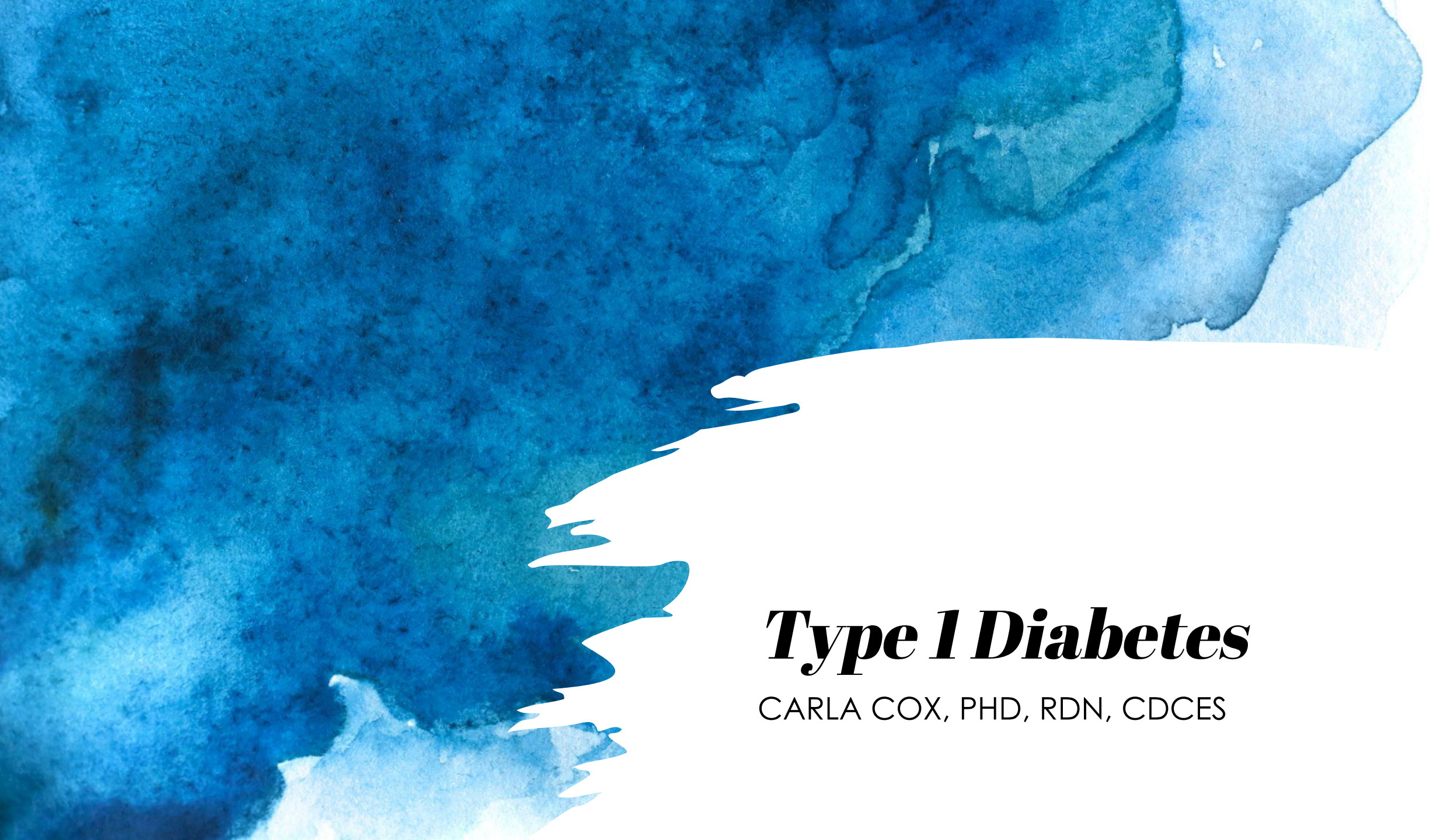


Type 1 Diabetes

