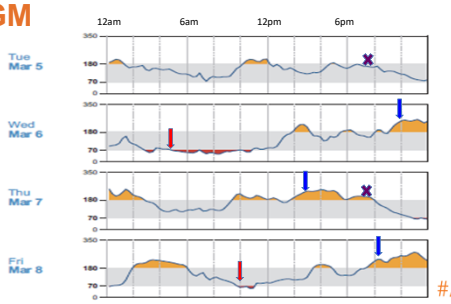
Rhee, et al. (2015) Updates on the management of diabetes in dialysis patients. Semin Dial. (27)2: 135-145.

CGM



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Collaborative plan with the Diabetes Educator

- Consistent carb intake at meals
  - No carbs, no prandial bolus
  - Educate on use of correction bolus
- On non-dialysis days
  - Continue current Toujeo dose/ change to shorter acting basal
  - Increase Humalog before meals
- On dialysis days
  - Decrease/ change Toujeo
  - Decrease Humalog before dialysis

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The case of Mr. A

- On continuous abdominal peritoneal dialysis (CAPD) for the past 3 months
  - A1C is 9%
  - He is on Tresiba before bed and Novolog before meals (~2 meals daily, feels full all the time)
  - He reports frequent night sweats and feeling restless overnight
    - Insulin doses have not been adjusted since starting dialysis
  - His bed time snack is ice cream, cookies or chips

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Continuous abdominal Peritoneal Dialysis: what is it?

- A mixture of dextrose, salt, & minerals are dissolved in water= dialysis solution
- Solution is placed in abdominal cavity via a catheter
- Peritoneal membrane allows waste & extra fluid to pass from the blood into the dialysis solution
- The solution is then drained from the abdomen
- Each cycle of draining & filling is called an exchange
- The time the solution remains in the abdomen between exchanges is called the dwell time

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Types of Peritoneal Dialysis

Continuous ambulatory peritoneal dialysis (CAPD)

- Patient performs exchanges manually
- Process uses gravity to fill & empty the abdomen
- Every 4-6 hours during the day
- Overnight dwell of 8-10 hours

Continuous cycler-assisted peritoneal dialysis (CCPD)

- A machine fills & empties the abdomen
- Cycles 3-5 times overnight
- The morning exchange dwells the entire day
- Sometimes an exchange is done during the day

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Factors Affecting Fluid & Waste Removal

- Number of daily exchanges & dwell time
  - When fluid first enters the abdomen it draws waste rapidly, this slows over hours
  - More exchanges with shorter dwell times= more waste removed
- Concentration of dextrose in dialysate solution
  - 1.5%, 2.5%, 4.25% dextrose concentrations & Extraneal (7.5% icodextran)
  - Higher concentrations increase efficiency of exchanges

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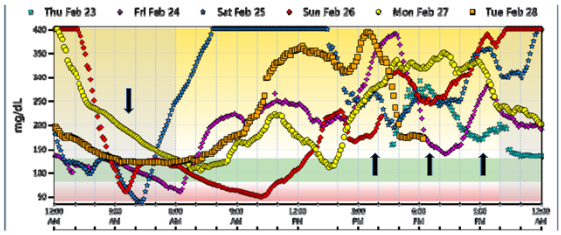
CGM: Mr. A; CAPD



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Collaborative Plan with the Diabetes Educator: Mr. A

- Minimize hypoglycemia
  - Reduce Tresiba dose and change to a shorter acting basal
- Reduce post-prandial hyperglycemia
  - Alternating dextrose solutions of 2.5% and 4.5% causing hyperglycemia and variability
  - +4 units with 2.5%, + 6units with 4.5%
- Encourage dietary modification
  - Meet with RD
  - Offer lower carb, lower calorie choices

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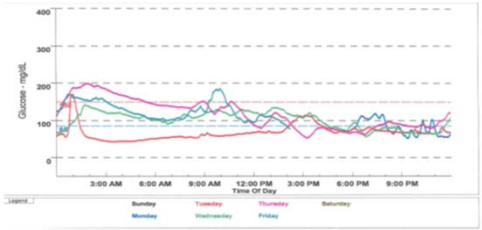
CGM: Mr. A: miracles do happen



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The case of Mrs. S and Mr. P

- Both are on continuous cycler-assisted peritoneal dialysis (CCPD)
  - Mrs. S is on a pump
  - Mr. P is on multiple daily injections
- Both are experiencing
  - Nocturnal hyperglycemia
    - Basal doses were increased
  - Daytime hypoglycemia
    - Too much basal

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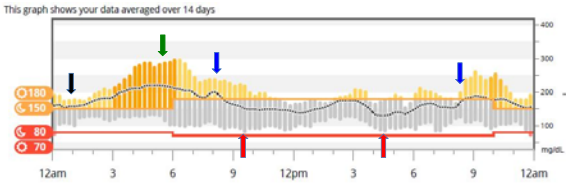
CGM: Mrs. S; CCPD