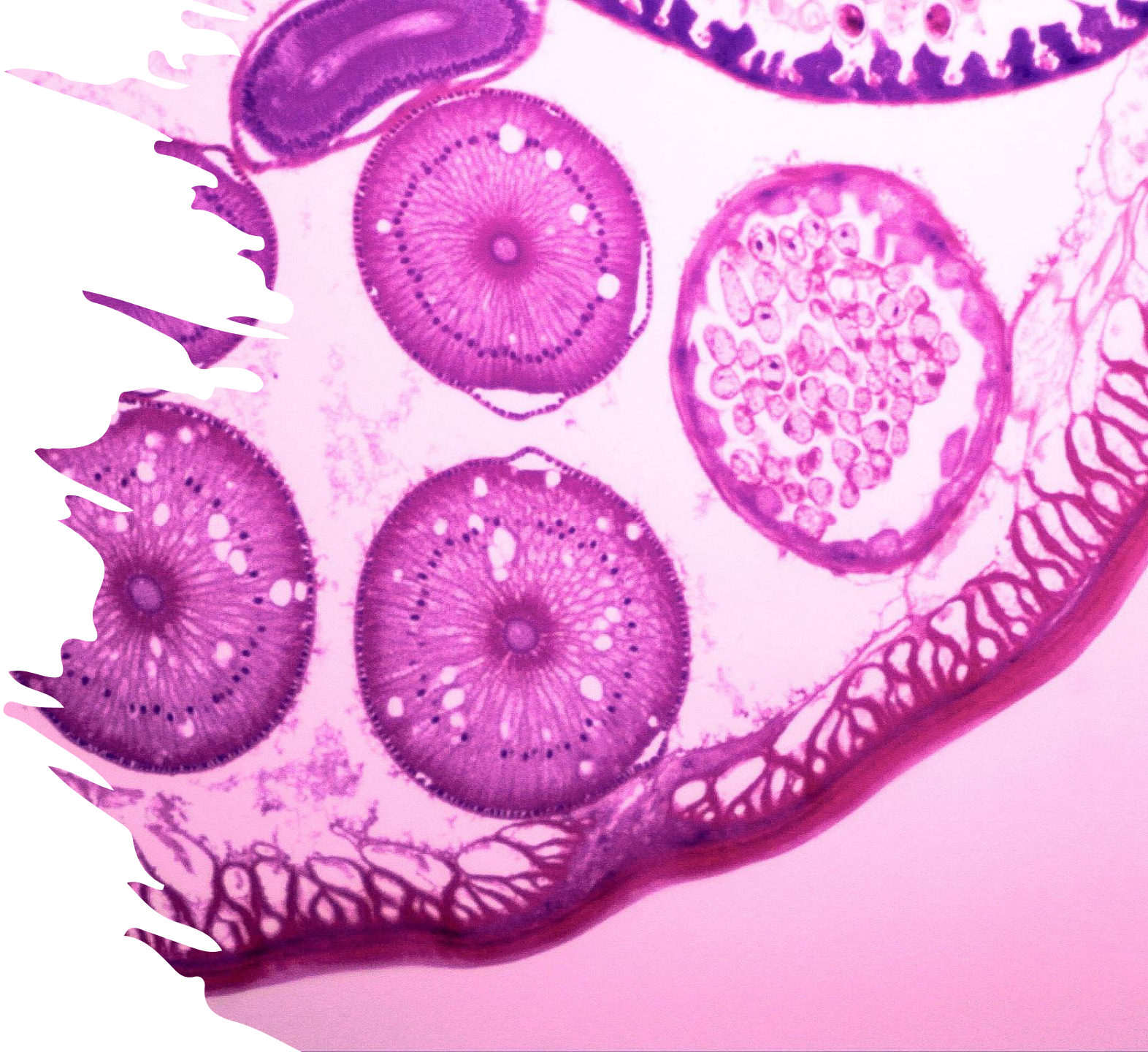
CARLA COX, PHD, RDN, CDCES

Let's talk about what it is!

- Auto immune chronic disease
- No cure at this time (recent drug to delay the onset in identified populations)
- NOT caused by being overweight nor eating too many sweets
- Requires the administration of insulin
- 50% of the diagnosis of type 1 are adults
- It's not rare – approximately 300,000 persons younger than 20 years of age in the US (About 1.5 million persons of all ages in the US – 8.4 million in the world)

Type 1 diabetes – the defect

- The beta cells of the pancreas are attacked – and their efficiency is weakened
- Less able to produce adequate insulin to cover the food that is eaten
- Insulin must be injected into the subcutaneous space and travel to the blood stream
- Inhaled insulin for meals is an option for some
- No oral agent



What do we discuss on diagnosis? It can be a bit overwhelming!

- Insulin
  - How to deliver – pens or syringes
  - How much to delivery and when
  - Timing of insulin delivery and frequency
- How to monitor – glucose meter and CGM
  - How many times do you check?
- What role does food play?
- What role does exercise play?
- What are the glucose goals? ("normal" is 70-99 fasting)
- What if you are outside that range?
- What happens if glucose is too low
  - Treat with glucose (how much and what?)
  - Treat with glucagon or baqsimi (what's that???)
- What about going to school?
- When to call!

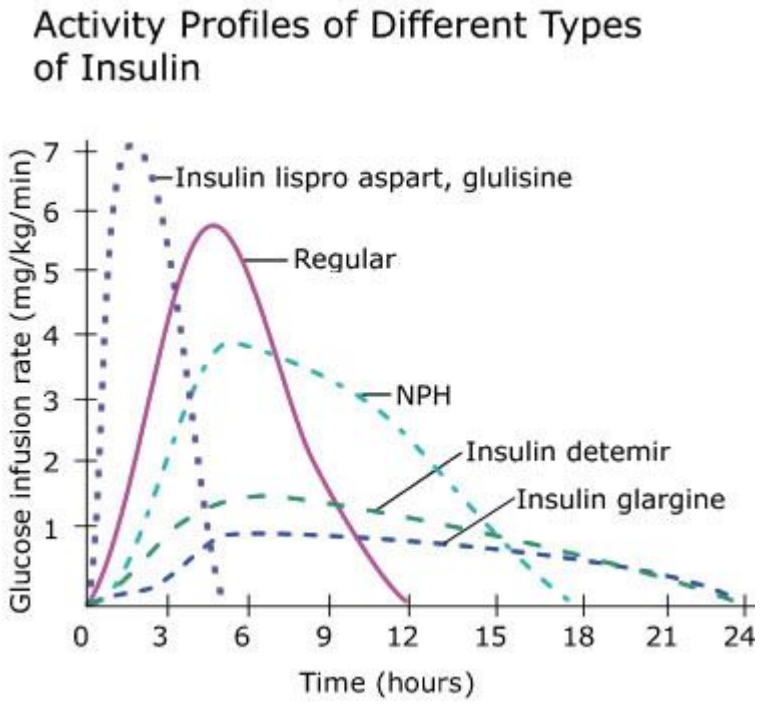
When we eat

- When we eat - a lot is happening!
- The digestion of food is slowed by an incretin hormone
- As the food is digested (particularly carbohydrate rich foods) the digestive systems turns it into glucose
- Glucose travels through the blood and must have insulin to effectively enter the cells* of the body

*brain and liver are exceptions

Insulin

- In the human body with an active pancreas, the insulin is produced on demand – in and out in a few minutes
- With subcutaneous insulin administration – it is slow to be absorbed and to exit