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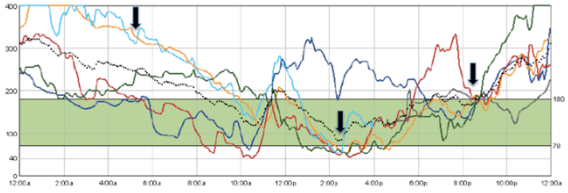
CGM: Mr. P; CCPD



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Collaborative Plan with the Diabetes Educator

Mrs. S

- Increase basal rate from 12a-8a
- Reduce basal rate from 8a-8p
- Tighten carb ratio for dinner

Mr. P

- Change Tresiba to a shorter acting basal and reduce dose
- Add evening NPH
- Assist with alternative breakfast choices

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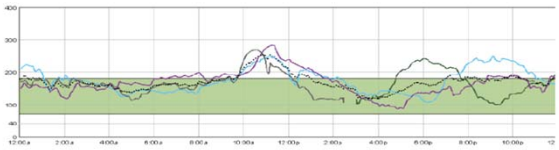
CGM: Mr. P



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The case of Ms. J

- 26 y/o, diagnosed with Type 1 diabetes at 11 months
- Reporting significant glycemic variability with a recent severe low after a meal
- A1c >8%, on multiple daily injections
- Otherwise feeling well
- After ruling out many potential causes, autonomic neuropathy suspected
  - Sent for a gastric emptying study, diagnosed with gastroparesis

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Gastroparesis

- Slowed/ delayed gastric emptying
  - Direct effect on glycemic variability
  - Impacts quality of life
  - Impacts absorption of nutrients
- Not enough large clinical trials to indicate prevalence
  - Seems to be more common in T1 DM
- Evaluate patients with long duration of DM and/or with other neuropathies
- May be clinically silent: severity of symptoms does not always correlate w/ severity of gastroparesis
- Acute changes in glucose can alter gastric emptying and/or be symptoms of altered gastric emptying

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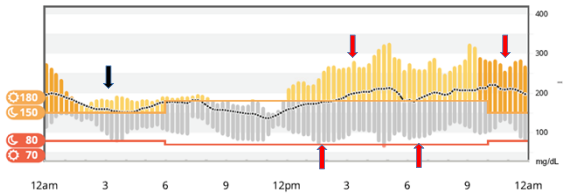
CGM: variability related to meals



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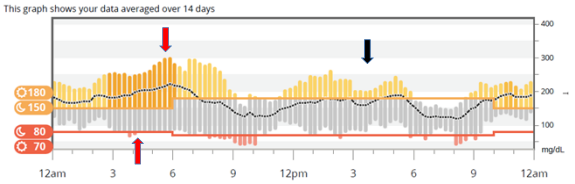
CGM: Night time eating



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Collaborative plan with the diabetes educator

- Small, frequent meals
  - Avoidance of high carb, high fat, high fiber
- Insulin pump therapy
  - Extended bolus option
  - Micro bolusing (with pump or injections)
- Use of personal CGM
  - Use of directional arrows to aide in decision making

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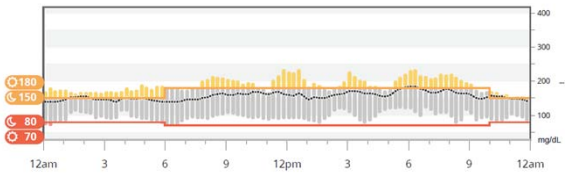
CGM: Ms. J…….success



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The case of Mr. H

- Type 1 DM for 10 years
- A1C 8.5%
- Ferry boat captain
  - Recent severe hypoglycemic event while driving the boat
  - Job requiring A1C <8%

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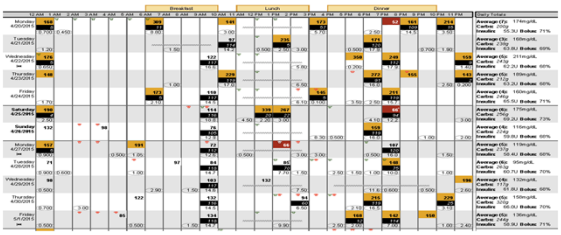
Pump download: what is happening ?!?!



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What's the Goal?

- Never assume
  - Start with the basics
  - Forensic nursing
- Review data with the patient
  - Engage in cause and effect
  - Utilize shared decision making and motivational interviewing
- Foster self-directed behavior
  - Ultimately, a process of self-management
  - Provide continued support

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References

- Rhee, et al. (2015) Updates on the management of diabetes in dialysis patients. Semin Dial. (27)2: 135-145.

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