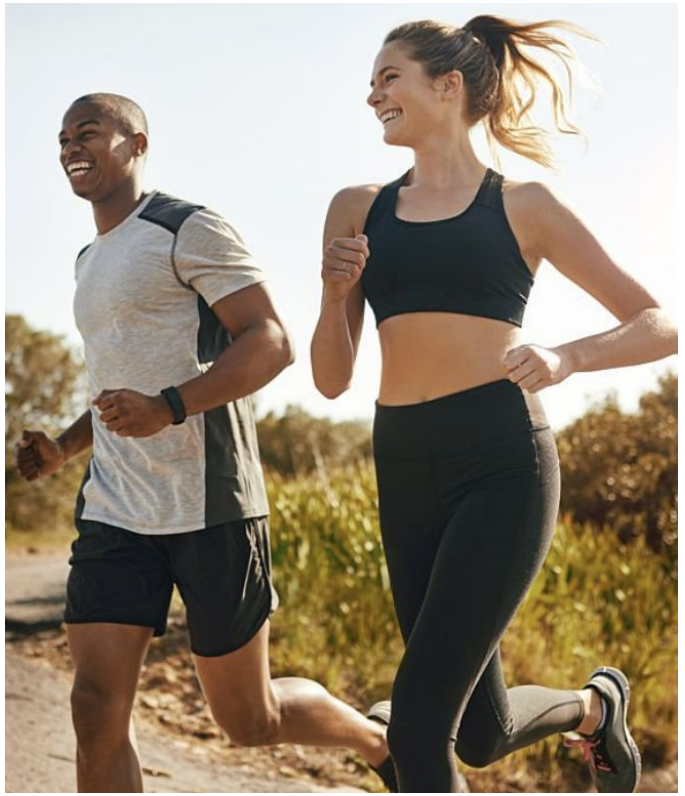


Timing of insulin delivery

- This is the tricky part –
  - If you inject insulin after a meal, you get high glucose and then a slow return to "normal" values
  - If you inject insulin right before – the match is still not perfect
  - If you inject 20 minutes prior it is a better match – however……
  - If glucose is high prior to a meal (like 300 mg/dl) it takes longer to achieve target….
  - And….different meal combinations break down differently so timing changes with fats, proteins and complex carbohydrates makes even a bigger challenge

What else can impact timing of insulin

- Exercise -
  - High intensity – raises glucose
  - Moderate intensity – lowers glucose
  - Interval training can do both
- Stress – generally raises
- Illness – generally raises

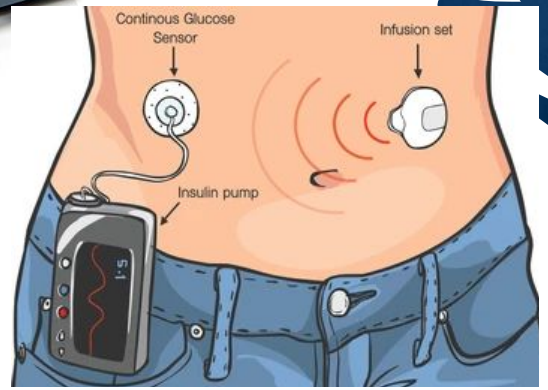


Scenario

- Your glucose is 325 mg/dl
- You are about to eat 77 grams of carbohydrate
- Your insulin Rx is 1 unit for every 11 grams of carbohydrate and 1 unit for every 50 points above 120 mg/dl
- You are going to play soccer in two hours
- How much insulin do you give and when?

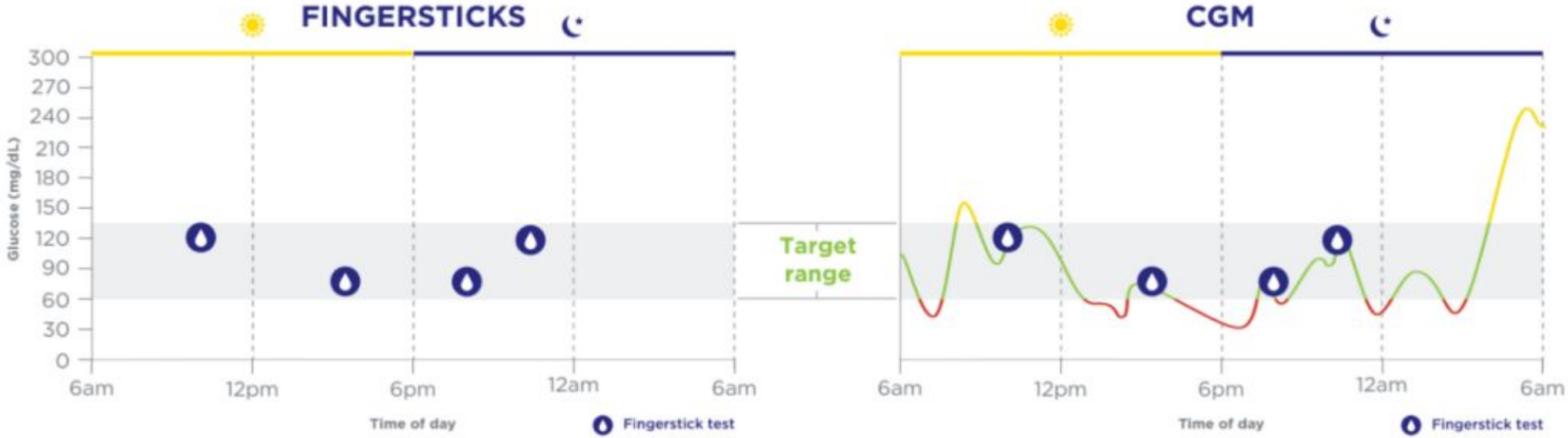
Ways to administer insulin

- Injections – syringe or pen
- Insulin pump with cannula
- Inhaled insulin



How do you get outcomes data

- Finger stick
- Continuous glucose monitor



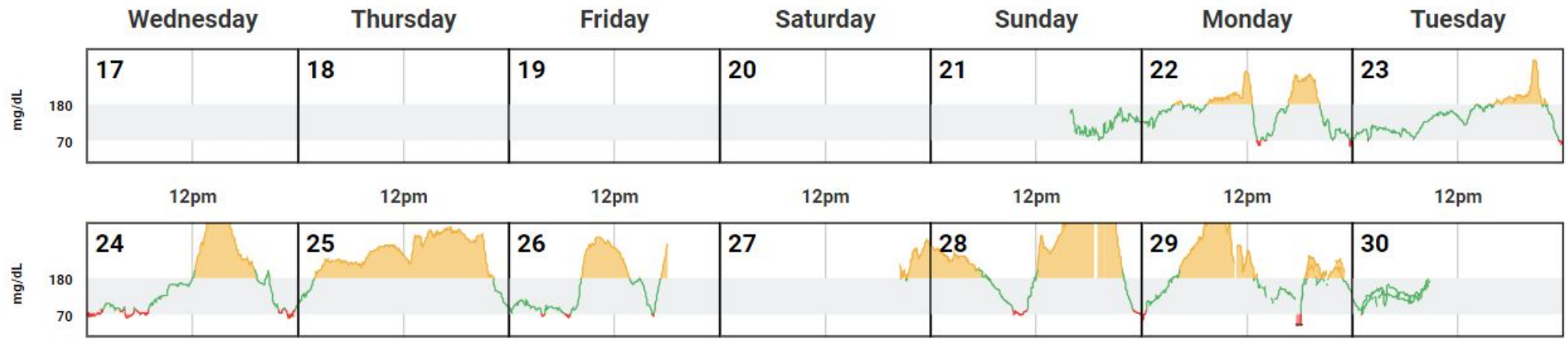
What results do we want to see

International standard is:

- 70-180 mg/dl 70 % or more of the time
- < 4% under 70 mg/dl
- <1% under 54 mg/dl
- <25% above 180 mg/dl

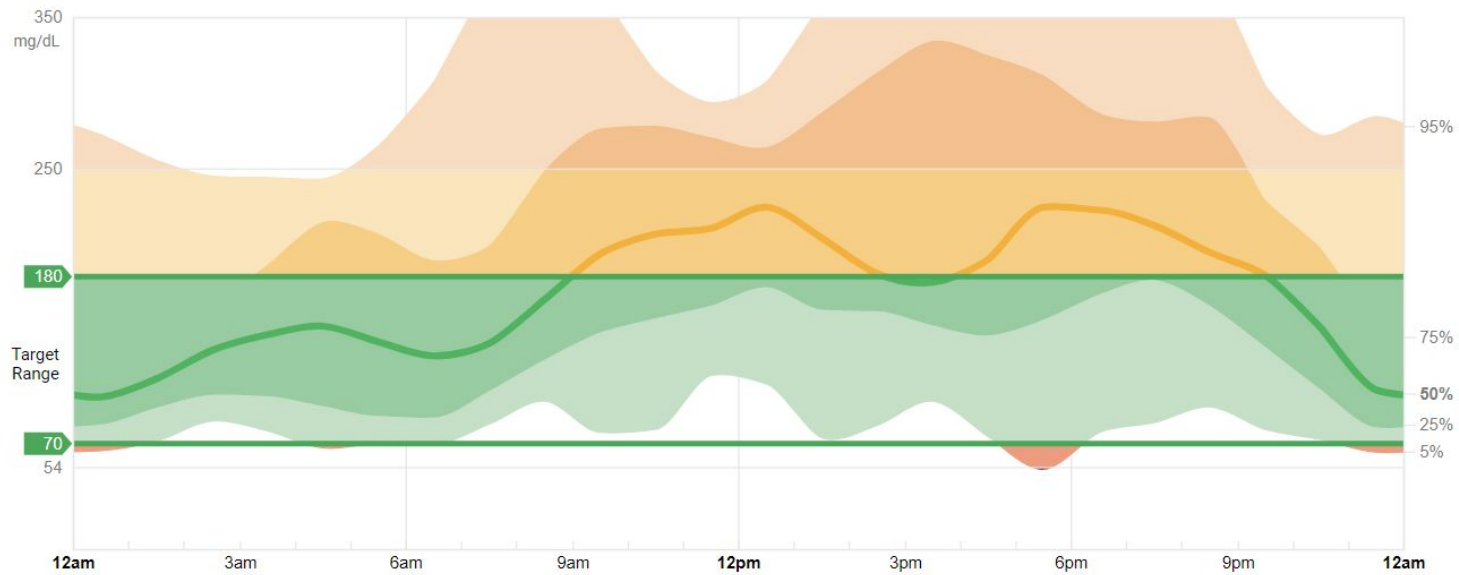
Daily Glucose Profile

Each daily profile represents a midnight-to-midnight period.



Ambulatory Glucose Profile (AGP)

AGP is a summary of glucose values from the report period, with median (50%) and other percentiles shown as if they occurred in a single day.



Time in Ranges

Goals for Type 1 and Type 2 Diabetes

Each 5% increase in the Target Range is clinically beneficial.
Each 1% time in range = about 15 minutes per day

23% Very High Goal: <5%		
22% High	45% Goal: <25%	
52% In Range Goal: >70%		
3% Low		
<1% Very Low Goal: <1%	3% Goal: <4%	

Target Range: 70-180 mg/dL
Very High: Above 250 mg/dL
Very Low: Below 54 mg/dL

Glucose Metrics

Average Glucose Goal: <154 mg/dL	183 mg/dL
GMI Goal: <7%	7.7%
Coefficient of Variation Goal: <36%	47.7%
Time CGM Active	92.0%

CAMP VIEWS OPTION

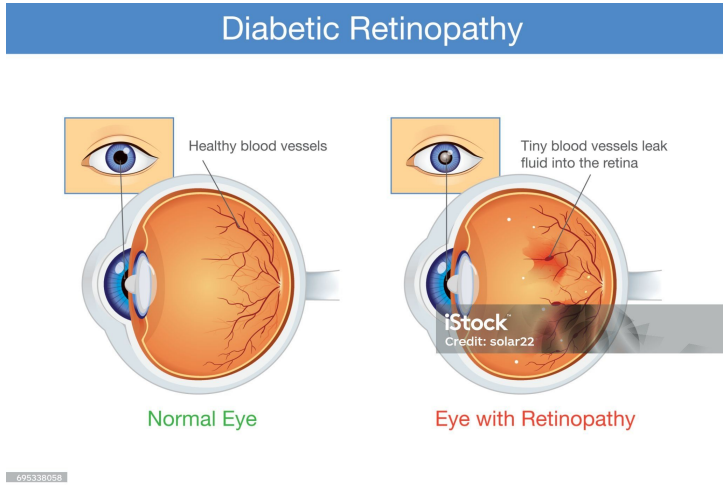
Why these standards?

- Low glucose
  - Unable to think clearly
  - Possible coma
  - Rare – but potential death

- High glucose
  - Unable to think clearly
  - Dry mouth
  - Potential weight loss (Diabulimia)
  - Nausea and vomiting
  - Potential – DKA
  - Long term complications
    - EVERYWHERE

High glucose over time

- Neuropathy
- Retinopathy
- Heart Disease
- Nephropathy
- Reduced V02
- Possibly reduced brain function
- Fatty liver
- ETC



What a crazy balancing act!

- 24 x 7
- 365 days per year
- Every year of life

- A day in the life
  - Wake up check glucose
  - Count carbohydrates, dose insulin, eat breakfast
  - Go to school
  - Low at 10 am
  - Eat something
  - High by lunch
  - Count carbohydrates, dose insulin, eat lunch
  - Afternoon track practice – eat before
  - Low 2 hours later – eat glucose you don't want
  - Head home and have a snack – count carbohydrates and dose
  - Head for dinner – count carbs and dose
  - Check glucose before bed – dose if needed

How is the dosing determined?

- Every persons is an “n” of one
- Certain formulas to start
- Work from there

Pumps and sensors to the rescue (with a knowledgeable medical team)

What is included in the pump/sensor system?

- Pump –
  - Omnipod – PODS, controller or PHONE and may link to a CGM (OP5)
  - Tandem – Insulin pump, reservoir, infusion set with tubing and may connect to a phone for optional bolus delivery and most likely connected to a CGM (control IQ)
  - Medtronic 780 G – Insulin pump, reservoir, infusion set with tubing and may connect to a phone for viewing and could be connected to a CGM (Guardian)
  - Ilet – Insulin pump, reservoir, infusion set with tubing, must be connected to a CGM
  - Twiist – new to the market. Insulin pump, reservoir, infusion set with tubing, dose through a phone app, connected with CGM (to be determined)

Psychological implications of this chronic disease

- Depression –
- Sense of loneliness (parents and children)
- Anxiety (fear or lows/fear of the future)
- Diabetes Distress

Consider challenges in life

- Adolescents and hormones – the shift in glucose values
- Adolescents – hanging out with friends and dosing interruptions
- Leaving home – the transition to making decision alone and with minimal or any support
- The challenges in adulthood
- What about pregnancy
- Chronic complications can arise
- Getting older….

Case study

- Jonathan is an 18 year old with type 1 who is leaving for college in the fall
- He has had lots of parental support for years but now needs to consider living alone
- He will be living in the dorm and has an assigned roommate
- What are some tips you could give him to help with this transition?

Case Study

- Sara is an 8 year old that has had type 1 diabetes since she was 2 years old
- She lives with her parents and 4 siblings and is the only one in her family with type 1 diabetes
- She feels alone and isolated

- What can you suggest as a friend of the family?

What can be done?

- Support groups online and in the community
- Recreation and camps for children and teens
- National websites for information and encouragement
- Facebook…yes and no

Camps offer

- A safe place to recreate
- A break for parents and caregivers
- A place for further knowledge
- A place to NOT feel alone with this diagnosis

Before we close – type 2 diabetes and children

- A growing concern
- Most commonly diagnosed in adolescents
- Generally related to
  - Family history
  - Obesity
  - Sedentary lifestyle

Type 2 diabetes and adolescents

- Encourage activity
- Work with food choices
- Weight loss is key
- May require medication
  - Oral agents
  - Injectables (not insulin)
  - Possibly insulin

- Of note: Complications from hyperglycemia at this age are earlier than adults with type 2 diabetes
- Complications are more aggressive and can have a negative impact for life

Questions?